



Award Documents

19F-PMAC2-0904

Pueblo Mechanical and Controls, LLC

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4/5/18 EH



NOTIFICATION OF AWARD LETTER

August 30, 2019

Sent this day via email to robcc@pueblo-mechanical.com

Rob Carr, Contracts Manager
Pueblo Mechanical and Controls, LLC
6771 E. Outlook Drive
Tucson, AZ 85756

Congratulations, Pueblo Mechanical and Controls, LLC's response has been awarded a contract under JOC RFP 19F-0808. Attached is a copy of the Mohave signed *Offer and Acceptance Form*. Important notes and action items regarding the award are listed on the following pages. **Some action items contain important deadlines noted in bold font. Be sure to meet the requests and/or requirements on or before the deadlines noted.**

Your organization is bound by the terms of this contract; **only items specifically requested in this solicitation and awarded in your response to this solicitation will be authorized/allowed. Your award is for Division 23 Heating, Ventilation and Air Conditioning.**

Advise your Mohave customers to make purchase orders out to Pueblo Mechanical and Controls, LLC. In the event you receive a purchase order from a member that does not contain the "MESC REVIEWED" stamp, it should be faxed to (928-718-3232), or emailed (orders@mesc.org) to Mohave for review.

Do not perform any work or provide any products until you receive an "MESC Reviewed" purchase order.

We highly recommend having your staff review our vendor information pages at (<http://www.mesc.org/resources-brochures>) to learn more about working with Mohave. Especially helpful is the Vendor Handbook.

The procurement file for JOC RFP 19F-0808 shall be made available for public inspection on September 3, 2019.

Please check all the entries on the contract record attached. You may make additions or revisions to the description (40 words or less), contact persons, contact information, or other information about your contract. Email back any changes as soon as possible to mike@mesc.org.

Your contract number is 19F-PMAC2-0904 and will take effect on September 4, 2019.

If you have any questions regarding your new contract, please call me at (928) 718-3203. We look forward to working with you and your company in the future.

A handwritten signature in black ink, appearing to read 'Michael Nentwig', with a long horizontal line extending to the right.

Michael Nentwig, CPPB
Contract Specialist I

NOTES ON AWARD FOR: Pueblo Mechanical and Controls, LLC

- Please remind the member of their responsibility to independently verify that quotations and purchase orders comply with the terms of the award of a contract or procurement. This responsibility is set by rule and statute and cannot be changed by Mohave. Members can go to (service.mesc.org/PVF/plist.php) to assist in meeting this due diligence responsibility.
- Financial information included under Tab 2 of your response will be kept confidential.
- All products must be priced using contract pricing approved by Mohave.
- All quotes shall include your contract #19F-PMAC2-0904.
- **Promotional Pricing (temporary pricing reductions):** Your contract includes terms and conditions that allows your firm to offer temporary pricing reductions. A Promotional Pricing Offer allows you to provide products and services to members at a reduced cost for a limited time basis. Promotional pricing may increase your contract usage and exposure to members. Mohave encourages promotional pricing under the awarded contract to provide additional value to members. Promotional pricing requests are typically reviewed and approved the same day as submitted. Some reminders regarding pricing reductions:
 - Promotional Pricing may be offered at any time during a contract and shall become effective upon notice of acceptance from Mohave.
 - Promotional Pricing (e.g., quantity discounts, time sensitive offers, bundles) must apply to all Mohave orders of similar size and scope.
 - Promotional Pricing limited to a single member are not acceptable.
 - Special time-limited reductions are permissible under the following conditions: 1) reduction is available to all members equally; 2) reduction is for a specific time period, normally not less than thirty (30) days; 3) original price is not exceeded after the time-limit; and 4) Mohave has approved the new prices prior to any offer of the prices to a member.
- Michael Carter, CPPB will be the Contract Specialist assigned to your Mohave contract. Send requests for pricing updates or contractual inquiries to Michael Carter, CPPB - michael@mesc.org after the contract effective date of September 4, 2019. *All future pricing updates must be electronic. Updates on the original Excel workbooks are preferred. Similar formats in Word or PDF are acceptable.*
- Do not provide any goods/services until you receive a Mohave reviewed purchase order.
- Quick payment discounts must be approved by Mohave before being offered to members and must be available equally.
- Order cycle overview:
 1. Member forwards purchase orders to Mohave. Vendor is Pueblo Mechanical and Controls, LLC.
 2. Mohave reviews and emails member order with "*MESC Reviewed*" stamp, to Pueblo Mechanical and Controls, LLC.
 3. Pueblo Mechanical and Controls, LLC provides product/services.
 4. Pueblo Mechanical and Controls, LLC invoices member.
 5. Member pays Pueblo Mechanical and Controls, LLC.
 6. Pueblo Mechanical and Controls, LLC sends Usage and Reconciliation Report to Mohave.
 7. Pueblo Mechanical and Controls, LLC remits administration fee monthly, based on invoices paid.
 8. Mohave audits selected purchases.
- Upon award of your contract, you may request to use estimating software other than *RS Means Costworks*. The estimating software shall use *RS Means pricing data* and meet all of the requirements for pricing under this IFB. Estimating samples shall be provided to Mohave for review prior to Mohave's acceptance of estimating software to be used under an awarded contract. Mohave shall make the final determination if estimating software meets all the requirements and is acceptable. Contract vendor agrees that if proposed alternate estimating software does not continue to meet the requirements of the RFP/IFB, contract vendor shall immediately switch to *RS Means Costworks* as the estimating software under an awarded contract.

REQUIREMENTS/ACTION ITEMS FOR THE AWARD:

NOTES ON AWARD FOR: Pueblo Mechanical and Controls, LLC

- You agreed to provide a Reconciliation Report detailing activity under the contract, and payment for Mohave administration fees for invoices paid in the previous month. Your report is due on the 20th of each month. **Mohave's Audit Specialist will contact you and provide you with a sample report, based on reports provided under contract 14G-PMAC2-0904.**
- If no invoices were paid under the contract in the previous month, you may send an email to adminreport@mesc.org advising of no sales to report for the month.
- Because you have an existing Mohave contract, we want to address how to properly report invoices on your monthly reconciliation reports because it may be necessary to submit two separate reports until all old contract purchases are closed:
 - Line item purchase orders that remain open under 14G-PMAC2-0904 should be reported on 14G-PMAC2-0904 reconciliation reports.
 - Blanket purchase order invoices with a ship date prior to, or on September 3, 2019 should be reported on the 14G-PMAC2-0904 reconciliation report.
 - New purchase orders issued under the 19F-PMAC2-0904 contract should be reported under 19F-PMAC2-0904 reconciliation reports.
 - Blanket purchase order invoices with a ship date after September 3, 2019 should be reported on the 19F-PMAC2-0904 reconciliation reports.
- Administration fee payments should be mailed to:

Mohave Educational Services
625 E. Beale St.
Kingman, AZ 86401
- In order to assist members with new contract award notices, Mohave will be releasing your contract award information to the members prior to September 4, 2019. Information regarding your contract award will be posted to our website and will be made available in our product vendor finder. Pricing from your awarded contract will also be made available to our members. All of this information will be accessible by our members before September 4, 2019. You may provide quotes to members for this contract. However, it will be your responsibility to inform members the contract is not effective until September 4, 2019, and members should not be processing purchase orders until that date. Acting on purchase orders (delivering products or services) prior to September 4, 2019 **is a violation of the contract**. Please ensure that your staff is aware of the effective date September 4, 2019, in order to avoid contract confusion.
- We feature marketing information about your current contract in the product vendor finder on our website. Please visit our website (www.mesc.org) and go to the "All Products/Vendors" under the "Contracts & Solicitations" menu. Find your company from the list and click on your name. Once on your company information, review the "About Vendor" section of the "Overview." Confirm in writing if that information is still accurate, or if changes need to be made. Mohave reserves the right to edit information for content or length. **Email this information to mike@mesc.org no later than September 20, 2019.**

Technical Proposal – Offer and Acceptance Form
(Place after Tab 1a)

RFP 19F-0808

Job Order Contracting for Various Construction Trades

To Mohave Educational Services Cooperative, Inc.:

The undersigned hereby certifies understanding and compliance with the requirements in all terms, conditions, specifications and amendments. Offeror further agrees to furnish materials and/or services in compliance with all terms, conditions, specifications and amendments in the solicitation and any written exceptions in the offer.

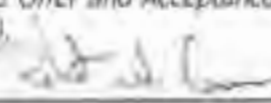
Federal Employer Identification Number 86-1027390

Company Name Pueblo Mechanical & Controls, LLC

Address 6771 E Outlook Drive City Tucson State AZ Zip 85756

Telephone Number 800.840.9170

The *Offer and Acceptance Form* should be submitted with a signature of the person authorized to sign the proposal. The person signing the proposal shall initial erasures, interlineations, or other modifications in proposal. Failure to sign the *Offer and Acceptance Form*, or to make other notations as indicated, may result in rejection of proposal.

Authorized Signature 

Printed Name Rob Carr Title Contracts Manager

Primary Email robcc@pueblo-mechanical.com Alternate email N/A

*Note: The primary email address will be used for all communication from Mohave regarding your response to this solicitation. Provide an alternate email address that will be used **only** if the primary email address is not valid.*

The contract vendor shall not commence any billable work or provide any material or service under this contract unless and until contract vendor receives a purchase order with Mohave's review noted.

Acceptance of Offer and Contract Award (Mohave Only)

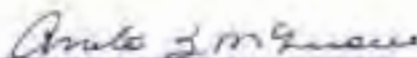
Your Proposal is Hereby Accepted:

As an awarded contract vendor, you are now bound to sell the materials and/or services offered to and accepted by Mohave in accordance with the solicitation, including all terms, conditions, specifications, amendments and any accepted written exceptions.

This contract shall be referred to as Contract Number 19F-PMAC2-0904

Awarded this 30 day of August 2019.

This contract shall be effective the 4 day of September 2019.



Anita S. McLemore, C.P.M., Executive Director
Mohave Educational Services Cooperative, Inc.



Date: 8/30/19

To: Anita S. McLemore, C.P.M., Executive Director

Through: Nancy Colbaugh, CPPB, Contracts Manager

From: Michael Nentwig, CPPB, Contract Specialist I

Subject: Award Recommendation for JOC RFP 19F-0808, Job Order Contracting for Various Construction Trades

On August 8, 2019 Mohave received thirteen responses to JOC RFP 19F-0808. Twelve were determined to be acceptable for further consideration after the evaluation of technical proposals. One response did not provide all the required information and was considered non-responsive.

The offers were evaluated using the criteria set forth in the solicitation. The following is a summary of the final scores utilizing the Heisman method of ranking:

General Contracting Divisions 1 – 49 Heisman Ranking	Mike Nentwig	Michael Carter	Nancy Colbaugh	Jeff Bohnenkamp	Phil Allred	Average Rank
GCON, Inc.	2	1	1	1	1	1.20
SD Crane Builders, Inc.	1	2	3	3	2	2.20
SDB, Inc.	3	4	2	2	3	2.80
Caliente Construction, Inc.	4	3	4	5	5	4.20
McCarthy Building Companies, Inc.	5	5	5	4	4	4.60

Details for the recommended awards are as follows for Divisions 1-49 General Contracting:

- GCON, Inc. was the number one ranking offer for Division 1- 49 General Contracting services. They offered a full service general contracting management of all projects. They oversee the entire construction process with their in-house staff and with the use of qualified subcontractors. UPB, and Open Book pricing methodologies were offered along with maintenance services and extended warranties. GCON, Inc. has an aggregate bonding capacity of \$90 Million and holds a current B-1 Arizona Registrar of Contractors license.
- SD Crane Builders, Inc. was the number two ranking offer for Division 1 – 49 General Contracting services. They offered general contracting and construction services, including new buildings, renovations, remodels and building improvements. UPB, and Open Book pricing methodologies were offered along with design and engineering services. SD Crane Builders, Inc. has an aggregate bonding capacity of \$25 Million and holds a current B-1 Arizona Registrar of Contractors license.
- SDB, Inc. was the number three ranking offer for Division 1 – 49 General Contracting services. They offered complete construction and construction management services. Pre-construction services include cost estimating, site investigation, LEED analysis, constructability and value engineering. UPB, and Open Book pricing methodologies were offered along with design and engineering services. SDB, Inc. has an aggregate bonding capacity of \$50 Million and holds a current A and B-1 Arizona Registrar of Contractors license.

JOC RFP 19F-0808 Award Recommendation

- Caliente Construction, Inc. was the number four ranking offer for Division 1 – 49 General Contracting services. They offered complete contract management services that include existing conditions analysis, scope definition, procurement planning, project schedule development and management. UPB, and Open Book pricing methodologies were offered. In-house design and engineering services were not offered but can be provided through the use of a qualified subcontractor. Caliente Construction, Inc. has an aggregate bonding capacity of \$75 Million and holds a current A, B and B-1 Arizona Registrar of Contractors license.
- McCarthy Building Companies, Inc. was the number five ranking offer for Division 1 – 49 General Contracting services. They offered construction and contraction management services. They have a local staff of over 796 craft workers and offered the following self-performed services to include solar, mechanical, electrical, concrete, plumbing, civil engineering and carpentry. UPB, and Open Book pricing methodologies were offered. In-house design and engineering services were not offered but can be provided through the use of a qualified subcontractor. McCarthy Building Companies, Inc. has an aggregate bonding capacity of \$6 Billion and holds a current A, B, and B-1 Arizona Registrar of Contractors license.

Plumbing Division 22 Heisman Ranking	Mike Nentwig	Michael Carter	Nancy Colbaugh	Jeff Bohnenkamp	Phil Allred	Average Rank
Midstate Mechanical, Inc.	1	1	1	1	1	1.00
Sun Mechanical Contracting, Inc.	2	2	2	2	2	2.00
McCarthy Building Companies, Inc.	3	3	3	3	3	3.00
Uni-Tech Mechanical	4	4	4	4	4	4.00

Details for the recommended awards are as follows for Division 22 Plumbing:

- Midstate Mechanical, Inc. was the number one ranking offer for Division 22 Plumbing job order contracting services. They provide complete turnkey plumbing projects from their offices in Phoenix and Tucson and field offices in Flagstaff and Yuma. As a value add, they provide 3-D modeling of projects allowing for the offsite prefabrication of plumbing systems. This reduces the impact to building operations and maximizing onsite work. System commissioning, preventive maintenance, and repair services were offered. Midstate Mechanical, Inc. has an aggregate bonding capacity of \$40 Million and holds a current B-1 and CR-37 Arizona Registrar of Contractors license.
- Sun Mechanical Contracting, Inc. was the number two ranking offer for Division 22 Plumbing job order contracting services. Value added services include the use of 3-D modeling and CAD to increase productivity. Members will have complete online access to all repair/service reports, work order history, and equipment logs. System commissioning, preventive maintenance, and repair services were offered. Sun Mechanical Contracting, Inc. has an aggregate bonding capacity of \$125 Million and holds a current B-1 and CR-37 Arizona Registrar of Contractors license.
- McCarthy Building Companies, Inc. was the number three ranking offer for Division 22 Plumbing job order contracting services. They provide complete plumbing projects, by conducting a “Pre-project Planning and Performance” meeting to identify goals, develop the schedule to meet the quality requirements and customer expectations. McCarthy Building Companies, Inc. is a national company that employ 796 local craft workers and can leverage additional support from four regional offices within a half a day of travel. McCarthy Building Companies, Inc. has an aggregate bonding capacity of \$6 Billion and holds a current A, B, B-1 and CR-37 Arizona Registrar of Contractors license.

JOC RFP 19F-0808 Award Recommendation

Heating, Ventilation and Air Conditioning Division 23 Heisman Ranking	Mike Nentwig	Michael Carter	Nancy Colbaugh	Jeff Bohnenkamp	Phil Allred	Average Rank
Midstate Mechanical, Inc.	1	1	1	1	1	1.00
Sun Mechanical Contracting, Inc.	2	2	2	2	3	2.20
McCarthy Building Companies, Inc.	4	5	3	3	2	3.40
Pueblo Mechanical and Controls, Inc.	5	3	4	4	4	4.00
HACI, Inc.	3	4	5	5	5	4.40

Details for the recommended awards are as follows for Division 23 Heating, Ventilation and Air Conditioning:

- Midstate Mechanical, Inc. was the number one ranking offer for Division 23 Heating, Ventilation and Air Conditioning job order contracting services. They can provide complete turnkey mechanical projects from their offices in Phoenix and Tucson and field offices in Flagstaff and Yuma. As a value add, they can provide 3-D modeling of projects allowing for the offsite prefabrication of HVAC systems. This reduces the impact to building operations and maximizing onsite work. System commissioning, preventive maintenance, and repair services were offered. Midstate Mechanical, Inc. has an aggregate bonding capacity of \$40 Million and holds a current B-1 and CR-39 Arizona Registrar of Contractors license.
- Sun Mechanical Contracting, Inc. was the number two ranking offer for Division 23 Heating, Ventilation and Air Conditioning job order contracting services. Value added services include the use of 3-D modeling and CAD to increase productivity. Members will have complete online access to all repair/service reports, work order history, and equipment logs. System commissioning, preventive maintenance, and repair services were offered. Sun Mechanical Contracting, Inc. has an aggregate bonding capacity of \$125 Million and holds a current B-1 and CR-39 Arizona Registrar of Contractors license.
- McCarthy Building Companies, Inc. was the number three ranking offer for Division 23 Heating, Ventilation and Air Conditioning job order contracting services. They provide complete mechanical projects, by conducting a "Pre-project Planning and Performance" meeting to identify goals, develop the schedule to meet the quality requirements and customer expectations. McCarthy Building Companies, Inc. is a national company that employ 796 local craft workers and can leverage additional support from four regional offices within a half a day of travel. McCarthy Building Companies, Inc. has an aggregate bonding capacity of \$6 Billion and holds a current A, B, B-1 and CR-39 Arizona Registrar of Contractors license.
- Pueblo Mechanical and Controls, Inc. was the number four ranking offer for Division 23 Heating, Ventilation and Air Conditioning job order contracting services. They can provide complete heating, ventilation and air conditioning projects from their offices in Phoenix and Tucson. This allows for quick response to customer emergencies. Pueblo Mechanical and Controls, Inc. can competitively access virtually all makes and models of equipment. System commissioning, preventive maintenance, and repair services were offered. Pueblo Mechanical Contracting, Inc. has an aggregate bonding capacity of \$45 Million and holds a current B-1 and CR-39 Arizona Registrar of Contractors license.
- HACI, Inc. was the fifth ranking offer for Division 23 Heating, Ventilation and Air Conditioning job order contracting services. They offered the ability to develop the most cost-effective HVAC systems through use of the design build / design assist process. They have fully automated fabrication facility and ample storage capabilities to provide "on-time" material deliveries. Repair services and maintenance service agreements were also offered. HACI, Inc. has an aggregate bonding capacity of \$80 Million and holds a current B-1 and CR-39 Arizona Registrar of Contractors license.

JOC RFP 19F-0808 Award Recommendation

Electrical Division 26 Heisman Ranking	Mike Nentwig	Michael Carter	Nancy Colbaugh	Jeff Bohnenkamp	Phil Allred	Average Rank
Rosendin Electric	1	1	1	1	1	1.00

Details for the recommended awards are as follows for Divisions 26 Electrical:

- Rosendin Electric was the number one ranking offer for Division 26 Electrical job order contracting services. They provided complete services for electrical projects including an engineering department with Arizona registered professional engineers. As a value add, Rosendin Electric capabilities include Building Information Modeling (BIM) that can electronically model a building to identify potential interferences between a building's utility and structural elements. Rosendin Electric has an aggregate bonding capacity of \$1.35 Billion and holds a current A, B-1, and C-11 Arizona Registrar of Contractors license.

The evaluation committee determined a single award is not advantageous to Mohave's members. The solicitation authorized multiple awards to meet the needs of Mohave's large number of various types of members located throughout Arizona. This is a statewide contract aimed at providing sources for job order contracting construction services for general contracting, plumbing, heating, ventilation and air conditioning and electrical. No single offer demonstrated the ability to effectively, and efficiently meet all our members' needs for new construction, renovation, remodel, remediation, installation of new equipment or systems, replacement, repair or equipment maintenance services.

Award is recommended to the least number of offerors determined necessary to meet the members' requirements. The decision was based upon considerations for the large number of members, diverse types of members, location of members throughout Arizona and members' past usage of similar contracts.

The criteria for selecting offerors for multiple contracts shall be based upon considerations for members' experience with existing general contracting, plumbing, heating, ventilation and air conditioning, and electrical services that include construction, renovation, design, emergency services, brand continuity for system replacement and future expansion. Awarded contract vendor's ability to provide for our large, diverse membership, geographic area(s) served, Mohave's past experience with contracts for similar product/services, and/or other relevant criteria.

None of the offerors recommended for award are on the United States General Services Administration's Excluded Parties List, or on the Arizona Department of Administration Excluded Parties List.

The current contracts under JOC RFP 14G-0808 expire on September 3, 2019. It is recommended the awards under JOC RFP 19F-0808 take effect on September 4, 2019.

It is the recommendation of the evaluation committee that contracts be awarded to Caliente Construction, Inc., GCON, Inc., HACI, Inc., McCarthy Building Companies, Inc., Midstate Mechanical, Inc., Pueblo Mechanical and Controls LLC., Rosendin Electric, SD Crane Builders, Inc., SDB, Inc., and Sun Mechanical Contracting, Inc. for Job Order Contracting for Various Trades.

Not acceptable for further consideration after initial evaluation

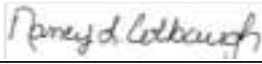
BWC Enterprises Inc. dba Woodruff Construction - The bonding capacity letter required by *Special Term and Condition 1.2. Bonding Capacity* was not included in the offer.

Not recommended for award

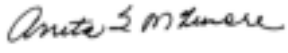
United Technologies Inc. dba UNI-TECH - The proposal received a lower score and a substantially higher coefficient than the three statewide offers recommended for award. The Division 22 Plumbing services included in the offer are provided by the higher scoring offerors recommended for award. There were no apparent price or additional services offered to substantiate award of this lower scoring proposal.

JOC RFP 19F-0808 Award Recommendation

Approval of the #19F-0808 award as recommended:

Signature: 
Nancy Colbaugh, CPPB
Contracts Manager

Date: August 30, 2019

Signature: 
Anita S. McLemore, C.P.M.
Executive Director

Date: August 30, 2019

DISCLAIMER

The data supplied below is based on your specific request(s) and is correct to the best of our knowledge as of the date and time it was extracted from our data files. The information is provided without personal research or analysis. The data is subject to change on a daily basis. You may obtain additional public records related to any licensee, including dismissed complaints and nondisciplinary actions and orders, by contacting the ROC directly. If this information is required for legal purposes, you may request an affidavit or certified copies for a fee as specified in [A.R.S. 32-1104A3 \(https://www.azleg.gov/viewdocument/?docName=http://www.azleg.gov/ars/32/01104.htm\)](https://www.azleg.gov/viewdocument/?docName=http://www.azleg.gov/ars/32/01104.htm). Please read our Standard Terms of Use at [roc.az.gov/terms \(/terms\)](https://roc.az.gov/terms).

Please note: The company or individuals listed on this license may hold other Arizona contracting licenses. To view information, status and complaint history for the past two years on other licenses held, go to the License Inquiry page and do a "Company Name and Personnel" search by entering the name of the company or individuals listed on the license.

DETAILS FOR

PUEBLO MECHANICAL AND CONTROLS LLC

LICENSE NUMBER ROC 173953

THURSDAY AUGUST 29, 2019 03:08:42 PM

CONTRACTOR	LICENSE
NAME / ADDRESS / PHONE	CLASS & DESCRIPTION
Pueblo Mechanical and Controls LLC	<u>General Commercial B-1 General Commercial Contractor</u>
6771 E Outlook Dr Tucson, AZ 85756-9409 Phone: (520) 545-1044	ENTITY TYPE
STATUS / ACTION	LLC
Active	ISSUED / RENEWAL
	First Issued: 2002-03-28 Renewed Through: 2020-03-31

QUALIFYING PARTY & PERSONNEL

The Qualifying Party listed below is associated with this license. All other persons named, if any, are associated with the company. They are not all necessarily associated with this license.

Name: Steven Joseph Barry	Name: Susanne Andrews	Name: Daniel Theodore Bueschel
Position: Qualifying Party	Position: Other	Position: Manager
Other Positions: EMPLOYEE	Other Positions: Executive	Other Licenses:
Other Licenses:	Administrative Assistant	176640 (/contractor-search?Id=a0Yt000000ACZHeEAP)
176640 (/contractor-search?Id=a0Yt000000ACZHeEAP)	Other Licenses:	(Pueblo Mechanical and Controls LLC)
(Pueblo Mechanical and Controls LLC)	176640 (/contractor-search?Id=a0Yt000000ACZHeEAP)	260462 (/contractor-search?Id=a0Yt000000ACNAwEAP)
260462 (/contractor-search?Id=a0Yt000000ACNAwEAP)	(Pueblo Mechanical and Controls LLC)	(Pueblo Mechanical and Controls LLC)
(Pueblo Mechanical and Controls LLC)	260462 (/contractor-search?Id=a0Yt000000ACNAwEAP)	323201 (/contractor-search?Id=a0Yt000000B65LPEAZ)
323201 (/contractor-search?Id=a0Yt000000B65LPEAZ)	(Pueblo Mechanical and Controls LLC)	(Pueblo Mechanical and Controls LLC)
(Pueblo Mechanical and Controls LLC)	323201 (/contractor-search?	

Mechanical and Controls LLC)
[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Danielle Marie Lalli
Position: Member
Other Licenses:
[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#)
(Pueblo Mechanical and Controls LLC)
[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#)
(Pueblo Mechanical and Controls LLC)
[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)
[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Arlene Adair Bleakney
Position: FORMER Officer
Disassociation Date: 2019-01-08

Name: Huron Capital Partners LLC
Position: Related Entity, Parent Entity

[Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)
[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Pamelyn Weatherly Tolkoff
Position: Chief Financial Officer
Other Licenses:
[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#)
(Pueblo Mechanical and Controls LLC)
[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#)
(Pueblo Mechanical and Controls LLC)
[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)
[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Robert Dennis DiFusco
Position: FORMER Vice President
Other Positions: Historical Officer
Other Licenses:
[077052 \(/contractor-search?Id=a0Yt000000ACW0FEAX\)](#)
(Pueblo Heating and Cooling Inc)
[079382 \(/contractor-search?Id=a0Yt000000ACauoEAD\)](#) (Pueblo Heating and Cooling Inc)
[275879 \(/contractor-search?Id=a0Yt000000ACHkUEAX\)](#)
(Robert's Heating & Cooling LLC)
[275880 \(/contractor-search?Id=a0Yt000000ACMF7EAP\)](#)
(Robert's Heating & Cooling LLC)
Disassociation Date: 2019-01-08

Name: Pueblo Holdings LLC
Position: Related Entity, Parent Entity

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: John Paul Beckham
Position: FORMER Treasurer
Other Positions: Historical Officer
Other Licenses:
[171635 \(/contractor-search?Id=a0Yt000000ACIEmEAP\)](#)
(Positive Plus Systems Inc)
Disassociation Date: 2019-01-08

Name: Craig Kenneth Lostutter
Position: FORMER Secretary
Other Positions: Historical Officer
Other Licenses:
[171635 \(/contractor-search?Id=a0Yt000000ACIEmEAP\)](#)
(Positive Plus Systems Inc)
[253141 \(/contractor-search?Id=a0Yt000000ACZ8XEAX\)](#)
(Beckham's Electric LLC)
Disassociation Date: 2019-01-08

COMPLAINT INFORMATION

Complaints against this contractor are listed below. Complaints that were cancelled, resolved or settled without a corrective work order or dismissed are not included. Contact the **Registrar of Contractors at 602-542-1525 or toll-free statewide at 1-877-My AZROC (1-877-692-9762)** to identify the ROC office location you need to visit to view complete complaint documentation.

0 Open Cases i	CLOSED CASES	
	0 Disciplined Cases i	0 Resolved / Settled Cases i

BOND INFORMATION

How to collect from a license bond (<https://roc.az.gov/recovery-fund?targetclass=answer-question-collect#question-collect>).

Bond Type:	SURETY
Bond Number:	59BSBAJ5579
Effective Date:	2010-03-29
Bond Company:	HARTFORD ACCIDENT AND INDEMNITY COMPANY
Amount:	\$ 0.00
Paid:	\$ 0.00
Available:	\$ 50000.00
Status:	ACTIVE

DISCLAIMER

The data supplied below is based on your specific request(s) and is correct to the best of our knowledge as of the date and time it was extracted from our data files. The information is provided without personal research or analysis. The data is subject to change on a daily basis. You may obtain additional public records related to any licensee, including dismissed complaints and nondisciplinary actions and orders, by contacting the ROC directly. If this information is required for legal purposes, you may request an affidavit or certified copies for a fee as specified in [A.R.S. 32-1104A3 \(https://www.azleg.gov/viewdocument/?docName=http://www.azleg.gov/ars/32/01104.htm\)](https://www.azleg.gov/viewdocument/?docName=http://www.azleg.gov/ars/32/01104.htm). Please read our Standard Terms of Use at [roc.az.gov/terms \(/terms\)](https://roc.az.gov/terms).

Please note: The company or individuals listed on this license may hold other Arizona contracting licenses. To view information, status and complaint history for the past two years on other licenses held, go to the License Inquiry page and do a "Company Name and Personnel" search by entering the name of the company or individuals listed on the license.

DETAILS FOR

PUEBLO MECHANICAL AND CONTROLS LLC

LICENSE NUMBER ROC 176640

THURSDAY AUGUST 29, 2019 03:08:56 PM

CONTRACTOR	LICENSE
NAME / ADDRESS / PHONE	CLASS & DESCRIPTION
Pueblo Mechanical and Controls LLC 6771 E Outlook Dr Tucson, AZ 85756-9409 Phone: (520) 545-1044	<u>Specialty Dual CR-39 Air Conditioning and Refrigeration</u>
STATUS / ACTION	ENTITY TYPE
Active	LLC
	ISSUED / RENEWAL
	First Issued: 2002-07-01 Renewed Through: 2020-07-31

QUALIFYING PARTY & PERSONNEL

The Qualifying Party listed below is associated with this license. All other persons named, if any, are associated with the company. They are not all necessarily associated with this license.

Name: Steven Joseph Barry Position: Qualifying Party Other Positions: EMPLOYEE Other Licenses: 173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC) 260462 (/contractor-search?Id=a0Yt000000ACNAwEAP) (Pueblo Mechanical and Controls LLC) 323201 (/contractor-search?Id=a0Yt000000B65LPEAZ) (Pueblo Mechanical and Controls LLC)	Name: Susanne Andrews Position: Other Other Positions: Executive Administrative Assistant Other Licenses: 173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC) 260462 (/contractor-search?Id=a0Yt000000ACNAwEAP) (Pueblo Mechanical and Controls LLC) 323201 (/contractor-search?Id=a0Yt000000B65LPEAZ) (Pueblo Mechanical and Controls LLC)	Name: Daniel Theodore Bueschel Position: Manager Other Licenses: 173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC) 260462 (/contractor-search?Id=a0Yt000000ACNAwEAP) (Pueblo Mechanical and Controls LLC) 323201 (/contractor-search?Id=a0Yt000000B65LPEAZ) (Pueblo Mechanical and Controls LLC) 324363 (/contractor-search?

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Danielle Marie Lalli

Position: Member

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#)
(Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Arlene Adair Bleakney

Position: FORMER Officer

Disassociation Date: 2019-01-08

Name: Huron Capital Partners LLC

Position: Related Entity, Parent Entity

Mechanical and Controls LLC)
[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Pamelyn Weatherly Tolkoff

Position: Chief Financial Officer

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#)
(Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Robert Dennis DiFusco

Position: FORMER Vice President

Other Positions: Historical Officer

Other Licenses:

[077052 \(/contractor-search?Id=a0Yt000000ACW0FEAX\)](#)
(Pueblo Heating and Cooling Inc)

[079382 \(/contractor-search?Id=a0Yt000000ACauoEAD\)](#) (Pueblo Heating and Cooling Inc)

[275879 \(/contractor-search?Id=a0Yt000000ACHkUEAX\)](#)
(Robert's Heating & Cooling LLC)

[275880 \(/contractor-search?Id=a0Yt000000ACMF7EAP\)](#)
(Robert's Heating & Cooling LLC)

Disassociation Date: 2019-01-08

Name: Pueblo Holdings LLC

Position: Related Entity, Parent Entity

[Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: John Paul Beckham

Position: FORMER Treasurer

Other Positions: Historical Officer

Other Licenses:

[171635 \(/contractor-search?Id=a0Yt000000ACIEmEAP\)](#)
(Positive Plus Systems Inc)

Disassociation Date: 2019-01-08

Name: Craig Kenneth Lostutter

Position: FORMER Secretary

Other Positions: Historical Officer

Other Licenses:

[171635 \(/contractor-search?Id=a0Yt000000ACIEmEAP\)](#)
(Positive Plus Systems Inc)

[253141 \(/contractor-search?Id=a0Yt000000ACZ8XEAX\)](#)
(Beckham's Electric LLC)

Disassociation Date: 2019-01-08

COMPLAINT INFORMATION

Complaints against this contractor are listed below. Complaints that were cancelled, resolved or settled without a corrective work order or dismissed are not included. Contact the **Registrar of Contractors at 602-542-1525 or toll-free statewide at 1-877-My AZROC (1-877-692-9762)** to identify the ROC office location you need to visit to view complete complaint documentation.

0 Open Cases i	CLOSED CASES	
	0 Disciplined Cases i	0 Resolved / Settled Cases i

BOND INFORMATION

How to collect from a license bond (<https://roc.az.gov/recovery-fund?targetclass=answer-question-collect#question-collect>)

Bond Type:	SURETY
Bond Number:	59BSBAJ5581
Effective Date:	2014-07-07
Bond Company:	HARTFORD FIRE INSURANCE COMPANY
Amount:	\$ 0.00
Paid:	\$ 0.00
Available:	\$ 54250.00
Status:	ACTIVE

DISCLAIMER

The data supplied below is based on your specific request(s) and is correct to the best of our knowledge as of the date and time it was extracted from our data files. The information is provided without personal research or analysis. The data is subject to change on a daily basis. You may obtain additional public records related to any licensee, including dismissed complaints and nondisciplinary actions and orders, by contacting the ROC directly. If this information is required for legal purposes, you may request an affidavit or certified copies for a fee as specified in [A.R.S. 32-1104A3 \(https://www.azleg.gov/viewdocument/?docName=http://www.azleg.gov/ars/32/01104.htm\)](https://www.azleg.gov/viewdocument/?docName=http://www.azleg.gov/ars/32/01104.htm). Please read our Standard Terms of Use at [roc.az.gov/terms \(/terms\)](https://roc.az.gov/terms).

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DETAILS FOR

PUEBLO MECHANICAL AND CONTROLS LLC

LICENSE NUMBER ROC 260462

THURSDAY AUGUST 29, 2019 03:08:05 PM

CONTRACTOR

LICENSE

NAME / ADDRESS / PHONE

Pueblo Mechanical and Controls LLC

6771 E Outlook Dr
Tucson, AZ 85756-9409
Phone: (520) 545-1044

STATUS / ACTION

Active

CLASS & DESCRIPTION

Specialty Dual CR-74 Boilers, Steamfitting & Process Piping, Including Solar

ENTITY TYPE

LLC

ISSUED / RENEWAL

First Issued: 2009-12-01
Renewed Through: 2019-12-31

QUALIFYING PARTY & PERSONNEL

The Qualifying Party listed below is associated with this license. All other persons named, if any, are associated with the company. They are not all necessarily associated with this license.

Name: Steven Joseph Barry	Name: Susanne Andrews	Name: Daniel Theodore Bueschel
Position: Qualifying Party	Position: Other	Position: Manager
Other Positions: EMPLOYEE	Other Positions: Executive	Other Licenses:
Other Licenses:	Administrative Assistant	173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC)
173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC)	Other Licenses:	176640 (/contractor-search?Id=a0Yt000000ACZHeEAP) (Pueblo Mechanical and Controls LLC)
176640 (/contractor-search?Id=a0Yt000000ACZHeEAP) (Pueblo Mechanical and Controls LLC)	173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC)	323201 (/contractor-search?Id=a0Yt000000B65LPEAZ) (Pueblo Mechanical and Controls LLC)
323201 (/contractor-search?Id=a0Yt000000B65LPEAZ) (Pueblo Mechanical and Controls LLC)	176640 (/contractor-search?Id=a0Yt000000ACZHeEAP) (Pueblo Mechanical and Controls LLC)	324363 (/contractor-search?
	323201 (/contractor-search?Id=a0Yt000000B65LPEAZ) (Pueblo	

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Danielle Marie Lalli

Position: Member

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#)
(Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Arlene Adair Bleakney

Position: FORMER Officer

Disassociation Date: 2019-01-08

Name: Huron Capital Partners LLC

Position: Related Entity, Parent Entity

Mechanical and Controls LLC)
[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Pamelyn Weatherly Tolkoff

Position: Chief Financial Officer

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#)
(Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

[324363 \(/contractor-search?Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: Robert Dennis DiFusco

Position: FORMER Vice President

Other Positions: Historical Officer

Other Licenses:

[077052 \(/contractor-search?Id=a0Yt000000ACW0FEAX\)](#)
(Pueblo Heating and Cooling Inc)

[079382 \(/contractor-search?Id=a0Yt000000ACauoEAD\)](#) (Pueblo Heating and Cooling Inc)

[275879 \(/contractor-search?Id=a0Yt000000ACHkUEAX\)](#)
(Robert's Heating & Cooling LLC)

[275880 \(/contractor-search?Id=a0Yt000000ACMF7EAP\)](#)
(Robert's Heating & Cooling LLC)

Disassociation Date: 2019-01-08

Name: Pueblo Holdings LLC

Position: Related Entity, Parent Entity

[Id=a0Yt00000081HCnEAM\)](#)
(Pueblo Mechanical and Controls LLC)

Name: John Paul Beckham

Position: FORMER Treasurer

Other Positions: Historical Officer

Other Licenses:

[171635 \(/contractor-search?Id=a0Yt000000ACIEEmEAP\)](#)
(Positive Plus Systems Inc)

Disassociation Date: 2019-01-08

Name: Craig Kenneth Lostutter

Position: FORMER Secretary

Other Positions: Historical Officer

Other Licenses:

[171635 \(/contractor-search?Id=a0Yt000000ACIEEmEAP\)](#)
(Positive Plus Systems Inc)

[253141 \(/contractor-search?Id=a0Yt000000ACZ8XEAX\)](#)
(Beckham's Electric LLC)

Disassociation Date: 2019-01-08

COMPLAINT INFORMATION

Complaints against this contractor are listed below. Complaints that were cancelled, resolved or settled without a corrective work order or dismissed are not included. Contact the **Registrar of Contractors at 602-542-1525 or toll-free statewide at 1-877-My AZROC (1-877-692-9762)** to identify the ROC office location you need to visit to view complete complaint documentation.

0 Open Cases i	CLOSED CASES	
	0 Disciplined Cases i	0 Resolved / Settled Cases i

BOND INFORMATION

How to collect from a license bond (<https://roc.az.gov/recovery-fund?targetclass=answer-question-collect#question-collect>)

Bond Type:	SURETY
Bond Number:	59BSBAJ5578
Effective Date:	2009-12-01
Bond Company:	HARTFORD FIRE INSURANCE COMPAN
Amount:	\$ 0.00
Paid:	\$ 0.00
Available:	\$ 57500.00
Status:	ACTIVE

DISCLAIMER

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DETAILS FOR

PUEBLO MECHANICAL AND CONTROLS LLC

LICENSE NUMBER ROC 324363

THURSDAY AUGUST 29, 2019 03:08:19 PM

CONTRACTOR	LICENSE
NAME / ADDRESS / PHONE	CLASS & DESCRIPTION
Pueblo Mechanical and Controls LLC	<u>Specialty Commercial C-11 Electrical</u>
6771 E Outlook Dr	ENTITY TYPE
Tucson, AZ 85756-9409	LLC
Phone: (800) 840-9170	ISSUED / RENEWAL
STATUS / ACTION	
Active	First Issued: 2019-04-28
	Renewed Through: 2021-04-30

QUALIFYING PARTY & PERSONNEL

The Qualifying Party listed below is associated with this license. All other persons named, if any, are associated with the company. They are not all necessarily associated with this license.

Name: Steven Joseph Barry	Name: David John Fortuna	Name: Susanne Andrews
Position: Qualifying Party	Position: Qualifying Party	Position: Other
Other Positions: EMPLOYEE	Other Licenses:	Other Positions: Executive
Other Licenses:	281606 (/contractor-search?Id=a0Yt000000ACNOMeAP) (Dave Fortuna Inc)	Administrative Assistant
173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC)	173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC)	Other Licenses:
176640 (/contractor-search?Id=a0Yt000000ACZHeEAP) (Pueblo Mechanical and Controls LLC)	176640 (/contractor-search?Id=a0Yt000000ACZHeEAP) (Pueblo Mechanical and Controls LLC)	173953 (/contractor-search?Id=a0Yt000000ACRJsEAP) (Pueblo Mechanical and Controls LLC)
260462 (/contractor-search?Id=a0Yt000000ACNAwEAP) (Pueblo Mechanical and Controls LLC)	260462 (/contractor-search?Id=a0Yt000000ACNAwEAP)	176640 (/contractor-search?Id=a0Yt000000ACZHeEAP) (Pueblo Mechanical and Controls LLC)
		260462 (/contractor-search?Id=a0Yt000000ACNAwEAP) (Pueblo Mechanical and Controls

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

Name: Daniel Theodore Bueschel

Position: Manager

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#) (Pueblo Mechanical and Controls LLC)

[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#) (Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

Name: John Paul Beckham

Position: FORMER Treasurer

Other Positions: Historical Officer

Other Licenses:

[171635 \(/contractor-search?Id=a0Yt000000ACIEmEAP\)](#) (Positive Plus Systems Inc)

Disassociation Date: 2019-01-08

(Pueblo Mechanical and Controls LLC)
[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

Name: Danielle Marie Lalli

Position: Member

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#) (Pueblo Mechanical and Controls LLC)

[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#) (Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

Name: Arlene Adair Bleakney

Position: FORMER Officer

Disassociation Date: 2019-01-08

LLC)
[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

Name: Pamelyn Weatherly Tolkoff

Position: Chief Financial Officer

Other Licenses:

[173953 \(/contractor-search?Id=a0Yt000000ACRJsEAP\)](#) (Pueblo Mechanical and Controls LLC)

[176640 \(/contractor-search?Id=a0Yt000000ACZHeEAP\)](#) (Pueblo Mechanical and Controls LLC)

[260462 \(/contractor-search?Id=a0Yt000000ACNAwEAP\)](#) (Pueblo Mechanical and Controls LLC)

[323201 \(/contractor-search?Id=a0Yt000000B65LPEAZ\)](#) (Pueblo Mechanical and Controls LLC)

Name: Robert Dennis DiFusco

Position: FORMER Vice President

Other Positions: Historical Officer

Other Licenses:

[077052 \(/contractor-search?Id=a0Yt000000ACW0FEAX\)](#) (Pueblo Heating and Cooling Inc)
[079382 \(/contractor-search?Id=a0Yt000000ACauoEAD\)](#) (Pueblo Heating and Cooling Inc)

[275879 \(/contractor-search?Id=a0Yt000000ACHkUEAX\)](#) (Robert's Heating & Cooling LLC)

[275880 \(/contractor-search?Id=a0Yt000000ACMF7EAP\)](#) (Robert's Heating & Cooling LLC)

Disassociation Date: 2019-01-08

Name: Craig Kenneth Lostutter

Position: FORMER Secretary

Other Positions: Historical Officer

Other Licenses:

[171635 \(/contractor-search?Id=a0Yt000000ACIEmEAP\)](#) (Positive Plus Systems Inc)

Name: Huron Capital Partners LLC

Position: Related Entity, Parent Entity

Name: Pueblo Holdings LLC

Position: Related Entity, Parent Entity

253141 (/contractor-search?
Id=a0Yt000000ACZ8XEAX).
(Beckham's Electric LLC)
Disassociation Date: 2019-01-08

COMPLAINT INFORMATION

Complaints against this contractor are listed below. Complaints that were cancelled, resolved or settled without a corrective work order or dismissed are not included. Contact the **Registrar of Contractors at 602-542-1525 or toll-free statewide at 1-877-My AZROC (1-877-692-9762)** to identify the ROC office location you need to visit to view complete complaint documentation.

0 Open Cases i	CLOSED CASES	
	0 Disciplined Cases i	0 Resolved / Settled Cases i

BOND INFORMATION

How to collect from a license bond (<https://roc.az.gov/recovery-fund?targetclass=answer-question-collect#question-collect>).

Bond Type:	SURETY
Bond Number:	LSM1240324
Effective Date:	2019-04-05
Bond Company:	RLI INSURANCE COMPANY
Amount:	\$ 2500.00
Paid:	\$ 0.00
Available:	\$ 2500.00
Status:	ACTIVE

RFQ 19F-0605 EVALUATOR AGREEMENT AND CONFLICT OF INTEREST FORM

NAME and TITLE Michael Nentwig Contracts Specialist I EMPLOYER MESC
 ADDRESS 625 East Beale St. Kingman AZ 86401 PHONE 928-718-3203
 Contract Specialist working with: Celt

Statement of Understanding*(Initial each section to indicate your understanding of the requirement)*

☒ I agree to evaluate the responses to the solicitation according to its evaluation criteria terms.
 The RFQ evaluation criteria is as follows:

Basis of award: In accordance with Arizona Administrative Code, Article 11, School District Procurement R7-2-1111(C), ARS §34-604(F)(2) and §41-257(F)(2), Mohave shall issue a Request for Proposal to a final list of responsive and responsible vendors determined to be most qualified to perform the specified construction services. To qualify for evaluation, a Statement of Qualifications must have been submitted on time and materially satisfy all mandatory requirements identified in this solicitation.

Responsive Statement of Qualifications: A responsive Statement of Qualifications conforms in all respects to the material requirements of the solicitation. The Statement of Qualifications shall be responsive to receive further consideration. Mohave reserves the right to waive minor informalities.

The Request for Qualifications is the first of a two-step procurement process. Contracts, if any, will be awarded in accordance with the subsequent Request for Proposal. Mohave will issue a Request for Proposal to a final list of responsive and responsible vendors determined to be the most qualified to perform the specified electrical services. The final list shall be at least three, but no more than five offerors.

☒ I understand that Mohave will consider my evaluation along with evaluations by other professionals. However, I also agree that Mohave is under no obligation to accept my evaluation, except as advisory. I also understand that Mohave will hold my employer and/or me harmless if any vendor or interested party protests any award or lack of award made by Mohave under the terms of this solicitation.

☒ I agree not to discuss my evaluation or any of the evaluation process prior to the announcement of an award, as required by Arizona statute (per ARS § 41-2616, C).

☒ I confirm that I have not received gratuities in the form of entertainment, gifts, or otherwise, that have been offered by any of the bidders responding to this solicitation with a view toward securing a contract.

Mohave may publicly thank members of the evaluation committee who are not employed by Mohave on our website. By making your selection below, this will indicate your understanding that we may publicly recognize your help with the evaluation process. Please indicate if you do or do not to be thanked in this manner, by indicating with Yes or No answer below:

☒ (Yes) ☐ (No)

Please indicate your answer by signing your initials in the appropriate boxes

☐ New Evaluator

☒ Returning Evaluator

The Arizona Revised Statutes (ARS) place some restrictions with which you must comply regarding conflict of interest not only for yourself but also your relatives (Relative means: spouse, child, child's child, parent, grandparent, siblings (full or half-blood) and their spouses, and the parent, sibling or child of a spouse, pursuant to ARS 38-502). You are required to complete the following form to determine that you're in compliance with these provisions. This form must be completed every time you participate in a contract evaluation.

Business Interest

Are you, or any of your relatives, involved in any ownership, employment, public or private affiliations, or special arrangements which may have a substantial (Substantial means: any pecuniary or proprietary interest, either direct or indirect, other than a remote interest) interest in any contract, sale, purchase, or service involving Mohave or any of Mohave's contracts, vendors or members?

☒ No

☐ Yes

Please describe below (attach sheet if necessary):

Liability

Violating Arizona's conflict of interest laws have significant consequences which include, but may not be limited to:

1. Intentionally or knowingly violating any provision of sections 38-503 through 38-505 is guilty of a CLASS 6 FELONY.
2. Recklessly or negligently violating any provision of sections 38-503 through 38-505 is guilty of a CLASS 1 MISDEMEANOR.

☒ I understand that I may be held personally liable for costs associated with violating Arizona's conflict of interest laws.

I also acknowledge that I am responsible for knowing and understanding Arizona's conflict of interest laws available in A.R.S. 38-501 through 38-510.

Signature MNentwig

Date 6/7/19

Signature by Mohave: Ante S. M. Jensen

Mohave Educational Services Cooperative, Inc., 625 E. Beale St. Kingman AZ, 86401

RFQ 19F-0605 EVALUATOR AGREEMENT AND CONFLICT OF INTEREST FORMNAME and TITLE JEFF BOHNEKAMP - Sr Project Mgr EMPLOYER ESB DESIGN+BUILDADDRESS 11780 W ADAMS ROAD, MARIANA, AZ 85508 PHONE 520-683-9004

Contract Specialist working with:

Statement of Understanding*(Initial each section to indicate your understanding of the requirement.)*IB I agree to evaluate the responses to the solicitation according to its evaluation criteria terms.
The RFQ evaluation criteria is as follows:

Basis of award: In accordance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1111(C), ARS §34-604(F)(2) and §41-2579(F)(2), Mohave shall issue a Request for Proposal to a final list of responsive and responsible vendors determined to be most qualified to perform the specified construction services. To qualify for evaluation, a Statement of Qualifications must have been submitted on time, and materially satisfy all mandatory requirements identified in this solicitation.

Responsive Statement of Qualifications: A responsive Statement of Qualifications conforms in all respects to the material requirements of the solicitation. The Statement of Qualifications shall be responsive to receive further consideration. Mohave reserves the right to waive minor informalities.

The Request for Qualifications is the first of a two-step procurement process. Contracts, if any, will be awarded in accordance with the subsequent Request for Proposal. Mohave will issue a Request for Proposal to a final list of responsive and responsible vendors determined to be the most qualified to perform the specified electrical services. The final list shall be at least three, but no more than five efforts.

IB I understand that Mohave will consider my evaluation along with evaluations by other professionals. However, I also agree that Mohave is under no obligation to accept my evaluation, except as advisory. I also understand that Mohave will hold my employee and/or me harmless if any vendor or interested party protests any award or lack of award made by Mohave under the terms of this solicitation.IB I agree not to discuss my evaluation or any of the evaluation process prior to the announcement of an award, as required by Arizona statute (per ARS § 41-2616, C).IB I confirm that I have not received gratuities in the form of entertainment, gifts, or otherwise, that have been offered by any of the bidders responding to this solicitation with a view toward securing a contract.

Mohave may publicly thank members of the evaluation committee who are not employed by Mohave on our website. By making your selection below, this will indicate your understanding that we may publicly recognize your help with the evaluation process. Please indicate if you do or do not to be thanked in this manner, by indicating with Yes or No answer below:

IB (Yes) (No) *Please indicate your answer by signing your initials in the appropriate boxes*☒ New Evaluator☐ Returning Evaluator

The Arizona Revised Statutes (ARS) place some restrictions with which you must comply regarding conflict of interest not only for yourself but also your relatives (Relative means: spouse, child, child's child, parent, grandparent, siblings (full or half-blood) and their spouses, and the parent, sibling or child of a spouse, pursuant to ARS 38-507). You are required to complete the following form to determine that you're in compliance with these provisions. This form must be completed every time you participate in a contract evaluation.

Business Interest

Are you, or any of your relatives, involved in any ownership, employment, public or private affiliations, or special arrangements which may have a substantial (Substantial means: any pecuniary or proprietary interest, either direct or indirect, other than a remote interest) interest in any contract, sale, purchase, or service involving Mohave or any of Mohave's contracts, vendors or members?

☐ No☒ Yes

Please describe below (attach sheet if necessary):

ESB has a MOHAVE CONTRACT FOR MODULAR BUILDINGS**Liability**

Violating Arizona's conflict of interest laws have significant consequences which include, but may not be limited to:

1. Intentionally or knowingly violating any provision of sections 38-503 through 38-505 is guilty of a CLASS 6 FELONY.
2. Recklessly or negligently violating any provision of sections 38-503 through 38-505 is guilty of a CLASS 1 MISDEMEANOR.

IB I understand that I may be held personally liable for costs associated with violating Arizona's conflict of interest laws.

I also acknowledge that I am responsible for knowing and understanding Arizona's conflict of interest laws available in A.R.S. 38-503 through 38-510.

Signature [Signature] Date 6/20/19Signature by Mohave: [Signature]**Mohave Educational Services Cooperative, Inc., 625 E. Beale St. Kingman AZ, 86401**

MESC 1-2018

RFQ 19F-0605 EVALUATOR AGREEMENT AND CONFLICT OF INTEREST FORM

NAME and TITLE Phil Alfred, Asst. City Engineer EMPLOYER City of Kingman
 ADDRESS 310 N 4th Street PHONE (928) 753-8124
 Contract Specialist working with: Mike Nentwig

Statement of Understanding**(Initial each section to indicate your understanding of the requirement)**☒

I agree to evaluate the responses to the solicitation according to its evaluation criteria terms.
 The RFQ evaluation criteria is as follows:

Basis of award: In accordance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1111(C), ARS §34-634(F)(2) and §41-2579(F)(2), Mohave shall issue a Request for Proposal to a final list of responsive and responsible vendors determined to be most qualified to perform the specified construction services. To qualify for evaluation, a Statement of Qualifications must have been submitted on time, and materially satisfy all mandatory requirements identified in this solicitation.

Responsive Statement of Qualifications: A responsive Statement of Qualifications conforms in all respects to the material requirements of the solicitation. The Statement of Qualifications shall be responsive to receive further consideration. Mohave reserves the right to waive minor informalities.

The Request for Qualifications is the first of a two-step procurement process. Contracts, if any, will be awarded in accordance with the subsequent Request for Proposal. Mohave will issue a Request for Proposal to a final list of responsive and responsible vendors determined to be the most qualified to perform the specified electrical services. The final list shall be at least three, but no more than five offerors.

☒

I understand that Mohave will consider my evaluation along with evaluations by other professionals. However, I also agree that Mohave is under no obligation to accept my evaluation, except as advisory. I also understand that Mohave will hold my employer and/or me harmless if any vendor or interested party protests any award or lack of award made by Mohave under the terms of this solicitation.

☒

I agree not to discuss my evaluation or any of the evaluation process prior to the announcement of an award, as required by Arizona statute (per ARS § 41-2516, C).

☒

I confirm that I have not received gratuities in the form of entertainment, gifts, or otherwise, that have been offered by any of the bidders responding to this solicitation with a view toward securing a contract.

Mohave may publicly thank members of the evaluation committee who are not employed by Mohave on our website. By making your selection below, this will indicate your understanding that we may publicly recognize your help with the evaluation process. Please indicate if wish or do not to be thanked in this manner, by indicating with Yes or No answer below:

☒ (Yes) ☐ (No)

Please indicate your answer by signing your initials in the appropriate boxes☒

New Evaluator

☐

Returning Evaluator

The Arizona Revised Statutes (ARS) place some restrictions with which you must comply regarding conflict of interest not only for yourself but also your relatives (Relative means: spouse, child, child's child, parent, grandparent, siblings (full or half-blood) and their spouses, and the parent, sibling or child of a spouse, pursuant to ARS 38-502). You are required to complete the following form to determine that you're in compliance with these provisions. This form must be completed every time you participate in a contract evaluation

Business Interest

Are you, or any of your relatives, involved in any ownership, employment, public or private affiliations, or special arrangements which may have a substantial (Substantial means: any pecuniary or proprietary interest, either direct or indirect, other than a remote interest) interest in any contract, sale, purchase, or service involving Mohave or any of Mohave's contracts: vendors or members?

☒

No

☐

Yes

Please describe below (attach sheet if necessary):

Liability

Violating Arizona's conflict of interest laws have significant consequences which include, but may not be limited to:

1. Intentionally or knowingly violating any provision of sections 38-503 through 38-505 is guilty of a CLASS 6 FELONY,
2. Recklessly or negligently violating any provision of sections 38-503 through 38-505 is guilty of a CLASS 1 MISDEMEANOR.

☒

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I also acknowledge that I am responsible for knowing and understanding Arizona's conflict of interest laws available in A.R.S. 38-503 through 38-510.

Signature

Phil Alfred

Date

6/10/18

Signature by Mohave:

Christa S. Moore**Mohave Educational Services Cooperative, Inc., 625 E. Beale St. Kingman AZ, 86401**

RFQ 19F-0605 EVALUATOR AGREEMENT AND CONFLICT OF INTEREST FORM

NAME and TITLE Nancy Colbaugh Contracts Manager EMPLOYER MESC, Inc.
 ADDRESS 1625 E. Beale Street PHONE 928-7536945
 Contract Specialist working with: Mike Neuberg, CPPB

Statement of Understanding*(Initial each section to indicate your understanding of the requirement)*

NC I agree to evaluate the responses to the solicitation according to its evaluation criteria terms.
 The RFQ evaluation criteria is as follows:

Basis of award: In accordance with Arizona Administrative Code, Article 11, School District Procurement R7-2-1111(C), ARS §34-504(F)(2) and §41-2579(F)(2), Mohave shall issue a Request for Proposal to a final list of responsive and responsible vendors determined to be most qualified to perform the specified construction services. To qualify for evaluation, a Statement of Qualifications must have been submitted on-time, and materially satisfy all mandatory requirements identified in this solicitation.

Responsive Statement of Qualifications: A responsive Statement of Qualifications conforms in all respects to the material requirements of the solicitation. The Statement of Qualifications shall be responsive to receive further consideration. Mohave reserves the right to waive minor informalities.

The Request for Qualifications is the first of a two-step procurement process. Contracts, if any, will be awarded in accordance with the subsequent Request for Proposal. Mohave will issue a Request for Proposal to a final list of responsive and responsible vendors determined to be the most qualified to perform the specified electrical services. The final list shall be at least three, but no more than five offerors.

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NC I agree not to discuss my evaluation or any of the evaluation process prior to the announcement of an award, as required by Arizona statute (per ARS § 41-2616, C).

NC I confirm that I have not received gratuities in the form of entertainment, gifts, or otherwise, that have been offered by any of the bidders responding to this solicitation with a view toward securing a contract.

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NIA (Yes) ☐ (No) ☒

Please indicate your answer by signing your initials in the appropriate boxes

☐ New Evaluator

☒ Returning Evaluator

The Arizona Revised Statutes (ARS) place some restrictions with which you must comply regarding conflict of interest not only for yourself but also your relatives (Relative means: spouse, child, child's child, parent, grandparent, siblings (full or half-blood) and their spouses, and the parent, sibling or child of a spouse, pursuant to ARS 38-502). You are required to complete the following form to determine that you're in compliance with these provisions. This form must be completed every time you participate in a contract evaluation.

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☒ No ☐ Yes Please describe below (attach sheet if necessary):

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I also acknowledge that I am responsible for knowing and understanding Arizona's conflict of interest laws available in A.R.S. 38-501 through 38-515.

Signature Nancy Colbaugh Date 6/6/19

Signature by Mohave Ante S. Moore

Mohave Educational Services Cooperative, Inc., 625 E. Beale St. Kingman AZ, 86401

RFQ 19F-0605 EVALUATOR AGREEMENT AND CONFLICT OF INTEREST FORM

NAME and TITLE Michael S. Carter EMPLOYER Mohave Educational
 ADDRESS 625 E. Beale St. Kingman AZ PHONE 928-753-6945
 Contract Specialist working with: M. Ke. Neuhwig

Statement of Understanding**(Initial each section to indicate your understanding of the requirement)**

MC I agree to evaluate the responses to the solicitation according to its evaluation criteria terms.
 The RFQ evaluation criteria is as follows:

Basis of award: In accordance with Arizona Administrative Code, Article 11: School District Procurement R7-3-1111(C), ARS 534-604(F)(2) and 541-2579(F)(2), Mohave shall issue a Request for Proposal to a final list of responsive and responsible vendors determined to be most qualified to perform the specified construction services. To qualify for evaluation, a Statement of Qualifications must have been submitted on time, and materially satisfy all mandatory requirements identified in this solicitation.

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✓ (Yes) (No)

Please indicate your answer by signing your initials in the appropriate boxes.

MC ☒ New Evaluator

☐ Returning Evaluator

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MC ☒ No ☐ Yes Please describe below (attach sheet if necessary):

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MC I understand that I may be held personally liable for costs associated with violating Arizona's conflict of interest laws.

I also acknowledge that I am responsible for knowing and understanding Arizona's conflict of interest laws available in A.R.S. 38-501 through 38-510.

Signature Michael S. Carter

Date 6/11/19

Signature by Mohave: Ante S. M. Moore

Mohave Educational Services Cooperative, Inc., 625 E. Beale St. Kingman AZ, 86401

SAM Search Results
List of records matching your search for :

Search Term : Pueblo Mechanical & Controls, LLC*
Record Status: Active

ENTITY	Pueblo Mechanical and Controls, LLC	Status: Active
DUNS: 105451186	+4:	CAGE Code: 3N3A9 DoDAAC:
Expiration Date: 02/22/2020	Has Active Exclusion?: No	Debt Subject to Offset?: No
Address: 6771 E Outlook Dr		
City: Tucson	State/Province: ARIZONA	
ZIP Code: 85756-9409	Country: UNITED STATES	

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State Services

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Ombudsman-Citizens Aide

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State Services

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ARIZONA

DEPARTMENT OF ADMINISTRATION
PROCUREMENT

(/)

The online home of the Arizona State Procurement Office

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[Suspended and Debarred Firms \(/administration-policy/state-procurement-resource/suspended-debarred-firms\)](#)

SUSPENDED AND DEBARRED FIRMS

SPO is responsible for maintaining a list of firms that are suspended or debarred from doing business with the State of Arizona.

THERE ARE NO SUSPENDED OR DEBARRED FIRMS AT THIS TIME.



[Contact Us \(/contact-us\)](/contact-us)

State Procurement Office, ADOA Building

100 N. 15th Ave., Suite 402

Phoenix, AZ 85007

Find in Google Maps

(<https://www.google.com/maps/place/100+N+15th+Ave+%23201/@33.4490935,-112.0926353,17z>)

[STATEWIDE POLICIES \(HTTP://AZ.GOV/POLICIES\)](http://az.gov/policies)

[SITE MAP \(/SITEMAP\)](/sitemap)



The Due Diligence Tutorial may be downloaded using the following link:

Click here to view and download the Due Diligence Tutorial for Mohave Contracts.

Pricing for this contract may be found at the following link:

Click here to go to the Mohave Pricing

For further assistance contact the Contract Specialist for this contract:

Michael Carter Specialist, CPPB

Phone: 928-718-3221

Email: **michael@mesc.org**

Price Proposal – Primary Vendor Information
(Place in a clearly marked, separate sealed envelope)

IF YOUR FIRM WAS SHORTLISTED FOR DIVISION 22 PLUMBING, DIVISION 23 HEATING, VENTILATION AND AIR CONDITIONING OR DIVISION 26 ELECTRICAL, PROVIDE COEFFICIENTS AND PRICING INFORMATION FOR BOTH DIVISIONS OR INDICATE IF THE COEFFICIENTS WILL BE IDENTICAL FOR BOTH DIVISIONS.

Price Proposal shall be submitted in a clearly marked, separate sealed envelope. Offeror shall provide a price proposal to include the following information:

1. **Name and Date of the Unit Price Book (UPB):**
2. **Coefficient(s) to be applied to pre-priced items (items listed in the UPB) for work performed during:**
 - Normal business hours (Monday - Friday 7 a.m. - 5 p.m.)
 - Other hours (after hours, weekends, and holidays)
 - Note adjustments to the coefficient(s), if applicable, for work performed in different regions of the state.
3. **Coefficient(s) to be applied to non pre-priced items (items not listed in the UPB) for work performed during:**
 - Normal business hours (Monday - Friday 7 a.m. - 5 p.m.)
 - Other hours (after hours, weekends, and holidays)
 - Note adjustments to the coefficient(s), if applicable, for work performed in different regions of the state.

Notes: Provide a brief explanation of the rationale for your coefficients. The rationale should indicate how you determined the cost of doing the work and the various elements that made up your coefficients. See Specification 1.2.13, Pricing, for additional information.

4. **Open Book Pricing Workbook:**

NOTE: *The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.*

If offeror is including the Open Book Pricing methodology in their price proposal, the Open Book Price workbook shall be completed as follows:

- Provide complete information in the worksheet titled, “*Price Summary*” in the electronic Open Book Price workbook titled, “*19F-0808 Open Book Price Summary.xlsx*” includes yellow highlighted cells for *General and Administrative Cost (G&A)* and *Profit*. Place the percentage value your firm will use to calculate overhead and profit for the Direct Project Costs and General Conditions.
- The worksheet titled, “*General Conditions*” in the electronic Open Book Price workbook titled, “*19F-0808 Open Book Price Summary.xlsx*”, includes general conditions, services, or costs not identified or included in the subcontractor quotations.
- Provide the labor and/or service unit price for the yellow highlighted cells in the section titled, *Admin Fee Items: Unit Price*. Additionally, include the unit of measure (e.g. per hour, per day, per week) as applicable in the *Unit Of Measure* column.
- Provide additional costs as applicable for yellow highlighted cells in the section titled, *Non-Admin Fee Items*. Non-Admin Fee items include costs that are “passed-through” to member at cost to the contract vendor. *Mohave shall not collect administration fees on the above non-admin fee items.*
- Add line items to the Admin and/or Non-Admin Fee schedules as necessary.
- **Only services/ costs identified in this price schedule will be allowed under an awarded contract.**
- This workbook will serve as your quoting template for all open book projects under an awarded contract.

Price Proposal – Primary Vendor Information
(Place in a clearly marked, separate sealed envelope)

5. Trade Service Price Guides for items and services not included in the UPB:

- The pricing methodology to determine the Mohave price shall be:
 - Discount off list (specify discount).
 - Discount off Column Two (specify discount) when List Price is unavailable.

6. Professional Services (Provide the applicable hourly rate for each service offered. No coefficient will be applied to these rates.)

- Design Services
- Engineering Services
- Other Professional Services (specify service and rate)

7. Maintenance Services and Extended Warranties (Provide the cost for all maintenance services and extended warranties that are available after the warranty period. No coefficient will be applied to these prices.)

8. Other Charges (Provide any additional costs, or incidental charges. Such charges may include the items listed below. No coefficient will be applied to these charges.)

- 100% Performance and Payment Bonds
- Meals and incidental expenses (M&IE), transportation and lodging
- Mobilization (Indicate when mobilization charges would apply.)

NOTE: Mobilization may only be used with projects priced using Trade Service and labor. Mobilization charges shall not be allowed with UPB or Open Book Pricing methodologies.

- Other

9. Will you offer members a quick pay discount if payment is made within 10 or 20 days? Yes ___ No X

- If Yes, what is the discount for 10 days? _____ 20 days? _____

Travel Description

If travel rates are applicable, describe how they are calculated, and when they are necessary, (e.g. 50 miles from origin). Include information regarding what the travel rates cover. (See **Pricing: Reimbursement for Transportation, Mileage, Lodging, Meals and Incidental Expenses** in the Special Terms and Conditions.)

Travel rates are applicable when work sites exceed 50-mile radius from our current Tucson and Phoenix office locations. In some

cases overnight lodging will not be required if it is more cost effective to travel to the work site daily versus overnight stays.

Meals & Incidentals are only applicable for work involving overnight accommodations.

Bond Methodology Description

Provide detailed information explaining the methodology to be used when bonds are applied to projects. Describe in detail the method your surety company requires you to use (e.g., bonds are applied before sales tax is applied, bonds are applied after sales tax is applied). Mohave will use this information to verify that your firm is consistently charging bonds in the same manner under an awarded contract.

The use of bonds is based on current state legislation and owners' requirements. Projects under \$100,000 do not require bonding

Unless specifically requested by the owner, all proposals will include this language. Bonding cost is calculated based on the total

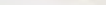
price obligation.

UNIT PRICE BOOK [UPB]
TRA-SER
OPEN BOOK
PRICE PROPOSAL SUMMARY

- **RS Means UPB [primary pricing method]**
- **Open Book**
- **TRA-SER [primarily used for Service related work not contained in UPB]**
- **Miscellaneous Pricing [bonds, shipping, credit cards, etc.]**

Note: RS Means and TRA-SER are not inclusive of applicable tax, therefore all coefficients in this response are inclusive of applicable (if any) AZ Department of Revenue tax.

1. Name/Date of Unit Price Book:	RS Means CostWorks 2019 [Updated Quarterly] Titles: Facilities Construction Cost Data, Mechanical Cost Data, Plumbing Cost Data, Facilities Maintenance & Repair Cost Data, Commercial Renovation Cost Data Service centric projects will utilize additional items in the TRA-SER catalog when not contained in the primary UPB



MOHAVE RFP 15F-0808

2. Coefficients - Pre-Priced Primary UPB Coefficients [RS Means CostWorks]:

APPLIES TO ALL DIVISIONS

Normal Business Hours [M-F 7am – 5pm]:	.85
Other Hours [Weekends, holidays, etc.]:	.95
Adjustments to the coefficient(s), if applicable for work performed in different regions of the state:	N/A - None

Professional Services

Design Services [Mechanical/Electrical]:	\$116.00/hr.
Engineering Services:	\$120.00/hr.
Principal Engineering Services:	\$142.00/hr.

Other Professional Services

Drafting [CAD] Design:	\$92.00/hr.
Architect:	\$142.00/hr.
Principal Architect:	\$160.00/hr.

Maintenance and Other Services [based on hourly labor rates]:

Duty Position	Normal Hours	After Hours / Emergency Hours	Holidays
HVAC Chiller Tech [Wetside Applications]	\$104.00/hr.	\$142.00/hr.	\$176.00/hr.
HVAC Unitary Tech [Dryside Applications]	\$99.00/hr.	\$136.00/hr.	\$168.00/hr.
Pipefitter / Steamfitter	\$94.00/hr.	\$129.00/hr.	\$159.00/hr.
Sheet Metal Installation	\$74.00/hr.	\$101.00/hr.	\$125.00/hr.
Plumber	\$98.00/hr.	\$134.00/hr.	\$166.00h/hr.
Water Treatment	\$101.00/hr.	N/A	N/A
HVAC Building Automation Tech – Controls/Programing	\$98.00/hr.	\$134.00/hr.	\$166.00/hr.
Project Manager / Quality Control	\$96.00/hr.	\$131.00/hr.	\$163.00/hr.
Electrical [by PMAC]	\$87.00/hr.	\$119.00/hr.	\$147.00/hr.
General Labor	\$50.00/hr.	\$68.00/hr.	\$85.00/hr.

Note: Labor rates above are all inclusive, no other factors or mark-ups are applied

**Note: Normal hours are 7:00 am – 5:00 pm Monday – Friday [Excluding holidays]
Other Charges**

3. Coefficients - Custom or Special Non-Prepriced Items Not Found in UPB or TRA-SER [Pricing based on three quotes when available; single source or customer mandated items due to specific specifications are available if they comply with contract requirements]

Normal Business Hours [M-F 7am – 5pm]: **1.20**
 Other Hours [Weekends, holidays, etc.]: **1.20**
 Adjustments to the coefficient(s), if applicable
 for work performed in different regions of the state: **N/A - None**

NOTE: The use of the non-prepriced pricing option will only take place when the equipment/supplies are not listed in primary or secondary costing and include a statement clearly indicating that pricing is not available via other pricing methodologies

Explanation Notes: Established coefficients represent the minimum realistic cost estimate to capture direct/indirect costs, overhead, and a sustainable profit. The coefficients represent project cost averages based on project spanning 15 years of UPB utilization.

4. Open Book Pricing Workbook/Summary:

Name of Pricing Source: **19F-0808 Open Book Price Summary Excel Spreadsheet – Jul 19**

General & Administrative Cost (G&A) **10%**

Profit **5%**

General Conditions **Derived from Open Book pricing spreadsheet General Conditions Tab**

Duty Position [Direct Company Labor]	Normal Hours	After Hours / Emergency Hours	Holidays
Project General Manager	\$94.00/hr.	\$129.00/hr.	\$159.00/hr.
Project Manager	\$83.00/hr.	\$114.00/hr.	\$141.00/hr.
Estimator	\$77.00/hr.	\$105.00/hr.	\$131.00/hr.
Senior Superintendent	\$77.00/hr.	\$105.00/hr.	\$131.00/hr.
Superintendent	\$72.00/hr.	\$99.00/hr.	\$122.00/hr.
CQC Inspector	\$77.00/hr.	\$105.00/hr.	\$131.00/hr.
Safety Manager	\$83.00/hr.	\$114.00/hr.	\$141.00/hr.

Field Engineer	\$94.00/hr.	\$129.00/hr.	\$159.00/hr.
Administrative Assistant	\$58.00/hr.	\$79.00/hr.	\$98.00/hr.
HVAC Chiller Tech [Wetside Applications]	\$90.00/hr.	\$123.00/hr.	\$153.00/hr.
HVAC Unitary Tech [Dryside Applications]	\$86.00/hr.	\$118.00/hr.	\$146.00/hr.
Pipefitter / Steamfitter	\$82.00/hr.	\$112.00/hr.	\$139.00/hr.
Sheet Metal Installation	\$64.00/hr.	\$88.00/hr.	\$108.00/hr.
Water Treatment	\$88.00/hr.	\$121.00/hr.	\$149.00/hr.
Plumber	\$85.00/hr.	\$116.00/hr.	\$144.00/hr.
Electrical [by PMAC]	\$68.00/hr.	\$93.00/hr.	\$115.00/hr.
HVAC Building Automation Tech – Controls/Programing	\$85.00/hr.	\$116.00/hr.	\$144.00/hr.
General Labor / Driver	\$43.00/hr.	\$59.00/hr.	\$73.00/hr.
In-House Design Services [Mech/Electric]	\$101.00/hr.	\$138.00/hr.	\$171.00/hr.
In-House Drafting [CAD] Design	\$80.00/hr.	\$110.00/hr.	\$136.00/hr.

See detailed Open Book Breakout Below:

5. Trade Service [TRA-SER] Price Guides/Summary:

Name/Date of Pricing Source: TradeService eDataFlex

Note: TRA-SER equipment pricing is also available as a stand-alone pricing option

Normal Business Hours [M-F 7am – 5pm]: .90 [List Price Column]

Other Hours [Weekends, holidays, etc.]: .90 [List Price Column]

Discount off Column Two when List Price not avail. TBD

Note: Labor rates are listed above in the UPB section; no additional mark-up is applied to these rates

Note: TRA-SER pricing may be combined with UPB pricing to provide a complete turn-key solution

6. Professional Services:

Professional Services

Design Services [Mechanical/Electrical]: \$105.00/hr.

Principal Engineering Services: \$130.00/hr.

Other Professional Services

Drafting [CAD] Design: \$83.00/hr.

Architect: \$130.00/hr.

7. Maintenance Services and Extended Warranties:

Factory or Misc. Formal Training / Instruction: Direct Cost

Maintenance Services Labor/Materials IAW standard JOC pricing [Trade Service/UPB]

Extended Warranties [if available through manufacturer and/or vendor] Direct Cost

Member		Date	
Project Title			
Project Location			

NOTE: The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.

This worksheet is for the detailed information and pricing for quotations from subcontractors, and the General and Administrative Cost (G&A) and Profit.

To complete the portion required for your price proposal, place the percentage value your firm will use to calculate overhead and profit for the Direct Project Costs and General Conditions in the yellow highlighted cells.

This workbook will serve as your quoting template for all open book projects under an awarded contract. After completion of this worksheet, you may delete this textbox in your template.

Direct Project Cost

Division/Specialty	#	Quote Summary		Selected Quote
		Subcontractor	Quote Amount	
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
Subtotal 1 (Total Direct Project Cost)				\$0.00
General Conditions (GCs) Adminfeeable				\$ -
General Conditions (GCs) Admin Fee				\$ -
General Conditions (GCs) Total Without Admin Fee				\$ -

Subtotal 2 (Direct Project Cost + General Conditions) **\$0.00****General & Administrative Cost (G&A)**
(Enter applicable G&A Percentage)10.00% % of Subtotal 2 **\$0.00**Subtotal 3 (Subtotal 2 + G&A) **\$0.00****Profit**
(Enter applicable profit percentage)5.00% % of Subtotal 3 **\$0.00**Subtotal 4 (Subtotal 3 + Profit) **\$0.00****Total Amount Subject to Mohave Admin Fees (based on costs including O&P)**

\$0.00	Total of Adminfeeable Amounts
\$ -	Total Admin fee due

General Conditions (GCs) (non-adminfeeable)

\$ -

Tax (Enter applicable tax rate)

\$0.00

Bond, if applicable (Enter applicable unit price)

\$0.00

Total Project Cost**\$0.00***** Provide vendor name & explanation if low quote is not selected.**

Item Number (optional)	Item Description	Quantity	Unit of Measure	Unit Price	Total	Remarks
Admin Fee Items						
	Project General Manager		hr	\$ 94.00	\$ -	
	Project Manager		hr	\$ 83.00	\$ -	
	Estimator		hr	\$ 77.00	\$ -	
	Senior Superintendent		hr	\$ 77.00	\$ -	
	Superintendent		hr	\$ 72.00	\$ -	
	COC Inspector		hr	\$ 77.00	\$ -	
	Safety Manager		hr	\$ 83.00	\$ -	
	Field Engineer		hr	\$ 94.00	\$ -	
	Administrative Assistant		hr	\$ 58.00	\$ -	
	HVAC Chiller Tech		hr	\$ 90.00	\$ -	
	HVAC Unitary Tech		hr	\$ 86.00	\$ -	
	Pipefitter / Steamfitter		hr	\$ 82.00	\$ -	
	Sheet Metal Installation		hr	\$ 64.00	\$ -	
	Water Treatment		hr	\$ 88.00	\$ -	
	Plumber		hr	\$ 85.00	\$ -	
	Electrical (by PMAC)		hr	\$ 68.00	\$ -	
	HVAC Building Automation		hr	\$ 85.00	\$ -	
	General Labor / Driver		hr	\$ 43.00	\$ -	
	Design Services (Mech/Electrical)		hr	\$ 101.00	\$ -	
	Drafting / CAD / Design		hr	\$ 80.00	\$ -	
	Architect		hr	\$ 123.00	\$ -	
	Principal Architect		hr	\$ 130.00	\$ -	
	Plans / Specs / Drawings			\$ -	\$ -	
	Temporary Electric			\$ -	\$ -	
	Electricity Usage			\$ -	\$ -	
	Water Usage (incl. bottled water)			\$ -	\$ -	
	Temporary Toilet Usage			\$ -	\$ -	
	Cellular / Mobile Service			\$ -	\$ -	
	Trash Service - Tonnage			\$ -	\$ -	
	Trash Service - Rental			\$ -	\$ -	
	Trash Service - Dumps			\$ -	\$ -	
	Temp. Fences & Barriers			\$ -	\$ -	
	Project ID Signs			\$ -	\$ -	
	Trailer Set-up & Remove			\$ -	\$ -	
	Trailer Rental			\$ -	\$ -	
	Field Office Expense			\$ -	\$ -	
	Postage / Messengers / Fedex			\$ -	\$ -	
	Safety Related -(Labor)			\$ -	\$ -	
	Safety Related -(Materials)			\$ -	\$ -	
	Gasoline / Fuel			\$ -	\$ -	
	Final Clean			\$ -	\$ -	
				\$ -	\$ -	
				\$ -	\$ -	
				\$ -	\$ -	
				\$ -	\$ -	
				\$ -	\$ -	
				\$ -	\$ -	
	Total Adminfeeable Items				\$ -	
	Item Description	Quantity	Unit of Measure	Subcontract Unit Price	Total	Remarks
Non-Admin Fee Items						
	Mileage Reimbursement				\$ -	
	Licensing & Permits				\$ -	
	Travel - Transport - Airfare				\$ -	
	Travel - Transport - Car Rental				\$ -	
	Travel - Lodging				\$ -	
	Travel - Meals				\$ -	
	Total Non-Adminfeeable Items				\$ -	

NOTE: The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.

This worksheet is for general conditions, services, or costs not identified or included in the subcontractor quotations. To complete the portion required for your price proposal, provide the information as applicable below:

- Provide the labor and/or service unit price for the yellow highlighted cells in the section titled, Admin Fee Items: Unit Price. Additionally, include the unit of measure (e.g. per hour, per day, per week, etc.) as applicable in the Unit Of Measure column.
- Provide additional costs as applicable for yellow highlighted cells in the section titled, Non-Admin Fee Items. Non-Admin Fee items are costs that is "passed-through" to member at cost to the contract vendor. Mohave shall not collect administration fees on the above non-admin fee items.
- Add line items to the Admin and/or Non-Admin Fee schedules as necessary.
- Only services/costs identified in this price schedule will be allowed under an awarded contract.
- This workbook will serve as your quoting template for all open book projects under an awarded contract.

This workbook will serve as your quoting template for all open book projects under an awarded contract. After completion of this worksheet, you may delete this textbox in your template.

8. Other Charges – Miscellaneous Pricing:

100% Performance/Payment Bonds:	1.50% of project cost
Note: P/P bonds are calculated based on the <u>total</u> project cost [base price + tax]	
Meals and Incidental Expenses (M&IE):	Per AZ State rates
Transportation and Lodging:	Per AZ State rates
Note: M&IE, travel, and lodging are only applicable outside 50 mile radius of Tucson & Phoenix offices	
Expedited Shipping:	Direct Cost
Factory or Misc. Formal Training / Instruction:	Direct Cost
Credit Card / P Card Fees [when applicable]:	Direct Cost + 1%
Mobilization	No additional charges other than allowed as pre-priced line items in the UPB, Open Book, or TRA-SER
Maintenance Services	Labor/Materials IAW standard JOC pricing
Extended Warranties [if available through manufacturer and/or vendor]	Direct Cost
Permits or other direct construction fees:	Direct Cost
Additional Print Sets or Extra O&M Manuals	Direct Cost
Miscellaneous Admin Fees Not Included Above [E.g. Native American TERO or other tribal fees, etc.]:	Direct Cost

9. Quick Pay Discounts:

Will you offer members a quick pay discount if payment is made within 10 or 20 days? Yes _____ No **X**



Solicitation as Issued

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4/5/18 EH



Request for Qualifications 19F-0605

Job Order Contracting for Various Construction Trades

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REQUEST FOR QUALIFICATIONS 19F-0605

Job Order Contracting for Various Construction Trades

Pursuant to the provisions in the Arizona procurement rules and code, Mohave Educational Services Cooperative, Inc. seeks Statements of Qualifications to establish contract(s) for Job Order Contracting for Various Construction Trades. A copy of this RFQ is available for public inspection at 625 East Beale Street, Kingman, AZ 86401.

Due Date and Time: Wednesday, June 5, 2019 at 3:00 p.m. (local Arizona time)

Pre-Qualifications Conference: Wednesday, May 15, 2019 at 10:00 a.m. (local Arizona time)
Meeting Bridge Conference Call – Audio Only
For login information contact Michael Nentwig,
no later than Tuesday, May 14, 2019.

Last Day for Questions: Wednesday, May 29, 2019 at 5:00 p.m. (local Arizona time)

Request for Qualifications Questions Must Be Directed To:

Michael Nentwig, CPPB, Contract Specialist I
Email: contracts@mesc.org
Telephone: (928) 718-3203

To be considered, Statements of Qualifications shall be delivered to Mohave Educational Services Cooperative, Inc. (Attn: Contracts Dept.), 625 East Beale Street, Kingman, AZ 86401 in a sealed envelope or package with RFQ 19F-0605, offeror's name, mailing address, and Statement of Qualifications due date and time clearly indicated on the envelope or package. Statements of Qualifications must be in the actual possession of Mohave on, or prior to, the exact time and date indicated above. Statements of Qualifications shall be opened immediately following the Statement of Qualifications due date and time, with the name of each offeror publicly read and recorded. Late Statements of Qualifications shall not be considered. Kingman is considered a "rural" area by many express delivery carriers and thus, they do not guarantee priority (next day) delivery by a specific time. Prospective offerors are encouraged to keep this in mind when arranging delivery of their Statement of Qualifications and are advised herein that late Statements of Qualifications shall be handled as specified by Arizona procurement rules and code.

Offerors are strongly encouraged to carefully read the entire contents of this solicitation prior to submitting a Statement of Qualifications. Failure to examine any of the requirements will be at the offeror's risk.

Mohave reserves the right to cancel this solicitation and/or reject all Statements of Qualifications in whole, or in part, if Mohave determines that cancellation and/or rejection is advantageous to Mohave and/or its members.

A handwritten signature in dark ink, appearing to read 'Anita S. McLemore'.

Anita S. McLemore, C.P.M.
Executive Director
Mohave Educational Services Cooperative, Inc.

Publish Date: May 1, 2019

Template Rev. 19-1

Offer and Signature Form
(Place after Tab 1a)

Request for Qualifications 19F-0605
Job Order Contracting for Various Construction Trades

To Mohave Educational Services Cooperative, Inc.:

The undersigned hereby offers a Statement of Qualifications in compliance with all terms and conditions, requirements and amendments in the solicitation and any written exceptions in the offer. Signature also certifies understanding and compliance with the certification requirements in the General Terms and Conditions.

Federal Employer Identification Number _____

Company Name _____

Address _____ City _____ State _____ Zip _____

Telephone Number _____

The *Offer and Signature Form* shall be submitted with a signature of the person authorized to sign the offer. The person signing the offer shall initial erasures, interlineations or other modifications in the Statement of Qualifications. Failure to sign the *Offer and Signature Form*, or to make other notations as indicated, may result in rejection of the Statement of Qualifications.

Authorized Signature _____

Printed Name _____ Title _____

Primary Email _____ Alternate email _____

*Note: The primary email address will be used for all communication from Mohave regarding your response to this solicitation. Provide an alternate email address that will be used **only** if the primary email address is not valid.*

Confidential/Proprietary Submittal Form
(Place after Tab 1a)

CONFIDENTIAL/PROPRIETARY SUBMITTALS

Confidential/Proprietary Submittals (mark one):

_____ No confidential/proprietary materials have been included with this Statement of Qualifications.

_____ Confidential/proprietary materials have been included with this Statement of Qualifications. Offerors shall identify below any portion of their Statement of Qualifications deemed confidential or proprietary (see General Terms and Conditions 4. Confidential Information).

Note that any documentation marked as confidential or proprietary must be identified below. Any confidential or proprietary information NOT identified as instructed shall be deemed as non-confidential or non-proprietary.

The confidential/proprietary information identified below does not guarantee that disclosure will be prevented but that the item(s) will be subject to review by the offeror and Mohave prior to any public disclosure. Requests to deem the entire offer or pricing as confidential shall not be considered.

Firm

Authorized Signature

Instructions to Offeror and Checklist Form
(Place after Tab 3a)

You have received this solicitation because of information you provided on Mohave's "online prospective bidders sign-up." **Review this document in its entirety to make sure you fully understand the services and products that we are requesting.** Please do not assume a particular form, section, or requirement does not, or should not, apply to you. Contact Mohave at contracts@mesc.org with questions.

We have included this checklist to assist you in preparing your response. Follow each step, placing the required information in your response binder in the proper place. **All of the items listed below are required.** Initial next to each item to indicate completion.

PRICING SHALL NOT BE INCLUDED IN YOUR STATEMENT OF QUALIFICATIONS.

_____ **Step ONE:** Read and understand the document. You are responsible for asking any questions regarding the information you are required to include with your response. Do not hesitate to contact the Contract Specialist as shown on page 1 for clarification on any items contained in this solicitation.

_____ **Step TWO:** One (1) original and five (5) additional complete copies of your Statement of Qualifications shall be submitted in separate three-ring loose-leaf binders in the format detailed below. Statements of Qualifications shall contain all descriptive literature, submittal requirements, and any other information required by the solicitation. Include two (2) CD, USB, or similar electronic media device containing electronic copies of your submitted documents with each binder.

Statements of Qualifications must be completed in ink, on a computer, or typewritten. No pencil submissions are allowed. Forms may be filled out by hand, but shall be legible.

_____ **Step THREE:** Statement of Qualifications shall be organized and presented in the order as required below, with separate tabs and sub-tabs (e.g. 1a, 1b) and dividers.

_____ **Step FOUR:** Confirm that the Statement of Qualifications is complete and signed on page 2 by an authorized representative.

_____ **Step FIVE:** Keep a complete copy of your Statement of Qualifications for your records.

_____ **Step SIX:** Statements of Qualifications shall be submitted to the proper location in a sealed and properly identified envelope or package, as specified on page 1 of this solicitation. Statements of qualifications must be in the actual possession of Mohave on, or prior to, the exact time and date set for Request for Qualifications opening. Pricing is not requested in the Statement of Qualifications and shall not be included in your response.

A Request for Qualifications tabulation (a list of respondents) will be posted at www.mesc.org within one week of the RFQ opening.

_____ Tab and Sub-tab Arrangement _____

• **Tab 1: Offer and Signature Form, General Terms and Conditions, and Scope of Work**

_____ **Tab 1a** – The signed *Offer and Signature Form* is placed after Tab 1a.

_____ A copy of suspension or debarment letter (if applicable) is placed after Tab 1a.

_____ A copy of the *Confidential/Proprietary Submittal Form* is placed after Tab 1a.

_____ **Tab 1b** – Signed amendments, if any, are placed after Tab 1b.

_____ **Tab 1c** – A complete copy of the General Terms and Conditions is placed after Tab 1c.
(Note: Unless and until the District Court's injunction in *Jordahl v. Brnovich* is lifted or stayed, the Anti-Israel Boycott Provision (A.R.S. §35-393.01 (A)) is unenforceable and Mohave will take no action to enforce it.)

Instructions to Offeror and Checklist Form
(Place after Tab 3a)

_____ A completed copy of the *General Terms and Conditions Acceptance Form* is placed after Tab 1c. Any exceptions to the General Terms and Conditions are noted and explained.

_____ **Tab 1d** – A copy of the Scope of Work is placed after Tab 1d.

• **Tab 2: Statement of Qualifications**

_____ **Tab 2** – A complete response to the Statement of Qualifications pages is placed after Tab 2, with the following sub-tabs as described.

_____ **Tab 2a** – Table of Contents is placed after Tab 2a.

_____ **Tab 2b** – Letter of Introduction is placed after Tab 2b.

_____ **Tab 2c** – Basic Company Information is placed after Tab 2c.

_____ **Tab 2d** – General and/or Specialty Contracting information is placed after Tab 2d.

_____ **Tab 2e** – Form of Ownership is placed after Tab 2e.

_____ **Tab 2f** – Company Personnel Information is placed after Tab 2f.

_____ A completed Standard Form 330 is placed after Tab 2f.

_____ **Tab 2g** – A complete List of Consultants and Subcontractors is placed after Tab 2g

_____ **Tab 2h** – Financial Information is placed after Tab 2h.

_____ **Tab 2i** – A current certificate or certificates of insurance (**see General Term and Condition 10.1 Insurance**) is placed after Tab 2i.

_____ **Tab 2j** – Past Performance information is placed after Tab 2j.

_____ **Tab 2k** – Contract Management Plan is placed after Tab 2k.

_____ **Tab 2l** – Quality Management Plan is placed after Tab 2l.

_____ **Tab 2m** – Subcontractor Management Plan is placed after Tab 2m.

_____ **Tab 2n** – Safety Plan is placed after Tab 2e.

• **Tab 3: Additional Information**

_____ **Tab 3a** – Completed *Instructions to Offeror and Checklist Form* is placed after Tab 3a.

_____ **Tab 3b** – Descriptive literature, slicks and any other supporting printed data are placed after Tab 3b.

Scope of Work (Place after Tab 1d)

1. DESCRIPTION

In order to gain economies of scale, Mohave is formally soliciting sources for Job Order Contracting for Various Construction Trades as specified within this Request for Qualifications. These services are requested for Mohave's statewide membership of approximately 450 public agencies. However, other members may be added during the term of an awarded contract(s). A current list of all members can be found on Mohave's website at www.mesc.org.

Mohave may procure, as an entity for its membership, construction and construction service contracts, as applicable, using the following project delivery method: Job Order Contracting, as stated in Arizona Administrative Code, Article 11: School District Procurement R7-2-1102 through R7-2-1115, ARS §34-602(A)(4) and §41-2582(A)(4). Mohave's use of alternative project delivery methods for construction contracts is in accordance with the Arizona Administrative Code, Article 11: School District Procurement R7-2-1106 through R7-2-1115, ARS §34-604 and §41-2579. Services shall be procured in accordance with the Arizona Administrative Code, Article 11: School District Procurement and ARS §34-604 and §41-2579.

This Request for Qualifications is the first of a two-step procurement process. Contracts, if any, will be awarded in accordance with the subsequent Request for Proposal. Mohave will issue a Request for Proposal to a final list of responsive and responsible vendors determined to be the most qualified to perform the specified construction services. The final list shall include a maximum of twenty total persons/firms, consisting of up to five firms for each specialty contracting divisions listed. Mohave is stating that three specialty contracting divisions will be considered beyond general contracting. Of these possible twenty firms no more than five contracts will be awarded per division for multiple contracts for similar job order contracting construction services to separate persons/firms.

Because any work under this contract will be on a job order basis, exact project details are not available. General information on the project site, scope of work, schedule, project design and construction budget, or life cycle budget information shall be provided by members prior to usage of awarded contracts. Specifications will be included in the subsequent Request for Proposal issued to firms whose Statements of Qualifications make the final list. Those specifications will form the basis for any work to be performed. The specifications are intended to indicate the requirements of Mohave's members, which will include generally accepted practices in the construction industry.

For purposes of this Request for Qualifications, specialty contracting divisions requested are Division 22, Plumbing; Division 23 Heating, Ventilation, and Air Conditioning; and Division 26, Electrical.

Mohave has current contracts for related work (e.g., electrical, JOC fencing, flooring, roofing, electronic safety and security, fire suppression, painting, asphalt paving, plumbing). Any contract awarded as a result of this Request for Qualifications will be in addition to those contracts but will not replace them. The Mohave member shall retain the right to determine which contracts are in their best interests.

Mohave desires to contract with a qualified and experienced offeror, or offerors, to provide quality Job Order Contracting (JOC) for various construction trades for Mohave's statewide membership. Various construction trades in the subsequent Request for Proposals may include, but not be limited to: construction, repair, rehabilitation and alteration services.

Under JOC, a master contract is established with standard specifications and pricing based upon a coefficient that is applied to a Unit Price Book (UPB). Pricing may also be established through an Open Book Pricing methodology. Open Book pricing allows the contract vendor to apply subcontractor price quotes and total direct project costs to a predetermined General and Administrative percentage and profit mark-up. Trade Service along with an established labor hourly rate may be used for service and repair projects. When a JOC order is issued, the member and the contract vendor agree on the scope of work, pricing methodology to be used, and the cost is determined by applying the agreed upon pricing methodology to the entire project. **Statements of Qualifications shall not include pricing, coefficients or General and Administrative percentage and profit mark-up information.**

**Scope of Work
(Place after Tab 1d)**

Mohave currently has two active and one expired JOC contracts (14G-0808) for general contracting. Activity under the contracts from 09/03/14 including year to date activity (as of the publication date of this RFQ) is \$101,558,666.

Mohave currently has one JOC contract (14G-0808) for Division 23. Activity under this contract from 09/03/14 including year to date activity (as of the publication date of this RFQ) is \$84,207,330.

This information is provided as an aid to vendors in preparing Statements of Qualifications only. If awarded a contract under a subsequent RFP, the coefficient(s) and any other pricing shall apply regardless of the dollar volume of orders under the contract. Work shall be performed at various locations statewide.

2. ESTIMATED TIMELINE OF EVENTS

Mohave has developed the following estimated timeline of events related to this formal solicitation. All dates are subject to change as required and at the sole discretion of Mohave.

<u>EVENT</u>	<u>ESTIMATED DATE</u>
Request for Qualifications Issued	May 1, 2019
Pre-qualifications Conference Held	May 15, 2019 at 10:00 a.m. (local AZ time) Pre-qualifications conference will be held using <i>Meeting Bridge</i> telephone conferencing. Please contact Mohave for reservation details.
Deadline for Questions	May 29, 2019 at 5:00 p.m. (local AZ time)
Published Request for Qualifications Due Date and Time	June 5, 2019 at 3:00 p.m. (local AZ time) 625 East Beale Street, Kingman, AZ 86401
Public Opening of Request for Qualifications	June 5, 2019 at 3:00 p.m. (local AZ time)
Selection of Final List (<i>estimated date only</i>)	June 14, 2019 NOTE: Notification will be sent by email to all selectee(s) and non-selectee(s) for the final list on or before this date.
Request for Proposals Issued (<i>estimated date only</i>)	July 1, 2019

3. SUBMISSION OF STATEMENT OF QUALIFICATIONS

3.1. The Statement of Qualifications shall provide straightforward, concise information that satisfies the requirements. Expensive bindings and/or color displays are not necessary. Emphasis should be placed on conformity to the terms and conditions, as well as the completeness and clarity of the submittal content.

3.2. The offeror must submit its Statement of Qualifications following information detailed in the *Instructions to Offeror and Checklist Form*.

3.3. A Statement of Qualifications submitted in response to this solicitation shall be valid and irrevocable for one hundred twenty (120) days after opening date and time.

**Scope of Work
(Place after Tab 1d)**

4. CONTRACT TYPE

No contracts shall be awarded from this Request for Qualifications. However, contracts for an initial one (1) year term and four (4) potential one-year extensions will be awarded in the subsequent Request for Proposal.

5. EVALUATION CRITERIA

The weighted award criteria for this solicitation, in relative order of importance, are as follows:

Criteria	Points
Offeror's qualifications and experience	40
Quality of the Statement of Qualifications	20
Offeror's contract management plan	10
Offeror's quality management plan	10
Offeror's subcontractor management plan	5
Offeror's financial capacity	5
Offeror's safety record	5
References, past performance information and other pertinent information	<u>5</u>
Total	100

References and definitions used for specifications: (acronyms used in the solicitation are noted in bold font below):

Construction Specifications Institute: www.csiresources.org

General Terms and Conditions (Place after Tab 1c)

Some General Terms and Conditions specify placement of information in tabs other than Tab 1c as noted in the title above. Pay close attention to placement information (identified in bold text) as indicated in select General Terms and Conditions.

1. AVAILABILITY OF FUNDS

Member funding availability is unknown to Mohave at the time this solicitation was issued. Use of any contract awarded by Mohave will be conditioned upon the availability of member funds.

2. CAPTIONS, HEADINGS AND ILLUSTRATIONS

The captions, illustrations, headings, and subheadings in this solicitation are for convenience and ease of perusal only, and in no way define, limit or describe the scope or intent of the request.

3. CERTIFICATION

By signing the *Offer and Signature Form* (page 2 of the Request for Qualifications), offeror certifies the following:

- Offeror has examined and understands the terms, conditions, scope of work, and other documents in this solicitation.
- The submission of the offer did not involve collusion or other anticompetitive practices. Neither signatory nor any person on his behalf has connived or colluded to produce a deceptive show of competition in the matter of the bidding or award of a contract under this solicitation.
- Offeror has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with the submitted offer.
- Neither offeror, nor any officer, director, partner, member or associate of offeror, nor any of its employees directly involved in obtaining contracts with the State of Arizona, Mohave Educational Services Cooperative, Inc., or any subdivision of the state has been convicted of false pretenses, attempted false pretenses, or conspiracy to commit false pretenses, bribery, attempted bribery or conspiracy to bribe under the laws of any state or federal government for acts or omissions after January 1, 1985.
- Offeror agrees to comply fully with any and all provisions of ARS, Title 32, Chapter 10 (Registrar of Contractors) that may regulate offeror's business.
- Offeror shall not discriminate against any employee, or applicant for employment, in violation of federal and state laws (see Federal Executive Order 11246; and ARS, Title 41, Chapter 9, Article 4).
- Offeror is not currently suspended, debarred or otherwise precluded from participating in any public procurement activity with any federal, state or local government entity.
- If awarded a subsequent contract, offeror agrees to promote, offer and sell under Mohave contract only those materials and/or services awarded to contract vendor by Mohave.
- If awarded a subsequent contract, offeror shall provide the equipment, commodities, and/or services to members of Mohave in accordance with the terms, conditions, scope of work, specifications, and other documents of this Request for Qualifications and the subsequent Request for Proposal.
- If awarded a subsequent contract, offeror agrees that all staff and other individuals eligible to receive services shall have equal access to the services regardless of race, religion, color, sex, disability, age or national origin (including language minority individuals).
- Offeror and all proposed subcontractors comply and shall remain in compliance with the Federal Immigration and Nationality Act (FINA), all other current federal immigration laws and regulations, ARS §41-4401, and ARS §23-214, which requires compliance with current federal immigration laws by Arizona employers, Arizona contractors and Arizona subcontractors in accordance with the E-Verify employee eligibility verification program.

General Terms and Conditions

(Place after Tab 1c)

- Offeror shall comply with ARS §35-393.01 and certify that they are not currently engaged in and agree that for the duration of the contract to not engage in, a boycott of Israel.
(Note: Unless and until the District Court's injunction in *Jordahl v. Brnovich et al.*, Case No. 3:17-cv-08263 (D. Ariz.) is stayed or lifted, the Anti-Israel Boycott Provision (A.R.S. the Anti-Israel Boycott Provision (A.R.S. 35-393.01 (A)) is unenforceable and will take no action to enforce it. Compliance to this term and condition is not a mandatory part of the offer as long as the injunction remains in place. Offers will not be evaluated based on whether the offeror complied or deviated to this term and condition.)
- If applicable to the products and services offered under this contract, Offeror shall comply with current applicable requirements of Health Insurance Portability and Accountability Act of 1996 (HIPPA), and accompanying regulations. Contract vendor agrees to work with the member in the course of performance so that the member and contract vendor are in compliance with HIPPA.

4. CONFIDENTIAL INFORMATION

4.1. Confidential information request: If offeror believes that its Statement of Qualifications contains confidential trade secrets or other proprietary data not to be disclosed, a statement advising Mohave of this fact shall accompany the Statement of Qualifications, and the information shall be so identified wherever it appears. Mohave shall review the statement and shall notify the offeror of their determination in writing whether the information shall be withheld or disclosed. Requests to deem the entire offer as confidential will not be considered.

4.2. Public record: All Statements of Qualifications submitted in response to this solicitation shall become the property of Mohave. They will become a matter of public record available for review, subsequent to award notification, with the exception of information deemed confidential by Mohave.

5. CONFIRMATION

If an apparent mistake in a Statement of Qualifications, relevant to the award determination is discovered after opening and before award, Mohave shall contact the offeror for written confirmation of the Statement of Qualifications. If offeror fails to act, the offeror shall be considered non-responsive.

Mohave may contact an offeror to confirm our understanding of the Statement of Qualifications. Such contact shall be prior to award. Mohave shall obtain written confirmation from the offeror and shall retain the confirmation in the procurement file. Correction of mistakes in a Statement of Qualifications shall only be allowed as described in Arizona procurement rules and code.

6. CONSTRUCTION

6.1. Construction services: Construction, and one or more related services, such as maintenance services, operations services, design services and preconstruction services are services authorized in the definition of JOC.

6.2. Subcontractor: A person who contracts to perform work or render service to a contractor or to another subcontractor as a part of a contract with Mohave.

7. CONTRACT MANAGEMENT

7.1. Applicable law: The contract shall be governed by the laws of the State of Arizona, and suits pertaining to the contract may be brought only in courts in the State of Arizona.

7.2. Application of law: The Arizona Procurement Code, the Arizona State Board of Education School District Procurement Rules, and the Uniform Commercial Code (UCC) as adopted by the State of Arizona, are part of this document as if fully set forth herein. Any provision or clause required by law, rule or regulation to be included in the contract will be read and enforced as if in the contract.

General Terms and Conditions (Place after Tab 1c)

7.3. Contract claims or controversies: The requirements of the Arizona procurement rules and code shall govern any contract awarded as a result of the subsequent RFP, as well as any subsequent RFP claims or controversies associated with it. Formal contract claims and controversies between a member and contract vendor shall be resolved in accordance with R7-2-1155 through R7-2-1159, or ARS, Title 41, Chapter 23, Article 9, as applicable. The member's authorized representative shall serve as the district representative for resolution of such claims and controversies. ARS, Title 41, Chapter 23, Article 9 and the rules promulgated under it, or R7-2-1155 through R7-2-1159, as applicable, provide the exclusive procedure for asserting a cause against the member under the contract.

7.4. Severability: The provisions of any subsequent contract are severable to the extent that any provision or application held to be invalid shall not affect any other provision or application of the contract which may remain in effect without the invalid provision or application.

8. COOPERATIVE PURCHASING

8.1. Cooperative purchasing: Any subsequent awarded contract is based on the need for Mohave to provide the economic benefits of volume purchasing and reduction in administrative costs through cooperative purchasing to members. Any offer that prohibits sales to specific types of members (e.g., state agencies or local government units) may not be considered. Sales without restriction to any members are preferred.

8.2. Cooperative purchasing agreements: Cooperative Purchasing Agreements between Mohave and its members have been established under Arizona procurement rules and code for use of contracts.

8.3. Eligible agencies: Any subsequent contract awarded from this solicitation process shall be available to all members. Members shall have a current signed Mohave Cooperative Purchase Agreement. Member is defined as a local or public procurement unit, or a governmental public entity that is a political subdivision for purposes of federal income tax, or a nonprofit educational or public health institution that is a political subdivision for purposes of federal income tax or meets the requirements of Section 115 of the Internal Revenue Code. Mohave has over 450 members including public school districts, community colleges, city and county governments and political subdivisions throughout Arizona. A list of members may be found on Mohave's website, www.mesc.org. Actual use of any contract shall be at the sole discretion of Mohave's members.

8.4. Most favored customer relationship: Nothing in this solicitation is intended to establish a most favored customer relationship between Mohave and contract vendor. Contract vendor may respond to any solicitation without regard to this contract. Offeror agrees all prices, terms, warranties, and benefits granted by offeror to members through any subsequent awarded contract are comparable to or better than the equivalent terms offered by offeror to any present customer meeting the same qualifications or requirements. If contract vendor offers lower prices to any of its other customers, it may lower its prices to Mohave at the same time by written notice.

9. EVALUATION and AWARD

9.1. Basis of award: In accordance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1111(C), ARS §34-604(F)(2) and §41-2579(F)(2), Mohave shall issue a Request for Proposal to a final list of responsive and responsible vendors determined to be most qualified to perform the specified construction services. To qualify for evaluation, a Statement of Qualifications must have been submitted on time, and materially satisfy all mandatory requirements identified in this solicitation.

9.2. Exceptions/deviations to requirements: All requested exceptions/deviations must be clearly explained. Unacceptable exceptions/deviations shall remove your Statement of Qualifications from further consideration. Mohave shall be the sole judge on the acceptance of exceptions/deviations and Mohave's decision shall be final.

General Terms and Conditions
(Place after Tab 1c)

9.3. Formation of contract: No contracts shall be awarded from the Request for Qualifications.

9.4. Interviews: Mohave shall not hold interviews during the evaluation of this Request for Qualifications.

9.5. Maximum JOC order: The maximum dollar amount of an individual JOC order shall be one million dollars or such higher or lower amount prescribed by the purchasing agency in an action noticed pursuant to ARS, Title 38, Chapter 3, Article 3.1 or a rule adopted by the purchasing agency as the maximum amount of an individual JOC order. Requirements shall not be artificially divided or fragmented in order to constitute a JOC order that satisfies this requirement.

9.6. Method of evaluation: Mohave shall select a committee of not more than seven (7) members to evaluate the Statements of Qualifications. Composition of the committee shall be in compliance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1107, ARS §34-604(C)(3) and §41-2579(C)(3).

9.7. Multiple award: To assure that our contracts meet the requirements of all members, Mohave may award up to five contracts to individual firms receiving the highest number of points, for similar job-order-contracting construction services within a specialty division (e.g. Division 23 HVAC) or within all divisions. Each of the multiple contracts will be awarded to a separate person/firm. Offeror should consider this fact in preparing their response. The decision to award multiple contracts, award a single contract, or make no award rests solely with Mohave. A multiple award shall be made only if the procurement officer determines in writing that a multiple award is necessary and is advantageous to Mohave members.

A multiple award shall be limited to the least number of contracts necessary to meet the requirements of the using agencies. Mohave shall make the sole determination of the least number of contracts required to meet the need. Mohave's basis for determining whether to award multiple contracts shall be based upon considerations for the large number of members, diverse types of members, location of members throughout Arizona and members' past usage of similar contracts.

Criteria for selecting vendors for multiple contracts shall be based upon considerations for members' experience with existing products and systems, brand continuity for parts replacement and future expansion, contract vendor's ability to provide for our large, diverse membership, Mohave's past experience with contracts for similar product/services, and/or other relevant criteria.

9.8. Past performance information: Past Performance Information (PPI) is relevant information regarding a contract vendor's actions under previously awarded contracts to public agencies. It includes contract vendor's record of performance under such contracts including, but not limited to: conformance to the terms, conditions, specifications and scope of work of the contracts, responsiveness to, and correction of, contract claims and controversies, and satisfaction of the contracting entities. PPI shall be a factor in evaluation and award.

9.9. Request for Proposal: The evaluation committee shall determine a final list of offerors to receive a subsequent Request for Proposal for general contracting and/or specialty contracting.

9.10. Responsive Statement of Qualifications: A responsive Statement of Qualifications conforms in all respects to the material requirements of the solicitation. The Statement of Qualifications shall be responsive to receive further consideration. Mohave reserves the right to waive minor informalities.

General Terms and Conditions
(Place after Tab 1c)

10. INSURANCE

10.1. Certificate: Evidence of the required insurance shall be provided with your Statement of Qualifications by means of a current certificate of insurance with the coverage's as stated within the requirements below. Before any orders are processed under an awarded contract, contract vendor shall provide a certificate that names Mohave Educational Services Cooperative, Inc. as the certificate holder.

Certificate (or certificates if using multiple carriers) shall include, at a minimum, coverage for:

- General Liability
- Automobile liability
- Umbrella or Excess Liability
- Workers' Compensation

In addition, contract vendor must be willing to provide, upon request, identical certificate of insurance to any member using this contract. Contract vendor must also be willing, upon request, to add any member as an additional insured entity. Any costs for adding a member as an additionally insured entity shall be clearly identified in submitted contract pricing. If no pricing is identified, adding a member as an additionally insured entity shall be provided at no additional cost.

Provide evidence of current insurance coverage after Tab 2i.

10.2. Deductibles: Contract vendor shall pay the deductibles required by the insurance provided under this contract.

10.3. Liability insurance: Prior to commencing services under this contract, contract vendor shall procure and maintain during the life of this agreement, comprehensive general liability insurance, to include automobile liability, providing limits of an aggregate amount of not less than \$2,000,000.

10.4. Scope of Insurance: Contract vendor's insurance shall provide adequate protection for contract vendor against damage claims which may arise from operations under this contract, whether such operations are by the insured or by anyone directly or indirectly employed by the insured. All insurance must be written by companies incorporated within the United States (exclusive of Territories or Possessions) and licensed or authorized to do business in Arizona.

10.5. Subcontractor insurance: Prior to commencing any work, any subcontractor shall procure and maintain at its own expense until final acceptance of the work, insurance coverage in a form and from insurers acceptable to the prime contractor. All subcontractors will provide workers' compensation insurance, which waives all subrogation rights against the prime contractor, member and Mohave.

10.6. Workers' compensation insurance: Contract vendor shall also procure and maintain during the life of this agreement, workers' compensation insurance for all of contract vendor's employees engaged in work under the contract. All workers' compensation insurance will be in compliance with Arizona state statute and evidenced by a certificate of insurance.

11. LICENSES

A contract vendor for JOC construction services shall be licensed to perform construction pursuant to ARS, Title 32, Chapter 10. The contract vendor shall maintain in current status all federal, state and local licenses, bonds and permits required for the operation of the business conducted by contractor. The contract vendor shall remain fully informed of and in compliance with all current ordinances and regulations pertaining to the lawful provision of services under the contract. Mohave reserves the right to stop work and/or cancel the contract of any contractor whose license(s) expire, are suspended or terminated. Contract vendor shall immediately notify Mohave of any expiration, lapse, suspension or termination of license(s).

General Terms and Conditions
(Place after Tab 1c)

12. OFFEROR QUALIFICATIONS

It is preferred that the offeror has extensive knowledge and at least three (3) years experience with the provision, installation and maintenance of the equipment, and job order contracting services offered. Mohave reserves the right to accept or reject newly-formed companies based solely on information provided in the subsequent proposal and/or its own investigation of the company.

13. PREPARATION OF THE STATEMENT OF QUALIFICATIONS and STATEMENT OF QUALIFICATIONS FORMAT

13.1. Modification of Statement of Qualifications: An offeror may modify a Statement of Qualifications in writing at any time before Request for Qualifications opening if the modification is received before the Request for Qualifications due date and time at the location designated in the Request for Qualifications for receipt of Statement of Qualifications.

13.2. Compliance with instructions: Offeror's ability to follow Statement of Qualifications preparation instructions in this solicitation will be considered an indicator of offeror's ability to follow instructions should it receive an award as a result of the subsequent RFP. The quality of organization and writing reflected in the Statement of Qualifications will be considered to be an indication of the quality of organization and writing which would be prevalent for any contract that may be awarded. As a result, the Statement of Qualifications will be evaluated as a sample of data submission. Subjective judgment on the part of Mohave's evaluators is implicit in this process.

13.3. Cost of Statement of Qualifications preparation: Mohave will not reimburse the cost of developing, presenting, or providing any response to this solicitation.

13.4. Offeror responsibility: Offeror shall examine the entire solicitation, seek clarification of any item or requirement that may not be clear, and check all responses for accuracy before submitting Statements of Qualifications. Failure to examine any requirements shall be at offeror's risk. Negligence in preparing an offer confers no right of withdrawal after due date and time.

13.5. Statement of Qualifications forms: The forms and format contained in the solicitation shall be used. Offerors may reproduce the forms and retype the information, but all of the required information must be presented in the tab order requested. Electronic or faxed Statements of Qualifications shall not be considered.

14. PRICING

14.1. Basis for pricing: Contract pricing under the subsequent request for proposal awards shall be based upon: Coefficient applied to a UPB; and/or Open Book pricing; and/or discount applied to Trade Service price guide.

14.2. Pricing requirements: Pricing is not requested in the Request for Qualifications and shall not be included in your response.

15. PROSPECTIVE BIDDERS REGISTRATION

Any offeror submitting a perfunctory Statement of Qualifications with no serious intent of being accepted may be removed from Mohave's prospective bidders list. Any vendor not responding to two (2) consecutive Requests for Qualifications or solicitations for similar procurements may be removed from the prospective bidders list. A "no bid" response or request to remain on the list is sufficient to keep a vendor on the Prospective Bidders Registration.

General Terms and Conditions
(Place after Tab 1c)

16. PROTESTS

Protests shall be filed with Anita McLemore, C.P.M., the Executive Director (the District Representative), and shall be resolved in accordance with Arizona procurement rules and code, ARS, Title 41, Chapter 23, Article 9 (<https://www.azleg.gov/arstitle>) and State Board Rules R7-2-1001 through R7-2-1196 (<https://azsos.gov/rules/arizona-administrative-code>). *A protest must be in writing and must be filed with the Executive Director at 625 E. Beale Street, Kingman, Arizona, 86401.* Protests based upon alleged improprieties in a solicitation shall be filed before the due date and time for responses to the solicitation. The interested party shall file the protest within ten (10) days after Mohave makes the procurement file available for public inspection. A protest filed on the tenth day must be received by 5:00 p.m., local Arizona time. The interested party may file a written request for an extension. The written request shall be filed before the time limit specified above and shall set forth good cause as to the specific action or inaction of Mohave that resulted in the interested party being unable to file the protest before the time limit specified above.

A protest shall be in writing and shall include the following information:

- The name, address and telephone number of the interested party;
- The signature of the interested party or the interested party's representative;
- Identification of the solicitation by contract number;
- A detailed statement of the legal and factual grounds of protest including copies of any relevant documents;
- The form of relief requested.

Should Mohave prevail in an appeal of a decision issued by the Executive Director, appellant waives any objection to the hearing officer awarding Mohave its reasonable attorney's fees and costs along with the costs for the hearing.

17. STATEMENT OF QUALIFICATIONS ACCEPTANCE PERIOD/WITHDRAWAL

17.1. Late Statement of Qualifications: Except as authorized by Arizona procurement rules and code, late Statements of Qualifications shall not be considered.

17.2. Withdrawal of Statement of Qualifications: An offeror may withdraw a Statement of Qualifications in writing at any time before Request for Qualifications opening if the withdrawal is received before the Request for Qualifications due date and time at the location designated in the Request for Qualifications for receipt of Statement of Qualifications. After the opening time and date, Statement of Qualifications may not be withdrawn, except as allowed by Arizona procurement rules and code.

18. STATEMENT OF QUALIFICATIONS OPENING

Statements of qualifications shall be opened immediately following the Request for Qualifications due date and time. The name of each offeror shall be publicly read and recorded in the presence of witnesses. All information in the Statement of Qualifications shall remain confidential until after award of subsequent contracts, with the exception of review by Mohave staff and selected evaluators.

19. SUSPENSION OR DEBARMENT STATUS

Offeror shall include a letter in its Statement of Qualifications notifying Mohave of any debarment, suspension or other lawful action taken by any federal, state or local government within the last five years that precludes offeror or its employees from participating in any public procurement activity. Such letter shall provide name and address of the public procurement unit, effective date, duration, and relevant circumstances of the suspension or debarment. Failure to supply such letter or not disclose all pertinent information shall result in cancellation of any subsequent contract. **Letter shall be placed after Tab 1a.**

General Terms and Conditions
(Place after Tab 1c)

20. TERM OF CONTRACT AND EXTENSION

20.1. Contract period: It is Mohave's intent to award a multi-term contract for the specified product, material, process, or services from the subsequent Request for Proposal awards. The initial contract term shall be for one (1) calendar year from the effective date of contract award. By mutual written agreement between Mohave and contract vendor, the contract may be extended for up to four (4) consecutive additional 12-month periods, beginning immediately after expiration of the prior term. However, no contract extension (contract modification) exists unless and until contract vendor is so notified by Mohave.

20.2. Contract extension (contract modification): Conditions for contract extension (contract modification) may include, but are not limited to: contract usage, satisfactory performance of services during the preceding contract term, ability to continue to provide satisfactory services, continued adherence to the contract requirements, and continued competitive prices for the materials and services provided under the contract. Mohave shall prepare a performance report for all contracts prior to issuing any extension (contract modification). This performance report shall use past performance information gathered by your assigned Contract Specialist. Past performance information shall be used when determining whether a contract receives an extension (contract modification).

21. TIME (DEFINITION OF)

Periods of time, stated as a number of days, shall be in calendar days, not business days.

General Terms and Conditions Acceptance Form
(Place after Tab 1c)

Signature on Page 2 certifies complete acceptance of the General Terms and Conditions in this solicitation, except as noted below (additional pages may be attached, if necessary).

Check one of the following responses to the General Terms and Conditions:

☐ **We take no exceptions/deviations to the general terms and conditions.**

(Note: If nothing is listed below, it is understood that no exceptions/deviations are taken.)

☐ **We take the following exceptions/deviations to the General Terms and Conditions. All exceptions/deviations shall be clearly explained. Reference the corresponding General Terms and Conditions that you are taking exceptions/deviations to. Clearly state if you are adding additional terms and conditions to the General Terms and Conditions. Provide details on your exceptions/deviations below:**

(Note: All requested exceptions/deviations must be clearly explained. Reference the specific terms and conditions that you are taking exceptions/deviations to, detail any proposed substitute terms and conditions, and clearly explain how the exceptions/deviations meet or exceed the requirements. Unacceptable exceptions/deviations shall remove your Statement of Qualifications from consideration for award. Mohave shall be the sole judge on the acceptance of exceptions/deviations and Mohave's decision shall be final.)

Statement of Qualifications Submittal
(Place after Tab 2)

Statement of Qualifications (Prepare a Statement of Qualifications as outlined below):

a. Table of Contents

- Provide a table of contents for your Statement of Qualifications.
- Place each major section after an indexed tab (e.g. 2a, 2b) and dividers.

b. Letter of Introduction

- Provide a brief introduction of your firm and its interest in this procurement.

c. Basic Company Information

- Company Name
- Address
- Telephone Number
- Fax Number
- Name of Primary Contact
- Email Address of Primary Contact
- Number of Years in Business
- License(s) held by the firm: License(s) shall include the current Arizona Contractors license number applicable to perform the scope of work. A copy of your current license shall be included in your response.
- If the firm has more than one office, provide specific information about the parent company and administering office, and other branch offices.

d. General Contracting and/or Specialty Contracting

- Indicate whether your firm is submitting a Statement of Qualifications for general or specialty contracting.
- If your firm is submitting as a specialty contractor, include a list of the divisions, (as defined by the Construction Specifications Institute), for the work you will perform.
 - *If your firm is submitting as a specialty contractor and does not hold a contractor's license for that specialty, explain in detail how you will perform the services requiring these licenses.*

e. Form of Ownership

- Indicate the type of ownership (corporation, joint venture, limited liability company, sole proprietorship, etc.)
- If responding as a joint venture with fewer than two relevant projects, submit qualifications for each firm.

f. Company Personnel

- Provide information about the firm's personnel resources (average size of workforce, position classifications, experience, training, location(s) of personnel).
- Include information about support staff (e.g., office workers, project administrators).
- Provide detailed information describing education, training and qualifications for key personnel (e.g., general management, project management, estimator, engineer, construction superintendent, FAA project experience and training).
- Describe your plan for personnel recruitment.
- Provide an organization chart for your firm.
- Complete and enclose a Standard Form 330, to the extent applicable to your firm. Notes on Standard Form 330 as follows:

Statement of Qualifications Submittal (Place after Tab 2)

GENERAL SERVICES ADMINISTRATION STANDARD FORM 330:

While the title of this form is "Architect-Engineer Qualifications", the intent is to have the firm responding to this Request for Qualifications fill out the form. We are not looking for you to obtain the services of an architect and/or engineering firm to fill out this form. The form is to be used to review your qualifications, as applicable under our Request for Qualifications.

Pages 1 - 8 of Standard Form 330 are instructions to assist you in filling out the form. Standard Form 330 Pages 1 - 5 (marked as Part I – Contract - Specific Qualifications) should be filled out and returned with your Statement of Qualifications. Page 6 of Standard Form 330 (marked as Part II - General Qualifications) will only need to be used if you have more than one branch office that would be seeking work under an awarded contract.

Section C "Proposed Team" (page 1 of Instructions) asks for information about your key subcontractors. You may skip this portion of the form, as this information is required in section g, "Consultants and Subcontractors", below.

g. Consultants and Subcontractors

- Provide the names and locations of consultants and subcontractors you plan to use, if any.
- List or describe the services to be provided by each.
- Provide a statement of your subcontractors' experience providing the services, particularly in a JOC setting.

h. Financial Information

- Provide a current letter from your financial institution indicating the range of credit available to your firm, (e.g. "credit in the low nine figures" or "credit line exceeding five figures"), or your firm's latest annual financial report.
- Provide a current letter from your financial institution and/or officers of major suppliers, indicating confidence in your firm's stability and payment history.
- Current audited annual financial reports in lieu of letters from financial institutions may be submitted. However, the annual financial reports must provide essentially the same information as requested from the letters. Offerors are encouraged to highlight the requested information in any audit annual financial report submitted in response to this Request for Qualifications.
- All financial information will be kept confidential. These letters will only be used to evaluate qualifications and will not be made available to the public.
- Provide a letter from your bonding company indicating the ability to bond JOC orders under the contract, and your current bonding capacity.
- Provide any judgments or liens against your firm within the last three years.
- Provide any current unresolved bond claims against your firm.
- Provide any filing under the United States Bankruptcy Code, assignments for the benefit of creditors, or other measures taken for protection against creditors during the last three years.

i. Insurance

- Provide a certificate of insurance indicating that your firm possesses the required insurance coverage as specified in the General Terms and Conditions. The Acord 25 form is the preferred certificate, but not the required form of certificate.
- A sample certificate may be provided. However, before any orders are processed the successful contractor under the sequential awarded Request for Proposal shall provide a certificate that names Mohave as a certificate holder.

Statement of Qualifications Submittal
(Place after Tab 2)

j. Past Performance

- Provide a statement of your experience providing general contracting or specialty contracting, particularly in a JOC setting. Indicate if you were the primary or subcontractor for the project.
- Provide a list of your JOC contracts, if any. Include date of contract, contracting agency, agency contact information, and value of contract for each contract in the list.
- If your firm has no JOC experience, provide a description of your understanding and experience partnering as a member of a team consisting of the owner, owner's customers and clients, design team, and the contractor. Provide other relative JOC experience.
- Describe your experience in pricing projects using a UPB and a coefficient, an Open Book pricing methodology, and/or Trade Service.
- If your firm has no experience pricing projects using a UPB, Open Book, and/or Trade Service, provide a description of your understanding on pricing projects using a UPB, Open Book pricing methodology, and/or Trade Service.
- Provide a description of your experience working on school district or governmental projects, working on multiple projects simultaneously, and working throughout the state. Include any specialized projects, such as airports, that require proven experience, training, knowledge, and/or certifications.
- Provide a statement of your history for submitting claims and change orders. Provide specific information (e.g. type of claim, date, reason, amount, and outcome).
- Provide any deficiency orders issued against your firm by the Arizona Registrar of Contractors within the last three years.

k. Contract Management Plan

- Provide a statement of your plan for performing and managing the work.
- What personnel will be used?
- Does your firm currently use RS Means Online, CostWorks CDs, 4Clicks, Trade Service, or any other estimating software based on UPBs? If not, how will you prepare JOC cost quotations and invoices?
- How do you plan to ensure prompt responses to JOC requests?
- What is your plan for responding to and performing multiple JOC orders at the same time?
- What limitations will you have geographically or in the number of simultaneous JOC orders?
- Provide other pertinent information that will help Mohave evaluate your firm and its capabilities.

l. Quality Management Plan

- How do you set goals and monitor the performance of your company?
- How do you inspect the work to ensure quality?
- How do you stay on schedule?
- What is your complaint and dispute resolution procedure?
- Provide other pertinent information that will help Mohave evaluate your firm and its capabilities.

m. Subcontractor Management Plan

- Provide a statement of your plan for managing subcontractors.
- Provide a statement acknowledging your intent to not use price as the sole determining factor when selecting subcontractors under any awarded contract.
- How will you recruit subcontractors, particularly in the local communities where work will be performed?
- For subcontractors performing specialized work, such as airports, include information as to how you will ensure subcontractor has the experience, training, knowledge, and/or certifications required to perform the work.

Statement of Qualifications Submittal
(Place after Tab 2)

- How will you ensure acceptable quality for work performed by subcontractors?
- How will you address controversies and claims related to work performed by subcontractors?
- Provide other pertinent information that will help Mohave evaluate your subcontractor management capabilities.
- For firms who self-perform and do not subcontract work, provide your confirmation that any future subcontracts shall follow the requirements specified in the subcontractor management plan as outlined above. Mohave may request a copy of your plan prior to allowing subcontracting under an awarded contract.

n. Safety

- Provide a copy of your firm's safety management plan.
- Provide a copy of your firm's safety training program.
- Provide a letter from your firm's insurance company stating the Workers' Compensation Experience Modification Rate (EMR) for the past three (3) years. The letter shall be on the insurance company's letterhead and shall be signed by an appropriate individual employed by the insurance company.



Request for Proposal 19F-0808 Job Order Contracting for Various Construction Trades

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Click section title to be taken directly to that section.



REQUEST FOR PROPOSAL 19F-0808

Job Order Contracting for Various Construction Trades

Pursuant to the provisions in the Arizona procurement rules and code, Mohave Educational Services Cooperative, Inc. seeks proposals to establish contract(s) for Job Order Contracting for General Contracting, Plumbing, Electrical and Heating, Ventilation and Air Conditioning Services. A copy of this RFP is available for public inspection at 625 East Beale Street, Kingman, AZ 86401.

Due Date and Time: Thursday, August 8, 2019 at 3:00 p.m. (local Arizona time)

Last Day For Questions: Thursday, August 1, 2019 at 5:00 p.m. (local Arizona time)

RFP Questions Must Be Directed To: Michael Nentwig, CPPB, Contract Specialist I
Email: contracts@mesc.org
Telephone: (928) 718-3203

To be considered, proposals shall be delivered to Mohave Educational Services Cooperative, Inc. (Attn: Contracts Dept.), 625 East Beale Street, Kingman, AZ 86401 in a sealed envelope or package with RFP 19F-0808, offeror's name, mailing address, proposal due date and time clearly indicated on the envelope or package. Proposals must be in the actual possession of Mohave on, or prior to, the exact time and date indicated above. Proposals shall be opened immediately following the proposal due date and time, with the name of each offeror publicly read and recorded. Late proposals shall not be considered. Kingman is considered a "rural" area by many express delivery carriers and thus, they do not guarantee priority (next day) delivery by a specific time. Prospective offerors are encouraged to keep this in mind when arranging delivery of their proposals and are advised herein that late proposals shall be handled as specified by Arizona procurement rules and code.

Offerors are strongly encouraged to carefully read the entire contents of this solicitation prior to submitting a proposal. Failure to examine any of the requirements will be at the offeror's risk.

Mohave reserves the right to cancel this solicitation and/or reject all proposals in whole, or in part, if Mohave determines that cancellation and/or rejection is advantageous to Mohave and/or its members.

A handwritten signature in dark ink, appearing to read 'Anita S. McLemore', is written above the printed name.

Anita S. McLemore, C.P.M.
Executive Director
Mohave Educational Services Cooperative, Inc.

Publish Date: July 8, 2019

Template Rev. 19-3

Technical Proposal – Offer and Acceptance Form
(Place after Tab 1a)

RFP 19F-0808
Job Order Contracting for Various Construction Trades

To Mohave Educational Services Cooperative, Inc.:

The undersigned hereby certifies understanding and compliance with the requirements in all terms, conditions, specifications and amendments. Offeror further agrees to furnish materials and/or services in compliance with all terms, conditions, specifications and amendments in the solicitation and any written exceptions in the offer.

Federal Employer Identification Number _____

Company Name _____

Address _____ City _____ State _____ Zip _____

Telephone Number _____

The *Offer and Acceptance Form* should be submitted with a signature of the person authorized to sign the proposal. The person signing the proposal shall initial erasures, interlineations, or other modifications in proposal. Failure to sign the *Offer and Acceptance Form*, or to make other notations as indicated, may result in rejection of proposal.

Authorized Signature _____

Printed Name _____ Title _____

Primary Email _____ Alternate email _____

*Note: The primary email address will be used for all communication from Mohave regarding your response to this solicitation. Provide an alternate email address that will be used **only** if the primary email address is not valid.*

The contract vendor shall not commence any billable work or provide any material or service under this contract unless and until contract vendor receives a purchase order with Mohave's review noted.

Acceptance of Offer and Contract Award (Mohave Only)

Your Proposal is Hereby Accepted:

As an awarded contract vendor, you are now bound to sell the materials and/or services offered to and accepted by Mohave in accordance with the solicitation, including all terms, conditions, specifications, amendments and any accepted written exceptions.

This contract shall be referred to as Contract Number _____

Awarded this _____ day of _____ 2019.

This contract shall be effective the _____ day of _____ 2019.

Anita S. McLemore, C.P.M., Executive Director
Mohave Educational Services Cooperative, Inc.

CONFIDENTIAL/PROPRIETARY SUBMITTALS

Confidential/Proprietary Submittals (mark one):

_____ No confidential/proprietary materials have been included with this offer.

_____ Confidential/proprietary materials have been included with this offer. Offerors shall identify below any portion of their offer deemed confidential or proprietary (see General Terms and Conditions 6. Confidential Information).

Note that any documentation marked as confidential or proprietary must be identified below. Any confidential or proprietary information NOT identified as instructed shall be deemed as non-confidential or non-proprietary.

The confidential/proprietary information identified below does not guarantee that disclosure will be prevented but that the item(s) will be subject to review by the offeror and Mohave prior to any public disclosure. Requests to deem the entire offer or pricing as confidential shall not be considered.

Firm

Authorized Signature

Technical Proposal – Instructions to Offeror and Checklist Form
(Place after Tab 5a)

From evaluation of responses to RFQ 19F-0605 and in accordance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1111(C), ARS §34-604 (F)(2) and §41-2579(F)(2), your firm has received this Request for Proposal. **Review this document in its entirety to make sure you fully understand the products and services that we are requesting.** Please do not assume a particular form, section, specification or requirement does not, or should not, apply to you. Contact Mohave at contracts@mesc.org with questions.

We have included this checklist to assist you in preparing your response. Follow each step, placing the required information in your response binder in the proper place. **All of the items listed below are required.** Initial next to each item to indicate completion.

_____ **Step ONE:** Read and understand the document. Your firm is responsible for asking any questions regarding the information you are required to include with your response. Do not hesitate to contact the Contract Specialist as shown on page 1 for clarification on any items contained in this solicitation.

_____ **Step TWO:** One (1) original and four (4) additional complete copies of your technical proposal shall be submitted in separate three-ring loose-leaf binders in the format detailed below. The technical proposal shall contain all specifications, and any other information required by the solicitation.

All proposals must be completed in ink, on a computer, or typewritten. No pencil submissions are allowed. Forms may be filled out by hand but shall be legible.

_____ **Step THREE:** The technical proposal shall be organized and presented in the order as required below, with separate tabs and sub-tabs (e.g. 1a, 1b) and dividers.

_____ **Step FIVE:** Confirm that the proposal is complete and signed on page 2 by an authorized representative.

_____ **Step SIX:** Keep a complete copy of your proposal for your records.

_____ **Step SEVEN:** Proposal shall be submitted to the proper location in a sealed and properly identified envelope or package, as specified on page 1 of this solicitation. Proposals must be in the actual possession of Mohave on, or prior to, the exact time and date set for proposal opening.

_____ Tab and Sub-tab Arrangement: _____

- **Tab 1: Offer and Acceptance, Terms and Conditions, Scope of Work and Specifications Documents, Anti-Lobbying Certificate, USDA Form AD-1048**

_____ **Tab 1a** – The signed *Offer and Acceptance Form* is placed after Tab 1a.

_____ A copy of suspension or debarment letter (if applicable) is placed after Tab 1a.

_____ A copy of the *Confidential/Proprietary Submittal Form* is placed after Tab 1a.

_____ **Tab 1b** – Signed amendments, if any, are placed after Tab 1b.

_____ **Tab 1c** – A complete copy of the General Terms and Conditions and Standard Terms and Conditions for Construction is placed after Tab 1c. *(Note: Unless and until the District Court's injunction in Jordahl v. Brnovich et al., is lifted or stayed, the Anti-Israel Boycott Provision (A.R.S. §35-393.01 (A)) is unenforceable and Mohave will take no action to enforce it.)*

_____ A completed copy of the *General Terms and Conditions and Standard Terms and Conditions for Construction Acceptance Form* is placed after Tab 1c. Any exceptions to the General Terms and Conditions and Standard Terms and Conditions for Construction are noted and explained.

_____ **Tab 1d** – A complete copy of the Special Terms and Conditions is placed after Tab 1d.

_____ A completed copy of the *Special Terms and Conditions Acceptance Form* is placed after Tab 1d. Any exceptions to the Special Terms and Conditions are noted and explained.

_____ **Tab 1e** – A complete copy of the Scope of Work is placed after Tab 1e.

Technical Proposal – Instructions to Offeror and Checklist Form
(Place after Tab 5a)

_____ A complete copy of the Specifications with compliance, deviation, or no bid noted for each item is placed after Tab 1e.

_____ A completed copy of the *Scope of Work and Specifications Acceptance Form* is placed after Tab 1e. Any exceptions to the Scope of Work and Specifications are noted and explained.

_____ **Tab 1f** – The original bid bond/alternate bid security (as detailed in the Special Terms and Conditions) in the amount of \$100,000 is placed after Tab 1f.

_____ Your current single job and aggregate bonding capacity information (**see Special Terms and Conditions 1.2 Bonding Capacity**) as required is placed after Tab 1f.

_____ **Tab 1g** – A completed copy of the *Anti-Lobbying Certificate Form* is placed after Tab 1g.

_____ A copy of OMB standard form LLL, *Disclosure of Lobbying Activities* (if applicable) is placed after Tab 1g.

_____ **Tab 1h** – A completed copy of *U.S. Department of Agriculture Form AD-1048* is placed after Tab 1h.

_____ Explanation from any prospective lower tier participant that is unable to certify to any of the statements in the certification is placed after (in Tab 1h).

Failure to complete and submit the Anti-Lobbying Certificate (Tab 1g) and USDA Form AD-1048 (Tab 1h) shall render your proposal nonresponsive.

- **Tab 2: Primary Vendor Information**

_____ **Tab 2a** – A complete response to the Method of Approach pages is placed after Tab 2a.

_____ **Tab 2b** – A complete response to the Qualification and Experience pages is placed after Tab 2b.

_____ Evidence of current Arizona contractor's license(s) is placed after Tab 2b.

_____ **Tab 2c** – A completed Past Performance and Management Plans are placed after Tab 2c.

_____ **Tab 2d** – A current certificate or certificates of insurance (**see Special Terms and Conditions 5.1 Insurance**) is placed after Tab 2d.

_____ **Tab 2e** – Financial information (statement from financial institution or letter of credit) is placed after Tab 2e.

- **Tab 3: (Reserved for Price Proposals after contract award)**

- **Tab 4: Supporting Contract Documents**

_____ **Tab 4a** – Completed Firm Information, Order Processing, Individual Contact Information, and Customer Support Information for warranty and maintenance services is placed after Tab 4a.

_____ **Tab 4b** – Sample Supplemental or End-User Agreement(s) (if applicable) are placed after Tab 4b.

_____ **Tab 4c** – Extended warranty or maintenance service plan information (if applicable) is placed after Tab 4c.

- **Tab 5: Additional Information**

_____ **Tab 5a** – Completed *Instructions to Offeror and Checklist Form* is placed after Tab 5a.

_____ **Tab 5b** – Descriptive literature, slicks and any other supporting printed data are placed after Tab 5b.

- **Tab 6: (Reserved for your Request for Qualifications response after contract award)**

Technical Proposal – Instructions to Offeror and Checklist Form
(Place after Tab 5a)

Step FOUR: Submit one (1) copy of your Price Proposal. Price proposal shall be completed and submitted as indicated below:

Price proposal shall be submitted in a clearly marked, separate sealed envelope. Your sealed price proposal shall be included with your sealed response to RFP 19F-0808.

A paper copy of your price proposal **shall** be included in your separate sealed envelope or package. Electronic copies of the entire price proposal, your price schedules, and any additional requested price information **shall** be included in your separate sealed envelope or package. Two electronic copies **shall** be provided on separate CD, DVD or USB devices. **All price proposal information shall be submitted in a clearly marked, separate sealed envelope.**

Technical Proposal - Scope of Work

(Place after Tab 1e)

1. DESCRIPTION

In order to gain economies of scale, Mohave is formally soliciting sources for Job Order Contracting construction services for General Contracting, Plumbing, Electrical and Heat, Ventilation and Air Conditioning as specified within this Request for Proposal. These services are requested for Mohave's statewide membership of approximately 450 public agencies. However, other members may be added during the term of an awarded contract(s). A current list of all members can be found on Mohave's website at www.mesc.org. Contracts, in whole or in part, shall be awarded to offeror, or offerors, for an initial one (1) year term and four (4) potential one-year extensions (contract modification).

Because any work under this contract will be on a Job Order basis, exact project details are not available. Information on the project site, scope of work, schedule, project design and construction budget, or life cycle budget information shall be provided by members prior to usage of awarded contracts.

Mohave may procure, as an entity for its membership, construction and construction services, as applicable, using the following project delivery method: Job Order Contracting, as stated in Arizona Administrative Code 7 - Article 11, Arizona Revised Statute § 34 and Arizona Revised Statute § 41.

Job Order Contracting services in this Request for Proposal may include, but not be limited to: general contracting services for construction, installation, repair, and upgrades. Specialty projects such as, plumbing, electrical and heating, ventilation and air conditioning are requested.

Under Job Order Contracting (JOC), a master contract is established with standard specifications and pricing based upon a coefficient that is applied to a Unit Price Book (UPB). Pricing may also be established through an Open Book Pricing methodology. Open Book Pricing allows the contract vendor to apply a predetermined General and Administrative (G&A) percentage and profit mark-up to subcontractor price quotes or total direct project costs. *Trade Service* along with an established labor hourly rate may be used for service and repair projects. When a specific project or job order is issued, the member and the contractor agree on the scope of work, pricing methodology to be used, and the cost is determined by applying the agreed upon pricing methodology for the entire project.

Mohave has current contracts for related work (e.g., plumbing, electrical and heating, ventilation and air conditioning). Any contract(s) awarded under this RFP are in addition to but will not replace these contracts. The Mohave member shall retain the right to determine which contracts are in their best interests.

Each firm may only respond to the division or divisions authorized by Mohave in your 19F-0605 notification of advancement letter.

General Contractors Divisions 1-49: Construction services for contract vendors in the Request for Proposal may include, but not be limited to: installation, repair, and upgrades for facilities and sites for a wide variety of educational, governmental and not for profit agencies.

Plumbing Division 22: Construction services in the Request for Proposals may include, but not be limited to: installation, repair, and upgrades of plumbing equipment.

Heating, Ventilation and Air Conditioning Division 23: Construction services in the Request for Proposals may include, but not be limited to: installation, repair, and upgrades of heating, ventilation and air conditioning equipment.

Electrical Division 26: Construction services in the Request for Proposals may include, but not be limited to: installation, repair, and upgrades of electrical equipment.

Technical Proposal - Scope of Work
(Place after Tab 1e)

If a contract vendor is eligible to respond to multiple divisions, only one response shall be submitted for this RFP. However, the contract vendor shall provide information relating to each division, combined or separate for the following: specifications, qualifications in the technical proposal, pricing co-efficient and pricing information.

Mohave currently has two JOC contracts (14G-0808) for general contracting. Activity under the contracts from 9/3/14 including year to date activity is \$13,290,710.

Mohave currently has one JOC contract (14G-0808) for Division 23. Activity under the contracts from 9/3/14 including year to date activity is \$87,796,050.

Mohave currently has one non-JOC contract (14T-1205) for plumbing services. Activity under the contracts from 1/15/15 including year to date activity is \$1,127,440.

Mohave currently has one non-JOC contract (18P-0130) for electrical services. Activity under the contracts from 2/13/19 including year to date activity is \$0. Previous contracts (13V-0124) activity from 3/7/14 to 3/7/19 was \$1,376,101.

2. ESTIMATED TIMELINE OF EVENTS

Mohave has developed the following estimated timeline of events related to this formal solicitation. All dates are subject to change as required and at the sole discretion of Mohave.

<u>EVENT</u>	<u>ESTIMATED DATE</u>
Request for Proposals Issued	July 8, 2019
Deadline for Questions	August 1, 2019 at 5:00 p.m. (local AZ time)
RFP Due Date and Time	August 8, 2019 at 3:00 p.m. (local AZ time) 625 East Beale Street, Kingman, AZ 86401
Public Opening of Proposals	August 8, 2019 at 3:00 p.m. (local AZ time)
Notice of Intent to Award (<i>estimated date only</i>)	September 1, 2019 NOTE: Notification will be sent by email to all awardee(s) and non awardee(s) on or before this date.
Execution of Contract(s) (<i>estimated date only</i>)	September 4, 2019

3. SUBMISSION OF PROPOSALS

- 3.1.** Proposals should provide straightforward, concise information that satisfies the requirements. Expensive bindings and/or color displays are not necessary. Emphasis should be placed on conformity to the specifications and terms and conditions, as well as the completeness and clarity of the submittal content.
- 3.2.** The offeror must submit a proposal following information detailed in the *Instructions to Offeror and Checklist Form*.
- 3.3.** A proposal submitted in response to this solicitation shall be valid and irrevocable for one hundred twenty (120) days after specified due date and time.

Technical Proposal - Scope of Work
(Place after Tab 1e)

4. CONTRACT TYPE

The term contract shall be a coefficient applied to a Unit Price Book (UPB), methodology as outlined in Open Book Pricing, and/or time for labor and/or a discount applied to *Trade Service* for products.

5. AWARD CRITERIA

The weighted award criteria for this solicitation are as follows:

Award(s) shall be made to the responsive and responsible offeror(s) whose proposal(s) are determined in writing to be most advantageous to Mohave for its members.

Responsive and responsible offeror(s) shall provide the following requirements:

Criteria	Points
Technical Proposal Evaluation	
Offeror's qualifications and experience	40
Quality of the technical proposal	20
Offeror's contract management plan	10
Offeror's quality management plan	10
Offeror's subcontractor management plan	5
Offeror's safety plan and record	5
Offeror's financial capacity	5
References, past performance information and other pertinent information	5
Technical Proposal Total	100
Price Proposal Evaluation	
Cost (Coefficients, and Open Book Rates, <i>Trade Service</i> if offered)	65
Other project costs, e.g. travel, meals and incidental expenses (M&IE), transportation costs, energy costs, ownership costs, life cycle costs	10
Price Proposal Total	75
Grand Total	175

References and definitions used for specifications:

National Electrical Contractors Association (NECA): www.neca-neis.org

Technical Proposal - Specifications
(Place after Tab 1e)

SPECIFICATIONS

Purpose of specifications: Specifications are designed to enable offeror to satisfy a requirement for a product, material, process, or service. A specification may be expressed as a standard, part of a standard, or independent of a standard. No specification is intended to limit competition by eliminating items capable of satisfactorily meeting the requirements of the procurement. If offeror believes a specification is unnecessarily restrictive, offeror must notify Mohave prior to specified proposal due date and time.

Brand names: Brand names that appear without the trademark or service mark remain the property of their respective owners.

Minimum specifications: The standard of quality and performance indicated in the specifications and scope of work or services shall be understood as the minimum requirements only. Unless otherwise indicated in the specifications or drawings, all work shall be done in accordance with the specifications and recommendations of the manufacturer of the product to be installed.

Compliance with specifications: Offerors shall offer products, materials, processes, or services they believe come closest to meeting specifications. The fact that a manufacturer, supplier or offeror chooses not to produce or provide product, material, process, or services to meet the specifications will not be considered sufficient cause to adjudge the specifications as restrictive.

Deviations from specifications: Offerors will respond to each numbered specification by checking the appropriate "Comply" or "Deviate" box. "No Bid" items shall be marked as such in the appropriate "Deviate" box. Your exceptions/deviations must be clearly explained. Reference the specification that you are taking exceptions/deviations to, detail any proposed substitute language, and clearly explain how the exceptions/deviations meet or exceed specifications. Unacceptable exceptions/deviations shall remove your proposal from consideration for award. Mohave shall be the sole judge on the acceptance of exceptions and Mohave's decision shall be final. Details for exceptions/deviations shall be listed by specification number on the *Scope of Work and Specifications Acceptance Form*.

Specifications		Comply	Deviate*
1.1 Job Order Contracting - General Specifications			
1.1.01	Contract vendor shall provide all labor, materials, equipment, services and all required bonds necessary to complete each project according to the scope of work developed with the member.		
1.1.02	All work shall be accomplished in accordance with the material and equipment manufacturer's instructions. Contract vendor shall supervise all work, use qualified personnel, and require personnel to be familiar with safety procedures, equipment operation, and manufacturer's installation requirements.		
1.1.03	If contract vendor prepares drawings, the member shall approve drawings prior to contract vendor starting any work.		
1.1.04	Contract vendor's work responsibility shall include all planning, programming, administration, and management necessary to provide all services, and related construction services as applicable, as specified in the job order. Contract vendor shall perform the work in strict accordance with the contract and all current applicable federal, state and local laws, and codes.		
1.1.05	Contract vendor shall provide related services such as preparing and submitting required reports, performing administrative work, and submitting necessary information as specified under this contract and within individual job orders.		
1.1.06	Contract vendor shall ensure that all work meets or exceeds critical reliability rates or tolerances specified or included in applicable documents.		
1.1.07	Contract vendor shall ensure all work areas that may pose a hazard are adequately identified and secured at all times.		

Technical Proposal - Specifications
(Place after Tab 1e)

1.1.08	Equipment and materials shall be produced by manufacturers and fabricators regularly engaged in the manufacture of similar items and with a history of successful production.		
1.1.09	All new materials furnished under the contract shall be of the latest design, from known manufacturers of the materials, free from defects, and in compliance with the specifications and scope of work.		
1.1.10	All materials and equipment furnished under the contract shall be of brands and models acceptable to the member.		
1.1.11	During progress of any job order that includes drawings, contract vendor shall keep a record at jobsite of all changes and corrections to the layouts shown in the drawings. Contract vendor shall enter all such changes and corrections on record drawings. Each sheet of the corrected set shall be stamped with "RECORD DRAWINGS AS-BUILT," or a similar notation.		
1.1.12	Record drawings shall include the actual location of all sub-surface utility lines and any overhead obstructions, as applicable.		
1.1.13	When requested or required by member, contract vendor shall provide reproducible, professional drafting quality drawings. The supplied drawings shall be a reproducible design with final record drawings, or drawings from which the contract vendor can develop detailed working drawings. The drawings provided shall be in accordance with current applicable federal, state and local laws and codes.		
1.1.14	The contract vendor shall promptly notify the member in writing if any discrepancies in, or omissions from, any plans, drawings, specifications, and any other document for the project are discovered. The contract vendor shall not proceed with the project without written direction from the member.		
1.1.15	Contract vendor's personnel may be permitted to use toilet facilities on the premises subject to approval from the member. In the event none are available, contract vendor shall, at the contract vendor's expense, provide portable facilities.		
1.1.16	The member may require occupying the area where work is to be performed during the construction period. Contract vendor shall coordinate with member to have access to that portion of the area within which work is to be performed.		
1.1.17	Contract vendor shall not build upon or conceal defective work.		
1.1.18	Materials classified by the member as salvageable or repairable shall remain the property of the member.		
1.1.19	Materials not classified by the member as salvageable or repairable shall be disposed of in accordance with current applicable federal, state and local laws and codes.		
1.1.20	The contract vendor shall immediately notify the member if asbestos is identified in the work area. The member will provide further instructions to the contract vendor. Removal of asbestos materials shall be accomplished by a contractor licensed in asbestos abatement, and following all current local, state and federal laws for the handling and disposal of asbestos.		
1.1.21	Contract vendor shall conduct a pre-final inspection prior to requesting a final inspection. Any discrepancies shall be corrected prior to final inspection.		

Technical Proposal - Specifications
(Place after Tab 1e)

1.1.22	Prior to final inspection, contract vendor shall submit any available manufacturers' original operation and maintenance manuals to the member for all installed equipment and materials. Contract vendor shall conduct a training session to brief member personnel on the operation and maintenance procedures of installed equipment and materials.		
1.1.23	Prior to final inspection, contract vendor shall submit and have the member approve all submittals, as-built drawings.		
1.1.24	The member shall perform the final inspection with contract vendor. Any discrepancies will be noted and corrected within the time agreed upon with the member prior to payment.		
1.2	Pricing – Unit Price Book Requirements (UPB)		
1.2.01	Upon member acceptance of unit price book pricing (UPB) methodology to be used under the job order, project pricing shall be based upon a coefficient to be applied to an approved UPB.		
1.2.02	Scope of work within Divisions 1-49 of the Construction Specifications Institute: The UPB for contract vendors providing work in Divisions 1-49 shall be the current edition of RS Means Online or Costworks CDs using the Facilities Construction Cost Data module.		
1.2.03	Scope of work within Divisions 1-49 of the Construction Specifications Institute: RS Means Online or Costworks CDs: Building Construction Cost Data, Maintenance and Repair Cost Data, Electrical Cost Data, Mechanical Cost Data, Heavy Construction Cost Data, Plumbing Cost Data, Interior Cost Data, Site Work & Landscape Cost Data, Concrete & Masonry Cost Data is allowable if the appropriate line item is not found in the RS Means Online or Costworks CDs Facilities Construction Cost Data.		
1.2.04	Scope of work within Division 22 of the Construction Specifications Institute: The UPB for Division 22 Plumbing shall be the current edition of the RS Means Online or Costworks CD Plumbing Cost Data. Contract vendor may perform related services, such as unit repairs, services, and installations for equipment and processes within Divisions 2 (Demolition), 11 (Equipment), and 13 (Special Construction).		
1.2.05	Scope of work within Division 22 of the Construction Specifications Institute: To complete a plumbing project using other ancillary services from other divisions, use of current editions of RS Means Online or Costworks CDs: Building Construction Cost Data, Interior Cost Data, Electrical Cost Data, Mechanical Cost Data, Repair and Remodeling Cost Data, Site Work Cost Data, is allowable if the appropriate line item is not found in the Facilities Construction Cost Data. (A brief descriptive narrative shall be required for all jobs that use ancillary services. Mohave shall randomly review and verify the validity of these ancillary services. Any work deemed excessive or not necessary to complete a plumbing job shall not be allowed under this contract).		
1.2.06	Scope of work within Division 23 of the Construction Specifications Institute: The UPB for Division 23 Heating Ventilation and Air Conditioning (HVAC) shall be the current edition of the RS Means Online or Costworks CDs Mechanical Cost Data. Contract vendor may perform plumbing and electrical related services, such as unit repairs, services, and installations for equipment and processes within Divisions 2 (Demolition), 11 (Equipment), and 13 (Special Construction: Controls and Instrumentation).		

Technical Proposal - Specifications
(Place after Tab 1e)

1.2.07	Scope of work within Division 23 of the Construction Specifications Institute: To complete a HVAC project using other ancillary services from other divisions, use of current editions of RS Means Online or Costworks CDs: Building Construction Cost Data, Interior Cost Data, Electrical Cost Data, Mechanical Cost Data, Plumbing Cost Data, Repair and Remodeling Cost Data, Site Work Cost Data, is allowable if the appropriate line item is not found in the Facilities Construction Cost Data. (A brief descriptive narrative shall be required for all jobs that use ancillary services. Mohave shall randomly review and verify the validity of these ancillary services. Any work deemed excessive or not necessary to complete a HVAC job shall not be allowed under this contract).		
1.2.08	Scope of work within Division 26 of the Construction Specifications Institute: The UPB for Division 26 Electrical shall be the current edition of the RS Means Online or Costworks CDs Electrical Cost Data. Contract vendor may perform plumbing and electrical related services, such as unit repairs, services, and installations for equipment and processes within Divisions 2 (Demolition), 11 (Equipment), and 13 (Special Construction: Controls and Instrumentation).		
1.2.09	Scope of work within Division 26 of the Construction Specifications Institute: To complete an electrical project using other ancillary services from other divisions, use of current editions of RS Means Online or Costworks CDs: Building Construction Cost Data, Interior Cost Data, Electrical Cost Data, Mechanical Cost Data, Plumbing Cost Data, Repair and Remodeling Cost Data, Site Work Cost Data, is allowable if the appropriate line item is not found in the Facilities Construction Cost Data. (A brief descriptive narrative shall be required for all jobs that use ancillary services. Mohave shall randomly review and verify the validity of these ancillary services. Any work deemed excessive or not necessary to complete a electrical job shall not be allowed under this contract).		
1.2.10	The Weighted City Cost Index (CCI) shall be applied to each division for the city closest to project location and the prices in "Total, include O & P" column in the applicable UPB will be used for project costing.		
1.2.11	The total value of applicable line items and quantities shall be multiplied by the appropriate CCI and the specified coefficient to determine the lump sum cost of each job order.		
1.2.12	Contract vendor shall provide the member with an itemized project cost prior to starting any job order. At a minimum, the project cost shall include: Date of Quote Item Number Applicable CCI: Item Description Number of Units (Year and Quarter) Total Line Cost Line Items Subtotal Unit Price Coefficient Unit Price Book used Grand Total		
1.2.13	Items that cannot be found in the UPB or other approved RS Means cost data index are considered "non pre-priced" items. If the UPB or other approved cost data index contain an item that is basically the same in form, fit and function, it may be used to price a non-pre-priced item. If such pricing is used, substantiating rationale and documentation shall be included in the line item cost sheet.		

Technical Proposal - Specifications
(Place after Tab 1e)

1.2.14	If like items cannot be found in the UPB, contract vendor shall obtain three written quotes for a non-pre-priced item and submit the quotes to Mohave. Mohave shall determine the most appropriate quote to use for adding the item to the approved contract pricing. If three quotes cannot reasonably be obtained for a non-pre-priced item, contract vendor shall explain why they were unable to obtain additional price quotes.		
1.2.15	Upon approval from Mohave, the non-pre-priced item shall become part of the contract pricing and available for any job order. Contract vendor shall not provide a new item unless and until Mohave approves it.		
1.2.16	A coefficient to be applied to the cost of non-pre-priced items shall be provided.		
1.2.17	Coefficients shall be provided for normal business hours (Monday – Friday, 7 a.m. – 5 p.m.) and “other” hours (after hours, weekends, and holidays). “Other” hours shall only be worked with prior approval from the member.		
1.2.18	Coefficients shall be extended no more than two decimal places.		
1.2.19	Coefficients shall include all costs associated with performing the work contained in the UPB. Such costs include, but are not limited to: the direct cost of doing the work; labor; overhead; general and administrative; profit; project office expenses; mobilization; close-out costs; insurance; compliance with current applicable federal, state and local laws and codes; protective clothing and equipment; traffic and work site barriers; computer systems and software; vehicles, maintenance and fuel; incidental costs and all contingencies connected to performing the work. <i>No additional payment will be allowed for these items.</i>		
1.2.20	Offeror shall specify in the proposal what additional types of costs are included in the coefficients.		
1.2.21	UPB Division 1 sections before 54, Construction Aids, are excluded from the contract except as specified below. Such items shall be included in coefficients. Member may approve specific exceptions caused by unusual and unforeseen circumstances.		
1.2.22	The following UPB Division 1 items are allowed, when the specified work is required or authorized by the member: 01 21 53.50-0010 through 1750 01 45 23.50-0010 through 9000 01 51 13.80-0010 through 0700		
1.2.23	Labor, equipment and material prices shall be adjusted in accordance with the prices in each new edition of the UPB. Adjustments will be to the UPB only. No adjustment will be applied to cost items comprising the coefficient. No upward adjustment shall apply to job orders awarded prior to effective date of the adjustment, regardless of the date of commencement of work.		
1.2.24	All prices in the UPB are for completed-in-place construction unless explicitly described otherwise. Waste or excess material quantities are incidental costs, which are included within the coefficient unless explicitly stated otherwise. Quantities used on individual job order proposals shall be taken from field measurements or design plans, as appropriate, without allowance for waste.		

Technical Proposal - Specifications
(Place after Tab 1e)

1.3	Pricing – Open Book Pricing Requirements		
1.3.01	Upon member acceptance of the Open Book Pricing methodology to be used under the job order, the project's direct job cost shall be based upon firm price quotes from contractors in the contract's approved subcontractor list. To the extent practicable, contract vendor shall obtain firm price quotes from three contractors for each discipline applicable to the project. If three quotes cannot reasonably be obtained for a discipline, contract vendor shall explain why they were unable to obtain additional price quotes.		
1.3.02	Upon request, contract vendor shall provide member with copies of subcontractor quotes and the basis for selection of each subcontractor. Contract vendor shall provide member explanation for any rejected low quote.		
1.3.03	All costs shall be identified in the Open Book Pricing workbook and included in your price proposal.		
1.3.04	If the member objects to a selected subcontractor, member shall make the objection and the reasons for the objection known to the contract vendor. Contract vendor shall then present an acceptable subcontractor for the applicable discipline. Member shall not unreasonably object to or withhold approval of a subcontractor.		
1.3.05	General conditions are requirements directly related to the work, but not included in direct construction cost. General conditions shall include, but are not limited to: project management, estimating, quality control, and administrative labor; field office equipment, materials and supplies; travel and subsistence; temporary field office rental and utilities; submittals and operations and maintenance manuals; small tools, face and clothing protection; project scheduling; compliance with current applicable environmental laws; marketing; and Mohave's 1% administrative fee.		
1.3.06	General and administrative costs include but are not limited to: home office general and administrative expense; excess liability and auto insurance; business licenses; and home office manager labor. General and administrative cost shall be assessed as a fixed multiplier applied to direct project cost and general conditions cost for the project.		
1.3.07	Profit shall be assessed as a fixed multiplier applied to direct project cost, general conditions cost, and general and administrative costs for the project. The amount of the profit multiplier shall be identified in the Open Book Pricing workbook and included in your price proposal.		
1.3.08	Each job order using Open Book Pricing shall include a completed copy of the worksheets named Price Summary and General Conditions provided in "JOC RFP 19F-0808 Open Book Price Summary.xlsx". All costs shall be identified in the Open Book Pricing workbook and included in your price proposal. Substantially similar documents may be used with Mohave's approval.		
1.4	Pricing – Trade Service Requirements		
1.4.01	As an alternative pricing methodology for service, repair, and maintenance projects, <i>Trade Service</i> price guide may be offered for product pricing. <i>Trade Service</i> price guide shall be for division(s) being offered.		
1.4.02	The <i>Trade Service</i> price guide shall be based on the most recent release of <i>Trade Service eData Flex Pricing Service</i> .		

Technical Proposal - Specifications
(Place after Tab 1e)

1.4.03	Quarterly archived electrical price guide (<i>Trade Service: eData Flex Pricing Service</i>) shall be required under an awarded contract. Archived pricing shall be made available upon the release of quarterly updates from <i>Trade Service</i> . Mohave shall set the schedule for allowable quarterly and yearly updates.		
1.4.04	Contract vendor shall supply discounts, multipliers, and/or any references used to determine Mohave pricing for the <i>Trade Service</i> price guide.		
1.4.05	Installation/maintenance services using <i>Trade Service eData Flex Pricing Service</i> pricing for products shall include all costs for installation on member quotations.		
1.4.06	Contract vendor shall provide the member with an itemized project cost prior to starting any job order. At a minimum, the project cost shall include: Date of Quote Number of Units Item Number Item Description Item/Unit Cost Labor Rate Labor Hours Total Line Cost Line Items Subtotal Grand Total		
1.4.07	Contract vendor may offer product only sales to members. Unit costs shall be based on <i>Trade Service</i> price guide.		
1.5	Specifications for the Work		
1.5.01	All work shall be performed in accordance with the attached specifications, as applicable to the awarded divisions.		
1.5.02	Contract vendor may recommend alternate specifications or additional specifications for work to be performed under a job order. Any alternate specification offered shall comply with all current applicable federal, state and local laws, and codes.		
1.5.03	Contract vendor shall obtain written approval from member prior to using any alternate specification for any work to be performed under the contract.		
1.5.04	Prior to starting any work, contract vendor shall notify member of any specification that is in conflict with current applicable federal, state and local laws and codes, and offer an alternate solution that is in compliance.		
1.5.05	When any aspect of a project is not covered by a specification or building code, the minimum standard for good and workmanlike construction shall be performed in accordance with the current National Electrical Contractors Association's standards for Good Workmanship in Electrical Construction.		
1.5.06	No products that contain asbestos fibers shall be used.		
1.5.07	Where practicable, all work shall be accomplished in a manner to match existing work in the same area or on the same elevation. Contract vendor shall not make adjustments to or alter in any manner member's existing facilities without prior written approval from member.		
1.5.08	Upon completion of the work, worksite shall be clean and free from debris.		
1.6	Services		
1.6.01	Upon request from member, contract vendor shall obtain the permits required for a job order. Contract vendor shall only be allowed to invoice for the actual cost of the permit. No amount for overhead and profit shall be allowed on permit costs.		

Technical Proposal - Specifications
(Place after Tab 1e)

1.6.02	Upon request from member, and if included in the awarded contract, contract vendor shall provide design services related to the job order. Such services are only allowable as part of an executed Job Order Contracting purchase order.		
1.6.03	Design services shall be provided in accordance with current applicable federal, state and local laws and codes.		
1.6.04	Upon request from member, and if included in the awarded contract, contract vendor shall provide engineering services related to the job order. Such services are only allowable as part of an executed Job Order Contracting purchase order.		
1.6.05	Engineering services shall be provided in accordance with current applicable federal, state and local laws, and codes.		
1.6.06	Upon request from member, and if included in the awarded contract, contract vendor shall provide maintenance services related to the job order. Such services are only allowable as part of an executed Job Order Contracting purchase order.		
1.6.07	Maintenance services shall be provided in accordance with current applicable federal, state and local laws and codes.		
1.6.08	There shall be no charge for repair services prior to expiration of the warranty period.		

***Exceptions/deviations must be listed on the *Scope of Work and Specifications Acceptance Form*. List the specification number for each exception/deviation.**

**Technical Proposal - Scope of Work and
Specifications Acceptance Form
(Place after Tab 1e)**

Signature on page 2 certifies complete acceptance of the Scope of Work and Specifications in this solicitation, except as noted below (additional pages may be attached, if necessary).

Check one of the following responses to the Scope of Work and Specifications:

- ☐ **We take no exceptions/deviations to the Scope of Work and Specifications.**

(Note: If nothing is listed below, it is understood that no exceptions/deviations are taken.)

- ☐ **We take the following exceptions/deviations to the Scope of Work and Specifications. All exceptions/deviations shall be clearly explained. Reference the corresponding Scope of Work or Specifications that you are taking exceptions/deviations to. Provide details on your exceptions/deviations below:**

(Note: All requested exceptions/deviations must be clearly explained. Reference the specific language that you are taking exceptions/deviations to, detail any proposed substitute language, and clearly explain how the exceptions/deviations meet or exceed Scope of Work and Specifications. Unacceptable exceptions/deviations shall remove your proposal from consideration for award. Mohave shall be the sole judge on the acceptance of exceptions/deviations and Mohave's decision shall be final.)

Anti-Lobbying Certification Form
(Place after Tab 1g)

ANTI-LOBBYING CERTIFICATION

Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions

In accordance with the Byrd Anti-Lobbying Amendment 31 U.S. Code § 1352, *CFR* § 200.450 and *Federal Acquisition Regulation* 52.203-11:

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that:

- (1) No Federal appropriated funds have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of this contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;
- (2) If any funds other than Federal appropriated funds have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer in accordance with its instructions; and
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subcontract awards at all tiers and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by 31 U.S. Code § 1352. Any person who makes expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(Firm Name)

(Signature)

(Print Name)

(Print Title)

(Date Certified)

UNITED STATES DEPARTMENT OF AGRICULTURE

**Certification Regarding Debarment, Suspension, Ineligibility
and Voluntary Exclusion Lower Tier Covered Transactions**

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552(a), as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.355, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal and civil fraud privacy, and other statutes may be applicable to the information provided.

(Read Instructions On Page Two (RFP Page 21) Before Completing Certification)

- A. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;
- B. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Organization Name

PR/Award Number or Project Name

Name(s) and Title(s) of Authorized Representative(s)

Signature(s)

Date

The U.S. Department of Agriculture (USDA) prohibits discrimination in all of its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Assistant Secretary for Civil Rights, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, S.W., Stop 9410, Washington, DC 20250-9410, or call toll-free at (866) 632-9992 (English) or (800) 877-8339 (TDD) or (866) 377-8642 (English Federal-relay) or (800) 845-6136 (Spanish Federal-relay). USDA is an equal opportunity provider and employer.

Instructions for Certification (for Form AD-1048)

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on 1 (RFP page 20) in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Technical Proposal – Primary Vendor Information
Method of Approach
(Place after Tab 2a)

Offeror shall respond to each item below. The information will be used to assist Mohave in evaluating the method of approach that an offeror would take regarding specific issues under an awarded contract. Do not use "boilerplate" answers. Respond to each item by specifically addressing the Mohave request. Failure to complete all questions may result in your proposal being considered nonresponsive.

1. Offeror shall provide a project plan that describes how the offeror intends to implement the plan. This plan shall include, but not be limited to:
 - a. Account team structure (for a Mohave contract) and role which includes, but is not limited to description of sales contact process, account team support, and periodic account review processes;
 - b. Communication process with Mohave and its members;
 - c. Specific value-added services that may benefit members;
 - d. Indicate how you will ensure your sales staff does not sell products or services that are not on contract; and
 - e. Are there any limitations to the types of members that you will provide services to? If so, indicate what those limitations are.
2. Mohave is established to offer a cooperative purchasing program, which can be accomplished more efficiently and economically as a multi-entity operation.

Efficiency and economy can be established through reduced bidding effort for members and vendors, management of a single contract, fewer price schedules to maintain, fewer contact persons, and using Mohave as an extension of members' purchasing departments. Additionally, it is Mohave's assertion that a statewide contract available to approximately 450 public agencies results in economies of scale and lower prices than those received by bidding individual contracts, especially, but not limited to small member agencies.

Will a contract based upon your proposal result in the efficiencies and economies described above?

Yes ____ No ____

If no, what efficiencies and economies would members receive from a contract based on your proposal?

3. In previous JOC contracts, Mohave has had isolated issues with members using design work (estimates, drawings, etc.) to shop our contracts against each other, or against other non-Mohave contracts. How would you prevent such issues from occurring under an awarded contract?

Technical Proposal – Primary Vendor Information
Method of Approach
(Place after Tab 2a)

4. Indicate if your proposal is regional or statewide: Regional _____ Statewide _____

If you are providing a regional or county specific offer, that offer shall cover all members within that region or county.

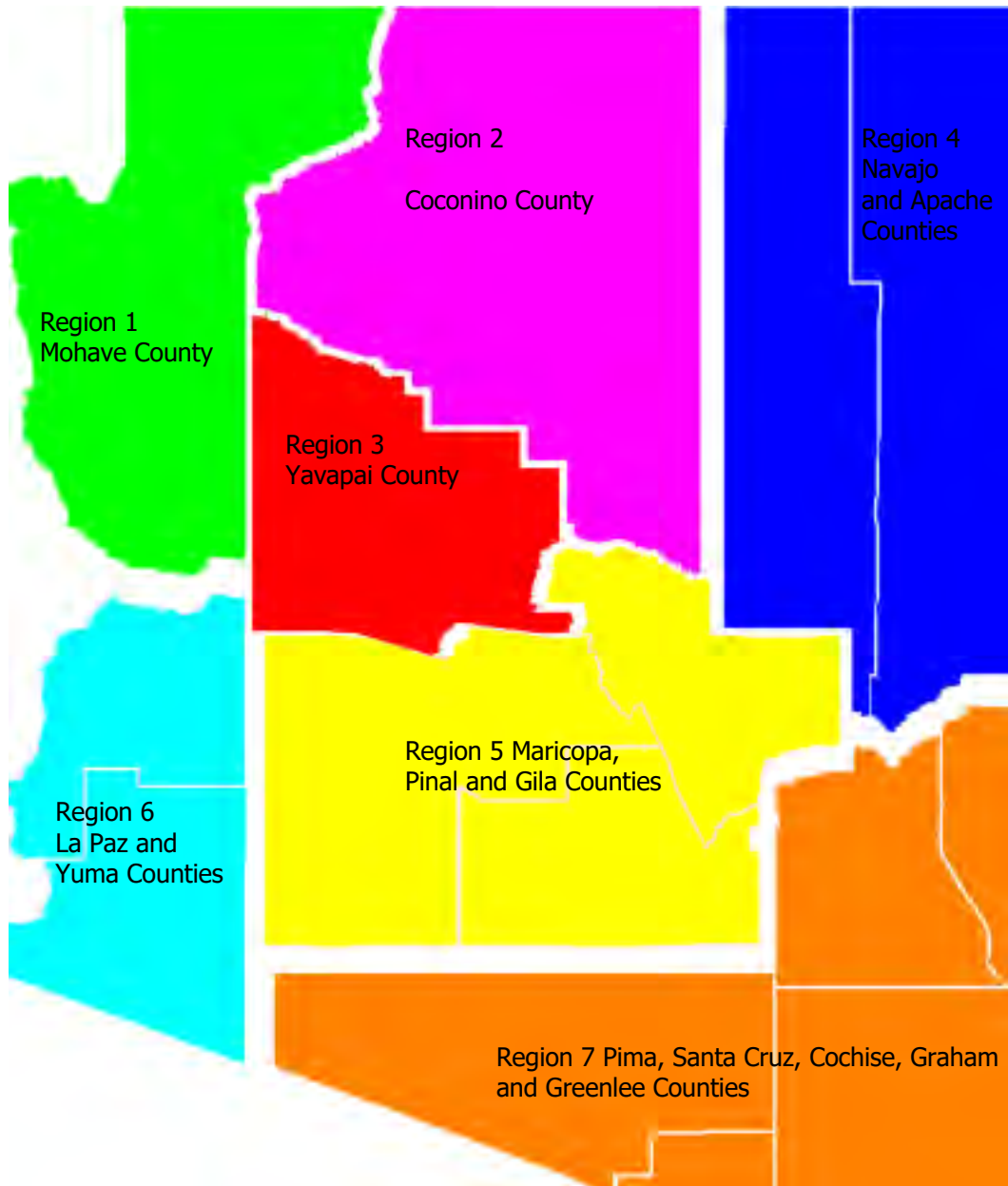
Regardless if your firm is providing statewide or regional/county services, complete the chart below to include the following:

- a. In the past three years, what percent of your Arizona business do you estimate was in each geographical area identified below?
- b. Based upon the regional map on Page 18, indicate which regions, or specific cities/counties within a region, that you will provide services under an awarded contract.
- c. If you are awarded a contract with Mohave, which area(s) of the state will your sales force target?

Region	Counties	a: Percentage of Business	b: Regions You Will Provide Services In	c: Regions Sales Force Will Target
1	Mohave			
2	Coconino			
3	Yavapai			
4	Navajo and Apache			
5	Maricopa, Pinal and Gila			
6	La Paz, Yuma			
7	Pima, Santa Cruz, Cochise, Graham and Greenlee			

Technical Proposal – Primary Vendor Information
Method of Approach
(Place after Tab 2a)

Below is a map, detailing the regions, and the counties that fall within each region.



Technical Proposal – Primary Vendor Information
Qualifications and Experience
(Place after Tab 2b and 2e)

Offeror shall respond to each item below. The information will be used to assist Mohave in evaluating the qualifications and experience of the offeror. Do not use “boilerplate” answers. Respond to each item by specifically addressing the Mohave request. Failure to complete all questions may result in your proposal being considered nonresponsive.

1. **Place after Tab 2b:** Prepare a summary of your firm, explaining the qualifications and experience necessary to provide the services in this solicitation as follows:
 - A short narrative description of what you are offering for this contract.
 - A *brief* history of your company that includes length of time in business, how long your company has provided the products/services you are proposing, and your firm’s philosophy of doing business.
 - Provide written verification if offeror has recently purchased an established business or has proof of prior success in this business or a closely related business.
2. **Place after Tab 2b:** Identify any past or pending litigation or mediation involving products or services your firm has provided within the last five (5) years.
3. **Place after Tab 2b:** Indicate if your firm would qualify as a small or minority owned business. To qualify for ownership as a minority owned business, at least 51% of the firm’s ownership must be held by a person, or persons, of a particular group (e.g., Woman owned, Hispanic owned, Native American owned). Proof of ownership is evidenced by the transaction privilege tax license or business privilege license for sole proprietorship; business privilege license **and** written partnership agreement for partnerships; or the Articles of Incorporation, Corporate By-laws **and** stock certificates for corporations.

NOTE: Businesses have equal opportunity to sign up as a prospective bidder on Mohave’s website. If small or minority owned businesses were signed up for a category selected for this solicitation, then they are included in the solicitation notification email list. The information on small and minority owned business are for informational purposes only and shall not be a factor in the evaluation. Mohave cannot ensure that affirmative steps have been used to assure small and minority owned businesses are awarded contracts, as funding sources of our members vary.

4. **Place after Tab 2b:** An online survey has been created to allow for the collection of reference information from Arizona public agencies where work and services have been successfully accomplished in the past five (5) years, for specific products/services similar to this solicitation. Provide the following link to Arizona public agencies who can provide reference information for your firm:
<https://www.surveymonkey.com/r/QHMZTKL>

The above survey is now active and will remain active until the due date and time for this solicitation. It is recommended that you send this link to as many Arizona public agencies as you determine to be appropriate, in order to ensure that Mohave receives a minimum of three (3) completed surveys.

If you cannot provide the link to three (3) Arizona public agencies, provide the link to other public agencies not located in Arizona. If you cannot provide the link to public agencies, do so with private business entities.

5. **Place after Tab 2b:** Provide copy of current of all Arizona contractor’s licenses held by your company.
6. **Place after Tab 2e:** Provide a current letter from your financial institution indicating the range of credit available to your firm, (e.g., “credit in the low nine figures” or “credit line exceeding five figures”). Provide a current letter from your financial institution and/or officers of major suppliers, indicating confidence in your firm’s stability and payment history. *These letters will only be used to evaluate proposals and will not be made available to the public.*

Offerors may submit current audited annual financial reports in lieu of letters from financial institutions. However, the annual financial reports must provide essentially the same information as requested from the letters. Offerors are encouraged to highlight the requested information in any audited annual financial report submitted in response to this solicitation. All financial information will be kept confidential.

Technical Proposal – Primary Vendor Information
Past Performance and Management Plans
(Place after Tab 2c)

- 1) Provide a list of your firm's job order contracts for the last three years.
 - a. *Include date, contracting agency, contract amount, and contact information for each.*
 - b. *If your firm has no Job Order Contracting experience, provide the required information for your major construction projects.*
- 2) If your firm has no Job Order Contracting experience, provide a description of your philosophy and experience partnering as a member of a team consisting of the owner, owner's customers, and the contractor.
- 3) Provide a description of your experience working on school district or other governmental projects, working on multiple projects simultaneously, and working throughout the state. Include any specialized projects, such as airports, that require proven experience, training, knowledge, and/or certifications.
- 4) Provide a statement of your history for submitting claims and change orders.
 - a. *Provide specific information, e.g., type of claim, date, reason, amount, and outcome.*
- 5) Indicate if you are offering design, engineering, maintenance, and/or operations services.
 - a. *Describe the services you are offering.*
 - b. *Indicate if in-house staff will provide the services.*
 - c. *Indicate the portions of a project that may be subcontracted to other firms.*
 - d. *Provide a statement of your experience or the subcontractor's experience providing the services, particularly in a job order contract setting.*
- 6) Provide a Contract Management Plan.
 - a. *Provide a statement of your plan for performing and managing the work.*
 - b. *What personnel will be used?*
 - c. *How many employees are located in Arizona?*
 - d. *How do you plan to ensure prompt responses to job order requests?*
 - e. *How do you plan to ensure an adequate workforce is maintained?*
 - f. *What is your plan for responding to and performing multiple job orders at the same time?*
 - g. *What limitations will you have geographically or in the number of simultaneous job orders?*
 - h. *Provide other pertinent information that will help Mohave evaluate your firm and its capabilities.*
 - i. *Describe your experience in pricing projects using a UPB and a coefficient, an Open Book pricing methodology, and Trade Service (if applicable).*
 - j. *Specifications 1.2.01 - 1.2.24 contain comprehensive requirements regarding the use of RS Means Online or Costworks CDs as the basis for the UPB for an awarded contract. If you are utilizing a different software product to prepare your quotations, proposals and invoices, provide detailed examples and information showing how you intend to comply with the specification requirements regarding RS Means Online or Costworks CDs as the basis for the UPB.*

Technical Proposal – Primary Vendor Information
Past Performance and Management Plans
(Place after Tab 2c)

- 7) Describe your Quality Management Plan.
- a. *How do you set goals and monitor the performance of your company?*
 - b. *How do you inspect the work to ensure quality?*
 - c. *How do you stay on schedule?*
 - d. *What is your complaint and dispute resolution procedure?*
 - e. *Provide other pertinent information that will help Mohave evaluate your firm and its capabilities.*
- 8) Describe your Subcontractor Management Plan.
- a. *Provide a statement of your plan for managing subcontractors.*
 - b. *Provide a statement acknowledging your intent to not use price as the sole determining factor when selecting subcontractors under any awarded contract. (See Special Term and Condition 12.6.)*
 - c. *How will you recruit subcontractors, particularly in the local communities where work will be performed?*
 - d. *Describe how you would use local subcontractors to accomplish the work.*
 - e. *How will you ensure acceptable quality for work performed by subcontractors?*
 - f. *How will you address controversies and claims related to work performed by subcontractors?*
 - g. *Provide other pertinent information that will help Mohave evaluate your subcontractor management capabilities.*
 - h. *Provide a list, including firm name, location, and current license number, for subcontractors your firm currently uses.*
 - i. *For firms who self-perform and do not subcontract work, provide your confirmation that any future subcontracts shall follow the requirements specified in the subcontractor management plan noted above. Mohave may request a copy of your plan prior to allowing subcontracting under an awarded contract.*
- 9) Describe your Safety Plan.
- a. *Provide a current letter from your firm's insurance company stating the Workers' Compensation Experience Modification Rate (EMR) for the past three (3) years. The letter shall be on the insurance company's letterhead and signed by an appropriate individual employed by the insurance company.*
 - b. *If your EMR is greater than 1, what actions will you take to lower it?*
 - c. *Describe your firm's safety oversight. Do you have a safety manager?*
 - d. *Describe the safety training used by your firm and provide a copy of your firm's safety training program.*

Price Proposal – Primary Vendor Information
(Place in a clearly marked, separate sealed envelope)

IF YOUR FIRM WAS SHORTLISTED FOR DIVISION 22 PLUMBING, DIVISION 23 HEATING, VENTILATION AND AIR CONDITIONING OR DIVISION 26 ELECTRICAL, PROVIDE CO-EFFICIENTS AND PRICING INFORMATION FOR BOTH DIVISIONS OR INDICATE IF THE CO-EFFICIENTS WILL BE IDENTICAL FOR BOTH DIVISIONS.

Price Proposal shall be submitted in a clearly marked, separate sealed envelope. Offeror shall provide a price proposal to include the following information:

- 1. Name and Date of the Unit Price Book (UPB):**
- 2. Coefficient(s) to be applied to pre-priced items (items listed in the UPB) for work performed during:**
 - Normal business hours (Monday - Friday 7 a.m. - 5 p.m.)
 - Other hours (after hours, weekends, and holidays)
 - Note adjustments to the coefficient(s), if applicable, for work performed in different regions of the state.
- 3. Coefficient(s) to be applied to non pre-priced items (items not listed in the UPB) for work performed during:**
 - Normal business hours (Monday - Friday 7 a.m. - 5 p.m.)
 - Other hours (after hours, weekends, and holidays)
 - Note adjustments to the coefficient(s), if applicable, for work performed in different regions of the state.

Notes: Provide a brief explanation of the rationale for your coefficients. The rationale should indicate how you determined the cost of doing the work and the various elements that made up your coefficients. See Specification 1.2.13, Pricing, for additional information.

4. Open Book Pricing Workbook:

NOTE: *The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.*

If offeror is including the Open Book Pricing methodology in their price proposal, the Open Book Price workbook shall be completed as follows:

- Provide complete information in the worksheet titled, "*Price Summary*" in the electronic Open Book Price workbook titled, "*19F-0808 Open Book Price Summary.xlsx*" includes yellow highlighted cells for *General and Administrative Cost (G&A)* and *Profit*. Place the percentage value your firm will use to calculate overhead and profit for the Direct Project Costs and General Conditions.
- The worksheet titled, "*General Conditions*" in the electronic Open Book Price workbook titled, "*19F-0808 Open Book Price Summary.xlsx*", includes general conditions, services, or costs not identified or included in the subcontractor quotations.
- Provide the labor and/or service unit price for the yellow highlighted cells in the section titled, *Admin Fee Items: Unit Price*. Additionally, include the unit of measure (e.g. per hour, per day, per week) as applicable in the *Unit Of Measure* column.
- Provide additional costs as applicable for yellow highlighted cells in the section titled, *Non-Admin Fee Items*. Non-Admin Fee items include costs that are "passed-through" to member at cost to the contract vendor. *Mohave shall not collect administration fees on the above non-admin fee items.*
- Add line items to the Admin and/or Non-Admin Fee schedules as necessary.
- **Only services/costs identified in this price schedule will be allowed under an awarded contract.**
- This workbook will serve as your quoting template for all open book projects under an awarded contract.

Price Proposal – Primary Vendor Information
(Place in a clearly marked, separate sealed envelope)

5. Trade Service Price Guides for items and services not included in the UPB:

- The pricing methodology to determine the Mohave price shall be:
 - Discount off list (specify discount).
 - Discount off Column Two (specify discount) when List Price is unavailable.

6. Professional Services (Provide the applicable hourly rate for each service offered. No coefficient will be applied to these rates.)

- Design Services
- Engineering Services
- Other Professional Services (specify service and rate)

7. Maintenance Services and Extended Warranties (Provide the cost for all maintenance services and extended warranties that are available after the warranty period. No coefficient will be applied to these prices.)

8. Other Charges (Provide any additional costs, or incidental charges. Such charges may include the items listed below. No coefficient will be applied to these charges.)

- 100% Performance and Payment Bonds
- Meals and incidental expenses (M&IE), transportation and lodging
- Mobilization (Indicate when mobilization charges would apply.)

NOTE: Mobilization may only be used with projects priced using Trade Service and labor. Mobilization charges shall not be allowed with UPB or Open Book Pricing methodologies.

- Other

9. Will you offer members a quick pay discount if payment is made within 10 or 20 days? Yes ___ No ___

- If Yes, what is the discount for 10 days? _____ 20 days? _____

Travel Description

If travel rates are applicable, describe how they are calculated, and when they are necessary, (e.g. 50 miles from origin). Include information regarding what the travel rates cover. (See **Pricing: Reimbursement for Transportation, Mileage, Lodging, Meals and Incidental Expenses** in the Special Terms and Conditions.)

Bond Methodology Description

Provide detailed information explaining the methodology to be used when bonds are applied to projects. Describe in detail the method your surety company requires you to use (e.g., bonds are applied before sales tax is applied, bonds are applied after sales tax is applied). Mohave will use this information to verify that your firm is consistently charging bonds in the same manner under an awarded contract.

**Technical Proposal – Supporting Contract Documents – Firm Information,
Order Processing, Individual Contact, and Customer Support Information
(Place after Tab 4a)**

1. Contact information for firm's headquarters:

Physical Address _____

Mail Address, if different _____

Main Phone Number _____

Website _____

2. Contact information for firm's Arizona branch office:

Physical Address _____

Mail Address, if different _____

Main Phone Number _____

Website, if different _____

Add additional contact information if firm has more than one Arizona branch office.

3. Contact information for purchase orders:

Physical Address _____

Email Address _____

Attention of _____

4. Payment remittance address _____

Attn: _____

City _____ State _____ Zip _____

Telephone (invoice questions) _____

5. Provide Arizona Transaction Privilege (sales) Tax License Number: _____

Do you collect city, county and/or other local sales tax in Arizona? Yes ____ No ____

If yes, please check one:

☐ Our combined state, city, county and/or other local sales tax rate is ____% (local rate).

☐ The sales tax rate varies by the location (e.g. ship to rate). Provide additional information below:

6. Acceptance of Pcards for Payment:

Will you accept Pcards as a method of payment? Yes _____ No _____

**Technical Proposal – Supporting Contract Documents – Firm Information,
Order Processing, Individual Contact, and Customer Support Information
(Place after Tab 4a)**

7. Contacts for Mohave:

Main Mohave representative contact: _____

(Shall be the main point of contact for members and be responsible for member information requests.)

Title _____ Email address _____

Phone number _____ Fax _____

Contract Administrator contact: _____

(Shall be the main point of contact for contract information requests.)

Title _____ Email address _____

Phone number _____ Fax _____

Accounting contact: _____

(Shall be the main point of contact for accounting issues.)

Title _____ Email address _____

Phone number _____ Fax _____

Open Order/Status Report contact: _____

(Shall be the main point of contact regarding open orders and status reports.)

Title _____ Email address _____

Phone number _____ Fax _____

Audit contact: _____

(Shall be the main point of contact for audit requests and clarifications.)

Title _____ Email address _____

Phone number _____ Fax _____

Reconciliation contact: _____

(Shall be the main point of contact for reconciliation report requests and/or clarifications and payment of administration fees.)

Title _____ Email address _____

Phone number _____ Fax _____

Escalation contact: _____

*(Shall be the main point of contact when an issue needs to be escalated above the main contact and/or contract administrator for the RFP/contract. **This contact shall be a different individual than those named for the contacts listed above.**)*

Title _____ Email address _____

Phone number _____ Fax _____

Marketing contact: _____

(Shall be the main point of contact for providing marketing information for Mohave's website.)

Title _____ Email address _____

Phone number _____ Fax _____

**Technical Proposal – Supporting Contract Documents – Firm Information,
Order Processing, Individual Contact, and Customer Support Information
(Place after Tab 4a)**

Provide the requested customer support information for warranty and maintenance service offered by your firm, as applicable.

Do you provide warranty and maintenance for the items in the proposal?

☐ **Yes**, the following is applicable to our offer. (If yes, please provide the information below.)

☐ **No**, the following is not applicable to our offer.

Describe the steps a member should take to activate a warranty and how they obtain warranty and maintenance service.

Provide the name and address of the facility that will provide warranty and maintenance service, under an awarded contract. Additionally, provide a contact person and phone number for warranty and maintenance service. If there is more than one facility, provide the names and addresses for all facilities. Attach a list if necessary.

Do you provide technical assistance via phone? ☐ Yes ☐ No If yes, provide a phone number and contact.

What is your service response time for metropolitan areas (e.g., Phoenix, Tucson) and rural areas?

Technical Proposal – Supporting Contract Documents
Sample Supplemental or End User Agreement(s)
(Place after Tab 4b)

Will members be required to sign supplemental or end-user agreements (sales, maintenance)?
(See **3.1 Contract vendor documents** in the Special Terms and Conditions)

☐ Yes ☐ No

If yes, review/revise your agreement(s) for terms that conflict with the Mohave terms and conditions. In addition, review for the following common issues:

Acceptable agreements **shall** include:

- Non-appropriations clause;
- Contract or agreement must be governed by the laws of the State of Arizona;
- Net payment is thirty (30) days.

Agreements **shall not** include:

- Terms beyond one year;
- Waiver of right for a jury trial;
- Requirement of upfront payment by member when purchase order is placed;
- Entire agreement language;
- Auto-renewal language.

Attach your reviewed/revised agreement(s). **Unacceptable agreement(s) may render your proposal nonresponsive.**

Technical Proposal – Supporting Contract Documents
Extended Warranty and Maintenance Plan Information
(Place after Tab 4c)

Do you offer extended warranty or maintenance service plans? ☐ Yes ☐ No

If yes, provide a summary of the plans here and/or copies of the plans after this page. Include pricing for extended warranty or maintenance service plans in your price schedule after **Tab 3a**. Place any supplemental end-user agreement forms, which include terms and conditions and/or member signature after **Tab 4b**.

Technical Proposal – Bid Bond
(Place after Tab 1f)

KNOW ALL MEN BY THESE PRESENTS:

THAT, _____
(hereinafter called Principal), as Principal, and _____
a corporation organized and existing under the laws of the State of _____, with its principal office in
the city of _____, (hereinafter called the
Surety), as Surety, are held and firmly bound unto Mohave Educational Services Cooperative, Inc. in the
State of Arizona, (hereinafter called the Obligee) in the amount of \$100,000 for payment whereof the said
Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns,
jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Job Order Contracting for Job Order Contracting for
Various Construction Trades.

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter
into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as
may be specified in the bidding or contract documents with good and sufficient surety for the faithful
performance of such contract and for the prompt payment of labor and material furnished in the prosecution
thereof, or in the event of the failure of the Principal to enter into such contract and give such bond or
bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the
amount specified in said bid and such larger amount for which the Obligee may in good faith contract with
another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise
to remain in full force and effect.

The prevailing party in a suit on this bond shall recover as part of his judgment such reasonable attorney
fees as may be fixed by a judge of the court.

Witness our hands this _____ day of _____, 20__.

PRINCIPAL SEAL

BY

SURETY SEAL

BY

AGENCY OF RECORD

Technical Proposal – Special Terms and Conditions (Place after Tab 1d)

Some Special Terms and Conditions specify placement of information in tabs other than Tab 1d as noted in the title above. Pay close attention to placement information (identified in bold text) as indicated in select Special Terms and Conditions.

1. **BID BONDS AND BONDING CAPACITY**

1.1. Bid Bond: Offeror shall provide an original bid bond or alternate bid security in the amount of **\$100,000. Place after Tab 1f.** Note: Bid security as a percentage of the bid value (e.g. – 10% of contract award) is not acceptable.

1.2. Bonding Capacity: The required minimum single job bonding capacity for this contract shall be \$1,000,000. Bidder shall provide a letter from your bonding agency describing your current bonding capacity, as follows:

- Your single job bonding capacity.
- Your aggregate bonding capacity.
- An agent of your licensed bonding agency shall sign the letter.

If the original letter is not signed and/or has conflicting information, it shall render your technical proposal nonresponsive. **Place letter from bonding agency after Tab 1f.**

2. **DELIVERY**

2.1. Default in one installment to constitute total breach: Contract vendor shall deliver conforming materials in each installment or lot under this contract and may not substitute nonconforming materials. Mohave reserves the right to declare a breach of contract if contract vendor delivers nonconforming materials to any member under this contract.

2.2. Defective goods: Contract vendor agrees to arrange and pay for return shipment of goods that arrive in a defective or non-operable condition.

2.3. Delivery time: Failure to deliver any order within the time frame specified on the purchase order may result in cancellation of that purchase order.

2.4. Improper delivery: If the goods or tender of delivery fail in any respect to conform to this contract, member may reject the whole, accept the whole, or accept any commercial unit or units and reject the rest.

2.5. Restocking fees: A restocking fee may only be charged on products ordered and delivered to member's site. Restocking fees in excess of fifteen percent (15%) shall not be allowed. Contract vendor may waive restocking fees. Restocking and return shipping charges shall be identified in the price workbook.

3. **FORM OF CONTRACT**

3.1. Contract vendor contract documents: If a firm submitting an offer requires member to sign an additional agreement, a copy of the proposed agreement shall be included with the proposal.

If awarded a contract, any additional contract vendor's documents shall not become part of Mohave's contract unless, and until, an authorized representative of Mohave reviews and approves them.

Contract vendor agrees to provide Mohave a copy of any agreements that are revised during the term of an awarded contract, prior to having the member sign the agreement.

3.2. Design and engineering services: This is not a contract for design or engineering services. Upon request from member, and if included in the awarded contract, contract vendor shall provide design services related to the job order. Such services are only allowable as part of an executed JOC purchase order, for performing services within the specifications and scope of work.

3.3. Form of contract: The form of contract for this solicitation shall be the Request For Proposal, the awarded proposal(s), the Request for Qualifications (RFQ), and properly issued member purchase orders referencing the requirements of the Request For Proposal.

Technical Proposal – Special Terms and Conditions
(Place after Tab 1d)

3.4. Parol evidence: The contract represents the final written expression of agreement. All agreements are contained herein and no other agreements or representations that materially alter it are acceptable.

4. INSTALLATION

Installation shall be scheduled directly with member and be done in a reasonable amount of time. Installation shall be in accordance with the manufacturer's instructions and shall be accomplished by skilled and properly licensed individuals.

5. INSURANCE

5.1. Certificate: Evidence of the required insurance shall be provided with your technical proposal by means of a current certificate of insurance with the coverage's as stated within the requirements below. Before any orders are processed under an awarded contract, contract vendor shall provide a certificate that names Mohave Educational Services Cooperative, Inc. as the certificate holder.

Certificate (or certificates if using multiple carriers) shall include, at a minimum, coverage for:

- General Liability
- Automobile liability
- Umbrella or Excess Liability
- Workers' Compensation

In addition, contract vendor must be willing to provide, upon request, identical certificate of insurance to any member using this contract. Contract vendor must also be willing, upon request, to add any member as an additional insured entity. Any costs for adding a member as an additionally insured entity shall be clearly identified in submitted contract pricing. If no pricing is identified, adding a member as an additionally insured entity shall be provided at no additional cost.

Provide evidence of current insurance coverage after Tab 2d.

5.2. Deductibles: Contract vendor shall pay the deductibles required by the insurance provided under this contract.

5.3. Liability insurance: Prior to commencing services under this contract, contract vendor shall procure and maintain during the life of this agreement, comprehensive general liability insurance, to include automobile liability, providing limits of an aggregate amount of not less than \$2,000,000.

5.4. Scope of Insurance: Contract vendor's insurance shall provide adequate protection for contract vendor against damage claims which may arise from operations under this contract, whether such operations are by the insured or by anyone directly or indirectly employed by the insured. All insurance must be written by companies incorporated within the United States (exclusive of Territories or Possessions) and licensed or authorized to do business in Arizona.

5.5. Subcontractor insurance: Prior to commencing any work, any subcontractor shall procure and maintain at its own expense until final acceptance of the work, insurance coverage in a form and from insurers acceptable to the prime contractor. All subcontractors will provide workers' compensation insurance, which waives all subrogation rights against the prime contractor, member and Mohave.

5.6. Workers' compensation insurance: Contract vendor shall also procure and maintain during the life of this agreement, workers' compensation insurance for all of contract vendor's employees engaged in work under the contract. All workers' compensation insurance will be in compliance with Arizona state statute and evidenced by a certificate of insurance.

Technical Proposal – Special Terms and Conditions
(Place after Tab 1d)

6. MAINTENANCE FACILITIES AND SUPPORT

It is preferred that each contract vendor should have maintenance facilities and a maintenance support system available for servicing products throughout Arizona, or the regions specified in their offer. Maintenance facilities shall have sufficient parts inventory to provide quality service on products sold to members. Trained and qualified technicians shall be available to cover all parts of the state, or specific regions within the state for regional offers. It is preferred that maintenance services are available within 24 hours. If a third party is used to provide maintenance or warranty work, offeror shall include details of any such arrangement in the proposal.

7. MANUFACTURER SUPPORT

Offerors submitting proposals as a manufacturer's representative must be able, if requested by Mohave, to supplement the proposal with a letter from the manufacturer certifying that offeror is a bona fide dealer for the equipment offered, and that offeror is authorized to submit a proposal on such equipment.

8. MEMBER AGREEMENTS

Some members may request the addition of specific requirements that would apply to products and services purchased under an awarded contract. These additional requirements shall be addressed through the use of an additional member agreement. In any agreement between the contract vendor and a member based on this contract, the terms and conditions of this contract shall prevail. Contract vendor and member must agree to all provisions in any additional agreements. If agreement requirements result in additional costs to the contract vendor, the contract vendor shall be entitled to direct reimbursement for these costs, in addition and separately to approved contract pricing. A copy of the additional member agreement shall accompany the member's purchase order.

9. OFFEROR QUALIFICATIONS

It is preferred that the offeror has extensive knowledge and at least three (3) years experience with the provision, installation and maintenance of the equipment and Job Order Contracting services offered. Mohave reserves the right to accept or reject newly-formed companies based solely on information provided in the proposal and/or its own investigation of the company.

10. PRICING

10.1. Administration fee: Mohave's 1% administration fee shall be included in offeror's contract price. Contract vendor shall not add the administration fee to approved contract prices. The value of trade-ins or rebates shall not affect the amount of administration fee paid to Mohave.

10.2. Application of pricing: In Mohave's purchase order review process, the date of a valid contract vendor's quote or the date Mohave receives a member purchase order will generally be used to determine the contract pricing that is in effect for that order. The date Mohave receives a member purchase order will only be used to determine the contract pricing that is in effect for an order when a contract vendor's quote does not exist or is invalid. However, other factors may apply.

10.3. Basis for pricing: Contract pricing under this RFP shall be based upon:

1. Coefficient applied to a UPB; or
2. Open Book Pricing; or
3. Discount applied to *Trade Service* price guides; or
4. A combination of the above.

10.4. Coefficients: A coefficient will be applied to the UPB. The coefficient is the multiplier (e.g., .95) that is applied to all UPB prices to determine the member's contract price. Several coefficients may apply to the UPB. Coefficients shall be extended no more than two (2) decimal places.

10.5. Coefficients, quarterly updates: Quarterly updates to the CCI shall be required under an awarded contract. Mohave shall set the schedule for allowable quarterly CCI updates.

10.6. Decimal places: Pricing shall use a maximum of two (2) decimal places.

Technical Proposal – Special Terms and Conditions
(Place after Tab 1d)

10.7. New price lists: New price lists, and workbooks shall only be submitted for review at the renewal anniversary of the contract. Contract vendor shall be bound to the pricing methodologies submitted in the price proposal. Contract vendor shall not be allowed to add new pricing methodologies to their price proposal. Contract vendor will be allowed to remove pricing methodologies. Mohave will review new price lists, and/or workbooks to determine if the new prices or an alternative option is in the members' best interests. New price lists, and/or workbooks shall apply to the contract only upon approval from Mohave. New price lists, and/or workbooks found to be non-competitive at any time during the contract shall be grounds for terminating the contract.

10.8. Open Book Pricing: In addition to UPB-based pricing, Open Book Pricing may be used as an optional pricing method. Member shall select the pricing method for a job order prior to requesting a price quote. Once selected, the pricing method for the job order may not be changed. Open Book Pricing shall consist of direct job cost, project-specific general conditions, a fixed general and administrative cost multiplier, and a fixed profit multiplier. Bond cost and transaction privilege tax (sales tax) will be added to Open Book Pricing for total job order cost. The factors used in Open Book Pricing shall be consistent with the factors used in determining the UPB coefficient originally awarded in the contract.

Projects that include preconstruction services shall use the UPB pricing methodology as the basis for that pricing. For projects using these preconstruction services, both UPB and Open Book Pricing methodology may be used: UPB for the preconstruction portion, and Open Book for the rest of the project.

10.9. Price reduction and adjustment: Price reduction may be offered at any time during a contract and shall become effective upon notice of acceptance from Mohave. Special time-limited reductions are permissible under the following conditions: 1) reduction is available to all members equally; 2) reduction is for a specific time period, normally not less than thirty (30) days; 3) original price is not exceeded after the time-limit; and 4) Mohave has approved the new prices prior to any offer of the prices to a member. Mohave shall be the sole judge on the acceptance of price reductions under an awarded contract.

10.10. Preferred order of pricing methodologies: The preferred order of pricing for UPB and *Trade Service* pricing may be as follows:

- a. Coefficient applied to a UPB
- b. Coefficient applied to UPB labor and equipment. *Trade Service* product pricing for materials
- c. Coefficient applied to UPB labor, equipment, and non pre-priced item
- d. *Trade Service* product pricing and labor rate

10.11. Reimbursement for transportation, mileage, lodging, meals and incidental expenses (M&IE): Contract vendor may charge for transportation, mileage, lodging and M&IE costs for employees that are required to travel to perform services at member site under this contract. An overnight stay is required for lodging reimbursement. Mileage reimbursement shall be at a specified rate. Transportation charges are separate from mileage, and may include airfare, car rental, etc.

Reimbursements under this section shall not exceed the rates listed in approved pricing, and shall not exceed the actual charge. To be eligible for reimbursement, estimated charges must be on the quote and approved by the member. Receipts for such reimbursements must be provided upon request from the member.

10.12. Promotional pricing offers: Promotional pricing offers (e.g., quantity discounts, time sensitive offers, bundles) must apply to all Mohave orders of similar size and scope. Promotional pricing limited to a single member is not acceptable. Mohave must approve promotional pricing before it is offered to any member.

Technical Proposal – Special Terms and Conditions

(Place after Tab 1d)

10.13. Trade Service The successful contract vendor shall reimburse Mohave the current subscription rate for a *Trade Service eDataFlex* pricing to facilitate eligible procurement agencies in placing orders. Contract vendor agrees to maintain their own subscriptions to *Trade Service eDataFlex* pricing to quote products under an awarded contract. The data contained in the *Trade Service eDataFlex* will be used to archive historical pricing information for Mohave staff to confirm pricing and perform audits under an awarded contract. Mohave will attempt to spread the costs for the *Trade Service eDataFlex* pricing between all contract vendors awarded a contract. Mohave shall invoice the contract vendor accordingly based on the number of awarded contracts using *Trade Service*. Travel/drive rates and/or mobilization may only be used with projects priced using *Trade Service* and labor. Mobilization charges shall not be allowed with UPB or Open Book Pricing methodologies.

10.14. Unit price book: Offeror shall provide the name and date of the unit price book to which the coefficient will be applied. Submission of outdated unit price books may result in rejection of the proposal.

10.15. Unit price book copies: The successful contract vendor shall be responsible for providing UPB pricing for Mohave's use. Mohave may require multiple copies of the UPB. Mohave will attempt to spread the costs for the UPB pricing between all contract vendors awarded a contract by purchasing the required pricing and invoicing the vendor, based on the modules used by each vendor.

11. SITE REQUIREMENTS

11.1. Cleanup: Contract vendor shall clean up and remove all debris resulting from their work as required or directed by member. Upon completion of the work, the premises shall be left in good repair and unobstructed condition.

11.2. Contract vendor employee fingerprinting: Contract vendor and its employees or subcontractors working under an awarded contract who are required to provide services on a regular basis at an individual school, shall obtain and present a valid Department of Public Safety fingerprint clearance card in accordance with ARS §15-512(H). The fingerprint card shall be issued pursuant to Title 41, Chapter 12, Article 3.1. Charges for such fingerprint checks will be the responsibility of the contract vendor, subcontractor or individual employee as determined by the member.

An exception to this requirement may be authorized in member's Governing Board policy, for persons who, *"as part of the normal job duties of the persons, are not likely to have independent access to or unsupervised contact with pupils."*

Contract vendor and its employees or subcontractors shall not provide services on school district property until so authorized by the school district. Additionally, contract vendor shall comply with applicable governing board fingerprinting policy(ies) at the school district where services are provided.

11.3. Onsite Contract Vendor Responsibilities: The contract vendor is responsible for ensuring that all onsite work performed under this contract meets or exceeds the current OSHA standards, and is responsible for ensuring safe work performance of employees and subcontract vendors.

Contract vendor and its employees or subcontractors shall report accidents and incidents immediately to the member's responsible staff or its administration. The contract vendor is responsible for providing and obtaining appropriate medical and emergency assistance and notifying fire and law enforcement agencies, when necessary. Except for rescue and emergency measures, the scene of the accident or incident shall not be disturbed, and the operation shall not resume until authorized by the member's responsible staff or administration. The contract vendor must assist and cooperate fully with the investigation of the accident/incident and ensure availability of all information, personnel and data pertinent to the investigation.

Technical Proposal – Special Terms and Conditions

(Place after Tab 1d)

For preemptive purposes, contract vendor and its employees or subcontractors shall immediately report to the member's responsible staff or administration all areas of concern that could potentially lead to accident or injury.

11.4. Preparation: Contract vendor shall not begin a project for which member has not prepared the site. Site preparation includes, but is not limited to: moving furniture, installing wiring for networks or power, and similar pre-installation requirements.

11.5. Registered sex offender restrictions: For work to be performed at an Arizona school, contract vendor agrees that no employee or employee of a subcontractor who has been adjudicated to be a registered sex offender will perform work at any time when students are or are reasonably expected to be present. Contract vendor agrees that a violation of this condition shall be considered a material breach and may result in the cancellation of the purchase order at the member's discretion.

11.6. Safety measures: Contract vendor shall take all reasonable precautions for safety on the worksite, and shall erect and properly maintain all necessary safeguards for protection of workers and the public. Contract vendor shall post warning signs against all hazards created by its operation and work in progress. Proper precautions shall be taken pursuant to current Arizona law and standard practices to protect workers, general public, and existing structures from injury or damage.

11.7. Smoking: Persons working under the contract shall adhere to current local smoking policies.

11.8. Stored materials: Upon prior written agreement between the contract vendor and member, payment may be made for materials not incorporated in the work but delivered and suitably stored at the site or some other location, for installation at a later date. An inventory of the stored materials shall be provided to member prior to payment. Such materials shall be stored and protected in a secure location, and be insured for their full value by the contract vendor against loss and damage. Contract vendor agrees to provide proof of coverage and/or addition of member as an additional insured upon member's request. Additionally, if stored offsite, the materials shall also be clearly identified as property of member and be separated from other materials. Member shall be allowed reasonable opportunity to inspect and take inventory of stored materials, on or offsite, as necessary.

Payment for stored materials shall not constitute final acceptance of such materials. The contract vendor shall be responsible for the protection of all material and equipment, whether stored on or off site. Title for all work, materials and equipment shall pass to the member only upon final inspection and payment of remaining job costs.

12. SUBCONTRACTORS

12.1. Awarding subcontracts: Offeror agrees that any subcontract competitively solicited by contract vendor will not be awarded solely upon membership or non-membership in a union or professional association.

12.2. Entering subcontracts: Subcontracts shall incorporate by reference the terms and conditions of the Mohave contract.

12.3. Prime contractor: Contract vendor will be considered a prime contractor and not a subcontractor. Neither Mohave nor the member will establish a contractual relationship with subcontractors.

12.4. Subcontracts: No subcontracts shall be entered into with any unlicensed party. Contract vendor must use subcontractors openly, include such arrangements in the proposal, and certify upon request that such use complies with the current rules of the Arizona Registrar of Contractors and the Arizona procurement rules and code. No subcontracting costs may be hidden in a cost proposal to member.

Technical Proposal – Special Terms and Conditions

(Place after Tab 1d)

12.5. Subcontractor payment: Contract vendor agrees to pay subcontractors within seven days after receipt of payment from member, as required in Arizona procurement rules and code. If contract vendor receives any interest monies for delay of payment from member, contract vendor will pay subcontractor the correct proportion of interest received. Complaints by subcontractor may be resolved as described in Arizona procurement rules and code. Failure to pay subcontractor for work faithfully performed and properly invoiced may result in the suspension or cancellation of this contract.

12.6. Selection Process for Subcontractors: Contract vendor shall select subcontractors based on qualifications alone or on a combination of qualifications and price and shall not select subcontractors based on price alone.

12.7. Use of subcontractors: If the contract vendor subcontracts or intends to subcontract part or all of the work under a job order:

The contract vendor has a duty to deliver promptly to each subcontractor invited to bid a coefficient to the contract vendor to do all or part of the work under one or more job orders.

Provide a copy of the descriptions of all standard individual tasks and a copy of the applicable current standard unit prices on which the subcontractor is invited to bid.

13. TERM OF CONTRACT AND EXTENSION

13.1. Contract period: It is Mohave's intent to award a multi-term contract for the specified product, material, process, or services. The initial contract term shall be for one (1) calendar year from the effective date of contract award. By mutual written agreement between Mohave and contract vendor, the contract may be extended for up to four (4) consecutive additional 12-month periods, beginning immediately after expiration of the prior term. However, no contract extension (contract modification) exists unless and until contract vendor is so notified by Mohave.

13.2. Contract extension (contract modification): Conditions for contract extension (contract modification) may include, but are not limited to: contract usage, satisfactory performance of services during the preceding contract term, ability to continue to provide satisfactory services, continued adherence to the contract requirements, and continued competitive prices for the materials and services provided under the contract. Mohave shall prepare a performance report for all contracts prior to issuing any extension (contract modification). This performance report shall use past performance information gathered by your assigned Contract Specialist. Past performance information shall be used when determining whether a contract receives an extension (contract modification).

13.3. Month-to-month extensions (contract modification): Mohave reserves the right to offer month-to-month extensions (contract modification), if that is determined to be in the best interests of members.

14. TRADE-IN EQUIPMENT

Member and contract vendor shall determine values placed on trade-in products. The value of trade-in shall not affect the amount of administration fee paid to Mohave. Trade-in equipment shall be dismantled and removed at contract vendor's expense. The condition of trade-in equipment at the time it is turned over to contract vendor shall be the same as when the original agreement was made, except for normal wear and tear from use between the time of the offer and trade-in.

15. WARRANTY/QUALITY GUARANTEE

15.1. Extended warranties contracts: The contract vendor or a manufacturer may offer extended warranties available at extra cost for members that agree to a maintenance contract. The extended warranty contract shall be offered as a separate line item. Upon request, training must be offered by the contract vendor for the maintenance staff of the member and will be arranged before installation as part of the purchase contract. This training shall be priced per contract pricing.

Technical Proposal – Special Terms and Conditions
(Place after Tab 1d)

15.2. Fitness: Contract vendor warrants that any equipment or material supplied to Mohave or its members shall fully conform to all requirements of the contract, all representations of contract vendor, and shall be fit for all purposes and uses required by the contract.

15.3. Inspection: The warranties set forth in this section shall not be affected by inspection or testing of, or payment, for the product or materials to contract vendor by member.

15.4. Quality: Unless otherwise specified, contract vendor warrants that for a period of two (2) years after acceptance of the equipment or materials by member, they shall be:

- Of a quality to pass without objection in the industry or trade normally associated with them;
- Fit for the intended purpose(s) for which they are used;
- Of even kind, quantity and quality within each unit and among all units, within the variations permitted by the contract;
- Adequately contained, packaged and marked as the contract may require; and
- Conform to the written promises or affirmations of fact made by contract vendor.

15.5. Warranty requirements: Contract vendor warrants that all products, materials, processes and services delivered under this contract shall conform to the specifications. Unless stated otherwise, all equipment shall carry a minimum two (2) year warranty that includes parts and labor. Contract vendor agrees to help member reach resolution in a dispute with the manufacturer over warranty terms. Any extended manufacturer's warranty shall be passed on to member without exception. Mohave reserves the right to cancel the contract if contract vendor charges member for a replacement part that the contract vendor received at no cost under a warranty.

15.6. Warranty work: The contract vendor shall perform all warranty work and remain available to the member should continue service be required after warranty obligations are met.

Technical Proposal – Special Terms and Conditions Acceptance Form
(Place after Tab 1d)

Signature on Page 2 certifies complete acceptance of the Special Terms and Conditions in this solicitation, except as noted below (additional pages may be attached, if necessary).

Check one of the following responses to the Special Terms and Conditions:

- ☐ **We take no exceptions/deviations to the Special Terms and Conditions.**

(Note: If nothing is listed below, it is understood that no exceptions/deviations are taken.)

- ☐ **We take the following exceptions/deviations to the Special Terms and Conditions. All exceptions/deviations shall be clearly explained. Reference the corresponding Special Terms and Conditions that you are taking exceptions/deviations to. Clearly state if you are adding additional terms and conditions to the Special Terms and Conditions. Provide details on your exceptions/deviations below:**

(Note: All requested exceptions/deviations must be clearly explained. Reference the specific special terms and conditions that you are taking exceptions/deviations to, detail any proposed substitute special terms and conditions, and clearly demonstrate how Mohave and its membership will be better served by the substituted special terms and conditions. Unacceptable exceptions/deviations shall remove your proposal from consideration for award. Mohave shall be the sole judge on the acceptance of exceptions/deviations and Mohave's decision shall be final.)

Technical Proposal – General Terms and Conditions (Place after Tab 1c)

Some General Terms and Conditions specify placement of information in tabs other than Tab 1c as noted in the title above. Pay close attention to placement information (identified in bold text) as indicated in select General Terms and Conditions.

1. ADVERTISING

Offeror shall not advertise or publish information concerning this solicitation prior to an award being announced by Mohave. After award, contract vendor(s) may advertise the availability of products, materials, processes and services to members. Any promotional marketing materials using the Mohave logo shall be approved by a Mohave Contract Specialist in advance.

2. AVAILABILITY OF FUNDS

Member fund availability is unknown to Mohave at the time this solicitation was issued. Use of any contract awarded by Mohave will be conditioned upon the availability of member funds.

3. CANCELLATION

3.1. Cancellation Process: The following requirements shall apply to all cancellation notices issued under an awarded contract:

- A written notice of cancellation shall be sent to the contract vendor and the effective date of cancellation shall be the date specified within the written notice of cancellation.
- Upon cancellation, all products, materials, processes and services paid for by the member, along with documents, data and reports prepared by contract vendor under the contract shall become the property of the member.
- Contract vendor shall be entitled to receive just and equitable compensation in accordance with applicable contract pricing for authorized work in progress, authorized work completed and materials accepted before the effective date of the cancellation.
- Cancellation shall have no effect on projects in progress prior to the effective date of the cancellation.
- Contract vendor is obligated to continue submitting monthly reconciliation reports and administrative fee payments until all purchases are complete and closed.

3.2. Cancellation for bankruptcy or acquisition: Mohave reserves the right to cancel, or suspend the use of, any contract if contract vendor files for bankruptcy protection, or if the original contract holder is sold and ownership is transferred to a new party.

3.3. Cancellation for conflict of interest: Mohave may cancel this contract pursuant to ARS §38-511 for conflict of interest. Conflict of interest occurs if any person significantly involved in initiating, negotiating, securing, drafting or creating the contract on behalf of Mohave, is or becomes at any time while the contract or an extension (contract modification) of the contract is in effect, an employee of, or a consultant to, any other party to the contract, with respect to the subject matter of the contract. Members shall incur no penalty or further obligation if the contract is cancelled for conflict of interest.

3.4. Cancellation for convenience: Mohave reserves the right to immediately cancel the contract without penalty or recourse, in whole or in part, when Mohave determines that action to be in the best interests of its members.

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3.5. Cancellation for non-performance or contract vendor deficiency: Mohave may terminate any contract if members have not used the contract, or if purchase volume is determined to be "low volume" in any 12-month period. Mohave reserves the right to cancel the whole or any part of this contract due to failure by contract vendor to carry out any obligation, term or condition of the contract. Mohave may issue a written deficiency notice to contract vendor for acting or failing to act in any of the following:

- Failing to comply with the accepted terms and conditions of the contract;
- Providing material that does not meet the specifications of the contract;
- Providing work and/or material that was not awarded under the contract;
- Failing to adequately perform the services set forth in the scope of work and specifications;
- Failing to complete required work or furnish required materials within a reasonable amount of time;
- Failing to make progress in performance of the contract and/or giving Mohave reason to believe that contract vendor will not or cannot perform the requirements of the contract
- Failing to provide required performance bonds;
- Performing work or providing services under the contract prior to receiving a Mohave reviewed member purchase order for such work.

Upon receipt of a written deficiency notice, contract vendor shall have ten (10) days to provide a satisfactory response to Mohave to adequately address all issues of concern. Failure to adequately address all issues of concern may result in contract cancellation. Upon cancellation under this clause, all goods, materials and work paid for by the member, along with documents, data and reports prepared by contract vendor under the contract shall become the property of the member.

3.6. Cancellation for replacement: Mohave reserves the right to cancel a contract awarded under this solicitation, if a new solicitation has been issued and a contract has been awarded to the same contract vendor for similar products, materials, processes and services. Mohave may, at its option, either replace a contract resulting from this solicitation or delay a new award until the existing contract expires. The decision to delay or replace the contract rests solely with Mohave.

3.7. Contract vendor cancellation: Contract vendor may cancel this contract at any time upon thirty (30) days prior written notice to Mohave or at time of annual contract renewal (contract modification). Termination shall have no effect on projects in progress at the time the notice of cancellation is received by Mohave.

3.8. Continuation of performance: Contract vendor shall continue to perform in accordance with the requirements of the contract, up to the date of cancellation and as directed in the cancellation notice.

3.9. Gratuities: Mohave shall cancel this contract if it is found that gratuities in the form of entertainment, gifts or otherwise, were offered or given by contract vendor or any agent or representative of contract vendor, to any employee of Mohave or member with a view toward securing a contract or with respect to the performance of this contract. Officers, employees and agents are prohibited from soliciting or accepting gratuities, favors or anything of monetary value from contractors or parties of subcontractors under an awarded contract. Paying the expenses of normal business meals shall be in accordance with each member's policy regarding gratuities. Samples as requested in the solicitation and provided to Mohave for demonstration or evaluation are not considered gratuities.

4. CAPTIONS, HEADINGS AND ILLUSTRATIONS

The captions, illustrations, headings, and subheadings in this solicitation are for convenience and ease of perusal only, and in no way define, limit or describe the scope or intent of the request.

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5. CERTIFICATION

By signing the *Offer and Acceptance Form* (page 2 of the RFP), offeror certifies the following:

- Offeror has examined and understands the terms, conditions, scope of work, specifications and other documents in this solicitation.
- The submission of the proposal did not involve collusion or other anticompetitive practices. Neither signatory nor any person on his behalf has connived or colluded to produce a deceptive show of competition in the matter of the bidding or award of a contract under this solicitation.
- Offeror has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with the submitted offer.
- Neither offeror, nor any officer, director, partner, member or associate of offeror, nor any of its employees directly involved in obtaining contracts with the State of Arizona, Mohave Educational Services Cooperative, Inc., or any subdivision of the state has been convicted of false pretenses, attempted false pretenses, or conspiracy to commit false pretenses, bribery, attempted bribery or conspiracy to bribe under the laws of any state or federal government for acts or omissions after January 1, 1985.
- Offeror agrees to comply fully with any and all provisions of ARS Title 32, Chapter 10 (Registrar of Contractors) that may regulate offeror's business.
- Offeror shall not discriminate against any employee, or applicant for employment, in violation of federal and state laws (see Federal Executive Order 11246; and ARS Title 41, Chapter 9, Article 4).
- Offeror is not currently suspended, debarred or otherwise precluded from participating in any public procurement activity with any federal, state or local government entity.
- If awarded a contract, offeror agrees to promote, offer and sell under Mohave contract only those materials and/or services awarded to contract vendor by Mohave.
- If awarded a contract, offeror shall provide the equipment, commodities, and/or services to members of Mohave in accordance with the terms, conditions, scope of work, specifications, and other documents of this Request For Proposal.
- If awarded a contract, offeror agrees that all staff and other individuals eligible to receive services shall have equal access to the services regardless of race, religion, color, sex, disability, age or national origin (including language minority individuals).
- Offeror and all proposed subcontractors comply and shall remain in compliance with the Federal Immigration and Nationality Act (FINA), all other federal immigration laws and regulations, ARS §41-4401, and ARS §23-214, which requires compliance with current federal immigration laws by Arizona employers, Arizona contractors and Arizona subcontractors in accordance with the E-Verify employee eligibility verification program.
- Offeror shall comply with ARS §35-393.01 and certify that they are not currently engaged in, and agree that for the duration of the contract to not engage in, a boycott of Israel. **(Note: Unless and until the District Court's injunction in *Jordahl v. Brnovich et al.*, Case No. 3:17-cv-08263 (D. Ariz.) is stayed or lifted, the Anti-Israel Boycott Provision (A.R.S. 35-393.01 (A)) is unenforceable and will take no action to enforce it. Compliance to this term and condition is not a mandatory part of the offer as long as the injunction remains in place. Offers will not be evaluated based on whether the offeror complied or deviated to this term and condition.)**
- If applicable to the products and services offered under this contract, Offeror shall comply with current applicable requirements of Health Insurance Portability and Accountability Act of 1996 (HIPPA), and accompanying regulations. Contract vendor agrees to work with the member in the course of performance so that the member and contract vendor are in compliance with HIPPA.

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6. CONFIDENTIAL INFORMATION

6.1. Confidential information request: If offeror believes that its proposal contains confidential trade secrets or other proprietary data not to be disclosed, a statement advising Mohave of this fact shall accompany the proposal, and the information shall be so identified wherever it appears. Mohave shall review the statement and notify the offeror of their determination in writing whether the information shall be withheld or disclosed. Requests to deem the entire proposal as confidential will not be considered.

6.2. Pricing: Mohave will not consider pricing to be confidential or proprietary.

6.3. Public record: All proposals submitted in response to this solicitation shall become the property of Mohave. They will become a matter of public record available for review, subsequent to award of all multiple contracts, with the exception of information deemed confidential by Mohave.

7. CONFIRMATION

If an apparent mistake in a proposal, relevant to the award determination is discovered after opening and before award, Mohave shall contact the offeror for written confirmation of the proposal. If offeror fails to act, the offeror shall be considered non-responsive.

Mohave may contact an offeror to confirm our understanding of the proposal. Such contact shall be prior to award. Mohave shall obtain written confirmation from the offeror and shall retain the confirmation in the procurement file. Correction of mistakes in a proposal shall only be allowed as described in Arizona procurement rules and code.

8. CONTRACT MANAGEMENT

8.1. Applicable law: The contract shall be governed by the laws of the State of Arizona, and suits pertaining to the contract may be brought only in courts in the State of Arizona.

8.2. Application of law: The Arizona Procurement Code, the Arizona State Board of Education School District Procurement Rules, and the Uniform Commercial Code (UCC) as adopted by the State of Arizona, are part of this document as if fully set forth herein. Any provision or clause required by law, rule or regulation to be included in the contract will be read and enforced as if in the contract, whether or not physically included. If any such provision is not included, or is not correctly included, contract will be amended in writing to make such inclusion or correction upon application from either party to contract.

8.3. Arbitration: After exhausting applicable administrative review, the parties to this contract may agree to resolve disputes arising out of or relating to this contract through arbitration, to the extent allowed by law.

8.4. Assignment: Contract vendor shall assign no right or interest in this contract without prior written permission from Mohave. No delegation of any duty of contract vendor shall be made without prior written permission from Mohave. Mohave shall not unreasonably withhold approval and shall notify contract vendor of its decision within fifteen (15) days of receipt of written notice from contract vendor.

8.5. Contract claims or controversies: The requirements of the Arizona procurement rules and code shall govern any contract awarded as a result of this solicitation, as well as any contract claims or controversies associated with it.

Formal contract claims and controversies between a member and contract vendor shall be resolved in accordance with R7-2-1155 through R7-2-1159, or ARS, Title 41, Chapter 23, Article 9, as applicable. The member's authorized representative shall serve as the district representative for resolution of such claims and controversies. ARS, Title 41, Chapter 23, Article 9 and the rules promulgated under it, or R7-2-1155 through R7-2-1159, as applicable, provide the exclusive procedure for asserting a cause against the member under the contract.

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8.6. Contract placed on hold: Mohave shall have the ability to place a contract on hold, if it is deemed necessary to address ongoing problems with an awarded contract. Details of the decision to place the contract on hold shall be provided in a written deficiency notice. A reasonable amount of time shall be provided to contract vendor to address issues in the written deficiency notice.

8.7. Modification of contract: An awarded contract may be modified for a variety of reasons. Contract modifications will be issued as deemed necessary by Mohave to address contractual issues that may arise.

8.8. Novation: If contract vendor sells or transfers all assets or the entire portion of the assets used to perform this contract, a successor in interest must guarantee to perform all obligations under this contract. Mohave reserves the right to accept or reject any new party. A simple change of name agreement will not change the contractual obligations of contract vendor.

8.9. Order cycle overview:

One, or both, of the following order cycles will apply to an awarded contract. A sample reconciliation report will be provided to contract vendors who have been awarded a contract. Instructions for filling out the purchase order, or Pcard process, will be contained in that sample reconciliation report.

For Procurements made with purchase orders:

1. Member forwards purchase orders to Mohave that lists the contract number, along with a copy of detailed contract vendor quote. Vendor listed on the purchase order is contract vendor.
2. Mohave reviews and emails member order with "*MESC Reviewed*" stamp, to contract vendor and member.
3. Contract vendor provides product/services.
4. Contract vendor invoices member.
5. Member pays contract vendor.
6. Contract vendor sends monthly Reconciliation Report to Mohave.
7. Contract vendor remits administration fee monthly, based on invoices paid.
8. Mohave audits selected invoices.

For Procurements made with Pcards:

1. Member purchases directly from contract vendor using a Pcard and forwards a copy of detailed contract vendor quote to Mohave (if applicable).
2. Mohave reviews and emails contract vendor quote with "*MESC Reviewed*" stamp, to contract vendor and member (if applicable).
3. Contract vendor provides product/services.
4. Contract vendor invoices member (if not previously paid with Pcard).
5. Member pays contract vendor (if not previously paid with Pcard).
6. Contract vendor sends monthly Reconciliation Report and copy of detailed Pcard transaction, invoice or quotation to Mohave.
7. Contract vendor remits administration fee monthly, based on Pcard purchases paid.
8. Mohave audits selected Pcard purchases.

8.10. Overcharges by antitrust violations: Mohave maintains that overcharges resulting from antitrust violations are borne by the purchaser. Therefore, to the extent permitted by law, contract vendor assigns to member any and all claims for such overcharges as to the products, materials, processes or services used to fulfill the contract.

8.11. Relationship of the parties: Vendors receiving contracts under this solicitation are independent contractors. Any party to the contract shall not be deemed to be the employee of another party to the contract.

8.12. Severability: The provisions of this contract are severable to the extent that any provision or application held to be invalid shall not affect any other provision or application of the contract which may remain in effect without the invalid provision or application.

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8.13. Successful performance: The sections of the solicitation defining the scope of services, requirements, or qualifications are not to be construed as a complete listing that exempts successful offeror from reasonable services required to ensure successful performance under the contract.

9. COOPERATIVE PURCHASING

9.1. Cooperative purchasing: This contract is based on the need for Mohave to provide the economic benefits of volume purchasing and reduction in administrative costs through cooperative purchasing to members. Any offer that prohibits to specific types of members (e.g., state agencies or local government units) may not be considered. Sales without restriction to any members are preferred.

9.2. Cooperative purchasing agreements: Cooperative Purchasing Agreements between Mohave and its members have been established under Arizona procurement rules and code for use of contracts.

9.3. Most favored customer relationship: Nothing in this solicitation is intended to establish a most favored customer relationship between Mohave and contract vendor. Contract vendor may respond to any solicitation without regard to this contract. Offeror agrees all prices, terms, warranties, and benefits granted by offeror to members through this contract are comparable to or better than the equivalent terms offered by offeror to any present customer meeting the same qualifications or requirements. If contract vendor offers lower prices to any of its other customers, it may lower its prices to Mohave at the same time by written notice.

9.4. Eligible agencies: Any contract awarded from this solicitation shall be available to all Mohave members. Members shall have a current signed Mohave Cooperative Purchase Agreement. Member is defined as a local or public procurement unit, or a governmental public entity that is a political subdivision for purposes of federal income tax, or a nonprofit educational or public health institution that is a political subdivision for purposes of federal income tax or meets the requirements of Section 115 of the Internal Revenue Code. Mohave has approximately 450 members including public school districts, community colleges, city and county governments and political subdivisions throughout Arizona. A list of members may be found on Mohave's website, www.mesc.org. Actual use of any contract shall be at the sole discretion of Mohave's members.

10. ESTIMATED QUANTITIES

Mohave anticipates considerable activity resulting from this solicitation. An estimate of purchases is provided in the Scope of Work (page 8) of the requested materials or services. However, no commitment of any kind is made concerning quantities to be acquired. Mohave does not guarantee usage. Usage depends on the actual needs of members and marketing by contract vendor.

11. EVALUATION and AWARD

11.1. Basis of award: In accordance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1111(J), ARS §34-604(F)(9) and §41-2579(F)(9), award(s) will be made to the responsive and responsible offeror(s) whose proposal(s) receive the highest score(s) under the method of scoring in the RFP. To qualify for evaluation, a proposal must have been submitted on time, and materially satisfy all mandatory requirements identified in this document.

11.2. Competitive range: Mohave reserves the right to establish a competitive range of acceptable proposals as part of the evaluation process. Proposals not in the competitive range are unacceptable and will not receive further award consideration.

11.3. Exceptions/deviations to requirements: All requested exceptions/deviations must be clearly explained. Unacceptable exceptions/deviations shall remove your proposal from consideration for award. Mohave shall be the sole judge on the acceptance of exceptions/deviations and Mohave's decision shall be final.

11.4. Effect of price: No contract shall be awarded solely on the basis of price.

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11.5. Evaluation criteria: The evaluation criteria for this solicitation, and the maximum points for each, are as follows:

Criteria	Points
Technical Proposal Evaluation	
Offeror's qualifications and experience	40
Quality of the technical proposal (including all required documents)	20
Offeror's contract management plan	10
Offeror's quality management plan	10
Offeror's subcontractor management plan	5
Offeror's safety plan and record	5
Offeror's financial capacity	5
References, past performance information and other pertinent information	5
Technical Proposal Total 100	
Price Proposal Evaluation	
Cost (Coefficients, and Open Book Rates, <i>Trade Service</i> if offered)	65
Other appropriate evaluations described in R7-2-1046:	
Travel; meals and incidental expenses (M&IE); transportation costs; energy costs; ownership costs; life cycle costs	10
Price Proposal Total 75	
Grand Total 175	

11.6. Evaluation process: Before opening any price proposal, the selection committee shall open and separately evaluate the final technical proposals and score the final technical proposals using the scoring method in this Request for Proposal. No other factors or criteria shall be used in evaluation and scoring. After completion of the evaluation and scoring of all final technical proposals, the selection committee shall open, evaluate and score the price proposals, and complete scoring of the entire proposal using the scoring method in this Request for Proposal. No other factors or criteria shall be used in evaluation and scoring.

Mohave reserves the right to use a ranking system (the Heisman scoring method) for determining the final ranking of proposals. Each evaluator shall calculate their total assigned points for each proposal, applying a ranking of 1 to their highest score, a 2 to their next highest score, and so forth for all proposals. Each proposal shall have a final calculated rank determined by averaging each applied individual evaluator rank. Any final calculated rank ties shall be broken by using the grand total points (total of all evaluator assigned point totals for each proposal) for each of the tied proposals.

11.7. Formation of contract: A response to this solicitation is an offer to contract with Mohave based upon the terms, conditions, scope of work, specifications and amendment(s) contained in this request. A proposal does not become a contract unless and until Mohave accepts it. A contract is formed when a Mohave administrator signs the award document.

11.8. Maximum job order: The maximum dollar amount of an individual job order shall be one million dollars or such higher or lower amount prescribed by the purchasing agency in an action noticed pursuant to Title 38, Chapter 3, Article 3.1 or a rule adopted by the purchasing agency as the maximum amount of an individual job order. Requirements shall not be artificially divided or fragmented in order to constitute a job order that satisfies this requirement.

11.9. Method of evaluation: Mohave shall select a selection committee of not more than seven (7) members to evaluate the statement of qualifications. Composition of the selection committee shall be in compliance with Arizona Administrative Code, Article 11: School District Procurement R7-2-1107, ARS §34-604(C)(3) and §41-2579(C)(3).

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11.10. Multiple award: To assure that our contracts meet the requirements of all members, Mohave may award up to five contracts to individual firms receiving the highest number of points, for General Contracting and similar job-order-contracting construction services within specialty Division 22, Plumbing; Division 23, Heating, Ventilation and Air Conditioning; or Division 26, Electrical. Each of the multiple contracts will be awarded to a separate person/firm. Offeror should consider this fact in preparing their response. The decision to award multiple contracts, award a single contract, or make no award rests solely with Mohave.

Mohave is stating that three specialty contracting divisions will be considered beyond general contracting. Of these possible twenty contracts no more than five contracts will be awarded per division for multiple contracts for similar job order contracting construction services to separate persons/firms.

A multiple award shall be made only if the procurement officer determines in writing that a multiple award is necessary and is advantageous to Mohave members. A multiple award shall be limited to the least number of contracts necessary to meet the requirements of the using agencies. Mohave shall make the sole determination of the least number of contracts required to meet the need. Mohave's basis for determining whether to award multiple contracts shall be based upon considerations for the large number of members, diverse types of members, location of members throughout Arizona and members' past usage of similar contracts.

Criteria for selecting vendors for multiple contracts shall be based upon considerations for members' experience with existing products and systems, brand continuity for parts replacement and future expansion, contract vendor's ability to provide for our large, diverse membership, Mohave's past experience with contracts for similar product/services, and/or other relevant criteria.

11.11. Non-exclusive contract: Any contract resulting from this solicitation shall be awarded with the understanding and agreement that it is for the sole convenience of Mohave's members. Mohave and its members reserve the right to obtain like goods and services from other sources.

11.12. Past performance information: Past Performance Information (PPI) is relevant information regarding a contract vendor's actions under previously awarded contracts to public agencies. It includes contract vendor's record of performance under such contracts including, but not limited to: conformance to the terms, conditions, specifications and scope of work of the contracts, responsiveness to, and correction of, contract claims and controversies, and satisfaction of the contracting entities. PPI shall be a factor in evaluation and award.

11.13. Price workbook: All offerors shall submit their price proposal in paper, and in an electronic format. Provide a CD, USB, or similar electronic media device with the completed price proposal in your response. ***Place within your separately submitted price proposal.***

If awarded a contract, all future pricing updates shall be based on the electronic workbook, or similar approved format.

11.14. Pricing extension errors: In case of error in extension of prices in the proposal, unit prices shall govern.

11.15. Reasonably susceptible of being awarded: A proposal is acceptable if it is determined to be reasonably susceptible of being awarded a contract in accordance with the evaluation criteria and a comparison and ranking of original proposals. Proposals to be considered reasonably susceptible of being awarded a contract shall, at a minimum, demonstrate the following:

- Affirmative compliance with mandatory requirements designated in this solicitation.
- An ability to deliver goods or services on terms advantageous to members sufficient to be entitled to continue in the competition.
- That the proposal is technically acceptable as submitted.

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11.16. Responsible offeror: A responsible offeror is a firm or person who at the time of contract award has the capability to perform the contract requirements and the integrity and reliability that will assure good faith performance. Mohave shall determine an offeror to be responsible before awarding a contract to offeror.

11.17. Responsive proposals: A responsive proposal conforms in all respects to the material requirements of the solicitation. Proposals must be responsive to receive award consideration. Mohave reserves the right to waive minor informalities.

11.18. Total costs: Total member costs include energy, facilities, repair costs, present values of money, contract vendor charges, personnel costs and all other identifiable member costs. Contract vendor charges include all the costs of contract vendor support, materials, transportation and all other identifiable costs associated with the proposal.

Contract vendor costs means the costs of all hardware, materials, software, transportation, contract vendor support and all other identifiable costs associated with the proposal.

Contract vendor support means services provided by the contract vendor, such as consulting, education, training, management of the system purchased and other integration and maintenance support.

12. FEDERAL and STATE REQUIREMENTS

12.1. Affordable Care Act requirements: Contract vendor understands and agrees that it shall be solely responsible for compliance with the Patient Protection and Affordable Care Act, Public Law 111-148 and the Health Care Education Reconciliation Act, Public Law 111-152 (collectively the Affordable Care Act "ACA"). Contract vendor shall bear sole responsibility for providing health care benefits for its employees who provide services to the member as required by state or federal law.

12.2. Audit rights: In accordance with applicable Arizona law, contract vendor's and subcontractor's books and records related to this contract may be audited at a reasonable time and place, for five years after completion of the contract.

12.3. Clean Air Act, Clean Water Act and Environmental Protection Agency Regulations: Contract vendor and its subcontractors shall comply with all applicable standards, orders or requirements issued under section 306 of the Clean Air Act, section 508 of the Clean Water Act, Executive Order 11738 and Environmental Protection Agency regulations (7 CFR 3016.36 (i) (12)). This shall only apply to federally funded projects subject to the Clean Air Act, Clean Water Act and current applicable EPA regulations.

12.4. Compliance with federal and state requirements: Contract vendor agrees, when working on any federally assisted projects with more than \$2,000 in labor costs, to comply with the Contract Work Hours and Safety Standards Act, the Davis-Bacon Act, the Copeland "Anti-Kickback" Act, the Housing and Urban Development Act of 1968, the Equal Opportunity Employment requirements as amended by Executive Order. In such projects, contract vendor agrees to post wage rates at the work site and submit a copy of their payroll to the member for their files.

In addition, to comply with the Copeland Act, contract vendor must submit weekly payroll records to the member. Contract vendor must keep records for three years and allow the federal grantor agency access to these records, upon demand. Contract vendor also agrees to comply with State of Arizona Executive Order 75-5, as amended by Executive Order 99-4.

When working on any projects funded with federal grant monies, contract vendor agrees to comply with the administrative requirements for grants and cooperative agreements to state, local and federally recognized Indian tribal government contract provisions.

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The forms listed below are incorporated by reference into this solicitation and any resultant contract.

- HUD-5369, Instructions to Offerors for Contracts, Public and Indian Housing Programs
- HUD-5369-A, Representations, Certifications, and Other Statements of Offerors, Public and Indian Housing Programs
- HUD-5369-B, Instructions to Offerors Non-Construction
- HUD-5369-C, Certifications and Representations of Offerors Non-Construction Contract
- HUD-5370, General Conditions of the Contract for Construction
- HUD-5370-C1, General Conditions for Non-Construction Contracts Section 1 (With or Without Maintenance Work)
- HUD-5370-C2, General Conditions for Non-Construction Contracts Section 1 (With Maintenance Work)

For federally funded projects only, the requirements of an applicable form shall supersede conflicting requirements in this solicitation. The forms may be accessed via HUDClips (<http://www.hud.gov>).

12.5. Compliance with workforce requirements: Pursuant to ARS §41-4401, contract vendor and subcontractor(s) warrant their compliance with all federal and state immigration laws and regulations that relate to their employees, and compliance with ARS §23-214 subsection A, which states, “...every employer, after hiring an employee, shall verify the employment eligibility of the employee through the E-Verify program.” [To register for E-Verify, go to: <https://e-verify.uscis.gov/enroll/startpage.aspx>.]

Mohave reserves the right to cancel or suspend the use of any contract for violations of immigration laws and regulations. Mohave and its members reserve the right to inspect the papers of any contract vendor or subcontract employee who works under this contract to ensure compliance with the warranty above.

12.6. Contract vendor employee work eligibility: By entering into the contract, contract vendor warrants compliance with ARS §41-4401, ARS §23-214, the Federal Immigration and Nationality Act (FINA), and all other current federal immigration laws and regulations. Mohave and/or Mohave members may request verification of compliance from any contract vendor or subcontractor performing work under this contract. Mohave and its members reserve the right to confirm compliance. Should Mohave or its members suspect or find that the contract vendor or any of its subcontractors are not in compliance, Mohave may pursue any and all remedies allowed by law, including, but not limited to suspension of work, termination of the contract for default, and suspension and/or debarment of the contract vendor. All costs necessary for compliance are the responsibility of the contract vendor.

12.7. Davis-Bacon wage decisions: For federally funded projects subject to the Davis-Bacon Act, the member shall specify the applicable Davis-Bacon wage decision, prior to the contract vendor providing a firm price quotation for the proposed project. The wage decision shall be identified by the WD Number, modification number, and date of the wage decision. Davis-Bacon wage decisions may be accessed via www.wdol.gov or by requesting a copy from the member.

12.8. Energy Policy and Conservation Act: Contract vendor and its subcontractors shall comply with mandatory standards and policies relating to energy efficiency (7 CFR 3016.36 (i) (13)). This shall only apply to federally funded projects subject to current applicable energy policies and the Energy Conservation Act.

12.9. Non-compliance: All federally assisted contracts with members that exceed \$10,000 may be terminated by the federal grantee for noncompliance by contract vendor. In projects that are not federally funded, offeror must agree to meet any federal, state or local requirements, as necessary. In addition, if compliance with the federal regulations increases the contract costs beyond the agreed on costs in this solicitation, the additional costs may only apply to the portion of the work paid by the federal grantee.

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12.10. Offshore performance of work prohibited: Due to security and identity protection concerns, direct services under this contract shall be performed within the borders of the United States. Any services that are described in the specifications or scope of work that directly serve the State of Arizona or its clients and may involve access to secure or sensitive data or personal client data or development or modification of software for the state shall be performed within the borders of the United States. Unless specifically stated otherwise in the specifications, this definition does not apply to indirect or 'overhead' services, redundant back-up services or services that are incidental to the performance of the contract. This provision applies to work performed by subcontractors at all tiers.

12.11. Procurement of recovered material: Contract vendor and its subcontractors shall comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, as stated in 2 CFR 200.321.

12.12. Rights to inventions: Rights to inventions made under a contract or agreement as specified under Appendix II to 2 CFR shall apply for federally funded projects.

12.13. Subcontracts: Prime Contractor, if subcontracts are to be let, will allow all business to have an equal opportunity to sign up as a prospective bidder for work assigned under this contract.

12.14. Terrorism country divestments: In accordance with ARS §35-392, Mohave and its members are prohibited from purchasing from a company that is in violation of the Export Administration Act. By entering into the contract, contract vendor warrants compliance with the Export Administration Act.

12.15. Compliance to USDA solicitation requirements:

- Offeror certifies that all pricing in their proposal has been arrived at independently, without consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other offeror or with any competitor certification regarding non-collusion.
- Offeror agrees to comply fully with U.S. Department of Agriculture, the Arizona Department of Education, U. S. Accounting Office, or any of their duly authorized representative to allow access to any books, documents, papers, and records of the offeror, which are directly pertinent to the specific contract, for the purpose of audits, examinations, excerpts, and transcriptions. Additionally, the offeror shall provide all documents as necessary for the independent auditor to conduct the school food authority (SFA) single audit (if applicable). In the event of any unresolved audit findings, the records shall be retained beyond the five (5) year period for as long as required for resolution of these issues raised by the audit.
- Offeror agrees to comply with all mandatory standards and policies relating to energy efficiency as cited in the State Energy Conservation Plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).
- Offeror shall comply with Executive Order 11246, entitled Equal Employment Opportunity, as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations, 41 CFR Part 60 3016.36(i)(3).
- Offeror shall comply with the following civil rights laws as amended: Title VI of the Civil Rights Act of 1964; Title IX of the Education Amendments of 1972; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975; Department of Agriculture regulations on nondiscrimination 7 CFR 210.23 (b); Title 7 CFR parts 15, 15a, and 15b; the Americans with Disabilities Act; and the FNS Instruction 113-6; "Civil Rights Compliance and Enforcement in School Nutrition Programs".
- Offeror shall comply with the provisions of the Consumer Product Safety Act.

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- Offeror shall disclose all discounts, rebates, allowances and incentives received by the offeror from its suppliers. If the offeror receives a discount, rebate, allowance, or incentive from any supplier, the offeror shall disclose and return to the SFA, (if applicable), the full amount of the discount, rebate, or applicable credit that is received based on the purchases made on behalf of the SFA. The offeror shall identify the amount of each discount, rebate and other applicable credit on bills and invoices presented to the SFA for payment and individually identify the amount as a discount, rebate, or in the case of other applicable credits, the nature of the credit according to 7 CFR 210.21(f)(1)(iv).
- Offeror shall agree no expenditure may be made from the nonprofit school food service account for any cost resulting from a procurement failing to meet the requirements of the requirements for prohibited expenditures or as required in 7 CFR §210.21 or 7 CFR §210.21(f)(2).

13. FORCE MAJEURE

Except for payments of sums due, neither party shall be liable to the other, nor be deemed in default under this contract, if and to the extent that such party's performance of this contract is prevented by reason of force majeure. The term "force majeure" means an occurrence that is beyond the control of the party affected and occurs without its fault or negligence, including, but not limited to the following: acts of God (e.g. fire, flood, snow, earthquakes, tornadoes, violent winds, hail storms); acts of the public enemy; war; riots; strikes; mobilization; labor disputes; civil disorders; lockouts; injunctions-intervention-acts, or failures or refusals to act by government authority; and other similar occurrences beyond the control of the party declaring force majeure, which such party is unable to prevent by exercising reasonable diligence. The force majeure shall be deemed to commence when the party declaring it notifies the other party of the existence of the force majeure, and shall be deemed to continue as long as the results or effects of the force majeure prevent the party from resuming performance in accordance with the contract. Force majeure shall not include late deliveries of equipment or materials caused by congestion at a manufacturer's plant or elsewhere, an oversold condition of the market, inefficiencies, or similar occurrences. If either party is delayed at any time by force majeure, the delayed party shall notify the other party in writing of such delay within forty-eight (48) hours.

14. INDEMNIFICATION

14.1. General indemnification: To the extent permitted by law, Mohave and its members shall be indemnified and held harmless by contract vendor for its vicarious liability as a result of entering into this contract. Each party to the contract is responsible for its own negligence. Contract vendor agrees to save and hold harmless Mohave and/or its members from any and all liability for loss or damage to persons or property arising out of the work required by the contract. Contract vendor further agrees to waive any right of recovery against Mohave and/or its members for damage to the property of contract vendor, whether caused by negligence on the part of Mohave and/or its members or otherwise. This provision includes specifically the waiver of right of recovery against Mohave and/or its members for damage to property under contract and not yet formally accepted by member even though said property at the time of loss may be occupied, in whole or in part, by member.

14.2. Modification by member: Contract vendor shall have no obligation with respect to any patent and copyright infringement claim based upon member's modification of the equipment and/or software, or its operation or use with apparatus, data or programs not furnished by contract vendor. However, one member's action will not preclude contract vendor's obligation to members who have not modified their equipment or software.

14.3. Patent and copyright indemnification: To the extent permitted by law, contract vendor shall indemnify and hold harmless Mohave and its members against any liability, including costs and expenses, for infringement of any patent, trademark or copyright arising out of contract performance or use by Mohave and its members of materials furnished or work performed under this contract. Mohave and its members shall reasonably notify contract vendor of any claim for which it may be liable under this paragraph.

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15. INTERVIEWS

After receipt and opening of preliminary technical proposals, Mohave will not hold interviews during the evaluation of this RFP.

16. LICENSES

In accordance with the Arizona Administrative Code, Article 11: School District Procurement R7-2-1112(A)(2), ARS §34-605(E)(2) and §41-2580(E)(2): The contractor is required to be licensed to perform construction.

A contract vendor shall maintain in current status all federal, state and local licenses, bonds and permits required for the operation of the business conducted by contract vendor. The contract vendor shall remain fully informed of and in compliance with all current ordinances and regulations pertaining to the lawful provision of services under the contract. Mohave reserves the right to stop work and/or cancel the contract of any contract vendor whose license(s) expire, lapse, are suspended or terminated. Contact vendor shall immediately notify Mohave of any expiration, lapse, suspension or termination of license(s).

The contract vendor is not required to be registered to perform design services pursuant to A.R.S. Title 32, Chapter 1 if the person actually performing the design services on behalf of the contract vendor is appropriately registered.

17. OFFER ACCEPTANCE PERIOD/WITHDRAWAL

17.1. Late proposals: Except as authorized by Arizona procurement rules and code, late proposals shall not be considered. Offeror shall be responsible for all shipping costs when requesting the return of a late proposal.

17.2. Withdrawal of proposal: An offeror may withdraw a proposal in writing at any time before proposal opening if the withdrawal is received before the proposal due date and time at the location designated in the Request for Proposal for receipt of proposals. After the opening time and date, proposals may not be withdrawn, except as allowed by Arizona procurement rules and code.

18. ORDER OF PRECEDENCE

In the event of a conflict in the provisions of the contract as accepted by Mohave, the following order of precedence shall prevail:

1. Special terms and conditions
2. General terms and conditions
3. Scope of work and specifications
4. RFP response
5. Attachments and exhibits
6. Documents referenced or included in the solicitation

19. ORDERING CYCLE

19.1. Acceptance of orders: This contract is for the sole use of Mohave and its members. All quotations provided to members must be based on prices in the contract and include the correct Mohave contract number. Contract vendor may only refuse a Mohave reviewed order under this contract after providing written documentation acceptable to Mohave describing the circumstances that warrant refusal. Improper documentation and/or frequent refusals may result in contract cancellation. Mohave may require the contract vendor to reject any purchase orders received from members based on this contract that may not comply with Mohave's rules, processes or standards.

19.2. Audit of contract activity: Mohave will audit some of the invoices related to this contract. The contract vendor agrees to provide all documentation necessary for Mohave to audit purchases made under contract, including invoices and credits issued to members, in a timely fashion.

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19.3. Contract vendor contacts: Contract vendor agrees to assign only one contact person for each of the following: accounting, audit, contract administration, escalation, main member contact, open order/status report, and reconciliation. These contacts may be the same person, with the exception of the escalation contact. The name(s) of the contact persons will be provided to Mohave.

19.4. Open order and status reports: Mohave will send contract vendor open order and status reports on a periodic basis. Contract vendor agrees to reply to information requests in a timely fashion.

19.5. Orders in process: Member purchase orders dated on or before the contract cancellation and/or expiration date, will be processed and are considered valid until order fulfillment, or cancellation by the member. Any such order must be in the possession of Mohave within a reasonable amount of time. Acceptance of such orders shall be at the sole discretion of Mohave.

19.6. Purchase verification: It is the member's independent responsibility to verify that quotations and purchase orders comply with the terms of the award of a contract or procurement.

19.7. Quotations: Quotations with no end date are considered invalid after sixty (60) days from the issue date.

20. PAYMENT

20.1. Contacting member about payment: Contract vendor may contact member for payment for a product or service delivered to the member under the contract. Such contact shall be professional and courteous.

20.2. Contract vendor invoice: All invoices shall list the applicable member purchase order number and Mohave contract number. Contract vendor will invoice members directly. All transactions are payable in U.S. currency only. Contract vendor shall invoice member after delivery of goods and/or services. Goods and services shall be invoiced at applicable contract prices, which include Mohave's 1% administration fee.

Mohave's administration fee is included in the invoice amount paid by the member. Contract vendor shall remit administration fee to Mohave monthly. Administration fee shall be calculated at .0099 of the subtotal amount. The Mohave administration fee shall not be calculated on ancillary charges (e.g. performance bonds, shipping, transaction privilege tax, transportation charges, mileage, lodging, meals and incidental expenses (M&IE), permits).

20.3. Contract vendor payment: Member shall issue payment to contract vendor after receipt of invoice.

20.4. Correct invoicing: Contract products/services may not be invoiced greater than the purchase order. If incorrect invoices are discovered, contract vendor must correct invoices resulting in excess charges, no matter the cause of the error. Any excess payment must be returned to member within the time allowed by law, in the form of a check or credit memo, as determined by the member.

If a member is invoiced at less than contract prices, contract vendor will invoice the member for the difference unless Mohave approves the undercharge.

If contract pricing in effect on the contract has gone down between the time of the order and the invoice date, contract vendor may invoice at the current contract price.

20.5. Credit hold: Contract vendor agrees to advise Mohave's Procurement Manager within five (5) days if member(s) are placed on credit hold.

20.6. Payment time: Payment terms are net thirty (30) days from receipt of contract vendor's invoice.

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20.7. Prepayment: In accordance with the Uniform System of Financial Records and ARS §15-905(N), prepayments may be requested on items that normally require prepayment in order to be procured or to receive a discounted price. Items not meeting these prepayment specifications may be paid only after receipt of goods and services.

20.8. Progress payments: Members may make progress payments under the following conditions: 1) Member and contract vendor agree to the terms of the progress payments prior to issuing a purchase order; 2) the purchase order describes the amounts/percentages to be paid and the dates/frequency of payment; 3) member accepts responsibility for verifying the validity of each payment application; 4) payments are made only after goods and/or services are verified; and 5) any such payments are made in full compliance with member's local governing entity rules and any and all other applicable state rules and regulations.

20.9. Quick pay discounts: Quick pay discounts may be offered to members, provided they have received the materials or services, and that such discounts are available equally to all members. Mohave must approve such discounts in writing and before they are offered to members.

20.10. Reporting and payment of administration fees to Mohave: The contract vendor agrees to provide a Reconciliation Report detailing activity under the contract, and payment for Mohave administration fees for invoices paid or Pcard transactions made in the previous month.

Purchases made with purchase orders: Items in the report must include member names, PO numbers, amounts, administration fees, invoice numbers, invoice dates and credit/return information for all invoices paid in the prior month.

Purchases made with Pcards: The report must be identified as Pcard (or as a credit card) when submitted. Items in the report must include member names, notation that the purchase was made with a Pcard, date of transaction, job number designation, amounts, administration fees, invoice numbers (if applicable), invoice dates (if applicable) and credit/return information for all invoices paid in the prior month. An electronic copy (e.g. PDF) of the detailed Pcard sales receipt, invoice, or quotation shall be provided for review.

Payment and report are due as per a schedule agreed upon by Mohave and contract vendor. The initial due date shall be the **10th, 15th, 20th, 25th or 30th** of the following month and will be specified in an award notification letter. If no invoices were paid under the contract in the previous month, the contract vendor will provide notice of no activity. A sample reconciliation report will be made available upon award of contract.

Make Mohave administration fees payable to Mohave Educational Services Coop., Inc. Payments shall be mailed to:
625 E. Beale St.
Kingman, AZ 86401

21. PREPARATION OF PROPOSAL and PROPOSAL FORMAT

21.1. Modification of proposal: An offeror may modify a proposal in writing at any time before proposal opening if the modification is received before the proposal due date and time at the location designated in the Request for Proposals for receipt of proposals.

21.2. Cost of proposal preparation: Mohave will not reimburse the cost of developing, presenting, or providing any response to this solicitation.

21.3. Offeror responsibility: Offeror shall examine the entire solicitation, seek clarification of any item or requirement that may not be clear, and check all responses for accuracy before submitting proposal. Failure to examine any requirements shall be at offeror's risk. Negligence in preparing a proposal confers no right of withdrawal after due date and time.

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21.4. Proposal forms: The forms and format contained in the solicitation shall be used. Offerors may reproduce the forms and retype the information, but all of the required information must be presented in the tab order requested. Electronic or faxed proposals shall not be considered. ***Each offeror shall submit separately a technical and a price proposal.*** When applying the scoring method, the committee will separately evaluate the technical and price proposals. The technical proposal will be evaluated and scored before opening the price proposal. To be considered responsive, the offeror's entire proposal must reasonably and substantially conform to all the terms and conditions in the solicitation.

Technical and price proposals:

Technical proposal consists of: the offer and acceptance form; instructions to offeror and checklist form; scope of work and specification documents with exceptions/deviations noted; *scope of work and specifications acceptance form*; Method of Approach; Qualification and Experience; primary vendor information; Supporting contract documents; bid bond/alternate security; special terms and conditions; *special terms and conditions acceptance form*; general terms and conditions; standard terms and conditions for construction; *general terms and conditions and standard terms and conditions for construction acceptance form*; amendments (if any); single job and aggregate bonding capacity; certificate of insurance; company financials; past performance and management plans; sample supplemental agreements; and any additional required information.

Price proposal consists of (submitted in a sealed package from the technical proposal): all pricing related to the work/services to be provided under an awarded contract, and pricing methodologies.

22. PROPOSAL OPENING

Proposals shall be opened immediately following the proposal due date and time. The name of each offeror shall be publicly read and recorded in the presence of witnesses. All information in the proposals shall remain confidential until after award of contracts, with the exception of review by Mohave staff and selected evaluators.

23. PROSPECTIVE BIDDERS REGISTRATION

Any offeror submitting a perfunctory proposal with no serious intent of being accepted may be removed from Mohave's prospective bidders list. Any vendor not responding to two (2) consecutive Requests for Proposal for similar procurements may be removed from the prospective bidders list. A "no bid" response or request to remain on the list is sufficient to keep a vendor on the Prospective Bidders Registration.

24. PROTESTS

Protests shall be filed with Anita McLemore, C.P.M., the Executive Director (the District Representative), and shall be resolved in accordance with Arizona Procurement rules and code, ARS, Title 41, Chapter 23, Article 9 (<https://www.azleg.gov/arstitle>) and State Board Rules R7-2-1001 through R7-2-1196 (<http://azsos.gov/rules/arizona-administrative-code>). *A protest must be in writing and must be filed with the Executive Director at 625 E. Beale Street, Kingman, Arizona, 86401.* Protests based upon alleged improprieties in a solicitation shall be filed before the due date and time for responses to the solicitation. The interested party shall file the protest within ten (10) days after Mohave makes the procurement file available for public inspection. A protest filed on the tenth day must be received by 5:00 p.m., local Arizona time. The interested party may file a written request for an extension. The written request shall be filed before the time limit specified above and shall set forth good cause as to the specific action or inaction of Mohave that resulted in the interested party being unable to file the protest before the time limit specified above.

A protest shall be in writing and shall include the following information:

- The name, address and telephone number of the interested party;
- The signature of the interested party or the interested party's representative;
- Identification of the solicitation by contract number;

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- A detailed statement of the legal and factual grounds of protest including copies of any relevant documents;
- The form of relief requested.

Should Mohave prevail in an appeal of a decision issued by the Executive Director, appellant waives any objection to the hearing officer awarding Mohave its reasonable attorneys fees and costs along with the costs for the hearing.

25. RIGHT TO ASSURANCE

Whenever one party to the contract has a good faith reason to question the other party's intent to perform, they may demand that the other party give written assurance of its intent to perform. If a demand is made and no written assurance is given within ten (10) days, the demanding party may treat this failure as an anticipatory breach of the contract.

26. SAFETY STANDARDS

Items supplied under the contract shall comply with current applicable Occupational Safety and Health Standards of the Arizona Industrial Commission, National Electric Code, and National Fire Protection Association Standards.

27. SHIPPING

27.1. Shipping terms/transfer of title: Shipments shall be F.O.B. destination. Title and risk of loss of material shall not pass to member until member receives the material at delivery point, unless otherwise provided in the solicitation.

27.2. Shipment under reservation: Contract vendor is not authorized to ship materials under reservation and no tender of a bill of lading will operate as a tender of the materials.

27.3. Shipping charges: Prices that include shipping to any location in Arizona, delivered to the specific receiving point identified in the purchase order, are preferred. If shipping is charged, it shall be that member is not charged more than the actual invoiced amount for shipping, and is prepaid by the contract vendor (PP&A). It is the member's responsibility to confirm shipping charges under the contract.

27.4. Shipping errors/risk of transportation: Shipping errors will be at contract vendor's expense. If contract vendor ships a product that was not ordered, contract vendor shall pay for return shipment at the convenience of member. All risk of transportation and all related charges shall be contract vendor's responsibility. Contract vendor shall file all claims for visible or concealed damage. Member will notify contract vendor promptly of any damaged goods and shall assist contract vendor in arranging for inspection.

28. SUSPENSION OR DEBARMENT STATUS

Offeror shall include a letter in its proposal notifying Mohave of any debarment, suspension or other lawful action taken by any federal, state or local government within the last five years that precludes offeror or its employees from participating in any public procurement activity. Such letter shall provide name and address of the public procurement unit, effective date, duration, and relevant circumstances of the suspension or debarment. Failure to supply such letter or not disclose all pertinent information shall result in cancellation of any contract. **Letter shall be placed after Tab 1a.**

29. TAXES

29.1. Federal Excise Tax: Most members are exempt from paying Federal Excise Tax.

29.2. Payment of taxes: Member is responsible for payment of all taxes listed on the invoice. Contract vendor is responsible for collecting such taxes and shall forward all taxes to the proper revenue office. All applicable taxes must be listed as a separate item on all invoices and will be paid by member issuing the purchase order.

29.3. Property taxes: Arizona public agencies may not pay state property taxes. (Arizona Constitution, Article 9, Section 2).

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29.4. Reservation or tribal tax: If goods or services are subject to reservation or tribal tax, contract vendor shall include such taxes as a separate item on the original invoice to the member.

29.5. Transaction Privilege Tax (Sales Tax): Members may be liable for Arizona Transaction Privilege Taxes, which may include state, county and city taxes. Contract vendor is responsible for charging taxes correctly.

29.6. Taxes on construction: Contract vendors for construction-related projects must follow the latest tax requirements as described in current Arizona Administrative Code and Department of Revenue transaction privilege tax procedures.

30. TIME (DEFINITION OF)

Periods of time, stated as a number of days, shall be in calendar days, not business days.

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1. BID SECURITY

1.1. Bid security requirement: School procurement rules [R7-2-1102 (A)] and as applicable in ARS §34-608 and §41-2573, require that all competitive sealed bidding for construction have bid security, if the amount of the construction contract will exceed the amount established by ARS §15-213(A). Bid security as a percentage of the bid amount is unacceptable, as this is a term contract with no specific bid amount. Bid security must be in the amount stated in "*Bid Bonds and Bonding Capacity*."

1.2. Form of bid security: Acceptable bid security for this RFP will be a certified or cashier's check, or an annual or one time bid bond underwritten by a surety company licensed to issue bid bonds in Arizona [R7-2-1102 (B, C), ARS §34-608 and §41-2573]. Bid security may be provided using the form found in this RFP, with the principal being the prime contractor and the Obligee being Mohave Educational Services Cooperative, Inc. An agent of your licensed bonding agency shall sign the bond. If the original bond is not signed and/or has conflicting information, it shall render your proposal nonresponsive.

2. CHANGE ORDERS

2.1. Adherence to specifications and drawings: The contract vendor shall follow the requirements of all specifications and drawings as closely as actual construction and work of contract vendors shall permit. Should existing conditions or limitations require a major change or rearrangement, the change shall be allowed only upon issuance of a written change order.

2.2. Change order requirement: Member and contract vendor shall establish a procedure for identifying and approving changes to the work. Said procedure shall include provisions for field change orders. Member shall notify Mohave of any change that revises the cost of the project. Contract vendor shall not begin the revised work prior to receipt of the Mohave reviewed member change order.

Contract vendor agrees to follow all applicable rules and regulations for any change orders, including R7-2-1005 and as applicable in ARS §41-2552.

Change orders shall be properly documented in writing. Minor changes mutually agreed between the member and the contract vendor that do not involve compensation may be made without informing Mohave.

2.3. Costs for changes associated with improper checking or coordination: The cost of any change in construction due to improper checking of site and/or other conditions, or coordination by contract vendor, shall be borne by the contract vendor, and the contract vendor shall not be entitled to reimbursement for such costs.

3. CONSTRUCTION CONTRACTS

3.1. Cancellation by Mohave: Mohave reserves the right to cancel a contract resulting from this RFP if the original contract holder is sold and ownership is transferred to a new party. If Mohave cancels the contract, the cancellation clause will be exercised, as required.

3.2. Compensation: Compensation for received goods, terms of progress payments, and a schedule of payments shall be described in the contract. The agreement shall state that Mohave will not be responsible for any late fees due the contract vendor by the member.

3.3. Member delays: As required by ARS §15-213 (D), the contract vendor shall negotiate with member for the recovery of damages related to expenses incurred by the contract vendor for a delay for which the member is responsible, which is unreasonable under the circumstances and which is not within the contemplation of the parties to the contract between the two parties. Any such negotiations shall not void any provisions between the parties that require notice of delays, provide for arbitration or other procedure for settlement or provide for liquidated damages.

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- 3.4. Construction contract requirement:** In any contract between the contract vendor and a member based on this contract, the terms and conditions of this contract shall prevail. In any contract between the member and the contract vendor, the scope of work shall include all specifications, drawings, and other official documents. All applicable codes around which the contract is made shall be included, as will any technical specifications and general conditions. The contract vendor shall acquire and pay for all permits and approvals from local, county, state and federal offices needed to accomplish the work. Contract vendor shall be entitled to direct reimbursement for the cost of such permits.
- 3.5. Form of construction contracts:** A contract between the member and the contract vendor for construction shall be an industry standard agreement. The parties may agree to use the American Institute of Architects (AIA) General Conditions of Contract for Construction Form A201 as a guide.
- 3.6. Member representative:** All formal contact between the contract vendor and/or contract vendor's personnel and the member shall be processed through the member representative. The member shall designate the member representative at the time of purchase.
- 3.7. Terms of acceptance:** Terms for acceptance by the owner and title to work must be clearly agreed upon and described in the contract. If any part of the construction requires the member to assume control before the completion, this shall be defined. Both parties shall agree on the definition of what constitutes final acceptance. Upon completion of the project, the worksite shall be left in a condition equal to or better than before the project.
- 3.8. Void provisions:** A provision, covenant, clause or understanding in, collateral to or affecting a construction contract that makes the contract subject to the laws of another state or that requires any litigation, arbitration or other dispute resolution proceeding arising from the contract to be conducted in another state is against public policy of the State of Arizona and is void and unenforceable. (ARS §15-213, §34-227, and §41-2583)
- 3.9. Work performed by the member:** Work to be performed by the member must be clearly described and agreed upon prior to project start up.

4. CONSTRUCTION SCHEDULE

- 4.1. Schedule adjustment:** The member retains the right to extend the schedule of work or to suspend the work, and to direct the contract vendor to resume work when appropriate. The agreement must describe an equitable adjustment for added costs caused by any suspension. Any increases shall be invoiced per approved contract pricing as allowed in the agreement.
- 4.2. Schedule requirement:** A schedule for performance of work that can be met without planned overtime is the responsibility of the contract vendor.
- 4.3. Work crew size:** The cost for each project shall include all costs of all necessary trained personnel to complete the project on, or before, the completion date(s) set forth in the contract. The member shall not incur additional expense for upsized crews, nor overtime costs, which might be necessary for the contract vendor to complete the project on schedule.

5. COORDINATION

- 5.1. Conflict with member activities:** The contract vendor and member shall coordinate activities so as to avoid conflicts. The contract vendor shall make every reasonable effort not to interrupt scheduled member activities with work under the contract. The contract vendor shall notify the member of any construction work that may negatively impact scheduled member activities.
- 5.2. Coordination with other vendors:** The contract vendor shall coordinate with other contractors.
- 5.3. Interruption of other work:** The contract vendor shall employ such methods or means as will not cause any interruption of, or interference with, work of any other contractor on the project site.

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6. DELIVERY OF CONSTRUCTION MATERIALS

- 6.1. Condition of materials on delivery:** The contract vendor shall deliver materials to the worksite in new, dry, unopened, and well-marked containers showing product and contract vendor's name. Damaged or unlabeled materials will not be accepted.
- 6.2. Delivery requirement:** The contract vendor shall deliver materials in sufficient quantity to allow for continuity of work. Delivery shall be coordinated with the member's representative.
- 6.3. Precautions:** The contract vendor shall take all necessary precautions to protect its materials from damage, theft and misuse. The member shall have no responsibility for such precautions or protection.
- 6.4. Rejected and damaged material:** Damaged or rejected materials shall be immediately removed from the work area.

7. INSURANCE

Course of Construction Insurance: Upon request from member, contract vendor shall purchase and maintain course of construction insurance equal to the estimated replacement cost of the property after completion of the entire work at the site as called for in the purchase order. The insurance form shall be an "all risk" type policy with standard exclusions. Coverage shall include temporary structures, scaffolding and office trailers at the site, as well as materials and equipment at the site destined to become a permanent part of the property. Any additional costs associated with course of construction insurance must be identified in the quote.

8. LABOR PRACTICES

- 8.1. Labor practices:** The contract vendor must agree to treat its labor in keeping with its labor contract agreement and to the best interest of the member. Any overtime practices or retroactive agreements with labor unions that would be to the detriment of the member must be limited to only those approved by the member.
- 8.2. Labor requirements:** The method and manner of performance must be stated in quotes and/or project documents: employees of the contract vendor are not employees of the member; the level of competency of the personnel will be subject to approval by the member; the contract vendor must agree to comply with all current applicable federal, state, and local laws; adjoining property owners must not be annoyed by noise, pollutants, material hauling operations; procedures for dealing with fire, theft, and storm damage must be established; methods the contract vendor will use to guarantee safe job practices relating to the health and welfare of the member employees and contract vendor employees will be clearly stated in quotes and/or project documents.
- 8.3. Quality of work:** All work under the contract shall be accomplished by experienced craftsmen, helpers and laborers under the supervision of the foreman or supervisor.
- 8.4. Removal of Employee or Representative:** The member shall have the right to require the contract vendor to remove from the project any employee or representative of the contract vendor, its subcontractors or suppliers that the member may deem incompetent, careless, insubordinate, or otherwise unacceptable.
- 8.5. Supervision:** The contract vendor shall furnish the services of an experienced foreman or supervisor who will continually be in charge of work on the project. The foreman or supervisor shall provide continuous supervision, coordination and inspection of the work required under the contract.

9. LIQUIDATED DAMAGES

Any agreements on liquidated damages and early completion incentives shall be between the member and the contract vendor and must be agreed upon in writing prior to start up. If the member declines liquidated damages or early incentive agreement, the contract vendor shall obtain a written and signed statement to this effect. Mohave shall not be a party to liquidated damages or early completion incentive agreements.

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10. LITIGATION FOR NONPAYMENT OR NONPERFORMANCE

All litigation for nonpayment or nonperformance shall be filed as allowed in R7-2-1103 (F), and in ARS title 34 or 41 as applicable.

11. MEMBER COSTS

Temporary electrical service and the cost for power, the cost for water, and other member costs shall be identified in writing and agreed upon.

12. PERFORMANCE AND PAYMENT BONDS

12.1. Issuing performance and payment bonds: It shall be the sole responsibility of the member to determine if any applicable performance and payment bonding requirements apply to the procurement under an awarded contract. Member must request that the contract vendor provide the performance and payment bonds that meets the requirements prior to project implementation.

The contract vendor shall supply Mohave with a copy of the procured bonds upon request. If the contract vendor fails to deliver any required performance or payment bonds requested by the member, the contract with Mohave may be cancelled.

12.2. Payment bond requirement: An irrevocable payment bond shall be executed in an amount equal to 100% of the price specified in the contract between the member and the contract vendor by a surety company authorized to do business in Arizona. This bond will protect all persons supplying labor and material to the contract vendor for the performance of the work provided in the contract.

12.3. Performance bond requirement: An irrevocable performance bond shall be executed in an amount equal to 100% of the price specified in the contract between the member and the contract vendor by a surety company authorized to do business in Arizona. The performance bond and payment bond for each job order shall cover the full amount of the project under the job order, and shall not include coverage of any amounts for design services, preconstruction services, finance services, maintenance services, operations services or other related services included in the job order. (The contract shall be available for use by any or all Mohave members. There is not an initial estimate of the amount of construction that will be done under the contract by the members. Therefore, the amount of performance and payment bonds must be based upon the amount of each job order.)

13. PROGRESS PAYMENTS

13.1. Progress Payments on Construction: R7-2-1105 and ARS §34-609 and §41-2577 allows for progress payments if the contract vendor agrees to adhere to ARS §34-609(B)(D)(F) and 41-2577(B)(D)(F) and as applicable in ARS §34-221. All progress payments must be invoiced to the member; it is the responsibility of the member to review and approve any estimates of work completed. If the member issues a written statement to the offeror that the estimate of work is not approved and certified, the member may withhold an amount from the progress payment the member reasonably expects to incur in correcting the deficiency set forth in the written finding, as permitted in R7-2-1105 (A) and ARS §34-609(B)(2) and §41-2577(A). In such cases, the offeror agrees to hold Mohave harmless for any deficiency of payment.

Progress payments may be made to the contract vendor on the basis of a duly certified and approved estimate of work performed during the preceding month. The contract vendor must agree to pay any subcontractors or material suppliers within seven days of their receipt of the progress payment, unless otherwise agreed on in writing between the parties.

Technical Proposal – Standard Terms and Conditions for Construction
(Place after Tab 1c)

13.2. Schedule of payments: Once all bonds are in place, the contract vendor and the member will agree upon a schedule of payments based on identifiable milestones.

If any payment is delayed beyond 30 days from the due date, the offeror agrees not to charge Mohave interest on the late payment. Any late charges will be the total responsibility of the member. The offeror may extend any due date to avoid the requirement to pay interest in R7-2-1105 (D) and ARS §34-609(I) and §41-2577(E).

Acceptance of final payment is a waiver of all claims except unsettled claims previously made in writing.

13.3. Subcontractor notification: A subcontractor to the prime contractor may request, in writing, that member notify the subcontractor in writing within five (5) days from payment of each progress payment made to the prime contractor [R7-2-1105(C) and ARS §41-2577(C) and §34-609(G). Upon request, the prime contractor must provide Mohave or the members with a contact name, title, company name, mailing address and fax number for all subcontractors and suppliers that are covered by a payment bond.

14. PROJECT ADVERTISING

The contract vendor must agree that the member reserves the right to release information about the project and that any advertising of the project by the contract vendor must be approved by the member.

15. PROJECT COMPLETION

15.1. Project documents: Upon completion of the work, the contract vendor shall present the member with all documents necessary to closeout the project. Maintenance manuals, drawings, warranties on installed equipment, etc., shall be given to the member.

15.2. Unfinished work: Even if final payments are made, if the member discovers an unfinished job that should have been completed, the contract vendor shall complete the work in a timely fashion at no additional cost.

16. PUBLIC WORKS

16.1. Preservation: The contract vendor shall be responsible for the preservation of all public and private property included on or adjacent to the worksite. This requirement shall apply to the surface and hidden features of the property.

16.2. Receipt of public funds: Contract vendors and subcontractors will meet the requirements of ARS § 34, Article 3, for eligibility to receive public funds.

16.3. Residency requirement: ARS §34-302 states that only persons who have been for not less than one year a bona fide resident of Arizona shall be employed in the performance in any public work. A public works contract is defined in ARS §34-321 as "*a contract to which the state or a political subdivision is a party involving the employment of laborers, workmen or mechanics in the construction, alteration or repair of public buildings or improvements.*" It shall be the responsibility of the contract vendor to comply with these laws, when applicable.

16.4. Restoration: The contract vendor shall repair, rebuild or otherwise acceptably restore any property on or adjacent to the worksite that was damaged during the course of work on the project. Such restoration shall be at the contract vendor's expense, and is not subject to reimbursement by the member.

Technical Proposal – Standard Terms and Conditions for Construction
(Place after Tab 1c)

16.5. Public building rules, regulations and codes: Construction work on public buildings shall be in compliance with the state fire code unless a fire code has been adopted by the city, town, county or fire district in which the building is located. Public buildings shall be constructed in compliance with applicable building, plumbing, electrical, fire prevention and mechanical codes adopted by the city, town, county or fire district in which the building is located. If a public building is built in an area that has not adopted local codes, the building shall be designed or constructed according to the state fire code adopted by the state fire marshal and the building, plumbing, electrical, fire prevention and mechanical codes that apply in the largest city in the county in which the building is located. Public buildings are subject to those codes that apply and are in effect when the building is designed or constructed and to the currently adopted codes when a building is found to be structurally unsafe, without adequate egress, or a fire hazard or are otherwise dangerous to human life. "Public Building" means a building or appurtenance to a building that is built in whole or in part with public monies (see ARS §34-461).

17. RETENTION

Retention shall not be allowed for any progress payments made under this contract.

18. RULES, REGULATIONS AND CODES

18.1. Certification of personnel regarding renovations, repair, and painting: Personnel performing renovations, repair, and painting activities that disturb lead-based paint in target housing and child-occupied facilities constructed before 1978, shall comply with Part II, Environmental Protection Agency, 40 CFR Part 745, Lead; Renovation, Repair, and Painting program; Lead Hazard Information Pamphlet (<http://www.epa.gov/>).

18.2. Compliance: All work will be accomplished in conformance to current applicable OSHA safety requirements, and any additional federal, state, or local fire or safety requirement. When specifications or scope of work will result in a violation of a code or result in an unsafe condition, the contract vendor must inform the member of the situation. The contract vendor will not construct any device or produce any condition that intentionally violates a fire or safety code or safety standard.

18.3. Hazard notification: Contract vendor must advise member whenever work is expected to be hazardous.

18.4. Liens/serial numbers: All materials shall be free of liens. Proposals must be for equipment on which the original manufacturer's serial number has not been altered in any way.

19. SURETY COMPANIES

Surety companies issuing bid bonds, performance bonds and/or payment bonds under this contract must be licensed by the Arizona Department of Insurance. Evidence of such license will be the name of the surety company as found in the license search database provided by the Arizona Department of Insurance (www.insurance.az.gov).

20. WORKSITE

20.1. Site access: The member shall provide an all-weather road to the site and prepare the site with room for construction equipment.

20.2. Site conditions: The condition of the site before start up shall be agreed upon between the member and the contract vendor and shall be written into the contract.

**Technical Proposal – General Terms and Conditions and
Standard Terms and Conditions for Construction Acceptance Form
(Place after Tab 1c)**

Signature on Page 2 certifies complete acceptance of the General Terms and Conditions and the Standard Terms and Conditions for Construction in this solicitation, except as noted below (additional pages may be attached, if necessary).

Check one of the following responses to the General Terms and the Standard Terms and Conditions for Construction:

- ☐ We take no exceptions/deviations to the General Terms and Conditions and the Standard Terms and Conditions for Construction.

(Note: If nothing is listed below, it is understood that no exceptions/deviations are taken.)

- ☐ We take the following exceptions/deviations to the General Terms and Conditions and the Standard Terms and Conditions for Construction. All exceptions/deviations shall be clearly explained. Reference the corresponding General Terms and Conditions and/or Standards Terms and Conditions for Construction that you are taking exceptions/deviations to. Clearly state if you are adding additional terms and conditions to the General Terms and Conditions and the Standard Terms and Conditions for Construction. Provide details on your exceptions/deviations below:

(Note: All requested exceptions/deviations must be clearly explained. Reference the specific terms and conditions that you are taking exceptions/deviations to, detail any proposed substitute terms and conditions, and clearly demonstrate how Mohave and its membership will be better served by the substituted terms and conditions. Unacceptable exceptions/deviations shall remove your proposal from consideration for award. Mohave shall be the sole judge on the acceptance of exceptions and Mohave's decision shall be final.)

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DIVISION 1-GENERAL REQUIREMENTS

- 1.0 As required by member

DIVISION 2-EXISTING CONDITIONS**Demolition**

- 1.0 DESCRIPTION OF WORK: This specification covers the dismantling, salvage, demolition, and disposal of designated structures, utilities, and/or materials as directed by the Authorized Member Representative.
- 2.0 PRODUCTS: (Not Used).
- 3.0 EXECUTION:
- 3.1 Submittals: Procedures proposed for the accomplishment of all demolition and salvage work, including a detailed description of the methods and equipment to be used for each operation and the scheduled sequence of operations, shall be submitted to the Authorized Member Representative for approval. Operations that involve interruption of utility services or the handling of toxic or hazardous materials shall be scheduled and approved by the Authorized Member Representative at least 48 hours prior to the start of such operations.
- 3.2 Clearances and Permits: Obtain as required from local authorities.
- 3.3 Salvage: Title to all materials and equipment to be demolished is vested in the member. Unsalvageable materials shall be disposed of as directed by the Authorized Member Representative. Materials and equipment for Member salvage or reuse shall be carefully removed and delivered to a storage site designated by the Authorized Member Representative.
- 3.4 Protection of Existing Work: All necessary precautions shall be taken to ensure against damage to existing work that is to remain in place or is to remain the property of the Member. Damaged areas shall be repaired or replaced with new products to match existing surrounding surfaces. Shoring, bracing, and supports shall be provided as required and structural elements shall not be overloaded. Care shall be taken to prevent unscheduled interruptions to any utility service.
- 3.5 Protection From Weather: The interior of buildings and all materials and equipment shall be protected from the weather at all times.
- 3.6 Dust and Dirt Control: Dust and dirt resulting from demolition operations shall be controlled to prevent spread into occupied portions of buildings and to avoid creation of a nuisance to the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding, and pollution.
- 3.7 Burning: Burning at the project site for the disposal of refuse and debris will not be permitted.
- 3.8 Explosives: The use of explosives will not be permitted.
- 3.9 Hazardous Materials: Extreme care and caution shall be exercised at all times when handling toxic or hazardous materials in order to prevent harm to personnel and property and to prevent environmental contamination. Federal and state regulations governing handling, transportation,

Attachment 1: Specifications for the Work

and disposal of such materials shall be rigidly adhered to.

- 3.10 Utilities: Temporary interruptions, disconnections, and relocation of existing utilities and removal of abandoned utility services shall be as directed by the Authorized Member Representative.
- 3.11 Cleanup: Debris and rubbish shall not be allowed to accumulate in buildings or on site. Local regulations regarding hauling and disposal shall be followed.

DIVISION 3-CONCRETE

Concrete Formwork

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of structural cast-in-place concrete formwork. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Form Materials shall conform to ACI 301 and shall be made especially for concrete form use.
 - 2.1.1 Corrugated or Formed Steel Sheets: ASTM A 361, G90 Coating, with depth of corrugations not less than 1/2 inch.
 - 2.1.2 Plywood: DOC PS 1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade. Minimum thickness shall be 3/4 inch.
 - 2.1.3 Asbestos Cement Formboard: ASTM C 220, 1/4 inch thick, Type U or Type F.
 - 2.1.4 Cylindrical Columns and Supports: Round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior.
 - 2.1.5 Pan Type: 16-gauge steel with 1/4-inch thick concrete form hardboard conforming to AHA A135.4, or fiberglass at least 0.11 inch thick.
 - 2.1.6 Lumber: Straight, uniform width and thickness and free from knots, offsets, holes, dents, and other surface defects. Minimum thickness shall be 1 inch.
 - 2.1.7 Void Forms: Moisture-resistant treated paper faces, biodegradable.
 - 2.2 Formwork Accessories:
 - 2.2.1 Form Ties: Form ties shall be metal, factory-fabricated, removable or snap-off and will leave holes not less than 1/4 inch nor more than 1 inch in diameter and not more than 1 inch deep.
 - 2.2.2 Form coating shall be industrial colorless material that will not stain concrete, absorb moisture, or impair natural bonding.
 - 2.2.3 Fillets for chamfered corners shall be wood strips or rigid plastic type.
 - 2.2.4 Dovetail anchor slots shall be galvanized steel material with release-tape-sealed slots and bent tab anchors, securable to concrete formwork.
 - 2.2.5 Flashing reglets shall be galvanized steel with release-tape-sealed slots and alignment splines for joints, securable to concrete formwork.
 - 2.2.6 Anchorages, spikes, nails, and lag and through bolts shall be as required to maintain formwork in place.
- 3.0 EXECUTION:
 - 3.1 Inspection: forms shall be cleaned and reconditioned between usages. Temporary ports shall be provided in formwork to facilitate cleaning and inspection.
 - 3.2 Preparation:
 - 3.2.1 Formwork shall be constructed to maintain tolerances in accordance with ACI 301.
 - 3.2.2 Form coating shall be applied prior to placing reinforcing steel, anchoring devices, and embedded items. Do not apply form coating where concrete surfaces are scheduled to receive special finishes.
 - 3.2.3 Chamfer strips shall be provided on external corners that will be exposed.
 - 3.3 Form Removal: Forms shall be removed in a progressive manner that will prevent injury to the concrete.

Concrete Reinforcement

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete

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reinforcement. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendation. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:**2.1 Reinforcement Materials:**

2.1.1 Billet-Steel Reinforcing Bars: ASTM A 615, minimum Grade 40 steel, plain or deformed bars, uncoated or galvanized finish.

2.1.2 Rail-Steel Reinforcing Bars: ASTM A 616, Grade 50 and 60 steel, plain or deformed bars, uncoated or galvanized finish.

2.1.3 Axle-Steel Reinforcing Bars: ASTM A 617, minimum Grade 40 steel, plain or deformed bars, uncoated or galvanized finish.

2.1.4 Welded Steel Wire Fabric: ASTM A 185 for plain type and ASTM A 497 for deformed type fabric.

2.1.5 Stirrup Steel: ASTM A 82.

2.1.6 Dowel Steel: ASTM A 675, Grade 80 or ASTM A 499. Steel pipes, if used for dowels, shall be closed at each end with mortar, metal, or plastic cap and shall conform to ASTM A 53, Schedule 80.

2.2 Reinforcement Accessories:

2.2.1 Wire Ties: 16 gauge black annealed wire.

2.2.2 Chairs, bolsters, bar supports, and spacers shall be provided in conformance with ACI SP-66. Supports for formed surfaces exposed to view shall be plastic protected wire or stainless steel. Precast concrete, if used for bar supports, shall be wedge-shaped, not larger than 3-1/2 inches by 3-1/2 inches in thickness and with an embedded hooked tie wire for anchorage.

3.0 EXECUTION:**3.1 Regulations:**

3.1.1 Reinforcement detailing and placement shall conform to ACI 318.

3.1.2 Laps or splices shall conform to ACI 318.

3.1.3 Welding shall comply with AWS D1.4.

3.2 Installation:

3.2.1 Reinforcement shall be free from loose or flaky rust and mill scale.

3.2.2 In slabs, beams, and girders, reinforcing steel shall not be spliced at points of maximum stress.

3.2.3 Dowels and tie bars in slabs on grade shall be placed at right angles to construction joints.

3.2.4 Wire fabric reinforcement shall be continuous between expansion, construction, and contraction joints in slabs on grade and between expansion joints in other slabs.

3.2.5 Reinforcing bars shall not be continuous through expansion joints but shall be 2 inches clear from the joint.

Concrete Accessories

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete accessories. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:**2.1 Joint Materials:**

2.1.1 Rubberized Asphalt Compound: ASTM D 1190.

2.1.2 Polyurethane-Base Elastomeric: Fed. Spec. TT-S-230.

2.1.3 Asphalt Compound: ASTM D 1190.

2.1.4 Liquid Neoprene: Applicable standards and/or specifications.

2.2 Sealer: Fed. Spec. TT-S-00227.

2.3 Waterstop:

2.3.1 Polyvinyl chloride: 1,750 psi minimum tensile strength, working temperature range from minus 51 F to plus 175 F, ribbed flaps on one side only.

2.3.2 Extruded neoprene: 2,000 psi minimum tensile strength, 60 Shore A hardness, flush or recessed from joint.

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3.0 EXECUTION:

- 3.1 Preparation: All surfaces of joints to which sealer is to be bonded shall be absolutely clean, dry, and free of loose concrete, dirt, oil, or other foreign material.
- 3.2 Application:
 - 3.2.1 All joints shall be in accordance with ACI 318.
 - 3.2.2 Accessible edges of expansion joint shall be sealed with sealer.
 - 3.2.3 The ambient temperature shall be between 50 and 100 F when the primer and joint sealing compound are applied.
 - 3.2.4 Contraction joints shall have a minimum width of 1/8 inch and a depth of 1/4 the slab thickness or 1-1/2 inches minimum, whichever is greater.
 - 3.2.5 Construction joints shall be doweled construction.
 - 3.2.6 Expansion joint filler shall be installed below the finished floor with a temporary wood strip to form a groove not less than 3/4 inch deep.
 - 3.2.7 Waterstops shall be installed so as to form a continuous water-tight diaphragm.

Cast-in-place Concrete

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cast-in-place concrete. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Concrete Admixtures:
 - 2.1.1 Air-Entraining Admixture: ASTM C 260.
 - 2.1.2 Accelerating Admixture (Calcium Chloride): ASTM D 98.
 - 2.1.3 Water-Reducing or Retarding Admixture: ASTM C 494.
 - 2.2 Concrete Mixture:
 - 2.2.1 Cement: ASTM C 150.
 - 2.2.2 Normal Weight Aggregate: ASTM C 33.
 - 2.2.3 Water: Potable, free from deleterious substances.
 - 2.2.4 Proportion of cement, aggregate, and water shall comply with ACI 318.
 - 2.2.5 Concrete shall have a compressive strength (28 day) as indicated on the drawings. Entrained air by volume shall be 6 percent, and the slump shall be a maximum of 4 inches and a minimum 1 of inch. All reinforcing steel shall be Grade 60.
 - 2.3 Concrete Accessories:
 - 2.3.1 Bonding agent shall be two component epoxy resin, two component polysulphide-epoxy, polysulphide polymer epoxy, or polysulphide polymer epoxy resin.
 - 2.3.2 Vapor barrier shall consist of 6-mil polyethylene sheet, complying with ASTM C 171, or heavy Kraft papers laminated together with glass fiber and overcoated with polyethylene.
 - 2.3.3 Floor Hardener:
 - 2.3.3.1 Metallic Floor Hardener: Magnesium fluosilicate and zinc fluosilicate with water.
 - 2.3.3.2 Non-metallic floor hardener shall be used when hardened floor is subject to light or medium floor traffic.
- 3.0 EXECUTION:
 - 3.1 Concrete Placement:
 - 3.1.1 Formwork, reinforcing steel, and embedment items shall be inspected before placing concrete.
 - 3.1.2 Concrete placement shall comply with ACI 304 and 301.
 - 3.1.3 Cold weather placing shall be in compliance with ACI 306. Concrete mixture temperature shall be not less than 50 F.
 - 3.1.4 Hot weather placing shall be in compliance with ACI 305. Concrete mixture temperature shall be not more than 80 F.
 - 3.2 Concrete finishes shall comply with ACI 301.
 - 3.2.1 Float finish shall be applied to monolithic slab surfaces receiving trowel finish or slab surfaces to be covered with membrane or elastic waterproofing.

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- 3.2.2 Trowel Finish: Power-driven troweling or hand troweling shall be applied to monolithic slab surfaces to be exposed to view and slab surfaces covered with resilient flooring.
- 3.2.3 Broom finish shall be applied to exterior concrete platforms, stairs, ramps, etc.
- 3.2.4 Rough Slab Finish: Slabs shall be screeded with straight edges so that no coarse aggregate is visible and slab is suitable to receive fill and mortar setting beds.

Concrete Topping

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete floor toppings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cement: Portland cement, ASTM C 150, Type I or III.
 - 2.2 Sand: ASTM C 33.
 - 2.3 Coarse Aggregate: ASTM C 33, maximum size 3/8 inch.
 - 2.4 Granolithic Material: Emery, hard mineral, or non-staining metallic material finely ground to produce non-skid surface.
- 3.0 EXECUTION:
 - 3.1 Integral Topping: Topping shall be a one part cement, one part sand, and two parts aggregate mix to produce a hard topping with a minimum 28-day compressive strength of 5,000 psi.
 - 3.1.1 Surface of base slab shall be roughened before placing topping.
 - 3.1.2 Spread topping mixture evenly over base, bring to required depth, and strike off level with a straightedge. Consolidate surface by power-float finishing.
 - 3.1.3 Hard trowel-finish slab topping.
 - 3.1.4 Control joints in topping shall be located directly above joints in base slab.
 - 3.2 Granolithic Finish: Topping shall be a one part cement, one part sand, and 1-1/2 parts aggregate mix. Topping shall be placed same as integral topping.
 - 3.2.1 Prior to final troweling, granolithic material shall be spread evenly over the topping surface.
 - 3.2.2 Granules shall be worked into the surface to provide complete bonding with the topping but also to provide an abrasion-resistant, non-skid surface.

Exposed Aggregate Concrete

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of exposed aggregate finish on concrete. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cement: ASTM C 150, Type I Portland cement.
 - 2.2 Admixtures: ASTM C 494, ASTM C 260.
 - 2.3 Aggregate: ASTM C 33.
 - 2.4 Water: Clean, potable.
 - 2.5 Cleaning Agent: Commercial grade muriatic acid, mixed 1 part acid to 10 parts water.
 - 2.6 Bonding Agent: Polyvinyl acetate emulsion.
 - 2.7 Surface Aggregate: As directed.
- 3.0 EXECUTION:
 - 3.1 Concrete shall be placed and vibrated to ensure that concrete is consolidated and that all voids are filled.
 - 3.2 Formed Concrete:
 - 3.2.1 Leave forms in place until removal can be effected without damage to the shape or strength of the concrete but, in no case, in less than 24 hours. Longer time periods will be required when lower ambient temperatures are experienced.
 - 3.2.2 Immediately after removal of form work, remove surface cement paste from around aggregate by

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either washing with water and scrubbing with a stiff bristle brush, wetting and scrubbing surface with acid etch solution, or sandblasting surface.

3.2.3 Cover concrete and continue curing procedures.

3.3 Slabs:

3.3.1 Allow concrete to cure until slab can be loaded without structural damage but, in no case, in less than 24 hours.

3.3.2 Uncover slab and remove surface cement paste from around aggregate, using methods described for the removal of paste from formed concrete.

3.3.3 Cover concrete and continue curing procedures.

3.4 Exposure: Do not expose more than 40 percent of aggregate surface.

3.5 Surface-Applied Aggregate:

3.5.1 Evenly distribute the aggregate on the prepared concrete surface.

3.5.2 Work aggregate into surface to form permanent bond.

3.5.3 Provide proper curing conditions for exposed aggregate surface.

Rusticated Concrete Finishes

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of rusticated concrete finishes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Overlaid Plywood: DOC PS 1, B-B High Density Overlaid Concrete Form, Class I.

2.2 Plywood: DOC PS 1, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection mark.

2.3 Chamfer Strips: Clear white pine with surface against concrete to be planed, metal, PVC, or rubber.

3.0 EXECUTION:

3.1 Form Construction: Forms shall be constructed to provide required sizes, shapes, lines, and dimensions and to provide continuous, straight, smooth exposed surfaces. Forms shall be fabricated for easy removal without hammering or prying against concrete surfaces. The number of joints shall be minimized. Joints shall be made watertight to prevent leakage of cement paste. Provisions shall be made for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, inserts, and other features required in the work.

3.2 Form Coatings: Forms shall be oiled with form-coating compounds that will not bond with, stain, nor adversely effect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

3.3 Finish: Fins and other projections shall be completely removed and smoothed. A smooth rubbed finish shall be provided not less than one day after form removal. •03353

Solid Board Concrete Finishes

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of solid board concrete finishes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Overlaid Plywood: DOC PS 1, B-B High Density Overlaid Concrete Form, Class I.

2.2 Plywood: DOC PS 1, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection mark.

2.3 Fiberboard: AHA A135.4, tempered, waterproof, screenback, concrete form hardboard.

3.0 EXECUTION:

3.1 Form Construction: Forms shall be constructed to provide required sizes, shapes, lines, and dimensions and to provide continuous, straight, smooth, exposed surfaces. The number of joints shall be minimized. Joints shall be made watertight to prevent leakage of cement paste.

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- 3.2 Form Coatings: Forms shall be oiled with form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- 3.3 Finish: Fins and other projections shall be completely removed and smoothed. A smooth rubbed finish shall be provided not later than one day after form removal.

Flexural Concrete

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of flexural concrete. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cement: ASTM C 150.
 - 2.2 Fine and Coarse Aggregates: ASTM C 33.
 - 2.3 Admixtures:
 - 2.3.1 Air-Entraining Agents: ASTM C 260.
 - 2.3.2 Retarders: ASTM C 494.
 - 2.3.3 Pozzolans: ASTM C 618.
 - 2.4 Mixture Proportions: The concrete shall possess the required 28-day flexural strength and shall be tested in accordance with ASTM C 293 and ASTM C 192.
- 3.0 EXECUTION:
 - 3.1 Placing: Concrete shall be deposited in the forms or in front of slip-form pavers within 45 minutes from the time all ingredients are charged into the mixing drum. Concrete shall be deposited as close as possible to its final position. The placement of the concrete shall be continuous and at a uniform rate without unscheduled stops. Concrete shall be consolidated with mechanical vibrating equipment immediately after spreading.
 - 3.2 Finishing operations shall be started immediately after placement of the concrete. Finishing shall be by the machine method except that, where directed, the hand method will be permitted on odd slab widths or shapes and in event of breakdown of the mechanical equipment to finish concrete. The sequence of operations shall be as follows: finishing, floating, straightedging, texturing or troweling, and, where directed, edging of joints.
 - 3.3 Curing: Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. Protection shall be provided as necessary to prevent cracking due to temperature changes during the curing period.

Specially Placed Concrete

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumped concrete. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Concrete pumps shall pump a minimum of 100 cubic yards of concrete per hour.
 - 2.1.1 Piston Type: Pump shall draw alternately from a hopper into the discharge pipe by a piston, operated mechanically or hydraulically.
 - 2.1.2 Pneumatic Type: Air pressure shall force the concrete into the discharge pipe.
 - 2.1.3 "Squeeze" Type: Pump-powered rollers shall deform a concrete-filled flexible tube to push the concrete into the discharge pipe.
 - 2.2 Discharge Lines:
 - a. 3- to 6-inch steel pipe.
 - b. 5-inch aluminum pipe with acceptable coating.
 - c. 4- to 5-inch rubber hose.

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- 2.3 Hopper: 15 to 20 cu ft concrete capacity.
- 3.0 EXECUTION:
- 3.1 Slump loss shall be less than one inch while passing through the pumping system.
- 3.2 When concrete must be pumped long distance, a relay system shall be installed (one pump feeds into the hopper of another pump).
- 3.3 Placing concrete by pumping methods shall comply with ACI 304.2R.

Second-pour Concrete

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of second-pour concrete. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Second-pour concrete shall match the materials and mix used for first-pour concrete. Use of second-pour concrete shall be in pre-planned situations in which a small section of the first pour must be interrupted for purposes of expediting construction. Alternating- section pours of large slabs or walls shall not be considered first- or second-pour concrete. Second-pour concrete planning shall be approved by the Authorized Member Representative.
- 3.0 EXECUTION:
- 3.1 Preparation:
 - 3.1.1 All bulkheads and keyways used as limits of the first pour shall be removed and contact surfaces prepared to receive the second-pour concrete.
 - 3.1.2 All forms, reinforcing, and embedments installed for the first pour that will be utilized in the second-pour shall be cleaned and prepared.
- 3.2 Erection:
 - 3.2.1 All additional forms, reinforcing, and embedments required for the second-pour concrete shall be installed.
 - 3.2.2 The second-pour concrete shall be placed in the manner specified for the first-pour concrete.
 - 3.2.3 The curing procedures used for the first-pour concrete shall be used for the second-pour concrete unless otherwise directed or approved by the Authorized Member Representative.

Concrete Curing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for concrete curing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Impervious Sheet Materials: ASTM C 171.
 - 2.2 Burlap: Fed. Spec. CCC-C-467.
 - 2.3 Membrane-Forming Compound: ASTM C 309, Type I.
- 3.0 EXECUTION: Concrete shall be cured by protection against loss of moisture and rapid temperature change for a period of not less than 7 days for normal concrete or 3 days for high early strength concrete in accordance with ACI 301 procedures.
 - 3.1 Absorptive cover shall be placed to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.
 - 3.2 Horizontal surfaces shall be cured by ponding, by covering with a 2-inch minimum thickness of continuously saturated sand, or by covering with polyethylene sheet, saturated burlap, or waterproof paper.
 - 3.3 Formed surfaces shall be cured by moist curing with forms in place for full curing period. Wooden forms shall be kept wet at all times during curing.
 - 3.4 Unformed surfaces, such as slabs and other flat surfaces, shall be cured by application of appropriate curing compound.
 - 3.5 Membrane-curing compound shall not be applied where a protective coat or waterproofing is to be

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Miscellaneous Precast Items

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous precast items. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Precast items shall include, but not be limited to, stairs, planters, picnic tables, including base, seats and tops, handrails, splash blocks, and bumper curbs and shall be supplied by a manufacturer normally engaged in the fabrication of these items.
 - 2.2 Fabrication: PCI MNL-117.
 - 2.3 Each unit shall be complete and self-contained.
 - 2.4 Items shall be fabricated from concrete with a minimum strength of 3,000 psi and shall be reinforced as required to withstand both construction loads and design loads.
 - 2.5 Stairs shall be supplied in complete runs.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Provide anchors, devices, and openings required to install precast units.
 - 3.1.2 Precast units shall be hoisted at points provided by the manufacturer and in manner that avoids damage to the units.
 - 3.1.3 Temporarily brace precast units in proper position and alignment until permanent anchorage and supports are in place.
 - 3.2 Erection:
 - 3.2.1 Anchor units in final position by bolting, welding, grouting, or as otherwise directed. Remove temporary shims, wedges, and spacers as soon as possible after anchoring is completed.
 - 3.2.1.1 At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.
 - 3.2.1.2 At welded connections, apply rust-inhibitive coating on damaged areas, identical to shop-applied material. Use galvanizing repair coating on galvanized surfaces.
 - 3.2.2 Cleaning: Clean exposed facings to remove dirt and stains that may be on units after erection and completion of joint treatments. Do not use cleaning materials or processes that could change the character of exposed concrete finishes.

Gypsum Concrete Decks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum concrete decks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Gypsum Concrete: ASTM C 317, Class A.
 - 2.2 Formboards:
 - 2.2.1 Sheetrock: ASTM C 36.
 - 2.2.2 Mineral Fiber Board: ASTM C 612.
 - 2.2.3 Cement Fiber Board: ASTM E 1264, Type IX, Fire Class A.
 - 2.2.4 Glass Fiber Board: Lightweight, rigid, composed of pressed glass fibers.
 - 2.3 Bulb Tees: Hot-rolled from high-strength rail steel, ASTM A 499.
 - 2.4 Reinforcing Mesh:
 - 2.4.1 Welded Wire Fabric: ASTM A 185, galvanized, 12 x 48-W 0.5 x W 0.5.
 - 2.4.2 Woven Wire Fabric: ASTM A 82, galvanized, 19 gauge wire, 2-inch hexagonal mesh.
- 3.0 EXECUTION:
 - 3.1 Support System: Sub-purlins shall be spaced to support formboard and rigidly attached to main supports. Formboards shall fit snugly at sub-purlins and at wall, curbs, and openings.

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- 3.2 Reinforcement: Lay wire fabric continuously over subpurlins. Do not lap side of reinforcement.
- 3.3 Gypsum Concrete: Gypsum concrete shall be placed continuously without interruption until entire panel or section is complete. Immediately after placement, screed, level, and trowel smooth.

Insulating Concrete Roof Decks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulating concrete roof decks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Portland cement: ASTM C 150, Type I or III.
 - 2.2 Aggregate: ASTM C 332, Type I, perlite or vermiculite.
 - 2.3 Water: Clean, potable.
 - 2.4 Admixture: Air-entraining, ASTM C 260.
 - 2.5 Reinforcement: Welded wire fabric, ASTM A 185, galvanized, 12 x 48 - W 0.5 x W 0.5.
- 3.0 EXECUTION:
 - 3.1 Reinforcing Mesh: Place reinforcing mesh at right angles to structural supports, with end laps at least 6 inches and no side laps. Cut to fit around roof openings and projections. Terminate mesh at control joints.
 - 3.2 Place lightweight insulating concrete, using equipment and procedures to avoid segregation of mix and loss of air content. Deposit and screed in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Leave top surface in acceptable condition to receive subsequent roofing application.
 - 3.3 Begin Curing Operations immediately after placement, and air cure for not less than 3 days.

Precast Lightweight Roof Slabs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast lightweight roof deck concrete channels, concrete planks, and gypsum planks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Channel Slabs: Slabs shall be composed of Portland cement and lightweight aggregate with minimum compressive strength 3,750 psi. Legs shall be reinforced with deformed bars; web shall have welded wire fabric reinforcement. Channels shall support a 30 psf live load plus a 20 psf superimposed dead load.
 - 2.2 Planks: Planks shall be composed of Portland cement and lightweight aggregate with a minimum compressive strength of 3,750 psi. Planks shall be reinforced with welded wire fabric. Planks shall support a 30 psf live load plus a 20 psf superimposed dead load.
 - 2.3 Gypsum planks shall be suitable for the intended use, factory-laminated to 2-inch thickness, 2-foot wide panels. Planks shall be continuously supported along sides.
 - 2.4 Subpurlins shall be bulb-tees, hot-rolled from high-strength rail steel, ASTM A 499.
 - 2.5 Grout shall be lightweight concrete or gypsum concrete.
- 3.0 EXECUTION:
 - 3.1 Concrete channels and planks shall be securely attached to support steel or concrete by metal clips or other approved attachments; minimum support bearing shall be 4 inches. Open joints between channels or planks shall be filled with lightweight concrete grout. Planks with tongue and groove edges may not require grouting.
 - 3.2 Gypsum planks shall be snugly fitted between bulb-tee subpurlins. Subpurlins shall be tack-welded or screw-attached to supporting steel or weld bar cast in supporting concrete. Joints at bulb-tees shall be grouted with gypsum grout.

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Cementitious Wood Fiber Roof Deck Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious wood fiberboard and tees for roof decks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cementitious wood fiber planks shall be precast units composed of extra long wood fiber pressure bonded with Portland cement. Plank edges shall be either tongue and groove or rabbeted to receive bulb-tee subpurlins.
 - 2.2 Bulb-Tees: Hot-rolled from high-strength rail steel, ASTM A 499.
 - 2.3 Grout: Lightweight concrete.
- 3.0 EXECUTION:
 - 3.1 Subpurlin System: Planks shall be fitted between bulb-tees. Bulb-tees shall be securely fastened to supporting members. Spaces between planks at subpurlins shall be filled with lightweight concrete grout. Systems of planks and subpurlins shall support a 30 psf live load and a 10 psf superimposed dead load.
 - 3.2 Tongue and Groove System: Planks shall be erected directly on supporting members and securely attached with metal clips or other approved fasteners. The tongue and groove of both ends and sides of plank shall be snugly fitted to eliminate open cracks.

Grout

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grout for bases and joints. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Premixed grout shall contain cement, sand, and admixtures to produce a non-shrinking grout with the addition of potable water. Expansion shall be limited to 0.10 percent at 28 days.
 - 2.1.1 Metallic grout shall be non-rusting, containing finely graded metallic aggregate with a compressive strength of 12,000 psi at 28 days.
 - 2.1.2 Non-metallic grout shall have a compressive strength of 13,000 psi at 28 days.
 - 2.1.3 Fluid grout shall be a non-metallic grout with flowable consistency.
 - 2.2.4 Field-Mixed Grout: Grout shall contain 1 part cement to 3 parts sand by volume, with the water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed.
- 3.0 EXECUTION:
 - 3.1 Baseplates shall be grouted with non-shrinking grout. Grout shall be placed so that all spaces and cavities below the top of base plates are completely filled without voids. Forms shall be provided where structural components of base plates will not confine the nonshrinking grout.
 - 3.2 Joints shall be filled with field-mixed grout by tamping or ramming with a bar or rod until the joint is completely filled. Grout surface shall be smooth-finished and level with the adjoining material.

Concrete Restoration and Cleaning

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of concrete. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Epoxy Resin: Two-part epoxy adhesive containing 100 percent solids.
 - 2.1.1 Bond Strength: ASTM C 882, 2,700 psi.
 - 2.1.2 Tensile Strength: ASTM D 638, 6,600 psi.

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- 2.1.3 Elongation: ASTM D 638, two percent.
- 2.1.4 Flexural Strength: ASTM D 790, 8,000 psi.
- 2.1.5 Compressive Strength: ASTM D 695, 10,000 psi.
- 2.2 Bonding Agent: Polyvinyl acetate emulsion, water-resistant when applied and cured.
- 2.3 Concrete:
 - 2.3.1 Portland cement: ASTM C 150.
 - 2.3.2 Sand: ASTM C 33.
 - 2.3.3 Coarse Aggregate: ASTM C 33.
 - 2.3.4 Water: Clean and potable.
 - 2.3.5 Air-Entraining Admixture: ASTM C 260.
 - 2.3.6 Water-Reducing and Retarding Admixture: ASTM C 494.
- 2.4 Cleaning Agent: Commercial muriatic acid, mixed one part to ten parts potable water. •03705
- 2.5 Reinforcing Steel: ASTM A 615, Grade 40 or 60.
- 3.0 EXECUTION:
 - 3.1 Cleaning:
 - 3.1.1 Clean concrete surfaces of dirt, laitance, corrosion, oil, stains, or other contamination. Surface cleaning shall be accomplished by one or more of the following methods as appropriate for the contamination: wire brush using plain water or acid, sandblasting, high pressure steam cleaning with or without chemical additives, high pressure water, high pressure air, or scrub brush and detergent. When acids or chemicals are used, surface shall be thoroughly rinsed and neutralized. Care shall be taken when sandblasting to not etch the surface.
 - 3.1.2 Deteriorated or Spalled Concrete:
 - 3.1.2.1 Completely remove all loose, deteriorated, or unsound concrete down to sound concrete.
 - 3.1.2.2 Where removal Exceeds 1/4 inch or where resurfacing of the entire area is not anticipated, concrete shall be removed to a minimum depth of 2 inches. If cover for reinforcing bars is 2 inches or less, remove concrete to completely expose the reinforcing in the repair area. Remove concrete to a minimum of 1 1/2-inches clear beyond reinforcing. Edges of the repair area shall be cut sharp, perpendicular to the face of the concrete surface, and at least 1 inch deep. Make the perimeter cut with a concrete saw and in a manner to not cut the reinforcing. Clean reinforcing of all rust and scale. Clean repair area of all loose or foreign material using high pressure air or water.
 - 3.2 Resurfacing:
 - 3.2.1 Resurfacing for concrete floors shall be with either epoxy coating or cementitious materials.
 - 3.2.1.1 Epoxy resurfacing shall be applied to a clean hard surface to a minimum thickness of 1/8 inch.
 - 3.2.1.2 Cementitious material resurfacing shall be a minimum of 1 inch thick. Mix shall be one part Portland cement, one part sand, and 1-1/2 parts coarse gravel not exceeding 3/8-inch size crushed rock. Apply bonding compound and immediately place new surfacing. Curing shall be by burlap blanket method. Blankets shall be kept thoroughly saturated and in intimate contact with the concrete.
 - 3.2.2 Resurfacing of Columns: Resurfacing of spalled or deteriorated column surfaces shall be with epoxy grout prepared with the addition of sand to epoxy resin to obtain a mix consistency that will not sag when placed in thin layers on vertical surfaces. Trowel finish.
 - 3.3 Concrete Rehabilitation:
 - 3.3.1 Concrete Patching:
 - 3.3.1.1 Surface shall be prepared as specified for deteriorated concrete cleaning.
 - 3.3.1.2 Any existing reinforcing bars that have a loss of more than 25 percent of their cross section through corrosion shall be replaced. Clean reinforcing bars by sandblasting or wire brushing.
 - 3.3.1.3 Patch with Portland cement concrete if average patch thickness is 2 inches or greater; if less than 2 inches, patch with epoxy grout. Use bonding compound when placing Portland cement concrete patch.
 - 3.3.2 Crack Repair:
 - 3.3.2.1 Epoxy Resin Adhesive Injection: Provide temporary surface seal on crack with entry ports spaced equal to the approximate thickness of the concrete. Inject adhesive into ports under pressure. Continue from port to port until crack is filled, working from bottom to top. Remove temporary seal and clean surface.

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- 3.3.2.2 Epoxy Grout: The crack shall be cut out at the surface in a V-shape that extends to approximately 2 to 3 inches in width. Thoroughly blow out crack with high pressure air and wet with clean water. Completely fill the crack beyond the V-shaped portion with epoxy grout. The mix shall be thin enough to run freely into the crack for horizontal surfaces. Vertical cracks shall require a stiff mix tamped into place to fill all voids. Trowel finish.

Bridge Piers, Abutments and Anchors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of bridge piers, piles, caissons footings, abutments, and anchors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Treated Timber Piles: Comply with the state's standard specifications.
- 2.2 Steel H-Piles: ASTM A 36.
- 2.3 Steel Pipe Piles: ASTM A 252, Grade 1.
- 2.4 Precast Reinforced Concrete Piles: Comply with the state's standard specifications.
- 2.5 Precast Prestressed Concrete Piles: Comply with the state's standard specifications.
- 2.6 Steel Sheet Piling: ASTM A 328.
- 2.7 Wales, Plate Washers, and Tie Rods: ASTM A 36.
- 2.8 High Strength Steel Bolts, Nuts, and Washers: ASTM A 325.
- 2.9 Electrodes: AWS A5.1 or AWS A5.5.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.
- 3.1.2 Clearing and Dewatering: Scalp the area around timber pile bents and abutments. Remove from the vicinity all weeds and bushes as necessary to eliminate fire hazards. Keep work areas clear of water by using cofferdams, diversion channels, or other approved methods. Submit details of methods to be used to the Authorized Member Representative for approval prior to beginning work.
- 3.2 Maintenance and Repair Methods:
- 3.2.1 General: Preparation for pile driving, penetration of piles, tolerance in driving, splicing of piles, cut-offs, determination of bearing values, treatment of pile heads, and test piles shall comply with the state's standard specifications and these specifications. Drive new pile in the location and batter as directed. Pile shall not be pulled into location after driving.
- 3.2.2 Existing Timber Piles: Replace or repair decayed portions of piles as directed.
- 3.2.3 Existing Steel Piles: Remove corroded material by sandblasting or wire brushing. Strengthen the web and flanges of the corroded section by the addition of structural carbon steel or high strength steel and encase the piles in Class A concrete.
- 3.2.4 Caissons and Piers: Construct new caissons and piers in compliance with the Recommended Specifications of the Association of Drilled Shaft Contractors, Inc.
- 3.2.5 Footings: Repair spalling and rounding off of side spaces, transverse cracks, and deteriorated concrete as directed. Install additional reinforcing and drilled anchors where required. Provide formwork as required to restore concrete to its original shape to the extent practicable. New concrete shall cure at least 3 days prior to removal of forms and restoration of the stream channel to its proper course.
- 3.2.6 Concrete Abutments, Pile Bents, Walls, and Piers: Repair spalling, scaling, and pop-outs as directed. Remove concrete to a depth of 1-1/2 inches minimum clear distance behind the layer of reinforcing. Install additional reinforcing and drilled anchor rods as required. Replace concrete as

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described above for footings.

- 3.2.7 Bearing Seats: Remove all debris from around bearings and bearing seats. Widen bearing seat and repair spalling, scaling, and pop-outs as directed. New concrete that will be in direct contact with a bearing shall be 4,000 psi concrete with 4 to 6 percent entrained air and 4 inch maximum slump if patch thickness is greater than 4 inches or non-shrink grout if patch thickness is less than 4 inches.
- 3.2.8 Steel Piers, Pile Abutments, Walls, and Pile Bents: Remove corroded material by sandblasting or wire brushing. Strengthen plates and shapes of corroded sections by the addition of structural carbon steel or high strength steel. Reweld or bolt loose connections as directed. Remove and replace loose bolts or rivets.
- 3.2.9 Repair of Displaced Sheet Pile: Remove displaced sheet pile and drive new pile in position of the original pile before it became displaced. Remove and replace deteriorated backing material. Backing material shall be approved by the Authorized Member Representative. Where directed, drive new sheet piling and add backing material in the void between old and new sheet piling.
- 3.2.10 Anchorage System: Repair tie rods and deadmen as directed.

Concrete Bridge Components

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of concrete bridge components. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Portland cement: ASTM C 150, Type I or Type III.
 - 2.2 Air-entraining Admixtures: ASTM C 260.
 - 2.3 Water-Reducing and Retarding Admixtures: ASTM C 494.
 - 2.4 Water: Potable water, free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
 - 2.5 Aggregate: ASTM C 33.
 - 2.6 Concrete Curing Materials:
 - 2.6.1 Membrane Curing Compound: Comply with ASTM C 309, Type I. Curing compound shall not be used where bituminous concrete surfaces will be added unless certified not to affect adherence of the surface.
 - 2.6.2 Vapor Barrier: A .004-inch thick polyethylene film complying with ASTM C 171.
 - 2.6.3 Burlap: Fed. Spec. CCC-C-467.
 - 2.7 Reinforcement:
 - 2.7.1 Reinforcement Bars: ASTM A 615, Grade 40 or 60.
 - 2.7.2 Welded Wire Fabric: ASTM A 185 for plain fabric; ASTM A 496 for deformed wire fabric.
 - 2.7.3 Accessories: Comply with CRSI "Manual of Standard Practice of Reinforced Concrete Construction."
 - 2.7.4 Prestressing Steel Strand: ASTM A 416, Grade 250.
 - 2.8 Formwork:
 - 2.8.1 Form Ties: Watersealing snap-in type with a minimum working strength of 3,000 psi.
 - 2.8.2 Plywood for Forms and Liners: DOC PS 1, minimum grade B-B High Density Concrete Form Overlay, Class I.
 - 2.8.3 Formwork Lumber: Straight and clean. All nails shall be withdrawn and surfaces in contact with concrete shall be thoroughly cleaned before reuse.
 - 2.9 Epoxy Bonding Compound: A 100 percent solids, moisture insensitive, epoxy resin system complying with Fed. Spec. FF-G-450.
 - 2.10 Concrete Sealer: A colorless liquid complying with Fed. Spec. TT-C-800.
 - 2.11 Poured Joint Sealers:
 - 2.11.1 Cold-Poured Joint Sealer: CE CRD-C-527.
 - 2.11.2 Hot-Poured Joint Sealer: AASHTO M173.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 General: Provide scaffolding, falsework, and cofferdams as required for access to the work.

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- 3.1.2 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all temporary pavement markings and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.
- 3.1.3 Formwork: ACI 347 and ACI 318. Use plywood or metal forms for exposed surfaces. All exposed external corners of concrete shall be chamfered.
- 3.1.4 Reinforcement:
 - 3.1.4.1 Fabrication: ACI 315 and ACI 318.
 - 3.1.4.2 Cover: Concrete protection for reinforcement shall comply with AASHTO Standard Specifications for Highway Bridges, Section 1.5.6.
- 3.1.5 Concrete Mixtures:
 - 3.1.5.1 General: The proportions of cement, aggregate, and water shall be selected by the Contractor in compliance with ACI 318 to provide a plastic and workable mix. Concrete shall be mixed in compliance with ASTM C 94. Concrete not otherwise indicated shall be Class A Concrete. Final mix proportions shall be subject to the approval of the Authorized Member Representative.
 - 3.1.5.2 Class A concrete shall have a strength of 4,000 psi after 28 days and a maximum slump of 4 inches. Concrete shall contain 7 bags cement per cubic yard and 4 to 6 percent entrained air by volume.
 - 3.1.5.3 Class B concrete shall have a strength of 4,000 psi after 28 days, contain 8 bags of cement per cubic yard, and have a maximum slump of 4 inches. Concrete shall be 3/8 inch maximum aggregate size and contain 6 to 9 percent entrained air by volume.
 - 3.1.5.4 Class C concrete shall have a strength of 4,000 psi after 28 days, contain 8 bags of cement per cubic yard, and have a maximum slump of 4 inches. Concrete shall be 1-1/2 inch maximum aggregate size and contain 6 to 9 percent entrained air by volume.
 - 3.1.5.5 Patching mortar shall be a mix of 1 part cement and 2 parts fine aggregate.
 - 3.1.5.6 Grout for bonding new concrete to old shall consist of equal parts by weight of Portland cement and sand, mixed with sufficient water to form a stiff slurry.
 - 3.1.5.7 Non-shrink grout shall have a strength of 9,000 psi after 28 days. Mixtures to be placed in excess of 1 inch thick may include 3/8 inch pea gravel.
- 3.2 Installation:
 - 3.2.1 Placing Concrete:
 - 3.2.1.1 Deposit concrete as close as practicable to its final position to avoid segregation of materials. Do not retemper or remix concrete that has reached its initial set.
 - 3.2.1.2 Under Water: All concrete deposited under water shall be mixed in the proportions specified except that 10 percent additional cement shall be used in the mix. Concrete deposited under water shall be placed in still water and shall be carefully placed in its final position by means of a tremie and shall not be disturbed after being deposited. The tremie shall consist of a 10 inch or larger watertight tube. The discharge end shall be kept below the top of the deposited concrete until the batch is discharged. The flow shall be continuous and in no case shall be interrupted until the work is complete.
 - 3.2.2 Consolidating Concrete: Where practicable, thoroughly compact concrete with internal vibrators having a frequency of 8,000 vibrations per minute. Do not laterally move concrete with the vibrator. Where vibrators cannot be used, hand spade or rod concrete. Do not vibrate concrete placed under water.
 - 3.2.3 Protection and Curing: Concrete shall be cured for not less than 7 days for normal concrete or 3 days for high early strength concrete. Comply with ACI 305 and ACI 306 for protecting and curing concrete in hot and cold weather.
 - 3.2.4 Tests:
 - 3.2.4.1 Compressive Strength: Secure two specimens for each day's pour in compliance with ASTM C 172. Laboratory cure the specimens in compliance with ASTM C 31. Make compressive strength tests at the ages of 7 and 28 days in compliance with ASTM C 39.
 - 3.2.4.2 Slump Tests: Make two slump tests each day. Tests shall comply with ASTM C 143.

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- 3.2.4.3 Air Entrainment Tests: Make two air entrainment tests each day. Tests shall comply with ASTM C 231.
- 3.3 Maintenance and Repair Methods:
 - 3.3.1 Repair of Deteriorated Concrete:
 - 3.3.1.1 Remove deteriorated or unsound concrete down to sound concrete and to a minimum depth of 2 inches. If cover for reinforcing bars is 2 inches or less, remove concrete to completely expose the reinforcing in the repair area. Remove concrete to a minimum of 1-1/2 inches clear beyond reinforcing. Edges of the repair area shall be cut sharp, perpendicular to the face of the concrete surface, and at least 1 inch deep. Clean reinforcing of all rust and scale. Clean repair area of all loose or foreign material.
 - 3.3.1.2 Formwork shall be of such size and shape to restore the original lines of the structure. If jacketing is used for repair of deteriorated columns, piers, or piling, jacket forms shall be held in position by spacers and bands.
 - 3.3.1.3 Provide bonding coat of either epoxy-resin or Portland cement mortar bonding course.
 - 3.3.1.4 Patch with Class A concrete if average patch thickness is 4 inches or greater; use Class B concrete if average patch thickness is less than 4 inches.
 - 3.3.2 Repair of Transverse Cracks: Cut the crack in the shape of a "V" at the surface to approximately 2 to 3 inches wide. Completely fill the crack beyond the V-shaped portion with an epoxy bonding compound or epoxy grout. Apply epoxy bonding compound to the V-shaped portion of the crack and fill with a stiff mix of patching mortar.
 - 3.3.3 Patching PCC Bridge Deck:
 - 3.3.3.1 Saw cut along all areas to be patched not bounded by existing joints. Cuts shall be vertical and at right angles to the pavement. Make cuts to a depth of 3/4 inch or the top of reinforcing, whichever is less.
 - 3.3.3.2 Completely remove loose and unsound concrete in the patch area. In no case remove less than 3/4 inch. Exercise care to prevent injury to load transmission devices, tie bars, or adjacent concrete to remain in place.
 - 3.3.3.3 Reinforcing: All existing reinforcement bars shall remain in place except any existing reinforcing bars that have a loss of more than 25 percent of their cross section through corrosion shall be replaced.
 - 3.3.3.4 Provide bonding coat of either epoxy-resin or Portland cement grout bonding course to all surfaces of existing concrete is to be in contact with new concrete.
 - 3.3.3.5 After the grout bonding course has been applied, place Class B concrete in patches less than 2 inches deep and Class C concrete in patches 2 inches or deeper. Consolidate concrete. Finish the concrete to the elevation of the adjacent surface. The surface of the new concrete shall be broomed to produce a light, corrugated texture.
 - 3.3.3.6 Cure the concrete by the burlap blanket method, AASHTO M182. Do not apply a waterproofing membrane or overlay until concrete has been allowed to dry 3 days after completion of curing.
 - 3.3.4 Sealing Cracks and Joints in PCC Bridge Deck: Remove excess existing bituminous sealer, dirt, stones, or other foreign matter from the concrete surface along cracks and joints. The sealing material shall be placed so that joints are completely filled from the bottom to top. Place sufficient compound in the joint so that the compound will be flush with the surface of the adjacent surfacing upon completion of the pouring operation. Dust the sealant lightly with Portland cement, finely pulverized limestone dust, pulverized calcium carbonate, calcium silicate, or other finely divided inert material or cover with a tape that will adhere to the concrete.

DIVISION 4-MASONRY

Unit Masonry

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of facing brick, concrete block, glazed concrete unit masonry, sound-absorbing unit masonry, clay wall tile, sound-absorbing structural glazed tile, glass unit masonry, and vitrified clay flue liners. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations.

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Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Facing Brick:

2.1.1 Facing brick units shall be of standard size, texture, and color and shall conform to ASTM C 216, Grade SW.

2.1.2 Glazed brick units shall be of standard size and color and shall conform to ASTM C 216, Grade S.

2.2 Concrete Block:

2.2.1 Solid Load-Bearing Concrete Block: ASTM C 145.

2.2.2 Hollow Load-Bearing Concrete Block: ASTM C 90.

2.2.3 Nonload-Bearing Concrete Block: ASTM C 129, Type I.

2.2.4 Patterned concrete block: compatible with existing in dimension and appearance.

2.2.5 Architectural or decorative concrete block: split face units shall be hollow concrete masonry units conforming to the applicable requirements of ASTM C 90. Color, pattern, and texture shall be compatible with existing or as selected by the Authorized Member Representative.

2.3 Glazed Concrete Unit Masonry:

2.3.1 Factory-applied, pre-faced, concrete masonry units shall be of standard shapes and sizes conforming to ASTM C 90, Grade N or Type 1.

2.3.2 Facing components shall conform to ASTM C 744.

2.3.3 Units shall be smooth and colored with satin gloss finish.

2.4 Sound-Absorbing Unit Masonry:

2.4.1 Sound-absorbing masonry units shall be of standard shapes and sizes conforming to ASTM C 90 or ASTM C 129, as applicable.

2.4.2 Slots in the masonry unit cavities shall be narrow slots in empty cavities or wide slots with fibrous fillers in cavities, as applicable, for desired sound transmission absorption.

2.4.3 Prefinished units shall have ground-face or glazed surface.

2.5 Clay Wall Tile:

2.5.1 Load-Bearing Wall Tile hollow units shall be of standard shapes and sizes conforming to ASTM C 34, Grade LB or LBX.

2.5.2 Nonload-bearing wall tile shall be of standard shapes and sizes conforming to ASTM C 56, Grade NB.

2.5.3 Clay wall tile color shall conform to ASTM C 212 or ASTM C 126.

2.5.4 Plaster base Finish shall conform to ASTM C 34 and ASTM C 56.

2.6 Sound-Absorbing Structural Glazed Tile: Sound-absorbing tile units shall be of standard shapes and sizes conforming to ASTM C 212 or ASTM C 126. The required Sound Transmission Class (STC) shall be in accordance with ASTM E 90.

2.7 Glass Unit Masonry:

2.7.1 Glass block hollow units shall be classified for 3/4 hour of fire exposure in accordance with UL Fire Exposure Classification 9 (UL-9): "Fire Test for Window Assemblies."

2.7.2 Insulation R-values for the following unit face sizes shall be: 6 inches by 6 inches equals R-2; 8 inches by 8 inches equals R-1.96; and 12 inches by 12 inches equals R-1.92.

2.7.3 Unit face pattern shall be of a standard design to provide desired light transmission, brightness, and privacy.

2.7.4 Mortar shall be Type S in accordance with ANSI A41.1 and ASTM C 270.

2.8 Refractories: Vitrified clay flue lining shall be rectangular, round, or modular, of standard sizes, and shall conform to ASTM C 315.

2.9 Mortar Materials and Mixing:

2.9.1 Hydrated Lime: ASTM C 207, Type S or N.

2.9.2 Admixtures: Fed. Spec. SS-C-1960/1 and consisting of water-repellant stearates and pozzolanic plasticizers in powder form.

2.9.3 Portland cement shall comply with ASTM C 150, Type I or II. Masonry cement shall comply with ASTM C 91.

2.9.4 Coarse aggregate for masonry grout shall comply with ASTM C 404. Do not use aggregate containing any substance that will stain masonry.

2.9.5 Sand shall comply with ASTM C 144 or ASTM C 33, paragraph 3.1.

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- 2.9.6 Mortar shall comply with ASTM C 270 and in the proportions, measured in parts by volume, as required for the application.
- 2.10 Masonry Accessories:
 - 2.10.1 Reinforcement bars for lintels, bond beams, pilasters, and other masonry reinforcement shall comply with ASTM A 615, Grade 40.
 - 2.10.2 Joint reinforcement shall be prefabricated from zinc-coated cold drawn steel wire complying with ASTM A 641, Class 2 or 3 coating. Side wires shall be 8-gauge deformed wire; truss rods shall be 9-gauge smooth or deformed wire.
 - 2.10.3 Wire-Mesh Ties shall be 16-gauge or larger diameter, zinc-coated steel wire woven into 1/2-inch mesh and cut into strips 1 inch narrower than the width of walls in which they are used. Zinc-coated wire shall comply with ASTM A 641, Class 2 or 3 coating.
 - 2.10.4 Rigid steel anchors shall be a minimum of 1 inch x 1/4 inch x 26 inches long with each end turned up not less than 2 inches. Anchors shall be zinc-coated complying with ASTM A 123.
 - 2.10.5 Seals and gaskets for control and expansion joint shall be of closed cell natural or synthetic rubber.
- 2.11 Water-repellent materials for concrete block shall be solvent type silicone complying with Fed. Spec. SS-W-110; transparent, nonstaining, 5 percent silicone resin.
- 3.0 EXECUTION:
 - 3.1 Water repellent application shall be spray or brush in a single coat, using not less than one gallon for each 80 square feet covered. A flood coating with a rundown of material on the surface of from 6 inches to one foot shall be produced.

Scaffolding - Tubular Steel

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tubular steel scaffolding. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Tubular steel or aluminum scaffolding system shall comply with OSHA Safety and Health Standards, Section 29 CFR, 1926/1910.
- 3.0 EXECUTION: (Section not used.)

Brickwork

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brickwork. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Face Brick: Compatible with existing in mechanical characteristics, permeability, and appearance and shall comply with ASTM C 216.
 - 2.2 Common Brick: Compatible with existing in mechanical characteristics, permeability, and appearance and shall comply with ASTM C 62.
 - 2.3 Concrete Brick: ASTM C 55.
 - 2.4 Mortar Materials and Mixing:
 - 2.4.1 Hydrated Lime: ASTM C 207, Type S or N.
 - 2.4.2 Admixtures: Fed. Spec. SS-C-1960/1 and consisting of water-repellent stearates and pozzolanic plasticizers in powder form.
 - 2.4.3 Portland cement shall comply with ASTM C 150, Type I or II. Masonry cement shall comply with ASTM C 91.
 - 2.4.4 Coarse aggregate for masonry-grout shall comply with ASTM C 404. Do not use aggregate containing any substance that will stain masonry.
 - 2.4.5 Sand shall comply with ASTM C 144.
 - 2.4.6 Colored masonry cement shall be a factory formulated mixture complying with Fed. Spec. SS-C-1960/1.
 - 2.4.7 Mortar shall comply with ASTM C 270 and in the proportions, measured in parts by volume, as

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required for the application.

2.5 Masonry Accessories:

- 2.5.1 Reinforcement bars for lintels, bond beams, pilasters, and other masonry reinforcement shall comply with ASTM A 615, Grade 40.
- 2.5.2 Joint reinforcement shall be prefabricated from zinc-coated, cold drawn steel wire complying with ASTM A 641, Class 2 or 3 coating. Side wires shall be 8-gauge deformed wire; truss rods shall be 9-gauge smooth or deformed wire.
- 2.5.3 Wire-mesh ties shall be 16-gauge or larger diameter, zinc-coated steel wire woven into 1/2-inch mesh and cut into strips 1 inch narrower than the width of walls in which they are used. Zinc-coated wire shall comply with ASTM A 641, Class 2 or 3 coating.
- 2.5.4 Rigid steel anchors shall be a minimum of 1 inch x 1/4 inch x 26 inches long with each end turned up not less than 2 inches. Anchors shall be zinc-coated complying with ASTM A 615, Class 2 or 3.
- 2.5.5 Seals and gaskets for control and expansion joint shall be of closed cell natural or synthetic rubber.
- 2.5.6 Nylon Rope for weep holes shall be 3/8 inch diameter by 12 inches long.
- 2.5.7 Wire brick ties shall be fabricated from 3/16-inch diameter zinc-coated steel wire conforming to ASTM A 641, Class 2 or 3 coating. Ties shall be at least 4 inches wide and embedded 4 inches into backup material.

2.6 Flashing:

2.6.1 Through-wall flashing shall be one of the following:

- 2.6.1.1 Five-ounce copper sheet shall comply with ASTM B 370, cold-rolled temper, coated both sides with a factory-applied elastic asphalt compound complying with ASTM D 449.
- 2.6.1.2 Ten-ounce rib-formed copper sheet shall comply with ASTM B 370, cold-rolled temper, with ribs approximately 3/16-inch high and spaced not more than 3 inches apart.
- 2.6.1.3 Rib-formed 32-gauge, Type 302 or 304 stainless steel sheet shall comply with ASTM A 167. Deformations shall be approximately 3/16 inch high and shall be spaced not more than 3 inches apart.

2.6.2 Flashing beneath coping stone shall be one of the following:

- 2.6.2.1 Stainless steel sheet shall comply with ASTM A 167, Type 302 or 304, finish No. 2P, dull, 26-gauge.
- 2.6.2.2 Copper sheet shall comply with ASTM B 370, cold-rolled temper, 16-ounce per square foot.
- 2.6.2.3 Aluminum-sheet shall comply with ASTM B 209, alloy 3003, temper H-14, .032 inch thick.
- 2.6.2.4 Galvanized steel Sheet, 26-gauge, shall comply with ASTM A 527, and coating shall comply with ASTM A 525, designation G90.

2.7 Caulking and sealants shall comply with Fed. Spec. TT-S-00227, Type II, Class A or Fed. Spec. TT-S-00230, Type II, Class A.

- 2.7.1 Backup material for sealants shall be closed-cell resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, oilless dry jute, or rope yarn.

- 2.7.2 Bond preventative material shall be pressure sensitive polyethylene tape, aluminum foil, or wax paper.

2.8 Water-repellent materials for facing brick masonry shall be solvent type silicone complying with Fed. Spec. SS-W-110; transparent, nonstaining, 5 percent silicone resin.

3.0 EXECUTION:

- 3.1 Brick shall be laid with completely filled mortar joints in line with and of equal width to existing jointing.

- 3.2 3/8-inch nylon weep rope, 24 inches apart, shall be provided in the head mortar in the first course above the top of steel lintels, shelf angles, and ledge supports and where flashings and waterproofing terminate in horizontal joints. 3.3 Water Repellent Application shall be spray or brush in a single coat, using not less than one gallon for each 100 square feet covered. A flood coating with a rundown of material on the surface of from 6 inches to one foot shall be produced.

Exposed Aggregate Surface Concrete Walls

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of exposed aggregate surface concrete walls. Products shall match existing materials and/or shall be as

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directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Concrete Materials and Mixing:

2.1.1 Portland cement: ASTM C 150, Type I or IA.

2.1.2 Shrinkage-Compensating Cement: Portland cement containing a stable expansive chemical compound such as calcium sulfoaluminate.

2.1.3 Aggregate: ASTM C 33; aggregate for exposed aggregate concrete shall match existing, if appropriate.

2.1.4 Admixtures: Submit manufacturer's literature for all fixtures proposed for the work.

2.1.5 Curing Compounds: ASTM C 309, Type 1.

2.1.6 Epoxy Bonding Agent: ASTM C 932.

2.2 Concrete Formwork, Reinforcement, and Accessories:

2.2.1 Formwork: plywood form and liners shall be minimum grade B-B High Density Concrete Form Overlay, Class I, complying with APA.

2.2.2 Reinforcement:

2.2.2.1 Reinforcement Bars: ASTM A 615, Grade 40 or Grade 60.

2.2.2.2 Welded Wire Fabric: ASTM A 185. Where welded wire fabric is needed, use No. 6 gauge wire at 6-inch spacing in each direction.

2.2.2.3 Accessories for proper installation of reinforcement shall comply with CRSI "Manual of Standard Practice for Reinforced Concrete Construction."

2.2.2.4 Reinforcement fabrication shall comply with ACI 318 and ACI 315.

2.3 Curing and Climatic Conditions:

2.3.1 Comply with ACI 306 and ACI 305 for protecting and curing concrete in cold and hot weather.

2.3.2 Immediately after finishing, begin curing slatwork by covering with constantly saturated moisture retaining fabrics, impervious sheeting, or membrane curing compounds.

2.3.3 Apply membrane curing compounds as required.

3.0 EXECUTION:

3.1 Preparation when attaching to existing surfaces:

3.1.1 Remove all defective material by chipping and cutting to sound concrete in order to secure a solid foundation.

3.1.2 Square cut or undercut the edges to a minimum depth of one inch to form a key.

3.1.3 Cut concrete out from behind exposed reinforcing bars and rods.

3.1.4 All exposed reinforcing shall be cleaned of rust and primed.

3.2 Installation:

3.2.1 Formwork Requirements:

3.2.1.1 Formwork shall comply with ACI 347. Joints in forms shall be horizontal or vertical.

3.2.1.2 Use plywood, fiberglass, or metal forms.

3.2.2 Reinforcement shall be repaired when rusted through. Rods at least 12 inches long shall be wired to the failed rods. In closing gaps, rods shall lap existing rods by at least 12 inches or 30 diameters, whichever is greater.

3.2.3 Mixing and Transporting Concrete: Ready-mixed concrete shall be mixed and delivered to the project in compliance with ASTM C 94. Job-mixed concrete shall comply with the requirements of ACI 318.

3.2.4 Mixing Epoxy-Resin Patching Mortar: Mix thoroughly with a power mixer at low speeds (150 - 400 rpm) until material attains uniform color and consistency (minimum time of two to three minutes at 70 F).

Terra Cotta

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of terra cotta. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

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2.0 PRODUCTS:

- 2.1 Terra Cotta: Hard-burned, nonload-bearing clay building units.
- 2.2 Material for Setting Terra Cotta:
 - 2.2.1 Cement shall be Portland cement complying with ASTM C 150, Type I or Type IA.
 - 2.2.2 Sand for mortar shall be tested in compliance with ASTM C 40 and C 117. Sand shall have a fineness modulus between 2.0 and 2.5.
 - 2.2.3 Lime shall comply with ASTM C 5.
 - 2.2.4 Hydrated lime, if allowed, shall comply with ASTM C 206.
- 2.3 Mortar for the resetting of terra cotta shall be composed of one part Portland cement, 3 1/2 parts sand, and 1/2 part lime putty by volume.
- 3.0 EXECUTION:
 - 3.1 Restoration of Terra Cotta Surface:
 - 3.1.1 Remove all loose chips or flaking pieces from the surface. Cut mortar out of all joints to a depth of 3/8 inch from the face of the terra cotta.
 - 3.1.2 Build up voids and Irregularities in the surface using successive coats of an epoxy caulk consisting of a 2-component 100 percent flexible-cured, thixotropic epoxy suitable for vertical surfaces.
 - 3.1.3 Give all patched surfaces of the terra cotta two coats of an epoxy glaze consisting of 2-component, 100 percent epoxy, high-solids content, flexible cured, interior-exterior, high-gloss glaze.
 - 3.2 Replacement of Terra Cotta:
 - 3.2.1 Terra cotta units required to be replaced shall be carefully removed to avoid disturbing adjacent units.
 - 3.2.2 Set replacement units plumb, level, true to line, and in a manner to match existing terra cotta.
 - 3.3 Sealing Terra Cotta Joints:
 - 3.3.1 Remove joint material to a depth of 3/8 inch or to the depth of sound material.
 - 3.3.2 Clean the joints thoroughly.
 - 3.3.3 RegROUT joints and tool surface to match appearance of adjacent floor.

Stonework

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of stonework. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Indiana Limestone: ASTM C 568, Category II.
 - 2.2 Field Stone: Compatible with existing.
 - 2.3 Marble: ASTM C 503.
 - 2.4 Building Sandstone: Compatible with existing.
 - 2.5 Structural Granite: ASTM C 615.
 - 2.6 Masonry Accessories:
 - 2.5.1 Fastenings for Stone: Furnish and install all anchors, dowels, clamps, clips, bolts, and other attachments necessary to fasten and anchor stone in place. Steel wire shall be zinc-coated in compliance with ASTM Specification A 641 for Class 2 coating. Stainless steel shall be used to fabricate the sizes, shapes, and types of all anchoring and fastenings, except wire.
 - 2.5.2 Slots for dovetail anchors shall be of 24-gauge commercial galvanized sheet metal, formed to give double anchorage for shoulder to forms.
 - 2.5.3 Dovetail anchors for fastening masonry to concrete shall be compatible with anchor slots.
 - 2.6 Epoxy Mortar Patching Materials:
 - 2.6.1 Epoxy Adhesive shall be a two-component epoxy consisting of epoxy resin and hardener and complying with the following performance requirements:
 - 2.6.1.1 Tensile Elongation: 2.5 percent minimum per ASTM D 638.
 - 2.6.1.2 Tensile Strength: 3,500 psi minimum per ASTM D 638.
 - 2.6.1.3 Compressive Strength: 6,000 psi minimum per ASTM D 695.
 - 2.6.1.4 Water Absorption (24 hours): 0.5 percent ASTM D 570.
 - 2.6.2 Stone filler shall be stone of the same type and color as the stone being patched and shall be

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- ground to approximately the texture of coarse sand.
- 2.6.3 Pigments shall be of the type that will not react with the epoxy adhesive.
- 2.6.4 Thickening powder shall be silicon carbide powder or asbestos powder.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Removal of Deteriorated Material: Chip out all deteriorated stone in areas to be patched to sound material. Square cut or undercut edges to a minimum 1-inch depth to form a key for patching material.
- 3.1.2 Cleaning: Clean area to be patched and dry thoroughly.
- 3.2 Installation:
- 3.2.1 Patching Stone:
- 3.2.1.1 Within 30 minutes after mixing epoxy adhesive, apply mortar to the area to be patched. Build up mortar beyond the adjacent surface to allow grinding to match existing surface textures. 3.2.1.2 Allow patching mortar to cure for a minimum of 24 hours before grinding or chiseling.
- 3.2.2 Replacing Stone:
- 3.2.2.1 Cut replacement stone accurately to shape and dimensions with joints and bonding as required.
- 3.2.2.2 Exterior sill stones, panels, copings, cornice, and similar stones with exposed top surfaces shall be cut to set on their natural beds and shall have a wash on the top surface.
- 3.2.3 Setting Stone:
- 3.2.3.1 Where stone is backed up with concrete or concrete blocks, coat the face of the backup material with an approved non-staining asphalt complying with ASTM D 449, Type D.
- 3.2.3.2 Provide expansion or control joints in stonework as required.
- 3.2.3.3 Install pressure sensitive polyethylene tape or aluminum foil bond breaker complying with Fed. Spec. QQ-A-1876, prime edges of stone, and fill remainder of joint with caulking and sealing compound.
- 3.2.4 Pointing and Cleaning:
- 3.2.4.1 Upon completion, all joints shall be carefully pointed.
- 3.2.4.2 Clean stone surfaces using fiber brushes and trisodium phosphate solution.

Masonry Restoration

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for general masonry restoration. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Abrasive blasting material shall be a combination of friable, finely graded, clean particles, containing approximately 97.8 percent silicates and other minerals by weight. The material shall contain no free silica nor any crushed or quarried sand.
- 2.1.1 Sieve analysis for wet blasting aggregate shall be:
- | Sieve Mesh (Percent Retained) | Min. | Max. |
|-------------------------------|------|------|
| 28 | 5 | 1 |
| 35 | 22 | 32 |
| 48 | 73 | 90 |
- 2.1.2 Aggregate for Dry Blasting: The size of aggregate for dry blasting shall be determined by careful material analysis for the given application.
- 2.2 Mortar Materials:
- 2.2.1 Hydrated Lime: ASTM C 207, Type S or N.
- 2.2.2 Cement:
- 2.2.2.1 Portland cement: ASTM C 150, Type I or II.
- 2.2.2.2 Masonry Cement: ASTM C 91.
- 2.2.2.3 Cement shall not have more than 0.60 percent alkali (sodium oxide) nor more than 0.15 percent water soluble alkali in the combination of lime and cement.
- 2.2.3 Aggregate:

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- 2.2.3.1 Coarse Aggregate: ASTM C 404 and not containing any substance that will stain the masonry.
- 2.2.3.2 Sand for Use with Masonry: ASTM C 144. Sand shall not contain any substance that will stain masonry.
- 2.2.3.3 Sand for Use with Stone: ASTM C 33.
- 2.2.4 Admixtures: Fed. Spec. SS-C-1960/1 consisting of water-repellent stearates and pozzolanic plasticizers in powder form. Salt, anti-freeze liquid, accelerator, or other admixtures shall not be used.
- 2.2.5 Colored Masonry Cement: Fed. Spec. SS-C-1960/1, Type II. Mortar colors shall be high purity, chemically inert, color-fast, and alkali-proof mineral oxides. Color shall not exceed 15 percent of the cement weight; carbon black shall not exceed 3 percent of the cement weight.
- 2.2.6 Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
- 2.2.7 Mortar proportions shall be as follows:

Portland Cement	Hydrated Lime	Sand
1	1	6

Add pigments if required.
- 2.3 Grout: Grout shall be a flexible, non-shrink, non-staining grout specifically formulated for use in masking and grouting.
- 2.4 Masking material shall be a special masking tape, compatible with the grout technique.
- 2.5 Caulking and Sealants shall comply with Fed. Spec. TT-S-00227, Type II, Class A or Fed. Spec. TT-S-00230, Type II, Class A.
- 2.6 Backup material for sealants shall be closed-cell resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, oilless dry jute, or rope yarn.
- 2.7 Bond preventive material shall be pressure sensitive polyethylene tape, aluminum foil complying with Fed. Spec. QQ-A-1876 or wax paper complying with Fed. Spec. A-A-883.
- 3.0 EXECUTION:
- 3.1 Preparation:
 - 3.1.1 General: Clean masonry surfaces free from efflorescence, mildew, fungus, graffiti, vines, tentacles, and all other blemishes. Wire brushing or sandblasting will not be allowed for paint removal.
 - 3.1.2 Deteriorated Material: For repointing, tuck pointing, masking, and grouting, cut out old mortar in brickwork to a minimum depth of 1/2 inch and cut out old mortar in stonework to a minimum depth of 1 inch. Deteriorated material shall be removed to the full depth of mortar disintegration. Following cleaning, blow joints clean to remove all dust, dirt, and remaining loose aggregate.
- 3.2 Masonry Cleaning:
 - 3.2.1 Washing: A specialized aeration type nozzle shall be used to project water at 1,000 or 1,200 psi pressure. Any evidence of masonry material damage or removal shall be cause for immediate work stoppage.
 - 3.2.2 Steam Cleaning: Scrub all surfaces to be cleaned with a mild soap or detergent. Apply steam at a pressure of 10 to 30 psi to thoroughly flush and remove all foreign matter and to neutralize and rinse away all cleaning solutions.
 - 3.2.3 Chemical Cleaning:
 - 3.2.3.1 Acidic products shall be used only on acid-tolerant materials such as granite, sandstone, and unglazed brick.
 - 3.2.3.2 Alkaline cleaners shall be used only on acid-sensitive materials such as limestone and marble.
 - 3.2.3.3 Surfactants shall be used only on polished granite or glazed brick.
 - 3.2.4 Abrasive Blasting:
 - 3.2.4.1 Wet aggregate blasting shall be performed using a specialized nozzle that combines specified aggregate, clean water and air. Water pressure shall not exceed 150 psi. Air pressure shall not exceed 70 psi. After cleaning, rinse surfaces to remove aggregate and loosened soil.
 - 3.2.4.2 Dry aggregate blasting shall be continuous bombardment of the masonry surface with a finely divided aggregate. Air pressure shall be between 20 and 100 psi. After cleaning, rinse surfaces to remove aggregate and loosened soil.

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3.2.5 Repointing and Tuckpointing:

3.2.5.1 Pointing of Brickwork: Compact new mortar in deep cuts in successive layers until a uniform joint depth throughout has been attained. After deep joints have been leveled, fill all joints with mortar and pack the back corners of the joint.

3.2.5.2 Pointing of stonework: compact new mortar in deep cuts in successive layers until a uniform joint depth throughout has been attained. After deep joints have been leveled, fill joints with a layer of mortar 1/2 inch deep and pack the back corners of the joint. Approximately 1 hour later, apply another layer of mortar completely filling the joint.

3.2.5.3 Tooling: Tool the joint to match the appearance of the adjacent mortar joints with a round jointer to produce smooth, dense, concave joints.

3.2.6 Masking and Grouting:

3.2.6.1 Masking: Mask the face of each individual masonry unit, keeping the edge of the tape 1/16 inch away from all edges of the masonry unit to allow an overlap of the grouting material onto the masonry.

3.2.6.2 Grouting: Completely fill all joints, cracks, and voids with grout.

3.2.6.3 Cleaning: Keep all exposed masonry clean and free of mortar as work progresses. Clean masonry surfaces using fiber brushes and trisodium phosphate solution. Rinse surfaces with clean water immediately after cleaning.

DIVISION 5-METALS

Structural Steel

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of structural steel. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. The contractor shall be responsible for all temporary shoring and/or bracing needed to support the construction. The structure may not be stable until all elements are in place.

2.0 PRODUCTS:

2.1 Structural Steel:

2.1.1 Carbon Grade Steel: ASTM A 36.

2.1.2 High-Strength Low-Alloy Steel: ASTM A 572.

2.1.3 Corrosion-Resistant High-Strength Low-Alloy Steel: ASTM A 242 or A 588.

2.1.4 Quenched and Tempered Alloy Steel: ASTM A 514.

2.1.5 Structural Tubing: ASTM A 500, Grade B or ASTM A 501.

2.1.6 Steel Pipe: ASTM A 53, Type E or Type S, Grade B.

2.2 Connections:

2.2.1 High-Strength Bolts: ASTM A 325 or A 490 including nuts and washers.

2.2.2 Carbon Steel Bolts: ASTM A 307, Grade A.

2.2.3 Carbon Steel Nuts: ASTM A 563, Grade A, Square or Hex Style.

2.2.4 Plain Washers, Other Than Those in Contact with High-Strength Bolts: ANSI B18.22.1, Type B.

2.3 Finish: Galvanized, ASTM A 123 and ASTM A 153 or ASTM A 386 or shop primer Fed. Spec. TT-P-86, Type I or II, or TT-P-645.

2.4 Fabrication: Fabrication shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Fabrication and assembly shall be done in the shop to the greatest extent possible. Ends shall be square within the tolerances for milled ends specified in ASTM A 6. Ungalvanized structural steelwork, except surfaces to be field welded or friction bolted, shall be prepared for painting in accordance with the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and primed with the specified paint. All welding shall be in accordance with AWS D1.1 and shall be performed by certified welders for the type of welds and positions indicated.

3.0 EXECUTION: Erection of structural steel shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

3.1 Connections: Anchor bolts and other connections between the structural steel and foundations shall

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- be provided and shall be properly located and built into connecting work.
- 3.2 Base Plates and Bearing Plates: Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be dry-packed solidly with bedding mortar.
 - 3.3 Galvanized Field Connections: Galvanized steel shapes shall be bolted connections only using galvanized bolts, nuts, and washers. No field welding of galvanized steel will be permitted.
 - 3.4 Welded Connections: Field welded structural connections shall be completed before load is applied. Quality of welds shall be as described in AWS D1.1. Welds determined to be defective shall be repaired at no additional expense to the member. All welds shall receive a visual examination. In addition to visual examination, fracture critical members shall receive other non destructive tests such as ultrasonic, radiographic and magnetic particle. Specific welds to receive this testing shall be as indicated on the drawings.
 - 3.5 Field Priming: After erection of ungalvanized structural steel, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

Steel Bridge Components

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of steel bridge components. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Structural Carbon Steel: ASTM A 36.
 - 2.2 High Strength Steel:
 - 2.2.1 High-Strength Low-Alloy Columbium-Vanadium Steel: ASTM A 572.
 - 2.2.2 High-Strength Low-Alloy Structural Steel with 50,000 psi Minimum Yield: ASTM A 588.
 - 2.2.3 High-Yield Strength Quenched and Tempered Alloy Steel Plate: ASTM A 514.
 - 2.2.4 Structural Steel for Bridges: ASTM A 709.
 - 2.2.5 High Strength Low-Alloy Structural Steel: ASTM A 242.
 - 2.3 Turned and Ribbed Bolts: High carbon steel turned and ribbed bolts shall comply with ASTM A 307.
 - 2.4 High Strength Steel Bolts, Nuts, and Washers: ASTM A 325.
 - 2.5 Electrodes for manual or arc welding shall comply with AWS A5.1 or AWS A5.5.
 - 2.6 Steel Forging: ASTM A 668 and of the class specified.
 - 2.7 Steel Castings: AASHTO M192 and of the class specified.
 - 2.8 Gray Iron Castings: AASHTO M105 and of the class specified.
 - 2.9 Malleable Castings: ASTM A 47, Grade 32510 or 35018.
 - 2.10 Rolled Copper-Alloy Plates: ASTM B 100, Alloy 510.
 - 2.11 Lead Plates: Comply with the requirements for common desilverized lead of ASTM B 29.
 - 2.12 Stud Shear Connectors: ASTM A 108, Grade 1015, 1017, or 1020, either semi- or fully killed.
 - 2.13 Rollers and Pins: ASTM A 36.
 - 2.14 Anchor Bolts:
 - 2.14.1 Cast-In-Place: ASTM A 307.
 - 2.14.2 Power Driven: Stainless steel with minimum penetration in concrete of 6 times bolt diameter.
 - 2.15 Rails: Section 4.2, Specifications for Steel Rails of AREA-01.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and

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Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.

- 3.1.2 Structural metal work shall comply with the following:
 - a. AISC Code of Standard Practice.
 - b. AWS Structural Welding Code as modified by the AASHTO Standard Specifications for Welding of Structural Steel Highway Bridges.
 - c. AREA-01.
 - d. AASHTO Standard Specifications for Highway Bridges.
- 3.1.3 Fabrication: Form shapes with sharp lines and angles and finish with smooth surfaces. Drill or ream bolt holes 1/16 inch larger than the diameter of the bolt. Provide welded shop connections wherever possible.
- 3.2 Maintenance and Repair Methods:
 - 3.2.1 Erection: bearing surfaces and surfaces to be in permanent contact shall be clean and free from dirt and scale. Ream holes that must be enlarged to admit bolts.
 - 3.2.2 Correction of Loose Connections: Remove loose rivets by cutting rivet heads off and removing the shank or by drilling. Torches shall not be used. Remove loose bolts in bolted connections. Bolts shall not be retightened. Thoroughly remove rust and scale around bolt and rivet holes by sandblasting or wire brushing. Install a new high strength bolt of the same size as the removed bolt or rivet, unless the hole has become enlarged and a larger bolt can be used. Tighten bolts by the turn-of-nut method.
 - 3.2.3 Repair of Corroded Material: Remove all rust and corrosion by and blasting or wire brushing. Strengthen corroded members by the addition of structural carbon steel or high strength steel.

Steel Trusses

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of steel trusses. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Steel Trusses:
 - 2.1.1 Structural Carbon Steel: ASTM A 36, unless otherwise indicated.
 - 2.1.2 High-Strength Low-Alloy Structural Steel: ASTM A 242, Grade 42.
 - 2.2 Steel Forgings: Forgings that are to be welded shall comply with Supplementary Provision S4 of ASTM A 668.
 - 2.3 Fasteners:
 - 2.3.1 High Strength Bolts, Nuts and Plain Hardened Washers: ASTM A 325.
 - 2.3.2 Anchor Bolts: ASTM A 307.
 - 2.4 Filler Metal for Welding: Electrodes for manual arc welding shall comply with AWS A5.1 or AWS A5.5.
 - 2.5 Field Repair of Shop Primer: Fed. Spec. TT-P-86.
- 3.0 EXECUTION:
 - 3.1 Structural Metals:
 - 3.1.1 Comply with AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" and "Code of Standard Practice," both as modified herein.
 - 3.1.2 Piping and electrical wiring conflicting with erection of members shall be removed and placed in a new position approved by the Authorized Member Representative. Provide temporary utilities and coordination to prevent outages during this period.
 - 3.1.3 Shop and field connections shall be high strength steel bolted unless otherwise indicated.
 - 3.1.4 All metal parts shall be shop-fabricated. Assemblies shall be fitted together in the shop and delivered complete and ready for installation. Welds shall be made by operators who have been previously qualified in compliance with AWS standards to perform the type of work required. Welds exposed to view shall be dressed smooth.
 - 3.1.5 Before members are assembled or installed, bearing surfaces to be in permanent contact shall be

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clean and free from dirt, scale, and corrosion. Immediately after cleaning add a prime coat of red lead paint. Drifting to enlarge holes will not be permitted. Holes that must be enlarged to admit bolts shall be reamed. Poor matching of holes caused by either shop errors or erection errors shall be cause for rejection by the Authorized Member Representative. Steel erected under this contract shall be cleaned of any dirt, mud, or grease and left in a condition to receive coatings.

- 3.2 Strengthening of Deteriorated Members: Remove corrosion by wire brushing, sanding, or other approved method. Strengthen as directed.
- 3.3 Correction of Loose Connections: Remove loose rivets by cutting rivet heads off and removing the shank. If necessary, remove the rivet shank by drilling. Remove loose bolts in bolted connections. Bolts shall not be retightened. Install a new high strength bolt of the same size as the removed bolt or rivet, and tighten by the turn-of-the-nut method.
- 3.4 Repair of Bearings and Anchor Bolts: Remove corrosion by wire brushing, sanding, or other approved method. Additional repair requirements shall be as directed.
- 3.5 Repair of Tie Rods and Bracing: Tighten loose tie rods to the snug tight condition. Remove corrosion by wire brushing, sanding, or other approved method. Strengthen as directed.

Steel Joists

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel joists. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Open Web Steel Joists: Steel joists shall conform to Steel Joist Institute SJI-01, K-Series. Joists shall be designed to support the loads given in the standard load table of SJI-01.
 - 2.2 Longspan Steel Joists and Deep Longspan Steel Joists: Steel joists shall conform to SJI-01, LH-Series or DLH-Series. Joists shall be designed to support the loads given in the standard load tables of SJI-01.
 - 2.3 Accessories and Fittings: Accessories and fittings, including end supports and bridging, shall be in accordance with the standard specifications under which the members were designed.
 - 2.4 Shop Painting: Joists and accessories shall be shop-painted with a rust-inhibiting primer paint.
- 3.0 EXECUTION: Joists shall be accurately set, and end anchorage shall be compatible with the bearing surface and the expansion requirements. Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging. Abraded, corroded, and field-welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

Steel Decks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel roof and floor deck. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Deck Units: Deck material shall be ASTM A 611, Grade C for painted deck and ASTM A 446, Grade A for galvanized deck. Deck units shall conform to the SDI Design Manual for Composite decks, form decks, roof decks, and cellular metal floor deck with Electrical Distribution. units shall be fabricated of 22-gauge or thicker steel and shall be galvanized with ASTM A 525, G90 coating class or painted with one coat of manufacturer's standard paint.
 - 2.2 Accessories: Metal accessories shall be of the same material as the deck and have minimum gauge as follows: saddles, 18-gauge; welding washers, 10-gauge; cant strip, 22-gauge; other metal accessories, 20-gauge; unless otherwise indicated.
 - 2.3 Closure Plates: Voids above interior walls shall be closed with 22-gauge sheet metal where directed. Open deck cells at parapets, end walls, eaves, and openings through floors and roofs shall

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- be closed with 22-gauge sheet metal.
- 2.4 Miscellaneous steel shapes: ASTM A 36.
- 3.0 EXECUTION:
- 3.1 Erection of deck and accessories shall be in accordance with the SDI Design Manual for Composite decks, form decks, roof decks, and cellular metal floor deck with Electrical Distribution. The deck units shall be placed on secure supports, properly adjusted, and aligned at right angles to supports before being permanently secured in place. The maximum uniform distributed storage load shall not exceed the design live load.
- 3.2 Attachment: The deck units shall be welded or fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners to supports in accordance with requirements of the SDI Design Manual for composite decks, form decks, roof decks, and cellular metal floor deck with Electrical Distribution.
- 3.3 Repair of Coatings: Welds and deck finish damage shall be touched up with an approved galvanizing repair paint for galvanized surfaces or the same type used for shop primer for painted surface.
- 3.4 Openings through deck: holes and openings required shall be drilled or cut, reinforced, and framed for rigidity and sufficient load-carrying capacity. Holes less than 6 inches across require no reinforcement. Openings 6 to 12 inches across shall be reinforced by 22-gauge steel sheet at least 12 inches wider and longer than the opening and be fastened to the steel deck a maximum of 12 inches on center. Openings larger than 12 inches shall be reinforced by steel angles on opposite sides of the opening and at a right angle to the deck ribs. Both sides of the angles shall be fastened to each rib. Angles shall extend at least two ribs beyond each side of the opening.

Anchor Bolts and Expansion Anchors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of anchor bolts and expansion anchors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Anchor Bolts and Nuts: ASTM A 307; Hot-dipped galvanized, ASTM A 153.
- 2.2 Flat Washers: ANSI B18.2.1, of the same material as bolt.
- 2.3 Expansion Anchors:
- 2.3.1 Lead Shield Type: Fed. Spec. FF-S-325, Group I, Type 1, Class 1.
- 2.3.2 Wedge Type: Fed. Spec. FF-S-325, Group II, Type 4, Class 1 or 2.
- 2.3.3 Self-Drilling Type: Fed. Spec. FF-S-325, Group III, Type 1.
- 2.4 Fabrication:
- 2.4.1 Anchor bolts shall be "J" type for use in concrete or hooked type for use in masonry. All bolts shall be hot-dipped galvanized and furnished complete with nut and washer.
- 2.4.2 Expansion anchors shall be of standard manufacture and unless otherwise specified shall be galvanized or cadmium-plated in accordance with Fed. Spec. FF-S-92.
- 3.0 EXECUTION:
- 3.1 Anchor bolts shall either be cast in new concrete or regouted in place with non-shrinking grout.
- 3.2 Expansion anchors shall be of the type best suited for the work. Embedment shall be as directed but in no case less than six times the bolt diameter. Minimum distance between the anchor center line and the edge of concrete shall not be less than 4-1/2 times the diameter of the hole in which anchor is installed.

Metal Stairs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal stairs. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Steel Plates, Shapes, and Bars: ASTM A 36.
- 2.2 Steel Bar Grating: ASTM A 569.
- 2.3 Gray Iron Castings: ASTM A 48, Class 30.
- 2.4 Malleable Iron Casting: ASTM A 47.
- 2.5 Cast Aluminum: ASTM B 26 or B 108.
- 2.6 Metal Pan Treads: Pressed or structural steel pans, ASTM A 446, Grade B, shop coated, with a minimum depth of 2 inches for concrete fill. 2.7 Cast Metal Treads shall have an integral non-skid surface.
- 2.8 Grating and metal pan treads shall have cast metal non-skid nosings. 2.9 Finish: Steel plates, shapes, bars, and grating shall be galvanized in accordance with ASTM A 386 or primed with fabricator's standard shop primer as directed.
- 2.10 Fabrication: stair units shall be shop welded or bolted. Units shall be shop-assembled to ensure fit. Stairs are to be shipped in the largest units practical to reduce field erection time. All fabrication shall conform to AISC Manual and ASTM A 6.
- 3.0 EXECUTION:
- 3.1 Erection: Erect stairs level and plumb. Treads shall be level both front to back and across the width. Stair units shall be securely fastened to floors and landings. Field erection shall be in accordance with AISC Manual except that connections shall be bolted only.
- 3.2 Repair of Coatings: Connections and abrasions in the shop coating shall be touched up with an approved galvanizing repair paint or primer to match shop primer.

Pipe and Tube Railings

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of handrailings and ladders. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Post and Rails: Steel pipe, ASTM A 53, Type E or S, Grade B, Schedule 40.
- 2.2 Bars and Rungs: ASTM A 36.
- 2.3 Finish: Galvanized, ASTM A 123 or shop primer, Fed. Spec. TT-P-86, Type I or II; TT-P-645.
- 2.4 Fabrication:
- 2.4.1 Handrailings shall be smooth, with all projecting joints and sharp corners ground smooth. Welded joints shall be flush type. Members shall be neatly coped and continuously welded at all junctions of posts and rails. Flattening of the rail or post ends at junctions of posts and rails will not be permitted. Fittings or other connectors shall not be used at junctions of posts and rails.
- 2.4.2 Ladders: Rails shall be angle or flat bars. Rungs shall be round or square bars and shall project through rails. Welds shall be continuous.
- 2.4.3 Cages shall be provided as directed and shall be fabricated from flat bars. Vertical bars shall be inside supporting hoops. Bars shall be welded at each intersection.
- 3.0 EXECUTION: Hand rails and ladders shall be erected in accordance with the AISC Manual. Hand rails shall be rigidly attached to structure to provide unyielding obstruction. Ladders shall be bolted to structure unless otherwise directed.

Grating

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grating. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aluminum Grating, Banding, and Kick Plate: Rectangular, pressure-locked bearing bars, ASTM B 221, 6063-T6, mill finish.
- 2.2 Steel Grating:
- 2.2.1 Grating: Rectangular, welded, ASTM A 569.

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- 2.2.2 Bands and Kick Plate: ASTM A 36.
- 2.2.3 Finish: Galvanized, ASTM A 123 or painted with fabricator's standard shop primer.
- 2.3 Fabrication: rectangular floor grating shall be in accordance with the Metal Bar Grating Manual published by the National Association of Architectural Metal Manufacturers (NAAMM). Where openings are directed in the grating, sections shall be laid out so that section edges will be centered on the openings. All openings shall be provided with kick plate or banding or required. All raw edges of grating shall be banded unless directed otherwise.
- 3.0 EXECUTION:
- 3.1 Erection: grating shall be anchored in place with welded stud bolts and saddle clips or other acceptable fasteners.
- 3.2 Touchup shall be either with an approved galvanizing repair paint or a primer to match shop primer.

Castings

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of castings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedure shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Frames, Covers, and Steps:
- 2.1.1 Gray Iron: ASTM A 48, Class 30.
- 2.1.2 Steel: ASTM A 36; Galvanized, ASTM A 123.
- 2.1.3 Aluminum: ASTM B 26, 356-T6.
- 2.2 Corner Protection: Steel angles with anchors, ASTM A 36; Galvanized, ASTM A 123.
- 2.3 Ventilation Boxes: Extruded Aluminum, ASTM B 221, 2063-T6.
- 2.4 Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
- 3.0 EXECUTION:
- 3.1 Frames, steps, corner protection, or other castings to be embedded in concrete shall be accurately positioned and securely anchored to forms prior to placement of concrete.
- 3.2 Castings to be located in masonry or other building material shall be temporarily braced and held firm to ensure accurate placement in final construction.
- 3.3 Aluminum surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals shall be coated with a heavy coat of bituminous paint.

Miscellaneous Metal Bridge Components

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of miscellaneous metal bridge components. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Structural Carbon Steel: ASTM A 36.
- 2.2 High Strength Steel Bolts, Nuts, and Washers: ASTM A 325.
- 2.3 Electrodes: Electrodes for manual or arc welding shall comply with AWS A5.1 or AWS A5.5.
- 2.4 Anchor Bolts:
- 2.4.1 Cast-In-Place: ASTM A 307.
- 2.4.2 Power Driven: Stainless steel. When set in concrete or masonry, the minimum penetration shall be 6 times the diameter of the shank.
- 2.5 Grid Flooring: ASTM A 36, galvanized, skid-resistant, unless otherwise directed.
- 2.6 Aluminum for Railings:
- 2.6.1 Aluminum Alloy Extruded Rail: ASTM B 221, Alloy 6061-T6 or 6351-T5.
- 2.6.2 Cast Aluminum Railing Posts: AASHTO M193, Alloy A444-T4.
- 2.7 Stainless Steel Hardware for Railings:
- 2.7.1 Stainless Steel Machine Bolts and Cap Screws: ASTM A 193, Grade B8 or B8M, Class 2A threads,

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- except the minimum tensile strength shall be 100,000 psi.
- 2.7.2 Stainless Steel Threaded Bars: ASTM A 276, Type No. 302, Condition B, Class 2B threads.
 - 2.7.3 Stainless Steel Flat Washers and Lock Washers: ASTM A 240, Type 302.
 - 2.7.4 Carbon and Alloy Steel Nuts: ASTM A 194, Grades 6 and 6F.
 - 2.8 Steel Pipe for Railings and Posts: ASTM A 53, Grade B, or ASTM A 120, black or galvanized.
 - 2.9 Steel Plate Beam Guardrail:
 - 2.9.1 Guardrail: AASHTO M180, Class A, Type 1.
 - 2.9.2 Bolts, Nuts, and Washers: ASTM A 307, galvanized in compliance with ASTM A 153.
 - 2.9.3 Post Connectors: ASTM A 36, galvanized in compliance with ASTM A 123.
 - 2.10 Cables and Accessories for Cable Guardrail: AASHTO M30, Class A, Type I.
 - 2.11 Metal Posts: ASTM A 36 galvanized in compliance with ASTM A 123.
 - 2.12 Wood Posts: Comply with the specifications for treated wood posts contained in the state's standard specifications.
 - 2.13 Steel Traffic Treads: Not less than 3/16 inch thick, exclusive of the raised portions, not less than 24 inches wide, and the individual sections not more than 15 feet long. Treads shall have a non-skid surface with alternate projections at right angles to each other. The raised portions shall be formed in the rolling and not by punching or pressing from the underside. Treads shall be punched 7/16 inch for lag screws or bolts. The holes shall be placed not less than 1-1/4 inches nor more than 1-1/2 inches from the edge of the tread. The spacing of holes on both sides of the tread shall not be more than 15 inches and on both ends of each section not more than 6 inches. The weight of the treads shall be approximately 8-3/4 pounds per square foot.
 - 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.
 - 3.1.2 Structural metal work shall comply with the following:
 - a. AISC Code of Standard Practice.
 - b. AWS Structural Welding Code as modified by the ANSI/AASHTO/AWS D1.5.
 - c. AREA-01, Chapter 15 .
 - d. AASHTO Standard Specifications for Highway Bridges.
 - 3.1.3 Fabrication: Form shapes with sharp lines and angles and finish with smooth surfaces. Drill or ream bolt holes 1/16 inch larger than the diameter of the bolt. Provide welded shop connections wherever possible. Fabricate rail elements parallel to grade line. Posts shall be normal to parapet.
 - 3.1.3.1 Steel Railing: Rails and posts shall be jointed by either mechanically fastened flush fittings or welding. Grind welds smooth and flush. Lay flex beam railing in the direction of traffic.
 - 3.1.3.2 Aluminum Railing: Join railings and posts by either slip type fittings, mechanically fastened fittings, or inner-wedge system. Fastenings shall be stainless steel, set flush or recessed.
 - 3.2 Erection:
 - 3.2.1 Connections: Bearing surfaces and surfaces to be in permanent contact shall be clean and free from dirt and scale. Ream holes that must be enlarged to admit bolts. Field correction of fabrication errors shall be made only with approval of the Authorized Member Representative.
 - 3.2.2 Coat aluminum surfaces that will be in contact with dissimilar materials as follows:
 - a. Contact with Steel: One coat of zinc chromate primer, Fed. Spec. TT-P-645 or one coat of a suitable nonhardening joint compound, Fed. Spec. TT-S-
 - b. Contact with Wood, Fiberboard, Masonry, or other Porous Material: Alkali-resistant bituminous paint, ASTM D 2939.
 - c. Aluminum Embedded in Concrete: One coat of zinc chromate primer, Fed. Spec. TT-P-645, alkali-resistant bituminous paint, ASTM D 2939, or wrapped with a suitable plastic tape.
 - 3.3 Maintenance and Repair Methods:

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- 3.3.1 Open Grid Bridge Floor: Realign grids that are not in proper alignment. Replace broken clips connecting grids to grid support system. Reweld cracked or broken welds between grid and grid support system. Remove and replace deficient rectangular grid decking as directed.
- 3.3.2 Concrete Filled Grating: Repair or remove and replace grating as directed. Replace concrete with 4,000 psi concrete with 4 to 6 percent entrained air.
- 3.3.3 Railing:
 - 3.3.3.1 Remove damaged and deteriorated railing and install new railing as directed.
 - 3.3.3.2 Anchor Bolts and Connections: Tighten all loose nuts. Replace all corroded anchor bolts with drilled anchor bolts to concrete, ASTM A 307 bolts to steel for steel railing, and stainless steel bolts for aluminum railing.
- 3.3.4 Repair of Corroded Material: Remove all rust and corrosion by sandblasting or wire brushing. Strengthen corroded members by the addition of structural carbon steel or high strength steel.

Ornamental Handrail and Railings

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ornamental handrail and railings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Tubing, Bars, and Shapes:
 - 2.1.1 Aluminum: ASTM B 221, 6063-T6, T-52.
 - 2.1.2 Steel: ASTM A 36, A 500, A 501.
 - 2.1.3 Bronze: ASTM B 135, Alloy C23000.
 - 2.1.4 Stainless Steel: ASTM A 554, Grade MT304; ASTM A 312, Grade TP304; ASTM A 167, Type 304.
 - 2.1.5 Brass: ASTM B 135, Alloy C28000 and ASTM B 455, Alloy C38500.
 - 2.2 Castings:
 - 2.2.1 Aluminum: ASTM B 26, 356-T6.
 - 2.2.2 Steel: Gray Iron, ASTM A 48, Class 30; Malleable Iron, ASTM A 47.
 - 2.2.3 Bronze: ASTM B 584, Alloy C92300.
 - 2.2.4 Stainless Steel: ASTM A 743, Grade CF8 or CF20.
 - 2.2.5 Brass: ASTM B 584, Alloy C85700.
 - 2.3 Wood handrails shall be hardwood handrail of species and profile selected from manufacturer's standards, bonded to metal subrail, with manufacturer's standard transparent finish, unless otherwise directed.
 - 2.4 Fasteners: Furnish fasteners of basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise directed. Unless otherwise directed provide Phillips flat-head screws for exposed fasteners.
 - 2.5 Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
 - 2.6 Fabrication: Stainless steel and steel handrails shall have welded connections. Aluminum handrails shall be either welded or non-welded. Bronze and brass handrail shall have non-welded connections.
 - 2.6.1 Welded Connections: Fabricate handrails and railings of materials indicated for interconnections of members by welding. Preassemble railing units, to maximum extent practicable, consistently with shipping and handling limitations. Welding shall comply with applicable AWS specifications, using method appropriate for metal and finish indicated. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.
 - 2.6.2 Nonwelded Connections: Fabricate railings and handrails for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise directed. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 2.6.3 Protective Lacquer: Metal handrails shall be shop-coated with clear non-yellowing lacquer, of type recommended for protection of the finished metal surface.
- 3.0 EXECUTION:
 - 3.1 Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

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- 3.2 Expansion Joints: Provide expansion joints at locations directed or at intervals not to exceed 40 feet. Provide internal sleeve type slip-joint extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6 inches of post.
- 3.3 Provide Anchorage Devices and Fasteners where necessary for securing ornamental metal items to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- 3.4 Form Tight Joints with exposed connections accurately fitted with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of the work, restore finishes to eliminate any evidence of such corrective work.

Ornamental Sheet Metal

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ornamental sheet metals. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Materials:
 - 2.1.1 Steel Sheet: ASTM A 527, galvanized.
 - 2.1.2 Aluminum Sheet: ASTM B 209, Alloy 5052-H32.
 - 2.1.3 Extruded Aluminum: ASTM B 221, Alloy 6063-T6, T-52.
 - 2.1.4 Bronze: ASTM B 455, Alloy C38500 and ASTM B 135, Alloy C8000.
 - 2.1.5 Stainless Steel: ASTM A 554, Grade MT304; ASTM A 312, Grade TP304; ASTM A 167, Type 304.
 - 2.2 Wall Louvers: Weather-resistant type, with bird screens and made to withstand a wind load of not less than 30 lb/sf. Wall louvers shall bear the AMCA certified rating program seal for air performance and water penetration in accordance with AMCA-500 and AMCA-511. The rating shall show a water penetration of 0.20 or less at 800 fpm.
 - 2.2.1 Extruded Aluminum Louvers: Fabricated of extruded 6063-T6 or 6063-T52 aluminum with a wall thickness of not less than 0.080 inch thick.
 - 2.2.2 Formed Metal Louvers: Formed of zinc-coated steel sheet not thinner than 16 U.S. gauge, or aluminum sheet not less than 0.08 inch thick.
 - 2.2.3 Mullions: Same material and finish as louvers.
 - 2.2.4 Screens and Frames: Minimum 1/4-inch square mesh and minimum 16-gauge aluminum bird screen. Mount screens in removable, rewirable frames of same material and finish as the louvers.
 - 2.3 Door Louvers: Inverted "Y" or "V" sightproof type not less than 1-3/8 inch thick with matching metal trim. Louvers for exterior doors shall be weather-resistant type.
 - 2.3.1 Extruded Aluminum Door Louvers: Minimum 0.050 inch thick 6063-T6 or 6063-T52 aluminum alloy. Frame and trim shall be clamp-in "L" type.
 - 2.3.2 Formed Metal Door Louvers: Minimum 20 U.S. gauge steel sheet or minimum 0.050 inch thick sheet aluminum. Trim shall be beveled "Z" molding both sides.
 - 2.3.3 Screens and Frames: Screen shall be aluminum, RR-W-365, Type VII. Mount screens in removable, rewirable frames of same material and finish as the louvers.
 - 2.4 Fasteners: Stainless steel screws and fasteners as required.
 - 2.5 Finishes:
 - 2.5.1 Aluminum: Factory-applied anodic coating or organic coating.
 - 2.5.1.1 Anodic Coating: AA-M10-C22-A31, Architectural Class II, clear finish or AA-M10-C22-A32, Architectural Class II, integral color finish.
 - 2.5.1.2 Organic Coating: AAMA 605.2, 0.8 mil minimum dry film thickness, baked enamel finish.
 - 2.5.2 Steel: Factory-applied coating, rust-inhibitive primer and baked enamel finish coat, 1 mil minimum total dry film thickness.
 - 2.6 Motorized Louvers: Electric motor shall be completely encased in the louver sill. Motor shall be U.L. approved, 120 volt, 60 hertz with a transformer.
- 3.0 EXECUTION:
 - 3.1 Copper or Copper-Bearing Alloys: Paint copper or copper-bearing alloys in contact with dissimilar

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- metal with heavy-bodied bituminous paint or separate with inert membrane.
- 3.2 Aluminum: Where aluminum contacts metal other than zinc, paint the dissimilar steel with a primer and two coats of aluminum paint.
- 3.3 Metal: Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.
- 3.4 Wood: Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

Expansion Control

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of building expansion joint covers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Frames and Covers:
 - 2.1.1 Aluminum: ASTM B 221, 6063-T6.
 - 2.1.2 Bronze: ASTM B 455, Alloy C 38500.
 - 2.1.3 Stainless Steel: ASTM A 167, Type 304.
 - 2.2 Resilient Filler: Neoprene, elastomeric, or extruded vinyl.
 - 2.3 Bituminous Paints: SSPC-Paint 12 (cold-applied asphalt mastic).
 - 2.4 Fabrication: Shop assemble components and package with anchors and fittings. Provide joint components in single lengths whenever practical.
- 3.0 EXECUTION:
 - 3.1 Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
 - 3.2 Installation: Rigidly anchor expansion assembly to both sides of expansion joints to prevent misalignment.

Bridge Expansion Devices, Bearings and Anchors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of bridge expansion devices, bearings, and anchors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Joint Filler:
 - 2.1.1 Preformed Bituminous: AASHTO M33.
 - 2.1.2 Preformed Fiber and Preformed Bituminous Inorganic Fiber: AASHTO M213.
 - 2.1.3 Preformed Cork: AASHTO M153, Type II.
 - 2.1.4 Preformed Self-Expanding Cork: AASHTO M153, Type III.
 - 2.1.5 Preformed Sponge Rubber: AASHTO M153, Type I.
 - 2.1.6 Preformed Closed Cell Plastic: Low density, extruded, closed cell expanded polyethylene plastic foam that is chemically inert.
 - 2.2 Cold-Poured Joint Sealer: CE CRD-C-527.
 - 2.3 Hot-Poured Joint Sealer: AASHTO M173.
 - 2.4 Preformed Elastomeric Compression Joint Sealer: AASHTO M220.
 - 2.5 Neoprene Expansion Joints:
 - 2.5.1 Elastomer shall have the following physical properties:
 - a. Tensile Strength (ASTM D 412): 1,800 psi minimum.
 - b. Elongation at Break (ASTM D 412): 400 percent minimum.
 - c. Hardness (ASTM D 2240): 40 to 50 points Durometer A.
 - 2.5.2 Sealant: A two-component polysulfide liquid sealant complying with Fed. Spec. TT-S-00227, Type II.

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- 2.6 Fabric bearing pads shall consist of a fabric and rubber body made with unvulcanized rubber and unused fabric fibers. The rubber body shall be natural polyisoprene or polychloroprene. Average hardness shall be 80 to 90 Shore A Durometer. Ultimate breakdown limit under compressive loading shall be no less than 7,000 psi. Tolerance on thickness shall be plus or minus 1/16 inch.
- 2.7 Graphited Asbestos Bearing Pads: Asbestos fibers bonded together with synthetic rubber elastomer. One face of each pad shall be impregnated with graphite. The surface hardness shall be 95-100 Shore A Durometer. Tolerance on thickness of pads shall be plus or minus 1/16 inch. Graphited surfaces shall be in contact.
- 2.8 Bronze Bearings and Expansion Plates: AASHTO M107, Alloy B.
- 2.9 Rolled Copper-Alloy Bearings and Expansion Plates: AASHTO M108, Alloy 510.
- 2.10 Bearing and Expansion Plates: Sliding bearings shall have a surface roughness value not exceeding 125 per ANSI B46.1.
- 3.0 EXECUTION:
- 3.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operation." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.
- 3.2 Maintenance and Repair Methods:
 - 3.2.1 Expansion Devices:
 - 3.2.1.1 Remove all dirt and debris from joints to be repaired. Adjust joint width accurately for temperature at time of setting. Cut joint filler to fit exactly and completely fill the joint.
 - 3.2.1.2 Expansion Devices, Including Elastomeric and Steel: Repair or replace as directed.
 - 3.2.2 Bearing Devices:
 - 3.2.2.1 General: Remove all debris from the bearing seats. Tighten loose connections. Loose high strength bolts shall be removed and replaced.
 - 3.2.2.2 Steel Components: Remove rust and corrosion by sandblasting or wire brushing.
 - 3.2.2.3 Bearing Devices, Including Bearing Plates, Roller Expansion Bearings, Rocker Expansion Bearings, Pins and Hanger Bearings, and Anchor Bolts: Repair or replace as directed.

Water Treatment Plant Debris Racks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation materials for repair and maintenance of debris racks for water treatment plant intake structures. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Manually Cleaned Racks: Repair or replacement parts for manually cleaned racks shall be galvanized or alloy steel rods, bars, or structural shapes. Galvanized material shall comply with ASTM A 153 and B 633. Alloy steel material shall comply with ASTM A 193, A 480; and A 564, as applicable.
 - 2.2 Fasteners shall comply with ASTM A 307 or A 325 for bolts and A 502 for rivets.
- 3.0 EXECUTION:
 - 3.1 Silt Removal: Cofferdams and temporary bypass inlets shall be provided to allow dewatering. Water level shall be lowered, and silt and debris shall be pumped, shoveled, or otherwise removed from around rack.
 - 3.2 Repair or replacement of structural members, rods, and shapes shall be by welding or riveting, as applicable to the existing construction. All welding shall be in compliance with AWS D1.1.

DIVISION 6-WOOD AND PLASTICS

Light Wooden Structures Framing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for light wooden structures framing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Grading and Marking: Materials shall bear the grademark, stamp, or other identifying marks indicating grades of material and rules or standards under which they were produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used. Except for structural laminated members, plywood, and lumber, bundle marking or certificates will be permitted in lieu of marking each individual piece. Species and grades are listed in Table 1 at the end of this section.
 - 2.2 Sizes: Lumber sizes shall conform to the requirements of the rules or standards under which produced, and unless otherwise specified, lumber shall be surfaced on four sides.
 - 2.3 Moisture Content: At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:
 - 2.3.1 Treated and Untreated Lumber 2 Inches or Less in Thickness, Except Roof Planking: 19 percent maximum.
 - 2.3.2 Treated and Untreated Lumber Over 2 Inches in Thickness, Except Roof Planking: 25 percent maximum.
 - 2.3.3 Roof Planking 2 Inches or More in Thickness: 15 percent maximum.
 - 2.3.4 Materials Other Than Lumber: In accordance with standard under which product is produced.
 - 2.4 Wood Member Design:
 - 2.4.1 Trussed Rafters: As an option to standard rafters, trussed rafters may be provided. Connections shall be made with light metal plate connectors. Light metal plate connected wood trusses shall be designed in conformance with TPI Design Specifications for Metal Plate Connected Wood Trusses and fabricated in conformance with the TPI Quality Standard for Metal Plate Connected Wood Trusses.
 - 2.4.2 Non-stress graded members shall include plates, caps, bucks, studs, framing for skirting and other miscellaneous framing, blocking, nailers, sleepers, and grounds. Members shall be standard grade or No. 2 grade except studs may be stud grade. Non-stress member grades shall conform to the National Grading Rule for Dimension Lumber established in conformance with the rules or standards under which produced and as applied in individual grading rules of applicable grading agencies.
 - 2.4.3 Structural glued laminated members shall be in accordance with AITC A 190.1. Members shall be sealed with a penetrating sealer and wrapped in accordance with AITC 111.
 - 2.5 Preservative Treatment: Lumber not over 5 inches thick and plywood, when in contact with soil, shall be treated in accordance with AWPB LP-22, LP-33, or LP-44; when specified to be painted or used in built-up roofing systems, AWPB LP-2 or LP-22; and for all other purposes, AWPB LP-2, LP-3, or LP-4. Except as otherwise specified, lumber over 5 inches thick shall be pressure preservative-treated in accordance with AWPB C2. Structural glued laminated timber shall be treated in accordance with AWPB C28. Wood treated with oil-borne preservatives shall be clean, free from surface oil, and properly seasoned for use in building construction. Wood treated with water-borne preservatives shall be marked with the word "Dry." Creosote or coal-tar solutions shall not be used. Surfaces of lumber that will be exposed shall not be incised. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPB M-4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil. Unless otherwise specified, all wood members exposed to weather or in contact with soil, water, masonry, or concrete, and all wood framing members

Attachment 1: Specifications for the Work

directly above soil when the bottom elevation is 18 inches or less above soil shall be pressure preservative-treated. The following items will always be treated:

- a. All wood members set into concrete regardless of location, including flush-with-deck wood nailers for roofs.
 - b. All wood members in contact with slabs-on-grade, including wood floor sleepers over waterproofed slab surface.
 - c. All wood members in contact with foundation walls.
 - d. Furring strips used on walls or partitions below grade.
 - e. Furring strips used on exterior walls above grade.
 - f. All wood members used for rough framing of openings in exterior concrete or masonry walls.
 - g. All wood members used in exterior exposed construction such as steps, platforms, walkways, railways, and framing for skirting and other miscellaneous framing.
 - h. Nailing strips used over fiberboard or gypsumboard wall sheathings as a base for wood shingles.
- 2.6 Fire-Retardant Treatment: Fire-retardant treated wood shall be pressure-treated in accordance with AWPAC20 for lumber and AWPAC27 for plywood. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D 2898 prior to being tested for compliance with AWPAC20 or C27.
- 3.0 EXECUTION:
- 3.1 All nailing shall be in accordance with the recommended nailing schedule as contained in NFOPA Manual for Wood Frame Construction.
- 3.2 Installation of timber connectors shall conform to applicable requirements of the NFOPA National Design Specification for Wood Construction.
- 3.3 Members shall be framed for passage of ducts and pipes and shall be cut, notched, or bored in accordance with applicable requirements of the NFOPA Manual for Wood Frame Construction.
- 3.4 Framing shall be kept at least 2 inches away from chimneys and 4 inches away from fireplace backwalls.
- 3.5 Leveling of joists, beams, and girders on masonry or concrete shall be with slate or steel; on wood or metal, leveling shall be without shims.

Grading Rules	Species	No. 1	No. 2
NHLA	Red Oak	X	

NELMA	Northern Pine		X
	Eastern Hemlock-Tamarack		X
SPIB	Southern Pine	X	
WCLB	Douglas Fir-Larch		X
	Hem-Fir		X
WWPA	Douglas Fir-Larch		X
	Hem-Fir		X
	Douglas Fir-South		X

Sheathing, Siding and Subflooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sheathing, siding, and subflooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General: Materials shall bear the grademark, stamp, or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on material shall be in accordance with the rule or standard under which the material is produced, including

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- requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used. Bundle marking or certificates will be permitted in lieu of marking each individual piece, except for structural laminated members, plywood, and lumber. Size and moisture content shall conform to requirements of the rules or standards under which materials are produced.
- 2.2 Plywood shall be in accordance with DOC PS 1, Grade C-D for wall sheathing and Grade C-D with exterior glue for roof sheathing, unless otherwise specified.
 - 2.3 Roof decking design stresses shall be as specified for structural members. Decking shall be tongue and groove, V-jointed, and matched and dressed where exposed. As an option, fabricated, laminated lumber decking with interlocking tongue and groove joints may be provided.
 - 2.4 Sheathing shall be of either fiberboard, gypsum board, plywood, V-structural-use panels, or wood for wall sheathing; and either plywood, structural-use panels, or wood for roof sheathing and skirting for temporary structures including access doors through skirting as required.
 - 2.4.1 Fiberboard shall be in accordance with ASTM C 208, sheathing grade, or ASTM D 2277; asphalt-impregnated or asphalt-coated to be water-resistant but vapor permeable.
 - 2.4.2 Gypsum board shall be in accordance with ASTM C 79.
 - 2.4.3 Structural-use panels shall meet the qualification requirements of APA Performance Standards and Policies for Structural-Use Panels. Panels shall conform to APA Product Guide for Performance Rated Panels for Sheathing, Exp 1 or 2, or Ext; or Structural I or II Rated Sheathing, Exp 1 or Ext.
 - 2.4.4 Wood shall be center-matched, ship-lapped, or square-edge, except exposed roof sheathing shall be V-jointed, matched and dressed. Species and grade shall be in accordance with Table 1 at the end of this section.
 - 2.5 Shear wall panels shall be of plywood or sheathing conforming to APA Product Guide for Performance Rated Panels for Sheathing, Exp 1 or 2, or Ext; or Structural I or II Rated Sheathing, Exp 1 or Ext.
 - 2.6 Subflooring shall be of either plywood, structural use panels, or wood.
 - 2.6.1 Plywood shall conform to DOC PS 1; Grade C-D for uses not otherwise specified, Grade C-D with exterior glue for reception of underlayment as wood flooring, underlayment grade with exterior glue or C-C (Plugged), and exterior grade for use as a combination subfloor-underlayment under resilient flooring.
 - 2.6.2 Structural-use panels shall be APA Rated structural-use panels qualified for subflooring or combination subfloor-underlayment under APA Performance Standards and Policies for Structural-Use Panels.
 - 2.6.3 Wood shall be center-matched, ship-lapped, or square-edge. Species and grade shall be in accordance with Table 1 at the end of this section.
 - 2.6.4 Adhesive shall conform to APA AFG-01.
 - 2.7 Underlayment shall be either hardboard, particleboard, or plywood.
 - 2.7.1 Hardboard shall be in accordance with ANSI A135.4, service class, sanded on one side, 1/4-inch thick and 4 feet wide.
 - 2.7.2 Particleboard shall be in accordance with ANSI A208.1, Grade 1-M-1, 1/4-inch thick, and 4 feet by 4 feet.
 - 2.7.3 Plywood shall be in accordance with DOC PS 1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade, 3/8-inch thick and 4 feet wide.
 - 2.8 Moisture barrier of building paper shall be asphalt-saturated felt conforming to ASTM D 226, Type I or polyethylene sheeting shall conform to ASTM D 2103, 4 mil thick.
 - 3.0 EXECUTION:
 - 3.1 Nailing shall be in accordance with the Recommended Nailing Schedule as contained in NFOPA Manual for Wood Frame Construction.
 - 3.2 Sheathing Installation:
 - 3.2.1 Fiberboard sheathing shall be applied with edges 1/8 inch apart at joints, fitted snugly at abutting frames of openings, and nailed or stapled. Sheets 2 feet wide shall be applied horizontally with the tongued groove up and with vertical joints over supports and staggered. Sheets 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal

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- joints over supports.
- 3.2.2 Gypsum board sheathing shall be applied with edges in light contact at joints and nailed. Sheets 2 feet wide shall be applied horizontally with tongued edge up and with vertical joints over supports and staggered. Sheets 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.
- 3.2.3 Plywood sheathing shall be applied with edges 1/8 inch apart at side joints, 1/16 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates. If applied horizontally, the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall have face grain at right angles to supports with end joints made over supports and staggered.
- 3.2.4 Structural-use panels shall be applied with edges 1/4 inch apart at side joints, 1/8 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates and, if applied horizontally, the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall have end joints made over supports and staggered.
- 3.2.5 Wood Sheathing: End joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 8 inches and less in width and three nails for boards more than 8 inches in width.
- 3.3 Subflooring Installation: A clearance of 1/4 inch shall be provided at walls. Plywood subflooring and structural-use panel subflooring may be installed with adhesive conforming to APA AFG-01 and nails spaced at 12 inches on center. Installation of subflooring with adhesives shall be in accordance with APA Design/Construction Guide: Residential and Commercial. Each plywood or structural-use panel shall have end joints made over supports and staggered. Where finish flooring of different thicknesses is used in adjoining areas, wood trips of the thickness required to bring the finish flooring surfaces to the same plane shall be used under the subfloor panels. Plywood subflooring shall be applied with the face grain at right angles to the supports, with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints. Structural-use panel subflooring shall be applied over two or more supports with the long dimension across supports and with edges 1/4 inch apart at side joints and 1/8 inch apart at end joints. Wood subflooring shall bear on at least three supports.
- 3.4 Installation of Underlayment shall be applied with edges 1/32 inch apart at joints and a clearance of 1/4 inch at walls. Joints at underlayment shall not be located directly over parallel joints at subflooring. Power driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface. When plywood combination subfloor-underlayment is used in lieu of separate layers, it shall be installed as specified for plywood subfloor, except all joints shall be made over supports with edge joints spaced 1/8 inch apart and end joints spaced 1/16 inch apart. When plywood combination subfloor-underlayment is tongued and grooved, only end joints shall require support. Tongued and grooved combination subfloor-underlayment shall be applied with joints spaced 3/32 inch apart.
- 3.5 Installation of Shear Wall Plywood or Structural-Use: Panels shall be installed with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports.
- 3.6 Moisture barrier shall be applied over all wood wall sheathing, over studs to directly receive horizontal siding or board siding, over any wall sheathing to receive an unbacked stucco base, and over square edge wood subflooring to receive wood strip flooring. Moisture barrier over sheathing shall be applied horizontally, starting at the bottom, lapped 6 inches at edges and ends, and nailed at laps 16 inches on center. Moisture barrier over subfloor shall be applied as the strip flooring installation progresses and lapped 2 inches at edges and ends.
- SPECIES AND GRADE

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Subflooring, Roof Sheathing, Wall Sheathing, Furring

Grading Rules	Species	Standard	Const Comm	No.2 Board	No.2 Comm	No.3 Comm
NHLA	Cypress					X
NELMA	Northern White Cedar					X
	Eastern White Pine	X				X
	Northern Pine	X				X
	Balsam Fir					X
	Eastern Hemlock-Tamarack					
NHPMA	Eastern White Pine					
	Northern Pine					
	Balsam Fir					
	Eastern Hemlock-Tamarack					
RIS	Redwood		X			
SCMA	Cypress				X	
SPIB	Southern Pine			X		
WCLB	Douglas Fir-Larch	X				
	Hem-Fir	X				
	Sitka Spruce	X				
	Mountain Hemlock	X				
	Western Cedar	X				
WWPA	Douglas Fir-Larch					X
	Hem-Fir					X
	Idaho White Pine					X
	Lodgepole Pine					X
	Ponderosa Pine					X
	Sugar Pine					X
	Englemann Spruce					X
	Douglas Fir South					X
	Mountain Hemlock					X
	Subalpine Fir					X
	Western Cedar					X

Wood Trusses

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for maintenance and repair of wood trusses. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Structural glue-laminated timber shall comply with ANSI/AITC A190.1. Lumber for laminating shall be of a stress grade providing glue-laminated members with allowable stress values of 2,000 psi in bending, 1,600 psi in tension, 1,500 psi in compression parallel to grain, and 385 psi in compression perpendicular to grain for dry condition of service.
 - 2.1.1 Adhesives shall meet requirements for dry condition of service.
 - 2.1.2 Appearance of members shall be Industrial Grade. Plywood shall comply with DOC PS 1.
 - 2.1.3 Surfaces of members shall be sealed with a penetrating sealer. Members shall be delivered individually wrapped. Do not unwrap until members are installed and adequate protection is provided.
 - 2.2 Timber Connections:
 - 2.2.1 Split-ring connectors shall be SAE 1010 hot-rolled carbon steel. Rings shall be of standard

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manufacture and shall fit snugly into pre-cut groove.

2.2.2 Shear Plate:

2.2.2.1 Pressed steel type shall be SAE 1010 hot-rolled carbon steel. Shear plates shall be of standard manufacture.

2.2.2.2 Malleable Iron Type: Casting shall comply with ASTM A 47, Grade 35018. Casting shall be of standard manufacture.

2.3 Fasteners:

2.3.1 Nails: Fed. Spec. FF-N-105.●06135

2.3.2 Anchor Bolts, Lag Bolts, and Miscellaneous Bolts and Screws: ASTM A 307. Type, size, and finish shall be best suited for the intended use.

2.4 Saw Lumber:

2.4.1 Lumber shall be one of the following species and commercial grades:

2.4.1.1 Douglas Fir or Larch: Select structural (1500 f) or better.

2.4.1.2 Southern Pine: No. 1 (1500 f) or better.

2.4.1.3 Western Hemlock: Select structural (1500 f) or better.

2.4.2 Sizes, grading and marking shall comply with the requirements of the rules or standards under which produced, and unless otherwise indicated, lumber shall be surfaced on four sides. Dressed sizes shall be accepted as the minimum net sizes conforming to nominal sizes. Lumber shall be free from warp. All timber materials shall bear a grademark or other identifying marks indicating grades of material and standards under which produced. If lumber is treated, treatment and retention shall be indicated.

2.5 Preservative Treatment: All lumber shall be preservative-treated unless otherwise indicated. Pressure treat with water borne salt preservative. The retention shall be a minimum of 0.25 pounds per cubic foot. Treatment shall comply with Fed. Spec. TT-W-00571 and AWP A P5. Give all cuts and abrasions 2 brush coats of the same preservative as used at the factory.

2.6 Moisture Content: The moisture content of wood shall not exceed 15 percent at the time of treatment or installation.

3.0 EXECUTION:

3.1 Wiring Conflicts: Piping and electrical wiring conflicting with erection of members shall be removed and placed in a new position approved by the Authorized Member Representative. Provide temporary utilities and coordination to prevent outages during this period.

3.2 Connections: Drive nails and spikes with just sufficient force to set the heads flush with the surface of the wood. Drill bolt holes a maximum of 1/16 inch larger than the diameter of the bolt. A washer not less than a standard cut washer, or in lieu thereof a metal plate or strap, shall be between the wood and the bolt head and between the wood and the nut. Lag screw holes for the unthreaded portion of the shank shall be the same diameter as the shank and the same depth as the length of the unthreaded shank. The lead hole for the threaded portion of the shank shall be properly sized for species of lumber involved. Insert the threaded portion of the lag screw into its lead hole by turning with a wrench.

3.2.1 Nails: Use 8-penny or larger nails for nailing through 1-inch thick lumber and for toe nailing 2-inch thick lumber; use 16-penny or larger nails for nailing through 2-inch thick lumber. Size and spacing of nails shall comply with NFOPA Specification for Stress-Graded Lumber and its Fastenings.

3.2.2 Wood Screws: Lead holes for withdrawal resistance shall have a diameter of 70 percent of the root diameter of the wood screw. Lead holes for lateral resistance shall have a diameter of 7/8 of the root diameter of the wood screw. The part of the hole receiving the shank shall be about 7/8 the shank diameter. Insert screws in the lead holes by turning with a screw driver or other tool.

3.2.3 Timber Connections: Install the split ring and shear plate in grooves cut by the Contractor.

3.3 Truss Connections and Splices: Tighten all loose bolts and screws, adding washers as required. Remove and replace severely corroded or deteriorated bolts and screws.

3.4 Repair of Bearings and Anchor Bolts: Remove corrosion by wire brushing, sanding, or other approved method. Additional repair requirements shall be as directed.

3.5 Repair of Excessive Truss Deflection: Install tension turnbuckles or install a strengthening system as required to correct deflection.

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Timber Bridge Components

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of timber bridge components. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Timber for bridges shall comply with the specifications for timber bridges contained in the state's standard specifications.
- 2.2 Preservative treatment shall comply with the specifications for preservative treatment contained in the state's standard specifications. All timber shall be treated unless specified otherwise.
- 2.3 Hardware and Castings:
- 2.3.1 Castings: Cast steel shall comply with ASTM A 27, Grade 70-36, or gray iron castings shall comply with AASHTO M105 Class No. 30, unless otherwise specified.
- 2.3.2 Hardware:
- 2.3.2.1 Machine bolts, drift-bolts, and dowels may be either wrought iron or rolled steel. Machine bolts shall have the square heads and nuts unless otherwise specified.
- 2.3.2.2 Cast washers shall be made of malleable or gray iron. The outside diameter shall not be less than 3 1/2 times the bolt diameter and its thickness equal to the bolt diameter. Plate washers shall be made of wrought iron or rolled steel. The outside diameter shall not be less than 3 1/2 times the bolt diameter, and they shall not be less than 1/4 inch thick.
- 2.3.2.3 Nails and spikes shall comply with Fed. Spec. FF-N-105.
- 2.3.2.4 Finish: Unless otherwise specified, all hardware for treated timber bridges shall be galvanized or cadmium-plated. Galvanizing shall comply with ASTM A 123 or A 153. Cadmium plating of steel shall comply with ASTM B 766.
- 2.4 Timber connectors shall be ring type or plate type and shall be galvanized in compliance with ASTM A 123 or A 153.
- 2.4.1 Split Ring: SAE 1010 hot-rolled carbon steel of standard manufacture.
- 2.4.2 Tooth Ring: Stamped cold form 16-gauge steel sheet complying with SAE 1010 hot-rolled carbon steel of standard manufacture.
- 2.4.3 Shear-plate timber connectors:
- 2.4.3.1 Pressed steel type shall be SAE 1010 hot-rolled carbon steel of standard manufacture.
- 2.4.3.2 Malleable iron type shall be ASTM A 47, Grade No. 36018 of standard manufacture.
- 2.5 Structural glue-laminated timber shall comply with ANSI/AITC A190.1. Lumber for laminating shall be of such stress grade as to provide glue-laminated members with allowable stress values of 2,000 psi in bending, 1,600 psi in tension, 1,500 psi in compression parallel to grain, and 385 psi in compression perpendicular to grain for dry condition of service.
- 2.5.1 Adhesives shall meet requirements for wet condition of service.
- 2.5.2 Surfaces of members shall be sealed with a penetration sealer or sealed with a sealer coat.
- 2.6 Ties: Comply with Section 3.1.1 of AREA-01 Manual. Ties shall be treated with creosote, creosote-petroleum solution, or pentachlorophenol in compliance with Section 3.9 of AREA-01.
- 2.7 Asphalt cement shall comply with AASHTO M20, penetration grade 85-100.
- 2.8 Surface coat aggregate shall be ASTM D 692, except the gradation shall be as follows:
- | Sieve Size | Percent Passing (Wt.) |
|------------|-----------------------|
| 1/2 in. | 100 |
| 3/8 in. | 94-100 |
| No. 4 | 15-45 |
| No. 16 | 0-4 |
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the

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- direction of traffic. Number, type, color, size and placement of all traffic control color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.
- 3.1.2 Treated Timber: Give all cuts, abrasions, and holes made after treatment 2 applications of 60 percent creosote oil and 40 percent roofing pitch or brush coat with 2 applications of hot creosote oil and covered with hot roofing pitch. Any unfilled holes, after being treated with preservative oil, shall be plugged with treated plugs.
- 3.2 Erection:
- 3.2.1 Holes:
- 3.2.1.1 Drift Bolts and Dowels: Bore holes for round drift bolts and dowels with a bit 1/16 inch less in diameter than the bolt or dowel to be used. The diameter of holes for square drift bolts or dowels shall be equal to the least dimension of the bolt or dowel.
- 3.2.1.2 Machine Bolts and Rods: Bore holes for field fabrication with a bit the same diameter as the bolt. Holes for fabrication prior to treatment shall be 1/16 inch larger than the bolt diameter.
- 3.2.1.3 Lag Screws: Bore hole with a bit not larger than the body of the screw at the base of the thread.
- 3.2.2 Nuts and Washers: Use a washer of the size and type specified under all bolt heads and nuts except carriage bolts. The nuts of all bolts shall be locked by scoring threads after they have been finally tightened.
- 3.2.3 Countersinking: Paint all recesses in treated timber formed for countersinking with hot creosote oil. Fill recesses likely to collect injurious materials with hot pitch.
- 3.2.4 Framing: All lumber and timber shall be accurately cut and framed to a close fit in such manner that the joints will have even bearing over the entire contact surfaces. Place stringers in position so that knots near edges will be in the top portions of the stringer. Screw type fastenings shall be screwed into place for the entire length of the fastener. Install the split ring and the shear plate in grooves cut by the Contractor. Force the toothed ring into the contact surfaces of the timbers jointed by means of pressure equipment.
- 3.2.5 Nailing: Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood.
- 3.3 Maintenance and Repair Methods:
- 3.3.1 Timber Deck:
- 3.3.1.1 Remove existing plank floor deck and fasteners and replace with new planks and fasteners. Lay the floor planks at 45 degrees to centerline of roadway. When more than one length of plank is required, stagger joints between abutting ends at least 3 feet in any two adjacent lines of plank.
- 3.3.1.2 Standard wrought washers shall be used under the heads of all lag screws and under the heads or nuts of all machine bolts. Where machine bolts are used for fastening the floor plank all nuts used shall be locknuts. Countersink heads of all lag screws and bolts in the surface of the floor. Fill recesses formed for countersinking with hot pitch.
- 3.3.1.3 Bituminous Surface Coat: Clean the floor of foreign materials. Apply asphalt cement at a temperature of 275 F to 350 F and at a rate of approximately 1/4 gallon per square yard of surface. The deck shall be dry at the time of bitumen application. Cover the entire surface with a thin coating of aggregate in a sufficient quantity to take up any free bitumen.
- 3.3.2 Hardware: Remove all corrosion by sandblasting or wire brushing. Replace all loose bolts and screws, adding washers as required. Replace deteriorated hardware.
- 3.3.3 Metal Tread Plates: Remove and replace treads as directed. Before installing treads, remove high spots and rough spots in the plank floor so that the treads will be in contact with the floor for their full length and width. Treads shall be laid in a heavy mop coat of asphalt filler. Treads shall be laid with a space of 1/4 inch between adjacent ends and shall be fastened by means of 3/8-inch galvanized bolts. Where bolts cannot be used, use 3/8-inch by 3-inch galvanized lag screws.
- 3.3.4 Timber Railroad Bridge Deck: Remove defective ties and guardrail, including fasteners, and replace with similar ties, guardrail, and fasteners as directed.
- 3.3.5 Repair of Structural Timber Members: Repair, including removal and replacement, shall be as directed.

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Millwork

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of millwork. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: All millwork products shall be marked with manufacturer's identification and grade, in compliance with Architectural Woodwork Institute (AWI) quality grade. Products shall conform to applicable requirements of AWI Architectural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program and Woodwork Institute of California (WIC) Manual of Millwork.
 - 2.2 Millwork: Millwork shall include the following representative examples of architectural woodwork:
 - a. Exterior cornices, fasciae, and soffits.
 - b. Trim for exterior and interior openings.
 - c. Frames for exterior and interior doors and other openings.
 - d. Casework.
 - e. Wood shelving.
 - 2.3 Wood Moisture Content: Lumber for millwork shall be kiln-dried to an average moisture content range of 9 percent to 13 percent for exterior work and 6 percent to 11 percent for interior work.
 - 2.4 Grade of Work: Interior millwork surfaces that are to receive transparent finishes shall be premium grade of the species selected. Millwork surfaces that are to be painted shall be custom grade of the species selected.
 - 2.5 Fire-Retardant Marking: Each unit of fire-retardant treated wood and plywood shall be marked with the producer's label and UL label showing grade and rating.
 - 2.6 Preservative Treatment: Exterior millwork and designated interior millwork shall be preservative-treated in accordance with NWWDA I.S.4. Use a preservative that will not interfere with the designated finish. Apply brush coat on surfaces cut after treatment.
- 3.0 EXECUTION: Millwork shall be installed plumb, level, true, and straight with no distortions. Millwork that abuts adjoining work shall be scribed and cut to fit. Millwork shall be installed with a minimum number of joints, coped at returns, mitered at corners, and shall comply with quality standards for joinery.

Cabinets

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cabinets. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cabinets shall comply with ANSI/NKCA A161.1.
 - 2.2 Countertops shall comply with ANSI A161.2.
 - 2.3 Materials:
 - 2.3.1 Particleboard shall be ANSI A208.1 mat-formed particleboard, Grade 1-M-2 with minimum density of 40 lbs/cu ft, internal bond of 60 psi; and minimum screw holding capacity of 225 lbs on faces and 200 lbs on edges.
 - 2.3.2 Plastic laminate shall be NEMA LD 3.
 - 2.3.3 Hardwood plywood shall be HPMA FE.
 - 2.3.4 Hardwood lumber shall be clear, dry, sound, and free of defects, First Grade Lumber (NHLLA).
 - 2.3.5 Hardboard shall be ANSI A135.4, Class 1, tempered.
 - 2.3.6 Decorative boards shall be low pressure melamine plastic laminate composite panels.
 - 2.3.7 Medium density fiberboard shall be ANSI A208.2.
 - 2.4.8 Transparent finish construction wood cabinet:
 - 2.4.1 Solid lumber and plywood face veneer shall be selected for compatible grain and color of the species.
 - 2.4.2 Semi-Exposed Materials:
 - 2.4.2.1 Solid Lumber: Dry, sound, selected to eliminate appearance defects, of any species of hardwood

Attachment 1: Specifications for the Work

- or softwood, with color and grain characteristics similar to exposed portions.
- 2.4.2.2 Plywood: Species to match color and grain of exposed members; with particleboard core or veneer core.
- 2.4.3 Style of Face Construction: Provide base, wall, and full height units with drawer fronts, doors, and fixed panels overlaying and concealing face frames of cabinet body, as required.
- 2.4.4 Face Frame Style: Provide base, wall, and full height units with face frames of cabinets exposed around drawer fronts and doors.
 - 2.4.4.1 Drawer Fronts and Doors: Surface applied or recessed flush with cabinet front, as required.
 - 2.4.4.2 Flush Style Door Construction: Lumber core plywood, 5-ply with hardwood face veneers and crossbanding.
 - 2.4.4.3 Flush Style Drawer Fronts: Same construction as door, or solid or glued-up lumber, not less than 1/2 inch thick.
 - 2.4.4.4 Stile and Rail Drawer Fronts and Doors: Of design selected, with stiles and rails of solid lumber, 3/4 inch thick for doors and 5/8 inch thick for drawer fronts.
- 2.5 Countertop Construction:
 - 2.5.1 Exposed Surfacing Material: High pressure plastic laminate, 0.050 inch thick, general purpose type (GP50); except where postformed countertop configuration is required, when 0.042 inch thick, postforming type (PF42) shall be used.
 - 2.5.2 Substrate (Core) for Exposed Surfacing Material: Particleboard.
 - 2.5.3 Countertop Configuration: Provide countertops with front styles (nose), cove, and backsplash style, as required.
 - 2.5.4 Countertop Thickness: Not less than 1-1/2 inches with substrate (core) not less than 3/4 inch thick.
- 2.6 Cabinet Hardware: ANSI/BHMA A156.9.
- 2.7 Accessories: Provide designated accessories.
- 3.0 EXECUTION: (Section not used.)

Wood Paneling

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood paneling. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: Paneling shall bear a stamp, brand, or other identifying mark indicating quality, construction and compliance with the grading rules of the respective grading and inspecting agency for the species and product indicated. Marking shall be placed on blind sides only.
 - 2.2 Plywood paneling shall be of softwood or hardwood veneers, as designated. Plywood shall comply with PS 1 and ANSI A199.1. Hardwood plywood shall comply with PS 51.
 - 2.3 Board type paneling shall be of softwood or hardwood, as designated. Softwood shall comply with PS 20. Hardwood shall comply with National Hardwood Lumber Association rules.
 - 2.4 Hardboard products type paneling shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84.
- 3.0 EXECUTION:
 - 3.1 Preparation: Backprime material when exposed to moisture and high relative humidity.
 - 3.2 Installation:
 - 3.2.1 Plywood Paneling: Where grain character or color variations are noticeable, select and arrange panels on each wall for best match of adjacent panels. Install in accordance with manufacturer's instructions.
 - 3.2.2 Board Type Paneling: Arrange in random-width pattern unless boards are of uniform width. Install in accordance with manufacturer's instructions.
 - 3.2.3 Hardboard Products Type Paneling: Install in accordance with manufacturer's instructions.

DIVISION 7-THERMAL AND MOISTURE PROTECTION

Bituminous Waterproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous waterproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Asphalt Waterproofing:
 - 2.1.1 Primer: Asphalt waterproofing material shall comply with Fed. Spec. SS-A-701.
 - 2.1.2 Bitumen: A heavy-bodied bituminous compound of trowel consistency, heavily reinforced with fiber, complying with Fed. Spec. SS-C-153, Type I.
 - 2.2 Tar Waterproofing:
 - 2.2.1 Primer: Creosote complying with ASTM D 43.
 - 2.2.2 Bitumen: Coal-Tar Pitch complying with ASTM D 450.
- 3.0 EXECUTION:
 - 3.1 Primer:
 - 3.1.1 Diluted Asphalt: Apply by brush or power spray in a continuous unbroken film, free from pinholes or other surface breaks.
 - 3.1.2 Creosote: Apply by brush, roller, or power spray.
 - 3.2 Bitumen:
 - 3.2.1 Asphalt: Apply a 1/16 inch coating by trowel in a continuous unbroken film. Wait 24 hours and apply a second 1/16 inch coating.
 - 3.2.2 Coal-Tar Pitch: Apply with mop or roller in a continuous, unbroken film, free from pinholes over any exposed surface area. Wait 24 hours and apply second coat.

Bituminous Membrane Waterproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous membrane waterproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Asphalt Membrane Waterproofing:
 - 2.1.1 Primer: Asphalt waterproofing compound complying with Fed. Spec. SS-A-701.
 - 2.1.2 Joint Covering: Asphalt saturated felt, complying with ASTM D 250.
 - 2.1.3 Membrane: Burlap fabric, complying with ASTM D 1327; open mesh fiberglass, smooth, evenly woven to permit complete penetration of asphalt compound complying with ASTM D 1668, Type I; or asphalt-coated or saturated felt, complying with ASTM D 250.
 - 2.1.4 Bitumen: A heavy-bodied bituminous compound of trowel consistency complying with Fed. Spec. SS-C-153, Type I.
 - 2.1.5 Protection: A rigid or semi-rigid board for protection of membrane waterproofing from penetration by sharp objects during backfilling and later settlement. The board shall be an asphaltic core board or asphalt-saturated fiberboard complying with ASTM C 208. Thickness shall be 1/8 inch.
 - 2.2 Tar Membrane Waterproofing:
 - 2.2.1 Primer: Creosote complying with ASTM D 43.
 - 2.2.2 Joint Covering: Coal-tar saturated felt, complying with ASTM D 227.
 - 2.2.3 Membrane: Burlap fabric complying with ASTM D 1327; open mesh fiberglass, smooth, evenly woven to permit complete penetration of coal-tar compound; or coal-tar coated or saturated felt.
 - 2.2.4 Bitumen: Coal-tar pitch complying with ASTM D 450.
 - 2.2.5 Protection: A rigid or semi-rigid board for protection of membrane waterproofing from penetration by sharp objects during backfilling and later settlement shall be provided. The board shall be an asphaltic core board or asphalt saturated fiberboard. If used with coal-tar products, the board shall

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be faced with a polyethylene film to separate dissimilar materials. Thickness shall be 1/8 inch.

3.0 EXECUTION:

3.1 Installation:

3.1.1 Primer:

3.1.1.1 Diluted Asphalt: Apply by brush or power spray in a continuous unbroken film, free from pinholes or other surface breaks.

3.1.1.2 Creosote: Apply by brush, roller, or power spray.

3.1.2 Bitumen and Membrane:

3.1.2.1 Reinforce all inside and outside corners, joints, cracks, or places where stresses are likely to occur, with no less than two plies of fabric in alternate coats of bitumen.

3.1.2.2 All penetrations through the wall such as pipes, conduits, etc., shall be sealed with two additional plies.

3.1.2.3 Apply the specified number of plies of membrane material in alternate coats of bitumen.

3.1.2.4 For vertical applications, secure membranes near the top of each course.

3.1.2.5 Coat last ply of membrane with a thorough coat of bitumen.

3.2 Protection: As the membrane is completed, apply the protection course. Apply the protection board in a solid coating of asphalt or coal-tar pitch. All coatings must be dry before application of the protection board. Apply protection board by the lap method (lap each sheet 6 inches over preceding sheet) or by the batten method (butt each sheet then apply a 6-inch strip of protection board in adhesive over all joints).

Plastic Sheet Waterproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic sheet waterproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Butyl Sheet shall be an impermeable butyl rubber membrane 1/16 inch thick having a tensile strength of 1,200 psi minimum, complying with ASTM D 412, and an elongation of 300 percent minimum, complying with ASTM D 412. Butyl sheet shall be resistant to ozone and remain flexible to 40 F below zero.

2.2 Neoprene Sheet shall be an impermeable, self-extinguishing, ozone-resistant material 1/16 inch thick. Neoprene shall have a tensile strength of 1,500 psi minimum, complying with ASTM D 412, and an elongation of 250 percent minimum, complying with ASTM D 412.

2.3 Ethylene Propylene Diene Monomers (EPDM) Sheet shall be an impermeable membrane resistant to ozone and ultraviolet. EPDM shall have a tensile strength of 1,400 psi minimum, complying with ASTM D 412, and an elongation of 300 percent minimum, complying with ASTM D 412.

2.4 Vinyl sheet shall be heavy-duty polyvinyl chloride sheet, complying with ASTM D 3083.

2.5 Primers: As required.

2.6 Adhesives:

2.6.1 Adhesive for cold application shall be a non-setting bitumen cut-back asphalt.

2.6.2 Adhesive for hot application shall be asphalt complying with ASTM D 312, Type III.

2.7 Butt Joint Tape: Elastomeric vapor barrier in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.

3.0 EXECUTION:

3.1 Primer: Apply primer by brushing or spraying uniformly over surface to receive membrane. Allow primer to dry before applying membrane.

3.2 Membrane:

3.2.1 At footings, shape the membrane to conform to the surface by cutting a strip of sufficient width to seat over the footing and at least six inches up the wall.

3.2.2 On vertical surfaces, apply adhesive to both wall and membrane.

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Fluid-applied Waterproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied waterproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Two-Component Polyurethane: Two component, self-curing urethane system to form a seamless, permanently flexible and waterproof coating. Compound shall be a light-weight, 99 percent solids, liquid-applied system.
 - 2.2 Single Component Polyurethane: One-part moisture cured elastomeric urethane for adhesion to concrete or wood. Compound shall be hard, flexible material with resistance to weather, gas, oil, and salt water having a temperature range of -65 F to +200 F.
 - 2.3 Two-Component Polyurethane Rubber Base: Liquid-applied, elastomeric two component urethane rubber, 100 percent solids materials containing no coal-tar or asphaltic extenders. After proper mixing, with activators that are supplied as a unit, it shall cure to an elastomeric urethane rubber.
 - 2.4 Two-Component Polysulfide Base Liquid Polymer: Two-component, chemically-curing, high-solids compound containing liquid polysulfide polymer. Product shall be furnished in two components: Part 1, consisting of the cure agent and suitable reinforcing agents; Part 2, the base component, incorporating liquid polysulfide polymer.
 - 2.5 Modified Polyurethane Coal-Tar (Spray Grade): Two-part product, consisting of: Part 1, a blend of polyurethane resins, and Part 2, containing a selected blend of coal-tars, catalysts, and modifiers. The cured membrane shall be a seamless, low modulus, high elongation, physically and chemically resistant synthetic rubber.
 - 2.6 Modified Polyurethane Coal-Tar (Trowel Grade): One component polyurethane coal-tar modified compound that forms a continuous seamless, flexible, impervious membrane when applied to vertical or horizontal surfaces.
 - 2.7 Elastomeric Sheet Reinforcing: Smooth, evenly woven, open mesh glass fiber fabric weighing 1/4 ounce per square foot and which permits complete penetration of waterproofing compounds.
 - 2.8 Protection Board: Rigid or semi-rigid board for protection of membrane waterproofing shall be an asphaltic core board or an asphalt saturated fiberboard complying with ASTM C 208. Protection board shall be 1/8 inch thick. If used with coal-tar products, the board shall be faced with a polyethylene film to separate dissimilar materials.
- 3.0 EXECUTION:
 - 3.1 Two-Component Polyurethane:
 - 3.1.1 Prime surfaces as required.
 - 3.1.2 Spray machine mixed membrane coating directly onto the prepared surfaces to the desired thickness.
 - 3.1.3 Apply the second spray coat after application of the first coat.
 - 3.2 Single Component Polyurethane:
 - 3.2.1 Prime surfaces as required.
 - 3.2.2 Application shall be spray-applied.
 - 3.2.3 Below grade exterior applications shall receive two coats.
 - 3.3 Two-Component Polyurethane Rubber Base:
 - 3.3.1 Prime surfaces as required.
 - 3.3.2 Apply compound by hand trowel to a thickness of 1/16 inch.
 - 3.3.3 Before membrane is completely cured, place protection board over the surface.
 - 3.4 Two-component Polysulfide Base Liquid Polymer:
 - 3.4.1 Fill all joints and cracks over 1/8 inch in width with a polysulfide polymer base sealant. Apply a bond breaker over the joint and cover with 100 mil coating of the elastomeric material.
 - 3.4.2 Apply membrane by spray in a continuous unbroken film. Surface coverage shall be at the rate of approximately 20-25 square feet per gallon to produce a thickness of 60 mils.
 - 3.5 Modified Polyurethane Coal-Tar (Spray Grade):
 - 3.5.1 Prime surfaces with required primer.

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- 3.5.2 Apply with proper spray equipment in a continuous unbroken film. Application rate shall be approximately 25 sq. ft. per gallon to produce a thickness of 60 mils.
- 3.6 Modified Polyurethane Coal-Tar (Trowel Grade):
 - 3.6.1 Prime surfaces with required primer.
 - 3.6.2 Mix and apply with hand trowel in a continuous unbroken film.
 - 3.6.3 Place protection board after membrane has attained its initial set.
- 3.7 Elastomeric Sheet Reinforcing for Fluid-Applied Waterproofing: Trowel fabric into first coat of membrane while membrane material is soft and pliable. Install sheet reinforcing in compliance with membrane compound manufacturer's requirements.
- 3.8 Protection Board:
 - 3.8.1 Apply protection board over membrane while membrane material is still tacky.
 - 3.8.2 Apply protection board by the lap method.

Metal Waterproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal waterproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Lead sheet and strip shall be fabricated from 99 percent pure soft lead or lead alloy containing six to seven percent antimony. Four or eight pound per square foot lead shall be used for all work.
 - 2.2 Copper sheet and strip shall be fabricated of 16 or 20 ounce per square foot tough-pitch copper. Copper shall be either hot-rolled soft copper or cold-rolled copper. Copper shall have a lead coating of 15 pounds per 100 square feet of copper (7-1/2 pounds on each face of copperplate).
 - 2.3 Solder: Solder shall be 50 percent lead and 50 percent tin solder with a resin flux.
 - 2.4 Bituminous paint shall be high quality proper bodied bituminous (asphalt) compound of brush or spray consistency. Compound shall contain a hydrophilic wetting agent to ensure proper adhesion. Bituminous paint shall comply with Fed. Spec. SS-A-701.
- 3.0 EXECUTION:
 - 3.1 Lead Pan Waterproofing:
 - 3.1.1 Preparation: All surfaces on which lead is to be applied shall be smooth; rough projections shall be eliminated. Lead surfaces in contact with uncured concrete, mortar, or in other corrosive locations shall be given a coat of bituminous paint prior to installation.
 - 3.1.2 Small holes and spot repairs shall be accomplished by soldering the leak spots.
 - 3.1.3 Large damaged areas shall be cut out and replaced with lead sheet or strip of the proper weight lead. Apply a coating of bituminous paint to the affected area after the new sheet or strip lead has been soldered in place.
 - 3.1.4 Joints: Use optimal size of sheet or strip to compensate for expansion. Pre-tin all soldered joints and clean immediately after soldering. All joints shall be soldered.
 - 3.1.5 Corners: Wall sheets shall end short of corners. Mold full sheet around corners and joint with wall sheets each side of corner.
 - 3.2 Copper Waterproofing:
 - 3.2.1 Preparation: All surfaces on which copper is to be applied shall be smooth; rough projections shall be eliminated. Give copper surfaces in contact with uncured concrete, mortar, dissimilar metals, or in other corrosive locations a coat of bituminous paint prior to installation.
 - 3.2.2 Fabrication: Prefabricate shapes as required. Copper sheet and strip shall be bent only to rounded angles with no sharp creases.
 - 3.2.3 Small holes and spot repairs shall be accomplished by soldering.
 - 3.2.4 Large damaged areas shall be cut out and replaced with copper sheet or strip of proper weight. Apply a coating of bituminous paint to the affected area after the new sheeting or strip copper has been soldered in place.
 - 3.2.5 Joints: Use optimal size sheet or strip to compensate for expansion. Pre-tin all soldered joints and clean immediately after soldering.

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Bentonite Clay Waterproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bentonite clay waterproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Preformed Bentonite Clay Panels and Tubes:
 - 2.1.1 Panels shall be made of dry bentonite granules packed into the corrugated flutes of biodegradable Kraft boards. Panels shall be four feet square by 3/16 inch thick and weigh 18 pounds.
 - 2.1.2 Tubes shall be a water soluble polyvinyl alcohol container filled with dry granular bentonite and hermetically sealed. Tubes shall be two-inch diameter by two-foot lengths and weigh approximately three pounds.
 - 2.2 Bentonite Gel: Clay composition of hydrated aluminum silicate, which swells upon absorption of water into a thick gel.
 - 2.3 Joint Seal: A hydrated bentonite gel for trowel application to concrete for sealing construction joints, form tie voids, and wall penetrations.
 - 2.4 Joint-pak Containers: A biodegradable Kraft container filled with dry bentonite granules for preformed concrete joints in below grade foundation walls. Standard joint-paks shall be 1-1/4 x 1-1/4 inches, weighing approximately 1.1 pounds. Provide triangular-shaped cross section 2-3/8 x 2-3/8 x 2-3/8 inches x 2 feet long, weighing approximately 3 pounds for inside corner joints.
 - 2.5 Chemically Modified Bentonite For Spray Application: High pressure spray combining bentonite clay with a modified asphalt binder that adheres the bentonite to vertical surfaces. Clay content shall be 1-1/2 pounds per square foot.
 - 2.6 Moisture Barrier: 4 mil polyethylene sheeting complying with ASTM D 2103.
 - 2.7 Protection Board: Multi-ply, semi-rigid board composed of a mineral fortified asphaltic core between a layer of asphalt saturated liner and a weathercoated glass mat liner with polyethylene film facing. Protection board shall be 4 feet by 8 feet by 1/8 inch.
 - 2.8 Masonry Nails: 2-inch minimum by No. 9 fluted masonry nails with 1-inch minimum diameter disks complying with Fed. Spec. FF-N-105 for fastening panels to concrete and masonry walls.
- 3.0 EXECUTION:
 - 3.1 Maintenance and Repair Methods:
 - 3.1.1 Preformed Bentonite Panels:
 - 3.1.1.1 Prior to installation of panels, parge all joints and cracks with joint seal to 1/8-inch minimum depth and 3-inch minimum width. Apply panels with masonry nails, joint seal, or approved mastic. Fold and attach panels around corners with corrugations horizontal. Lap all adjoining panel edges 1 1/2 inches and stagger vertical joints of succeeding courses.
 - 3.1.1.2 Install polyethylene sheeting immediately after panels are installed to provide temporary protection to bentonite panels against moisture. Overlap sheeting four inches. Apply sheeting with adhesive.
 - 3.1.1.3 Install protection board with the asphalt-saturated felt face against the waterproofing for protection from damage by maintenance and repair activities including backfilling.
 - 3.1.1.4 Bentonite Tubes: Place bentonite tubes along the base of the first panel course on sidewall applications to provide protection at the footing-foundation joint.
 - 3.1.2 Chemically Modified Bentonite Spray:
 - 3.1.2.1 Remove damaged material if damage is extensive, and completely clean area of application.
 - 3.1.2.2 If small spot repair is all that is required, cover damaged area with bentonite panel or pour loose dry granular bentonite adjacent to the damage.
 - 3.1.2.3 For large scale repair work, apply a spray coating of minimum 3/8-inch bentonite to the damaged surface.
 - 3.1.2.4 At foundation-footing joint spray, application shall be two inches thick in a cove or cant configuration.
 - 3.1.2.5 Spray joints with a double thickness, resulting in a membrane 3/4 inch to one inch thick. For

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small areas, joint seal may be trowel-applied.

3.1.3 Miscellaneous Joint Seals:

3.1.3.1 Bentonite gel shall be trowel-applied to concrete for sealing construction joints, form tie voids, and wall penetrations.

3.1.3.2 Bulk granular Bentonite may be poured at the base joints of walls and foundations.

3.1.3.3 Press joint-pak containers filled with dry granular bentonite into preformed joint cavities next to PVC waterstop in joints between two concrete pours.

Bituminous Dampproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous dampproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Asphalt Dampproofing:

2.1.1 Primer: Fed. Spec. SS-A-701.

2.1.2 Cement, Bituminous Plastic: ASTM D 449. A heavy-bodied asphalt emulsion of brush or power spray consistency.

2.1.3 Asphalt: ASTM D 449. Hot asphalt or asphalt emulsions for mop application.

2.2 Tar Dampproofing:

2.2.1 Primer: Creosote complying with ASTM D 43.

2.2.2 Bitumen: Coal-tar pitch complying with ASTM D 450.

3.0 EXECUTION:

3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.

3.2 Installation:

3.2.1 Application of Dilute Asphalt Emulsion Primer: Brush or spray in a continuous unbroken film, free from pinholes or other surface breaks.

3.2.2 Application of Creosote Primer: Apply with a brush or roller to entire surface.

3.2.3 Interior and Exterior Cold Application: Brush or spray apply without thinning in a continuous unbroken film, free from pinholes or other surface breaks. Apply to entire primed area.

3.2.4 Exterior Hot Application:

3.2.4.1 Coal-Tar Pitch: Apply over exposed surface area with mop or roller in a continuous, unbroken film, free from pinholes.

3.2.4.2 Asphalt: Mop two coats of hot asphalt over the entire primed area. Use not less than 25 pounds per 100 square feet.

Silicone Dampproofing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of silicone dampproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of material shall be as required to support the work.

2.0 PRODUCTS: Silicone water repellent (5 percent solution) shall be a clear, ready to use liquid consisting of polymerized silicone resins and penetrating hydrocarbon solvents specifically formulated to repel water. Silicone solution shall comply with Fed. Spec. SS-W-110.

3.0 EXECUTION:

3.1 Precautions: Immediately remove any solution that comes in contact with glass surfaces. Protect glass surfaces with polyethylene.

3.2 Installation: Apply silicone solution by brush or a low pressure spray unit. If pumped from a barrel, use an agitator. Apply in one or two coats so that the surface is flooded to the point of maximum absorption. Start at top and work down, providing a continuous rundown of 6 to 12 inches during application. Start at top with second coat as soon as drop has been made.

Water-repellent Coating Dampproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water-repellent coating dampproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General: The materials shall be colorfast, non-yellowing, and impervious to the following solutions:
 - Water.
 - One percent soap solution.
 - Salt solutions.
 - Most dilute acids.
 - Most alkalis.
 - Urine.
 - Color fast and non-yellowing.
- 2.2 Acrylic Sealers: Clear, water-white, non-staining sealing compound shall consist of a blend of penetrating and film-forming materials in a petroleum distillate and a methacrylate resin and shall have a flash point (tag open cup) of 82 F minimum. The product must breathe and have the ability to be later recoated without any special treatment.
- 2.3 Polymeric Resins: Clear, colorless, inorganic polymer water repellents for impregnating and hardening the surfaces. The product must breathe and have the ability to be later recoated without any special treatment.
- 2.4 Polyester Resins: A mixture of modified polyester resins.
- 2.5 Butyrate Resins: Clear liquid, one component mixture of selected butyrate resins in a mineral spirit base.
- 3.0 EXECUTION:
- 3.1 Preparation: Prior to application of dampproofing, fill voids, cracks, and holes with cement mortar.
- 3.2 Installation: Coating may be applied by conventional spray equipment, airless spray equipment, brush, or roller.

Cementitious Dampproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious dampproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Portland cement: ASTM C 150, Type I cement shall be used when the special properties of other types are not required.
- 2.2 Sand: Washed silica sand graded within the following limits:

Sieve	Percent Passing
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10
- 2.3 Water: Clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
- 2.4 Bonding Agent:
 - 2.4.1 A re-emulsifiable one-component liquid resinous emulsion shall be used where area is not subject to constant dampness.
 - 2.4.2 A two-component epoxy resin compound shall be used in areas under damp conditions.

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- 2.5 Waterproofing Admixtures: A calcinated solution of colloidal resonates that increases impermeability, workability, and compressive strength of mortar.
- 3.0 EXECUTION:
- 3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.
- 3.2 Installation:
- 3.2.1 Bonding Agent: Apply as required.
- 3.2.2 Bearing Surface: Parge or apply a coating of the cementitious mixture to the areas to be dampproofed, using a brush or trowel. Minimum thickness shall be 1/4 inch.

Bituminous Vapor Barrier for Roofs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous vapor barriers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Asphalt Primer: ASTM D 41.
- 2.2 Bitumen:
- 2.2.1 Asphalt: ASTM D 312, Type III, steep asphalt.
- 2.2.2 Coal-Tar Pitch: ASTM D 450, Type A, for slopes up to and including 1/2 inch per foot.
- 2.3 Bituminous Cement: Fed. Spec. SS-C-153.
- 2.3.1 Type I: For use with asphalt saturated felts.
- 2.3.2 Type II: For use with coal-tar saturated felts.
- 2.4 Vapor Barrier Membrane:
- 2.4.1 Asphalt Saturated Organic Felt: ASTM D 226, No. 15, asphalt saturated organic fiber felt weighing approximately 13 pounds per square.
- 2.4.2 Asphalt Saturated Inorganic Felt: ASTM D 250, No. 15, asphalt saturated asbestos fiber felt weighing approximately 13 pounds per square.
- 2.4.3 Coated Base Sheet: ASTM D 2626, asphalt saturated organic fiber roofing felt, both faces coated with asphalt including mineral stabilizers and mineral surfacing, weighing not less than 37 pounds per square.
- 2.4.4 Coal-Tar Saturated Felt: ASTM D 227, No. 15 coal-tar pitch saturated organic felt weighing minimum of 13 pounds per square.
- 2.4.5 Sheathing Paper: Rosin-sized sheathing paper weighing not less than 5 pounds per square or saturated felt weighing approximately 7-1/2 pounds per square.
- 2.5 UL Listing: Bituminous vapor barrier materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Bituminous vapor barrier materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
- 2.6 FM Listing: Bituminous vapor barrier materials of roofing systems that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Bituminous vapor barrier materials bearing FM's examination and follow-up inspection service shall be provided.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Concrete Decks: Prior to installation of vapor barrier, apply asphalt primer at the rate of 1 gallon per square over area to receive vapor barrier.
- 3.1.2 Precast Concrete Decks: Prior to installation of vapor barrier, cover joints between precast units with a 4-inch to 6-inch wide strip of roofing felt embedded in, and coated with, bituminous cement. Prime deck surface to receive vapor barrier with asphalt primer applied at rate of 1 gallon per square.
- 3.1.3 Wood Deck: Prior to installation of vapor barrier, apply one layer of sheathing paper over areas to be surfaced with vapor barrier.

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- 3.2 Installation:
 - 3.2.1 Laying Felts: Lay vapor barrier free of wrinkles or bubbles, at right angles to the slope of the deck.
 - 3.2.2 Mopping: Solid mop heated bitumen under and between felts.
 - 3.2.3 Embedment in Bitumen: Broom in felts with 18-inch or 20-inch wide soft fiber type broom.
 - 3.2.4 Nailing Felts: Drive nails and fasteners for securing roofing flush through flat metal disks. •07192
 - 3.2.5 Embedding Vapor Barrier at Roof Edge: Embed vapor barrier felts in 9-inch wide solid coat of bituminous plastic cement.
- 3.3 Installation to Non-Nailable Deck:
 - 3.3.1 Asphalt Saturated Felt System: Vapor barrier system shall consist of two-ply asphalt saturated felts embedded in solid moppings of asphalt applied at rate of 15 to 20 pounds per square per ply.
 - 3.3.2 Coal-Tar Saturated Felt System: Vapor barrier system shall consist of two-ply coal-tar saturated felts embedded in solid moppings of coal-tar pitch applied at rate of 20 to 30 pounds per square per ply.
 - 3.3.3 Coated Base Sheet System: Vapor barrier system shall consist of two-ply coated base sheet embedded in solid moppings of asphalt applied at rate of 20 pounds per square per ply.
- 3.4 Installation to Nailable Deck:
 - 3.4.1 Asphalt Saturated Felt System: Vapor barrier system shall consist of two-ply asphalt saturated felt, first ply laid dry and second ply embedded in solid mopping of asphalt applied at rate of 15 to 20 pounds per square.
 - 3.4.2 Coal-Tar Saturated Felt System: Vapor barrier system shall consist of two-ply coal-tar saturated felts, first ply laid dry and second ply embedded in solid mopping of coal-tar pitch applied at rate of 20 to 30 pounds per square.
 - 3.4.3 Coat Base Sheet System: Vapor barrier system shall consist of two-ply coated base sheet. Apply first ply dry. Embed second ply in solid coating of asphalt applied at the rate of 15 to 20 pounds per square.
 - 3.4.4 Attachment to Existing Vapor Barrier Membrane: Install a 25-inch wide strip of vapor barrier felt; lap

Laminated Sheet Vapor Barrier for Roofs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated sheet vapor barrier for roofs. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Vapor Barrier:
 - 2.1.1 Reinforced Paper Laminate: Two layers of high strength Kraft papers laminated together with asphalt, reinforced with glass fiber, with vapor transmission rating of 0.2 perm or less when tested in accordance with ASTM E 96.
 - 2.1.2 Polyethylene Sheet Laminate: Two layers of high strength Kraft papers, laminated, with polyethylene sheet between, with vapor transmission rating of 0.2 perm or less when tested in accordance with ASTM E 96, Procedure A.
 - 2.2 Adhesive: Water-resistant adhesive with a nontoxic vehicle. Adhesive shall be vapor barrier manufacturer's recommended product and shall be compatible with contact surfaces.
 - 2.3 Asphalt: ASTM D 312, Type III, steep asphalt.
 - 2.4 Vapor Barrier Joint Strips: Vapor barrier material cut into strips, approximately 6 inches wide.
 - 2.5 UL Listing: Laminated sheet vapor barrier materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Laminated sheet vapor barrier materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
 - 2.6 FM Listing: Laminated sheet vapor barrier materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Laminated sheet vapor barrier materials bearing FM's examination and follow-up inspection service shall be provided.

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3.0 EXECUTION:

- 3.1 Preparation: Surfaces to receive vapor barrier membrane shall be smooth, with no protruding surfaces that would puncture membrane.
- 3.2 Installation:
 - 3.2.1 Application of Vapor Barrier with Adhesive: Lay vapor barrier sheet directly on deck in ribbons of adhesive approximately 1/2 inch wide and spaced 6 inches on center.
 - 3.2.2 Application of Vapor Barrier with Asphalt: Lay vapor barrier sheet directly on deck in solid coat of asphalt applied at rate of 15 to 25 pounds per square.
 - 3.2.3 Laps: Side laps shall be not less than 2 inches, and end laps shall be not less than 6 inches.
 - 3.2.4 Nailable Decks: Nail lapped areas, spacing nails maximum of 12 inches on center.
 - 3.2.5 Sealing Joints: Seal joints in vapor barrier system and seal to other surfaces at extremities of coverage with vapor barrier strips.

Polyvinyl Sheet Vapor Barrier for Roofs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of polyvinyl sheet vapor barriers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Vapor Barrier: Polyvinyl chloride sheet, minimum 4 mils thick, with vapor transmission rating of 0.2 perm or less when tested in compliance with ASTM E 96.
 - 2.2 Adhesive: Water-resistant adhesive with a nontoxic vehicle specially prepared for application of polyvinyl sheet membrane to roof decks.
 - 2.3 Vapor Barrier Tape: Aluminum foil, minimum 1 mil thick, laminated between two sheets of polyester film with pressure-sensitive adhesive on one face, vapor transmission of 0.015 perm or less.
 - 2.4 Vapor Barrier Joint Strips: Vapor barrier material cut into strips, approximately 6 inches wide.
 - 2.5 UL Listing: Polyvinyl sheet vapor barrier materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Polyvinyl sheet vapor barrier materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
 - 2.6 FM Listing: Polyvinyl sheet vapor barrier materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Polyvinyl sheet vapor barrier materials bearing FM's examination and follow-up inspection service shall be provided.
- 3.0 EXECUTION:
 - 3.1 Preparation: Surfaces to receive vapor barrier membrane shall be smooth, with no protruding surfaces that would puncture membrane.
 - 3.2 Installation:
 - 3.2.1 Installation of Basic Membrane: Lay polyvinyl sheet directly on deck in solid covering of approved adhesive.
 - 3.2.2 Nailable Decks. Nail lapped areas, spacing nails maximum of 12 inches on center.
 - 3.2.3 Sealing Joints. Seal joints in vapor barrier system and seal to other surfaces at extremities of coverage with vapor barrier tape or vapor barrier strips.

Bituminous Vapor Barriers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous vapor barriers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Asphalt Vapor Barrier: Provide one of the following:
 - 2.1.1 A proper-bodied bituminous coating of brush or spray consistency for application to interior masonry walls above or below grade, containing a hydrophilic agent that assures proper adhesion. Compound shall comply with ASTM D 449.
 - 2.1.2 A soft, adhesive "self-healing" hot mop type asphalt that flows readily under the mop and is not susceptible to wide temperature ranges. Compound shall comply with ASTM D 449, Type B. Used with a cold-applied primer complying with ASTM D 41.
- 2.2 Tar Vapor Barrier: Primer shall be coal-tar pitch complying with ASTM D 43 Type B for use below ground level under uniformly moderate temperature conditions, both during the process of installation and during service. The coal-tar pitch shall be homogeneous and shall comply with the requirements prescribed in Table I, ASTM D 450.
- 2.3 Reinforcing shall be tar-saturated felt complying with ASTM D 227 or glass mat complying with ASTM D 1668.
- 3.0 EXECUTION:
 - 3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.
 - 3.2 Installation: Below grade applications shall receive two coats. Allow 24 hours between coats.
 - 3.3 Reinforcing Method: Reinforce all inside and outside corners, joints, cracks, or places where stresses are likely to occur with no less than 2 plies of felt or glass mat.

Laminated Sheet Vapor Barriers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated sheet vapor barriers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Bonded Multi-Ply Flexible Core Board:
 - 2.1.1 Board with core plies of polyvinyl chloride shall consist of a core sheet of polyvinyl chloride suspended between two layers of pure-blown, high melt point asphalt and sandwiched between two asphalt saturated felt liners. The felt liners shall be covered with an asphalt weathercoat.
 - 2.1.2 Semi-rigid asphalt board shall consist of an asphalt core sandwiched between two saturated felt liners to which an independent weather-coating is bonded.
 - 2.1.3 Self-adhesive multi-ply flexible board shall consist of a 1/16-inch thick waterproof highly flexible elastomeric material with a release paper on one side. The membrane shall be bonded to a reinforcing carrier sheet, vinyl center sheet, additional bitumen, and a protective weathercoating.
 - 2.2 Bonding Agent:
 - 2.2.1 Hot asphalt for bonding to vertical surfaces or sealing joints shall be a mopping asphalt with a softening point in the range of 180 to 200 F and complying with ASTM D 312, Type III.
 - 2.3 Butt Joint Tape: Elastomeric vapor barrier shall be in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.
- 3.0 EXECUTION: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.

Plastic Sheet Vapor Barriers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic sheet vapor barriers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Polyethylene Sheet shall comply with ASTM D 2103.
 - 2.2 Butyl sheet shall be an impermeable butyl rubber membrane 1/16 inch thick having a tensile strength per ASTM D 412 of 1,200 psi minimum and an elongation per ASTM D 412 of 300 percent

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- minimum. Butyl sheet shall be resistant to ozone and remain flexible to 40 degrees F below zero.
- 2.3 Neoprene sheet shall be an impermeable, self-extinguishing, ozone-resistant material, 1/16 inch thick. Neoprene shall have a tensile strength per ASTM D 412 of 1,500 psi minimum and an elongation per ASTM D 412 of 250 percent minimum.
 - 2.4 Ethylene Propylene Diene Monomer (EPDM) sheet shall be an impermeable membrane resistant to ozone and ultra-violet radiation. EPDM shall have a tensile strength per ASTM D 412 of 1,400 psi minimum and a elongation per ASTM D 412 of 300 percent minimum.
 - 2.5 Vinyl sheet shall be a heavy-duty polyvinyl chloride sheet complying with ASTM D 3083.
 - 2.6 Primers shall be as required.
 - 2.7 Adhesives:
 - 2.7.1 Adhesive for cold application shall be a non-setting bitumen cutback asphalt.
 - 2.7.2 Adhesive for hot application shall be asphalt complying with ASTM D 312, Type III.
 - 2.8 Butt joint tape shall be an elastomeric vapor barrier in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.
 - 3.0 EXECUTION:
 - 3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.
 - 3.2 Installation:
 - 3.2.1 Primer: Apply primer by brushing or spraying uniformly over surface to receive membrane.
 - 3.2.2 Membrane:
 - 3.2.2.1 At footings, shape the membrane to conform to the surface.
 - 3.2.2.2 Apply adhesive to both the footing and to the membrane.
 - 3.2.2.3 On vertical surfaces, apply adhesive to both wall and membrane.
 - 3.2.2.4 Seal joints between adjacent sheets centering 6-inch sealing tape over the joint.

Batt and Blanket Building Insulation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of batt and blanket building insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Mineral Fiber Insulation shall comply with ASTM C 665, Type II.
 - 2.2 Reflective Insulation shall comply with ASTM C 665, Type III.
 - 2.3 Membrane Covering: All vapor permeable back surface coverings, membrane coverings, or facings affixed to insulation in compliance with ASTM E 84 shall have a flame spread rating not greater than 25 and a smoke developed rating not greater than 50 when tested.
 - 2.4 Separately Applied Vapor Barriers:
 - 2.4.1 General: Separate vapor barrier material shall have a permeability of 1.0 perm or less, in compliance with procedure "A" of ASTM E 96.
 - 2.4.2 Ground cover for crawl spaces: Ground cover for crawl space applications shall have a permeability of 0.5 perm or less, in compliance with ASTM E 154.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Separately Applied Vapor Barriers: All surfaces on which separately applied vapor barrier material is to be applied shall be free of any projections that might puncture the vapor barrier material.
 - 3.1.2 Masonry Wall Applications: Provide wood fastening strips for fastening rigid insulation to masonry walls.
 - 3.2 Installation. Install insulation to a thickness necessary to provide the designated or directed R-value.
 - 3.2.1 Exterior Walls:
 - 3.2.1.1 Insulate each space between framing members completely with batt or blanket type insulation sized to fit the full width of the space.
 - 3.2.1.2 Install insulation having an affixed facing with the facing toward the interior (warm-in-winter)

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side of the construction.

- 3.2.1.3 Install reflective insulation with an air space of not less than 3/4 inch, adjacent to the reflective facing, when insulation thickness permits.
- 3.2.1.4 Crawl Spaces (Unvented): Contractor shall cut vent openings in exterior walls of crawl spaces, frame as necessary to reinforce the openings, and install wood or aluminum louvers and screening.
- 3.2.1.5 Crawl Spaces (Vented): Insulate each space between framing members completely with batt or blanket type insulation sized to fit the full width of the space.
- 3.2.1.6 Ceiling: Insulate each space between framing members completely with batt or blanket type building insulation, sized to fit the full width of the space. Install insulation around, not over, all recessed lighting fixtures in ceiling construction. Install insulation so as to permit air passage from eave vents to air space above insulation.

Loose or Granular Fill Insulation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of loose or granular fill insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Mineral fiber insulation shall comply with Fed. Spec. HH-I-1030, Type I, Class A or B.
 - 2.2 Perlite insulation shall comply with ASTM C 549, treated for water repellency.
 - 2.3 Vermiculite insulation shall comply with ASTM C 516, Type II, treated for water repellency.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Cavity Applications: Close off all openings in cavities to receive loose or granular fill insulation, except at the top so as to permanently prevent insulation from escaping.
 - 3.1.2 Ceiling Applications: Wherever loose or granular fill insulation is to be applied over dropped soffit or other large cavities exposed to the attic, install fiberboard or other suitable material between framing members over soffit cavity to support insulation.
 - 3.2 Installation:
 - 3.2.1 Install insulation to a thickness necessary to provide the designated R-value.
 - 3.2.2 Install insulation to completely fill all required ceiling and horizontal areas.

Rigid Insulation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of rigid insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Mineral fiberboard insulation shall comply with Fed. Spec. HH-I-558, Form A, class as specified.
 - 2.2 Polystyrene plastic board insulation shall comply with ASTM C 578, Type II.
 - 2.3 Urethane plastic board insulation shall comply with Fed. Spec. HH-I-530, Type I, Class 2.
 - 2.4 Cellular glass block insulation shall comply with ASTM C 552, Type I.
 - 2.5 Organic fiberboard insulation shall comply with ASTM C 208. Organic Fiberboard Insulation shall be chemically treated to resist decay, fungus growth, and insect attack.
 - 2.6 Corkboard insulation shall comply with ASTM C 640.
 - 2.7 Glass fiberboard insulation shall comply with Mil. Spec. MIL-I-742.
- 3.0 EXECUTION:
 - 3.1 Preparation: All surfaces to which rigid insulation will be mastic-mounted shall be free from all materials that will prevent proper adhesion.
 - 3.2 Installation: Install insulation to a thickness necessary to provide the designated R-value.

Perimeter Insulation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of perimeter

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insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

- 2.1 Polystyrene insulation board shall comply with ASTM C 578, Type I.
- 2.2 Urethane insulation board shall comply with Fed. Spec. HH-I-530, Type I, Grade 2, Class 1. Urethane insulation board shall have a minimum density of 1.7 pounds per cubic foot.
- 2.3 Insulation thickness shall be 1 inch, except where otherwise specified or directed.
- 2.4 Surface Burning Characteristics: Insulation shall have a maximum flame spread index of 25, in compliance with ASTM E 84.
- 2.5 Plastic cement shall comply with Fed. Spec. SS-C-153.
- 2.6 Asphalt-saturated felts shall comply with ASTM D 226, Type I.
- 2.7 Adhesive or mastic for bonding insulation shall comply with applicable fire-resistance requirements for the insulation being installed.

3.0 EXECUTION:

- 3.1 Preparation: The Contractor shall remove all materials and construction necessary to gain access to the work.
- 3.2 Installation: Apply insulation to the full thickness required over the entire area to be insulated.
- 3.3 Reconstruction: Restore existing slabs, construction, and finishes that have been removed for the installation of insulation or damaged to their original condition.
- 3.4 Restoration of Landscaping: Restore landscaping that is disturbed to its original condition.

Sprayed-on Insulation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed-on insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

- 2.1 Urethane foamed-in-place insulation shall be a spray-applied two-component material that when mixed together in proper proportions produces a rigid closed cell foam material.
 - 2.1.1 Physical properties of cured foam shall be as follows:
 - 2.1.1.1 Nominal density shall be 1.5 to 2.5 lbs/cu ft (ASTM D 1622).
 - 2.1.1.2 Closed cell content shall be 90 percent minimum.
 - 2.1.1.3 Compressive strength, parallel to rise, shall be 40 psi.
 - 2.1.1.4 Thermal conductivity (k factor) Btuh/psf/F/in. shall be 0.17 when aged 90 days at 14 F dry heat (ASTM C 518).
 - 2.1.1.5 Vapor transmission shall be 3.0 perm-inch.
 - 2.1.1.6 Water absorption shall be 3.0 percent.

3.0 EXECUTION:

- 3.1 Substrates shall be cleaned prior to application of sprayed-on insulation.
- 3.2 Openings in roofs to receive foamed-in-place insulation shall be closed sufficiently to prevent escape of insulation.
- 3.3 Protect installed insulation from harmful weather exposures and possible physical abuses including fire hazards.

Roof Insulation and Underlayment: Cellular Glass

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cellular glass. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

- 2.1 Cellular Glass Block Insulation: ASTM C 552, Type I, rigid, closed cell, noncombustible, foamed

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- glass blocks. Sizes shall be manufacturer's standard sizes and required thickness, edges square.
- 2.2 Cellular Glass Board Insulation: ASTM C 552, Type IV, rigid, closed cell, noncombustible, foamed glass boards, with laminated Kraft paper faces.
 - 2.2.1 Board Sizes: Manufacturer's standard sizes and required thickness with 1/4-inch bevel on long edges at bottom of board.
 - 2.2.2 Tapered Unit Sizes: Manufacturer's standard sizes and taper.
 - 2.2.3 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.
 - 2.3 UL Listing: Cellular glass roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Cellular glass roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
 - 2.4 FM Listing: Cellular glass roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Cellular glass roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.
 - 3.0 EXECUTION:
 - 3.1 Installation: Place beveled edge of board units to the deck surface in same direction continuously throughout each course.
 - 3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.

Roof Insulation and Underlayment: Mineral Fiber

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mineral fiber. Products shall match existing material and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Insulation board shall be Fed. Spec. HH-I-526, rigid inorganic fiberboard formed with fillers and water-resistant binders.
 - 2.1 Glass Fiberboard: Mineral fiber insulation boards formed of glass fibers shall be bonded together with asphalt and surfaced on top surface with glass-fiber reinforced asphalt mat.
 - 2.2 Mineral Fiberboard: Mineral fiber insulation boards formed of rock or slag processed into fiber shall be bonded together with asphalt and surfaced on top surface with asphalt saturated felt.
- 2.3 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.
- 2.4 UL Listing: Mineral fiber roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Mineral fiber roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
- 2.5 FM Listing: Mineral fiber roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Mineral fiber roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.
- 3.0 EXECUTION: Install insulation to a thickness necessary to provide the designated R-value.

Roof Insulation and Underlayment: Composite Board

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of composite board. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product

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manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Composite board insulation shall consist of two insulation boards chemically bonded together. Top board shall be expanded rigid polyurethane foam board complying with Fed. Spec. HH-I-530; top surface shall be surfaced with one layer of asphalt saturated felt or glass fiber mat. Second layer shall be one of the following materials:

2.1.1 Inorganic Perlite Mineral Aggregate Board: ASTM C 728.

2.1.2 Inorganic Glass Fiberboard: Fed. Spec. HH-I-526.

2.1.3 Mineral Fiberboard: Fed. Spec. HH-I-526.

2.2 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.3 Edge Sealant: Mastic sealant of type recommended by insulation manufacturer.

2.4 UL Listing: Composite board roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Composite board roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.5 FM Listing: Composite board roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Composite board roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Installation: Install composite insulation boards with urethane surface up.

3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.

Roof Insulation and Underlayment: Expanded Perlite Board

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of expanded perlite board. Products shall match existing material and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Board shall be ASTM C 728, rigid, noncombustible board formed of expanded perlite aggregate and fibers combined with water-resistant mineral binders. Boards shall have integral top surface coating of insulation manufacturer's standard type.

2.2 Flame spread rating: insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.

2.3 UL Listing: Expanded perlite board roof insulation and underlayment materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Expanded perlite board roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.4 FM Listing: Expanded perlite board roof insulation and underlayment materials of roofing systems which have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Expanded perlite board roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Insulation board shall be covered with wood board walkways where transport of materials will

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result in damage to the insulation. Remove walkways ahead of roofing operations.

- 3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.

Roof Insulation and Underlayment: Fiberboard

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fiberboard. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General: ASTM C 208, Rigid, organic fiberboard derived from wood, cane, or other vegetable fibers, formed with fillers and water-resistant binders. 2.2 Asphalt Impregnation: Insulation board shall be impregnated with asphalt, applied at rate not to exceed 4 percent by weight.
- 2.3 Bituminous Coating: Insulation board shall be surfaced with manufacturer's standard bituminous coating.
- 2.4 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.
- 2.5 UL Listing: Fiberboard roof insulation and underlayment materials of roofing systems that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Fiberboard board roof insulation and underlayment materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
- 2.6 FM Listing: Fiberboard roof insulation and underlayment materials of roofing systems that have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Fiberboard board roof insulation and underlayment materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.
- 3.0 EXECUTION: Install insulation to a thickness necessary to provide the designated R-value.

Sprayed-on Fireproofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed-on fireproofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Products shall be provided that have been tested in accordance with ASTM E 119, UL 263, ANSI A2.1, or NFPA 251 for fire-resistance and rated by UL or other industry-recognized agency for the required resistances.
- 2.1 Spray-applied Fireproofing: Materials shall conform to the requirements of ASTM E 1042, Type I, Category A. Spray-applied fireproofing materials shall not contain asbestos.
- 2.1.1 Water shall be clean, fresh, potable, and free from amounts of oils, acids, alkalis, and organic matter that would be injurious to the fireproofing.
- 2.2 Performance Requirements: Spray-applied fireproofing material shall conform to the following requirements:
- 2.2.1 Deflection: Spray-applied fireproofing shall not crack, spall, or delaminate when tested in accordance with ASTM E 759.
- 2.2.2 Cohesion/adhesion: spray-applied fireproofing material shall have a minimum cohesive/adhesive force of 80 psf when tested in accordance with ASTM E 736.
- 2.2.3 Bond-impact: spray-applied fireproofing material shall not crack, spall, or delaminate when tested in accordance with ASTM E 760.
- 2.2.4 Compressive Strength: The minimum compressive strength shall be 500 psf based upon the average load of 10 percent deformation or at ultimate load, whichever is less as tested in accordance with ASTM E 761.
- 2.2.5 Air Erosion: Gain in weight of the collecting filter shall not exceed 0.025 gram per square foot when

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- tested in accordance with ASTM E 859.
- 2.2.6 Corrosion Resistance: No evidence of corrosion, after testing in accordance with ASTM E 937, for metal surfaces to be covered.
- 2.3 Fire Hazard Classification:
- 2.3.1 Surface Burning Characteristics: Spray-applied fire-proofing material shall have a flame spread of 25 or less, a smoke developed rating of 50 or less, and a fuel contributed rating of 50 or less when tested in accordance with ASTM E 84.
- 2.4 Fire resistance rating for building elements shall be as indicated and shall conform to the fire rated assemblies as listed in the UL Fire Resistance Directory.
- 2.5 Substrate Primers: Provide type that is compatible with condition of each substrate to be fireproofed, including shop primers applied by metal fabricators/erectors, and is compatible with bonding adhesives and fireproofing materials.
- 2.6 Metal Lath: Except as otherwise indicated, provide 3.4-pound (per sq yd) expanded galvanized diamond steel lath, with reinforcing members and clips and other anchorage devices as appropriate for substrate and complying with selection requirements of applicable fire endurance tests. Provide corner beads and other lathing accessories of standard design and weight, where required.
- 3.0 EXECUTION:
- 3.1 Surface Preparation: Surfaces to be fireproofed shall be thoroughly cleaned of all dirt, grease, oil, paint, rust, and mill scale or other contaminants that will interfere with the proper bonding of the sprayed fireproofing to the substrate. Ceiling areas to be fireproofed shall be cleared of all obstructions interfering with the uniform application of the spray-applied fireproofing. Hardware such as support sleeves, inserts, clips, hanger attachment devices and the like shall be installed prior to the application of the fireproofing.
- 3.2 Surface Acceptability: Surfaces to receive sprayed fireproofing shall be inspected prior to application of fireproofing material and certified to be clean and in acceptable condition for application of spray-applied fireproofing.
- 3.3 Application: Prior to spray application, surfaces not to receive spray-applied fireproofing, including instruments, gauges, and equipment shall be covered to prevent contamination by splatter, rebound, and overspray. Exterior openings in areas to receive spray-applied fireproofing shall be covered prior to and during application of fireproofing with tarpaulins or other approved material. Fireproofing material shall be applied to a thickness as required to obtain the specified fire resistance rating and to provide a fire-protective coating of uniform density and texture. Fireproofing shall be applied in accordance with the procedure recommended by the manufacturer. Fireproofing applied to underside of steel roof deck or steel floor assemblies shall be installed only after respective roof or floor construction is complete. No roof or floor traffic shall be allowed during application and during curing period. Sealer shall be applied to clean, dry fireproofed surfaces in accordance with manufacturer's recommendations.
- 3.4 Cleanup: Surfaces not indicated to receive fireproofing shall be thoroughly cleaned of all sprayed material.

Asphalt Shingles

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphalt shingles. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Nails shall be nonferrous metal or zinc-coated steel long enough to penetrate at least 3/4 inch into the deck sheathing.
- 2.2 Roll Roofing:
- 2.2.1 Smooth Surfaced: ASTM D 224, Type II.
- 2.2.2 Mineral Surfaced: Fed. Spec. SS-R-630 and provided with 2-inch selvage. 2.3 Shingles shall meet requirements of Underwriters' Laboratories, Inc., for Class C wind-resistant shingles by equaling or exceeding the requirements of UL 55A and UL 997. Shingles shall be square-butt strips of uniform

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- thickness or of thick-butt style, 12 by 36 inches, and either 2-tab or 3-tab design.
- 2.4 UL Listing: Asphalt and composition shingle materials of roofing systems which have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Asphalt shingle materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
 - 2.5 FM Listing: Asphalt shingle materials of roofing systems which have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Asphalt shingle materials bearing FM's examination and follow-up inspection service shall be provided.
 - 3.0 EXECUTION:
 - 3.1 Preparation: Loose, curled, broken, or lifted asphalt shingles shall be nailed down or replaced, if required, to provide a solid nailing base. Protruding or loose nails shall be removed or nailed down.
 - 3.2 Installation:
 - 3.2.1 Application of Roofing When Existing Roofing is Removed:
 - 3.2.1.1 Underlayment: Apply one layer of 15-pound asphalt-saturated felt to roof-deck sheathing.
 - 3.2.1.2 Underlayment: Apply two layers of 15-pound asphalt-saturated felt applied to roof-deck sheathing. A solid coating of bituminous cement shall be applied between the layers of underlayment.
 - 3.2.1.3 Shingles: Apply shingles over underlayment allowing 5-inch butt exposure, and in no case shall there be less than 2-inch head lap.
 - 3.2.1.4 Hips and Ridges shall be formed with 9- by 12-inch individual shingles.
 - 3.2.1.5 Valleys:
 - 3.2.1.5.1 Closed woven-shingle valleys shall have a single layer lining of smooth-surfaced or mineral-surfaced roll roofing, 36 inches wide.
 - 3.2.1.5.2 Roll roofing valley shall be two thicknesses of mineral-surfaced roll roofing.
 - 3.2.2 Application of Roofing Over Existing Asphalt Shingles: Shingles shall be applied over old shingles with butt exposure, except for starter course, equal to old shingles, and in no case shall there be less than 2-inch head lap.
 - 3.2.3 Roof Patching and Replacement: Match existing shingles in design, weight, texture, pattern, and color.

Slate Shingles

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of slate shingles. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Nails shall be large head slater's nails, either hard copper wire nails, cut copper, cut brass, or yellow metal and shall be long enough to penetrate at least 1 inch into the deck sheathing.
 - 2.2 Slate shingles shall comply with ASTM C 406 and shall be of matching or designated size, thickness, color, and texture.
 - 2.3 Asphalt-saturated organic felt shall comply with ASTM D 226.
- 3.0 EXECUTION:
 - 3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.
 - 3.2 Slating:
 - 3.2.1 Starter Course: Apply starter course at eave on cornice line with same thickness slate as main roofing material. Slate shall be approximately 3 inches longer than exposure of first course and shall be installed over a 1/4-inch thick treated wood cant.
 - 3.2.2 First and Succeeding Courses: Apply slate over underlayment with 6-1/2 inch butt exposure with minimum 3-inch head lap. Slate shall project 1 inch at eaves and 1/2 inch at gable ends. Each course shall break joints with preceding course by minimum 3 inches.
 - 3.2.3 Nailing: Fasten each slate with two nails. Do not drive far enough to produce a strain on the slate. Exposed nails shall be permissible only in top courses where unavoidable, and exposed nail heads

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shall be covered with bituminous cement.

Clay Roofing Tiles

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of clay roofing tiles. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Mortar: Mixture of Portland cement, sand, and pigment.
 - 2.2 Nails: Copper or noncorrosive metal.
 - 2.2.1 Ring Type Nails: Used on plywood sheathing.
 - 2.2.2 Slater's Nails: Minimum of 1-1/2 inches long and shall be used on board sheathing.
 - 2.3 Asphalt-saturated organic felt shall comply with ASTM D 226.
 - 2.4 Roofing tiles shall be a clay or shale product that is burned to a hard dense structure, glazed or nonglazed on exposed surfaces.
- 3.0 EXECUTION:
 - 3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.
 - 3.2 Application of Slab Shingle Tiles: Install a 3/4-inch by 1-inch cant strip along eave. On top of cant install under-eave tiles, projecting 1 inch over the rear edge of gutter and flush with the gable edge. Install first course of roofing tiles flush with butt edge of under-eave tile and extend 2 inches over the gable ends. Lay field tiles in straight courses with 2-inch head lap and secure with roofing nails in all holes provided in tiles. Lay all tiles within one foot of hips, ridges, and abutting vertical surfaces in bituminous cement.
 - 3.3 Application of Interlocking Tiles: Install cant strip or under-eave fittings as required by tile configuration. On top of cant or under-eave fitting, install first course of roofing tiles projecting 1 inch over rear edge of gutter. Lay roof tiles with straight butt lines, interlocked into adjoining tiles with a 3-inch headlap and secure with nails in all holes provided in tiles. Provide gable rake fittings at all gables.
 - 3.4 Application of Spanish and Mission Tiles: Install cant strip over eave closure fittings and nailing strips as required by configuration of tiles. Set eave closures back 2 inches from lower edge of eave. Lay tiles in straight vertical lines up roof and with uniform exposure to weather. Give all tiles minimum lap of 3 inches, and extend eave tiles 1 inch over edge of gutters. Fit all tiles properly and secure with nails in all holes provided. Nails shall be long enough to penetrate at least 1 inch into wood base. Cement and nail cover tiles to gable rakes with bituminous cement, all the way up the gables. When eave closures and top fixtures are not required, cement eaves and joint at ridge with mortar.
 - 3.5 Replacing Individual Spanish or Mission Roofing Tiles: Remove broken tiles by cutting nails with a ripper. Insert new tiles of the same color and size as broken one by troweling Portland cement mortar on new tile surface that will be lapped by tile in course above and on surface that will lap tile in course below. Fasten new tile in place with metal strap or wire.

Concrete Roofing Tiles

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete roofing tiles. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Mortar: Mixture of Portland cement, sand, and pigment.
 - 2.2 Nails: Copper or noncorrosive metal.
 - 2.2.1 Ring Type Nails: Used on plywood sheathing.
 - 2.2.2 Slater's Nails: Used on board sheathing.
 - 2.3 Roofing Tiles: Waterproof concrete product reinforced with steel wire. Each tile shall be manufactured with nail holes. Standard rake, closures, hip, and ridge fittings same color as tile,

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shall be provided.

- 2.4 Asphalt-saturated organic felt shall comply with ASTM D 226.
- 3.0 EXECUTION:
- 3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.
- 3.2 Application of Slab Shingle Tiles: Apply 1-inch by 1/2-inch cant strip 1/2 inch from edge of eave. On top of cant, install a starter strip of tiles projecting 1 inch over rear edge of gutters and 1 inch beyond gable ends. Install the first course of tiles flush with edges of starter strip. Lay field tiles in straight courses with a 2-inch head lap and secure with two large-head roofing nails. Lay all tiles within 1 foot of hips, ridges, and abutting vertical surfaces in bituminous cement.
- 3.3 Application of Interlocking Tiles: Install cant strip or under-eave fittings as required by tile configuration. On top of cant, or under-eave fitting, install first course of roof tile projecting 1 inch over the rear edge of gutter. Lay roof tiles with straight butt lines interlocked into adjoining tiles with a 3-inch headlap and secure with nails in all holes provided in the tiles. Provide gable rake fittings at all gables.

Preformed Roofing and Siding

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of preformed roofing and siding panels. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aluminum Roof Panels: Fabricated from roll-formed panels of aluminum alloy in accordance with ASTM B 209, tempered as required for forming operation, with a minimum thickness of 0.032 inch. Thickness of panels shall be the standard thickness as required for roofing span and design loading.
 - 2.1.1 Color-Coated Finish. One of the following standard factory-applied, baked-on coatings:
 - 2.1.1.1 Acrylic Enamel Coating: Epoxy primer and acrylic enamel top coat, dry film thickness not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 2.1.1.2 Fluoropolymer Coating: Full strength 70 percent polyvinylidene fluoride finish, dry film thickness not less than 1.0 mil over a minimum 0.2 mil baked-on modified epoxy primer.
 - 2.1.1.3 Siliconized Polyester Coating: Epoxy primer and silicone-modified polyester enamel topcoat, dry film thickness not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 2.1.2 Factory Prime Coating: Factory-applied baked-on epoxy primer coat, not less than 0.2 mil dry film thickness applied after pretreatment.
 - 2.1.3 Natural Finish: Stucco embossed finish, plain mill-finished or special alloy-clad sheet (Alclad), as required.
 - 2.1.4 Corrugated panels shall be standard 7/8 inch deep with corrugation crests at 2.67 inches on centers with either interlocking ribs or overlapping side laps at side joints, as required.
 - 2.1.5 V-Beam panels shall be standard V-shaped ribbed panels, nominally 4-7/8 inches on centers and 1-3/4 inches deep with either interlocking ribs or overlapping side laps at side joints, as required.
- 2.2 Steel roof panels shall be factory-painted steel metal panels which shall be zinc-coated steel conforming to ASTM A 446, Grade A, G90 zinc coating designation. Roof covering shall be 22 galvanized sheet gauge or thicker. Steel roof panels shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum roof panels.
 - 2.2.1 Corrugated panels shall have similar dimensional and side joint characteristics as specified for aluminum roof panels.
 - 2.2.2 Box rib panels shall be standard units, approximately 1-1/2 inches deep with 1-3/8 inch wide flutes and 5 box ribs at 7-13/64 inches on centers for a 36-inch wide coverage.
 - 2.2.3 Four-inch ribbed panels shall be standard units approximately 1 inch deep with 9 box ribs at 4 inches on centers for a panel width of 37-1/2 inches.
- 2.3 Standing Seam Roofing:
 - 2.3.1 General: Roof-covering panels shall be fabricated of zinc-coated steel conforming to ASTM A 446, G90 coating designation or aluminum-coated steel conforming to ASTM A 463, Type 2. Roof

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- covering shall be 24 galvanized sheet gauge or thicker. Panels shall have configurations designed for mechanically formed lock seams for securing adjacent sheets. Sealant for standing seams shall be factory-applied. Width of sheets shall provide not less than 12 inches of coverage in place. Height of standing seam shall be not less than 2-1/2 inches for slopes less than 3 inches in 12 inches, and not less than 1-3/4 inches for slopes 3 inches in 12 inches or greater.
- 2.3.2 Color Coating: Color finish shall consist of either a synthetic resin base coating applied to a pretreated and primed surface or a dry film coating material bonded to the metal substrate with adhesive. Dry film thickness of color coat shall be not less than 0.8 mil for exterior surface finish.
- 2.3.3 Accessories shall include flashing, trim, cps, and similar accessories of not less than the minimum thicknesses specified for roofing. Accessories of zinc-coated steel used with aluminum-coated steel shall be painted. Molded closure strips shall be closed-cell or solid-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match configuration of the covering.
- 2.3.4 Panel clips shall be of two-piece construction with movable tabs. Clips shall provide for at least 2 inches of panel movement. Tabs shall be designed to be folded into the lock seam.
- 2.3.5 Fasteners shall be zinc-coated steel or corrosion-resisting steel.
- 2.3.5.1 Screws shall be not less than No. 14 diameter if self-tapping type and not less than No. 12 diameter if self-drilling and self-tapping type.
- 2.3.5.2 Blind rivets shall be stainless steel.
- 2.3.5.3 Bolts shall be not less than 1/4-inch diameter, shouldered or plain shank, as required, with proper nuts.
- 2.4 Aluminized Steel Roof Panels:
- 2.4.1 General: Roof panels shall be formed of Type II aluminized sheet in accordance with ASTM A 463. Thickness shall be not less than 22-gauge material.
- 2.4.2 Aluminized steel corrugated panels shall be similar to standard profiles and dimensional and side joint characteristics as specified for aluminum roof panels and steel roof panels.
- 2.5 Plastic Roof Panels:
- 2.5.1 General: Preformed translucent plastic roof panels shall be glass fiber-reinforced polyester plastic panels conforming to ASTM D 3841.
- 2.5.2 Non-fire rated translucent plastic roof panels shall be manufactured of acrylic modified resins with either a smooth or embossed finish. Glass reinforcement shall be not less than 27 percent by weight and resins approximately 73 percent by weight and shall be of high quality light-stabilized polyester, modified with acrylic monomer.
- 2.5.3 Low flame spread translucent plastic roof panels shall be manufactured of light-stabilized, fire-retardant polyester approximately 75 percent by weight and modified with acrylic monomer. Glass reinforcement shall be not less than 25 percent by weight. Panels shall be classified by Underwriters' Laboratory with a flame spread of not greater than 25 when tested in accordance with ASTM E 84. Finish shall be smooth or embossed as required.
- 2.5.4 Corrosion-resistant opaque panels shall be manufactured of resins composed of high quality light-stabilized polyester, modified with acrylic monomer. Where required, panels shall be the fire-retardant type classified by Underwriters' Laboratories, with a flame spread not greater than 25 when tested in accordance with ASTM E 84.
- 2.5.5 High strength opaque fire-retardant panels suitable for walkable roof service shall be composed of high quality light-stabilized, fire-retardant polyester, modified with acrylic monomer. Glass reinforcement shall be a minimum of 38 percent, composed of woven continuous strand and chopped strand glass. Interior and exterior surfaces shall have a surface veil. Finish shall be embossed. All panels shall be classified by Underwriters' Laboratories, with a flame spread not greater than 25 when tested in accordance with ASTM E 84.
- 2.6 Aluminum Siding Panels: Aluminum siding panels shall be similar to aluminum roofing panels. Four-inch ribbed panels shall be approximately 1 inch deep with 9 box ribs at 4 inches on centers for a panel width of 37-1/2 inches.
- 2.7 Steel Siding Panels shall be similar to steel roofing panels, including finish and profiles (except box rib profile). Thickness shall be 24 galvanized sheet gauge or thicker.
- 2.8 Insulated Siding Panels:
- 2.8.1 Factory-assembled Sandwich Panels:

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- 2.8.1.1 General: Interior and exterior panels shall be shop-assembled, fabricated of hot-dipped, zinc-coated, roll-formed steel sheet, ASTM A 446, Grade A, except where higher strength is required for performance, and G90 zinc coating. Thickness of interior and exterior panels shall be determined for wall spans and design loading as required.
- 2.8.1.2 Insulation shall be standard glass fiber blanket insulation complying with ASTM C 665, Type I, with a k-value of 0.27 at 75 F and a density of not less than 1.5 lbs/cu ft.
- 2.8.1.3 Assembled panel system shall have standard continuous gasket at male legs isolating metal-to-metal contact. Panels shall be factory-caulked.
- 2.8.1.4 All related closures, flashings, and copings shall be manufactured from same gauge material as exterior face metal panel and shall be properly engineered to job conditions.
- 2.8.1.5 Finish of exterior panels shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum panels. Finish of interior panels shall be prime coat with a color coat as required.
- 2.8.2 Field-Assembled Sandwich Panels:
 - 2.8.2.1 Interior wall facing units shall be hot-dipped, zinc-coated, single rib design steel sheet, ASTM A 446, Grade A, G90 zinc coating. Interior wall facing units may be of 0.024 inch or thicker aluminum. Interior units shall be roll-formed in unit widths of 12 inches with 1-1/2 inch ribs or 24 inches with 2-inch ribs. Interlocking joints shall be provided between units. Interior wall units shall present a flush inside wall surface.
 - 2.8.2.2 Insulation: Rigid or semi-rigid board insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or 2. Blanket insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6. Insulation shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Insulation shall be of sufficient thickness to provide the designated U-value.
 - 2.8.2.3 Exterior panel materials shall be mill-embossed finished aluminum, galvanized steel, galvanized and painted steel, or stainless steel.
 - 2.8.2.3.1 Aluminum Sheets shall be ASTM B 209. Where required, stucco embossed finish shall be provided. Where required, provide Alclad aluminum alloy-clad sheets where exposed without applied coatings.
 - 2.8.2.3.2 Steel panels shall be metal panels of zinc-coated steel conforming to ASTM A 446, Grade A, G90 zinc coating. Where color coating is required, finish shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum roof panels.
 - 2.8.2.3.3 Stainless steel panels shall be fabricated from ASTM A 167, sheet stock types 302 or 304 stainless steel with No. 2B surface finish. Where exposure to corrosive atmospheres or coastal areas is required, stainless steel panels shall be fabricated from ASTM 167, sheet stock type 316, with No. 2B surface finish.
- 2.9 Solid vinyl siding shall comply with ASTM D 3679, Class 2.
- 3.0 EXECUTION:
 - 3.1 General: Installation shall include all standard fasteners, flashings, sealants, gaskets, closure strips, trim, and insulation associated with roofing and siding. Provide expansion joints where required.
 - 3.2 Field-Assembled Sandwich Panel Siding shall include installation of subgirts. All panels shall be erected with flutes and ribs running vertically.
 - 3.3 Factory-assembled sandwich panels shall be erected by means of standard concealed clip attachments.
 - 3.4 Solid vinyl siding shall include all accessories required for a complete installation.

Asbestos Cement Roofing and Siding

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asbestos cement roofing and siding. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Wall Covering and Roof Covering: Corrugated asbestos cement panels shall conform to ASTM C 221, Type A, natural gray color.
- 2.2 Accessories: Accessories of asbestos cement used as supplementary or finishing pieces shall conform to ASTM C 221. Molded closure strips shall be bituminous saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match the configuration of the covering.
- 2.3 Fasteners: Fasteners exposed to weather shall be gasketed or have gasketed washers to weatherproof the penetration. Gaskets shall be neoprene, other elastomeric material, or lead approximately 1/8 inch thick. Bolts and drive screws shall be zinc-plated steel. Self-tapping screws shall be cadmium-coated or 300 series corrosion-resisting steel. Bolt clips shall be galvanized steel of standard design appropriate for the application.
- 2.4 Insulation Materials: Insulation shall be of sufficient thickness to provide the designated roof and wall U-values through the completed construction, when determined for winter conditions in accordance with recognized methods in agreement with the ASHRAE Handbook & Product Directory, Fundamentals. Insulation shall have a facing providing a permeability as required when tested in accordance with ASTM E 96. Facing shall be either of reinforced foil with a vinyl finish or sheet vinyl, except unreinforced foil may be used in concealed locations. Facings and finishes shall be factory-applied. Insulation, including facings and finishes, shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84.
 - 2.4.1 Rigid or semi-rigid board insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or Class 2. Exposed insulation shall have a white non-dusting and non-shedding finish.
 - 2.4.2 Blanket insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6.
- 2.5 Insulation Retainers: Insulation retainers shall be type, size, and design necessary to hold the insulation adequately. Metallic retaining members shall be nonferrous or have a nonferrous coating. Nonmetallic retaining members, including adhesives used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.
- 2.6 Wall Liners: Wall liners shall be 0.024-inch or thicker aluminum or 26 galvanized sheet gauge or thicker steel. Wall liners shall be formed or patterned to prevent waviness and distortion and shall extend from the floor to height as required. Matching metal trim shall be provided at the base of wall lining, top of wall liner, around openings in walls and roof and over interior and exterior corners.
 - 2.6.1 Steel wall liners shall be zinc-coated steel conforming to ASTM A 446, G 90 coating designation, or aluminum-coated steel conforming to ASTM A 463, Type 2.
 - 2.6.2 Aluminum wall liners shall conform to ASTM B 209, temper as required for the forming operation.
 - 2.6.3 Sealant shall be as recommended by the roofing and siding manufacturer.
- 3.0 EXECUTION:
 - 3.1 Wall Covering and Roof Covering: Sheets shall be laid the straight or staggered joint method as required. Wall covering shall be applied with edge corrugations turned in and the longitudinal configurations in the vertical position. Roof covering shall be applied with the edge corrugations turned down and the longitudinal configurations in the direction of the roof slope. End laps shall be made over framing members with fasteners into framing members approximately 3 inches from the end of the overlapping sheet. Side laps and end laps of roof and wall covering and joints at accessories shall be sealed. Holes for fasteners shall be drilled only in the high part of the corrugation. Fasteners shall be driven normal to the surface and to a depth to seat the gasketed washers properly without overdriving and cracking the crests. Automatic end-welded studs shall not be used for applying wall and roof sheets. Cutting of sheets shall be accomplished with a saw equipped with a vacuum or a water jet and in accordance with OSHA 1910.1001 and 1926.103.
 - 3.2 Molded closure strips shall be installed wherever covering sheets terminate in open-end configurations, exclusive of flashings.
 - 3.3 Insulation shall be installed between covering and supporting members. Blanket insulation shall have facing at joints lapped and fastened in a manner that will provide tight joints. Exposed rigid or semi-rigid insulation in ceilings shall be fastened securely without loose joints and unsightly sags.

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Insulation retainers shall be fastened securely in place.

- 3.4 Wall Liners: Additional framing and accessories shall be provided as necessary for the installation of the wall liners.

Built-up Roofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of built-up roofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Primer: Asphalt, ASTM D 41; coal-tar, ASTM D 43.
- 2.2 Bitumen:
- 2.2.1 Asphalt: ASTM D 312, Type I on slopes from 1/4 inch per foot up to and including 1/2 inch per foot, Type II or Type III on slopes above 1/2 inch per foot up to and including 1 inch per foot, Type III on slopes above 1 inch per foot and including 3 inches per foot.
- 2.2.2 Coal-Tar Bitumen for slopes from 1/4 inch per foot up to and including 1/2 inch per foot: ASTM D 450, Type III, unless Type I is approved by the Authorized Member Representative.
- 2.2.3 Cold-Process Asphalt Emulsion: A mechanical mixture of minute particles of asphalt and special clays suspended in water.
- 2.3 Cants: Treated fiberboard, ASTM C 208; wood blocking treated with waterborne preservative, AWPB LP-2; or foamglass. Cants shall have maximum 5-1/2 inch face dimensions at a 45 degree incline to roof plane and lengths as long as practical.
- 2.4 Felt:
- 2.4.1 Organic-Fiber Felt:
- 2.4.1.1 Plies: ASTM D 226, Type I, asphalt-saturated; or ASTM D 227, Type I, coal-tar saturated.
- 2.4.1.2 Asphalt-Saturated Base Sheet: No. 40 felt, ASTM D 2626, Type I or II.
- 2.4.2 Glass-Fiber Felt:
- 2.4.2.1 Plies: ASTM D 2178, Type III or IV where average January temperature is above 40 F and Type IV where average January temperature is below 45 F.
- 2.4.2.2 Asphalt-Impregnated Combination Base Sheet: ASTM D 2178, Type V.
- 2.4.3 Venting Base Sheet: Asphalt-saturated and coated base sheet with granular surfacing and embossed channels (or grooves) on bottom surface.
- 2.4.4 Cold-Process System Felts: Coated organic, glass-fiber, or a combination of both.
- 2.5 Flashings: Bituminous and sheet metal as required.
- 2.6 Flashing Cement: Bituminous plastic cement complying with Fed. Spec. SS-C-153, Type I for use with asphalt-saturated felts and Type II for use with coal-tar saturated felts.
- 2.7 Cold-Process Cement: Solvent-based cement that evaporates slowly in cool damp weather, more rapidly in hot dry weather, and is standard with the cold-process glass-fiber reinforced asphalt emulsion roofing system manufacturer.
- 2.8 Mastic: Solvent-based mastic that evaporates slowly in cool damp weather, more rapidly in hot dry weather, and is standard with the cold-process mastic roofing system manufacturer.
- 2.9 Nails and Mechanical Fasteners: Industry standard, noncorrosive material, shape and size required for substrate.
- 2.10 Surfacing Materials:
- 2.10.1 Aggregate: Crushed stone, gravel, or crushed slag conforming to ASTM D 1863. Subject to approval, other materials may be used when blended to the grading requirements of ASTM D 1863.
- 2.10.2 Smooth Surfacing:
- 2.10.2.1 Fibrated, clay-stabilized, water thinned asphalt emulsion with non-asbestos reinforcing, ASTM D 1227, Type IV (clay-type).
- 2.10.2.2 Reflective Coating: ASTM D 2824, Type I if non-fibrated, Type II if fibrated.
- 2.10.3 Mineral Surfacing: Mineral surface cap sheet complying with ASTM D 3909.
- 2.11 Sheathing Paper: ASTM D 549, 5-pound rosin-sized paper.
- 2.12 Wood Nailers and Edge Blocking: Non-stress graded wood members, treated with waterborne

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- preservative in compliance with AWFB LP-2.
- 2.13 Walkway Protection Boards: Mineral surfaced bituminous composition boards, approximately 1/2 inch thick, manufactured specifically for hot bituminous application on built-up roofing as a protection course for foot traffic.
- 2.14 Roofing Systems:
- 2.14.1 Nailable Deck, Asphalt/Organic Felt Membrane With Aggregate Surfacing: NRCA Specification Plate No. 31-NAOA, Diagram B for light-weight insulating concrete decks and Diagram A for other nailable decks.
- 2.14.2 Nailable Deck, Asphalt/Glass-Fiber Felt Membrane:
- 2.14.2.1 With Aggregate Surfacing: NRCA Specification Plate No. 32-NAGA, Diagram B for lightweight insulating concrete decks and Diagram A for other nailable decks.
- 2.14.2.2 With Smooth Surfacing: NRCA Specification Plate No. 32-NAGA except for substitution of smooth surfacing for aggregate surfacing.
- 2.14.2.3 With Mineral Surfacing: NRCA Specification Plate No. 32-NAGA except for deletion of one ply of felt and substitution of mineral surfacing for aggregate surfacing.
- 2.14.3 Nailable Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 33-NCOA, Diagram B for light-weight insulating concrete decks and Diagram A for other nailable decks.
- 2.14.4 Insulated Deck, Asphalt/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 41-IAOA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.
- 2.14.5 Insulated Deck, Asphalt/Glass-Fiber Felt Membrane:
- 2.14.5.1 With Aggregate Surfacing: NRCA Specification Plate No. 42-IAGA; Diagram B for insulation substrate of composite board, poly-isocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.
- 2.14.5.2 With Smooth Surfacing: NRCA Specification Plate No. 42-IAGA except for addition of one ply of felt and substitution of smooth surfacing for aggregate surfacing.
- 2.14.5.3 With Mineral Surfacing: NRCA Specification Plate No. 42-IAGA except for substitution of mineral surfacing for aggregate surfacing.
- 2.14.6 Insulated Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 43-ICOA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.
- 2.14.7 Concrete Deck, Asphalt/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 51-CAOA, Diagram A or B as directed.
- 2.14.8 Concrete Deck, Asphalt/Glass-Fiber Felt Membrane:
- 2.14.8.1 With Aggregate Surfacing: NRCA Specification Plate No. 52-CAGA, Diagram A or B as directed.
- 2.14.8.2 With Smooth Surfacing: NRCA Specification Plate No. 52-CAGA except for addition of one ply of felt and substitution of smooth surfacing for aggregate surfacing.
- 2.14.8.3 With Mineral Surfacing: NRCA Specification Plate No. 52-CAGA except for substitution of mineral surfacing for aggregate surfacing.
- 2.14.9 Concrete Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 53-CCOA; Diagram A or B as directed.
- 2.14.10 Temporary Roofing: NRCA Specification 10-TR; Diagram TR-N for nailable decks, Diagram TR-C for non-nailable decks (except steel) and Diagram TR-SI for steel decks.
- 2.14.11 Cold-Process Built-Up Membrane Roofing:
- 2.14.11.1 Glass-Fiber Reinforced Asphalt Emulsion System: Minimum two layers of coated ply felts with smooth surfacing (asphalt emulsion).
- 2.14.11.2 Mastic System: Coated ply felts (three plies on slopes less than 1 inch per foot and two plies on slopes greater than 1 inch per foot) embedded into a spray application of mastic with embedded mineral granule surfacing.
- 2.15 UL Listing: Built-up roofing systems and component materials of roofing systems that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Roof covering materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been

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- produced under UL's Classification and Follow-Up Service.
- 2.16 FM Listing: Built-up roofing systems and component materials of roofing systems that have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Built-up roofing systems and component materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Mineral Surfaced Cap Sheet: Cut sheet in 12- to 18-foot lengths and leave to flatten prior to application.
- 3.1.2 Temporary Roofing: Remove temporary roofing completely prior to installation of permanent roofing.
- 3.1.3 Weather Limitations: Do not apply roofing when it is excessively windy, wet, or when the ambient temperature is less than 40 F.
- 3.1.4 Heating Bitumen: Asphalt shall not be heated above 475 F. Coal tar shall not be heated above 400 F. Application temperatures shall be measured at the mop bucket and/or mechanical applicator.
- 3.2 Application:
- 3.2.1 NRCA-Specified Roofing Systems shall be applied in accordance with the NRCA specifications.
- 3.2.2 Smooth Surfacing: Glaze-coat entire surface of completed built-up roof membrane with hot mopping of Type III asphalt, applied at same rate and concurrent with interply moppings. Allow asphalt coating to age a minimum of 7 days, then apply top coating of asphalt emulsion at an average rate of 2.5 gallons per square. If roof is to receive reflective coating, it shall be applied promptly after application and initial cure (next day) of emulsion coating at an average rate of 1.25 gallons per square.
- 3.2.3 Mineral Surfacing: Promptly after completion of ply-sheet membrane (same day where possible), apply one lapped course of cap sheet. Set cap sheet in uniform mopping of same hot bitumen used in ply-sheet courses, at an average rate of 15 lbs per square. Lap ends a minimum of 6 inches.
- 3.2.4 Cold-Process Roofing Systems:
- 3.2.4.1 Glass-Fiber Reinforced Asphalt Emulsion: Nail or spot-mop the first ply felt. Apply additional plies with cold-process cement brushed, sprayed, or rolled on at the rate of approximately 1-1/2 gallons per square. If precipitation is expected within 48 hours, a solid mopping of hot asphalt shall be used instead of cold-process cement. Over the base sheet assembly, the asphalt emulsion shall be spray-applied with a three-nozzle gun that has a glass fiber cutter that disperses glass fibers 3/4 inches long into the emulsion as it is spray-applied. Reinforced asphalt emulsion shall be sprayed at the rate of approximately 9 gallons of emulsion and 3 pounds of glass-fiber reinforcement per square. If the roof is designated to receive a reflective coating, it shall be applied as soon as the asphalt emulsion membrane is firm enough to support roof traffic without indentations forming in the film.
- 3.2.4.2 Mastic System: Embed ply felts in mastic sprayed at a rate of approximately 2-1/2 gallons per square per coat. Embed mineral surfacing in top coat of mastic.
- 3.3 Accessories and Flashings: Install flashings as recommended by the NRCA Roofing and Waterproofing Manual and the SMACNA Architectural Sheet Metal Manual. Set walkways in additional pour-coat of hot bitumen after aggregate surfacing of built-up roofing membrane.
- 3.4 Surface Maintenance of Existing Aggregate Surfaced Roofs:
- 3.4.1 Preparation: Sweep surface and remove all loose and poorly embedded existing aggregate before applying new surface materials.
- 3.4.2 Primer: Apply thin coat of asphalt primer over affected areas. Allow to dry thoroughly before applying flood coat.
- 3.4.3 Flood Coat: Apply hot bitumen of type compatible with existing roofing materials, at a rate of 60 pounds per square for Type III asphalt and 75 pounds per square for coal tar.
- 3.4.4 Aggregate Surfacing: While bitumen is hot, embed clean surfacing aggregate of type to match existing, applied at a rate of 400 pounds per square for gravel, 300 pounds per square for slag, and 400 pounds per square for crushed stone.

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- 3.5 Maintenance and Repair Patching (Hot-Applied Roofing):
 - 3.5.1 Blisters: Make two cuts at right angles to each other, extending cuts 12 inches beyond edge of defective areas and to substrate surface. Fold back cut areas and allow substrate and membrane to dry. Wet insulation shall be removed and replaced with dry insulation matching the original. When dry, apply solid bitumen mopping over opened area and fold cut sections of membrane into bitumen. Totally embed membrane in bitumen.
 - 3.5.2 Splits: Cut out membrane at least 12 inches on each side and extending 18 to 24 inches on each side and extending 18 to 24 inches beyond each end of split area. Dry lay a 6-inch wide strip of roofing felt, cemented over split area. Apply uniform coat of bitumen over dry felt, extending to embedded aggregate in all directions.
 - 3.5.3 Disintegrated and Damaged Felts: Cut and remove disintegrated, damaged, and loose felts to extent necessary to provide sound materials. Cut out wet felts and allow wet surfaces to completely dry before in-stalling patch materials. Replace removed felts with equal plies of felt. Felts shall be solidly mopped into place in hot bitumen and shingled into existing plies to extent possible.
 - 3.5.4 Additional Plies: Finish defective areas by applying at least two additional plies of roofing felt, embedded in hot bitumen. Extend edges of first ply a minimum of 9 inches beyond affected area on all sides and second ply 18 inches beyond affected area on all sides.

Polymer-modified Asphalt Built-up Roofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of a class "A" fire rated 12 Year Built Up Roofing System conforming to a manufacturer's standard, prefabricated, reinforced polymer-modified fiberglass sheets (base sheet & 3 plies), SEBS asphalt, gravel ballast with insulation, flashing, and accessories as specified and indicated. The manufacturer shall have a minimum of 10 years experience in manufacturing of the proposed roofing system for similar applications. Roofing Contractor shall warrant workmanship for a period of two (2) years from date work is accepted in addition to all manufacturer's or supplier warranties. Demolition and removal of materials shall be as specified and as required to support the work. Work shall conform to NRCA, SMACNA industry standards and material manufacturer's recommendations.
- 2.0 PRODUCTS:
 - 2.1 Primer: Asphalt, ASTM D 41.
 - 2.2 Bitumen:
 - 2.2.1 Asphalt: Modified-Asphalt (SEBS), ASTM D 312, Type III for slopes up to 25 percent (1/4 inch per foot vertical/horizontal) and Type IV for slopes up to 50 percent (1/2 inch per foot vertical/horizontal) or as specified by roof material manufacturer.
 - 2.2.2 Mastic: Cement shall conform to ASTM D 4586 and as recommended by roof materials manufacturer.
 - 2.3 Cants: Treated fiberboard, ASTM C 208; wood blocking treated with waterborne preservative, AWP A C9 listed in AWP A P5. Cants shall have maximum 5-1/2 inch face dimensions at a 45 degree incline to roof plane and lengths as long as practical. Field cut ends of wood cants shall be field treated with AWP A M4.
 - 2.4 Felts:
 - 2.4.1 Fiberglass Felts:
 - 2.4.2 Plies: ASTM D 2178, Type IV Sheets shall be a polymer modified asphalt of styrene butadiene styrene (SBS); or SBS which has been further modified with styrene ethylene butadiene styrene (SEBS). Sheets shall be reinforced with fiber made from glass, polypropylene, or polyester. as recommended by the manufacturer by Allied Signal, Manville, GAF Corporation, Siplast or equal.
 - 2.5 Flashing:
 - 2.5.1 Base Flashing: Flashing shall be White, SBS/SEBS polymer modified asphalt, mineral surfaced cap ply as recommended by material manufacturer.
 - 2.5.2 Metal Flashing: Metal flashing as specified and as required.
 - 2.5.3 Flashing Cement: MBR type only (asbestos free), compatible for use with SBS/SEBS polymer modified built-up roof system.
 - 2.5.4 Cap Flashing Underlayment Membrane: Protective underlayment, SBS/SEBS modified asphalt flashing material with polyester face, paper backed, with adhesive. TAMKO, Moisture Guard Plus or

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- equal.
- 2.6 Nails and mechanical Fasteners:
 - 2.6.1 Roof Nails: Galvanized or non-ferrous type, size as required to suite application and as recommended by roof materials manufacturer.
 - 2.6.2 Mechanical Fasteners for Flexible Flashing: Masonry, specially heat treated, stress relived, I-1/4 inch; Masonry nails manufactured by Simplex Nails, Inc. or equal. Wood blocking, high carbon, zinc coated steel, annular threaded shank nails; with minimum 1 inch x 30 gauge metal disk; Roofing nails manufactured by Simplex Nails, Inc or equal.
 - 2.6.3 Mechanical Fasteners for Insulation to Steel Deck: #14 screw with corrosive resistant coating (able to pass 30K cycles) with compatible disk; sufficient screw shank length to penetrate steel deck in accordance with manufacturer's instruction for base layer of insulation. Plastic disks shall have provision for recessed fastener head.
 - 2.6.4 Mechanical Fasteners for Metal Flashing: As recommended by materials manufacturer.
 - 2.7 Surfacing Materials: Surfacing shall be light colored, crushed stone or gravel conforming to ASTM D 1863.
 - 2.8 Adhesive: Adhesive shall be approved type recommended by the roofing membrane manufacturer.
 - 2.9 Walkway Surfaces: Walkways shall be mineral asphalt planks, Minimum inch thick, ASTM D517 as specified or as recommended by roof membrane manufacturer.
 - 2.10 Wood Nailers and Edge Blocking: As specified and as required, Non-stress graded wood members, treated with waterborne preservative in compliance with AWFB LP-2.
 - 2.11 Insulation: As specified and as required, insulation shall be compatible with roof membrane as recommended by material manufacturer and installed in accordance with FM I-90, NRCA and manufacturer recommendations.
 - 2.12 Metal Flashing, Gravel Guards, Gutters, and Downspouts and accessories: As specified and as required.
 - 2.13 Coating: As specified; aluminum coating shall conform to ASTM D 2824 Type I or III, or shall be as recommended by roof membrane manufacturer.
 - 2.14 Pitch Pan: As specified and indicated; Pitch pans shall have rain cap and shall be filled with a 2 part pourable sealant. Sealant shall conform to ASTM D 529, Firestone Rubber-guard sealer S-10 or equal.
 - 3.0 EXECUTION
 - 3.1 Preparation Requirements: The substrate construction of any bay or section of building shall be clean before roofing work is begun thereon. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Nailers, curbs and other items attached to roof surface shall be in place before roofing is begun.
 - 3.2 Installation of Cants: Cants shall be installed in the angles formed between the roof and walls or other vertical surfaces. Cants shall be laid in a solid coat of bituminous cement just prior to laying the base sheet or membrane. Cants shall be continuous, and shall be installed in lengths as long as practicable.
 - 3.3 Condition of Surfaces: Surfaces shall be inspected and approved immediately prior to application of roofing and flashing. The roofing and flashing shall be applied to a smooth and firm surface free from ice, frost, visible moisture, dirt, projections, and foreign materials. Prior to application of primer on pre-cast concrete decks, joints shall be covered with 4 inch strip of roofing felt, embedded in and coated with bituminous cement.
 - 3.4 Application of Roofing System: Application shall be in accordance with NRCA specifications and roofing materials manufacturer recommendations and warranties.
 - 3.5 Mechanical Application Devices: Mechanical application devices shall be mounted on pneumatic-tired wheels, and shall be designed and maintained to operate without damaging the insulation, roofing membrane, or structural components.
 - 3.6 Priming: Concrete, masonry and metal surfaces to receive bitumen shall be uniformly coated with primer at a rate of not less than 0.4 liters per square meter, 1 gallon per square and allowed to dry.
 - 3.7 Heating of Asphalt: Asphalt shall not be heated higher than 75 degrees F above EVT or 50 degrees F below the flash point or 525 degrees F (maximum) whichever is lower. EVT and flash point

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- temperatures of asphalt in the kettle shall be conspicuously posted on the kettle. Heating kettle shall be provided with automatic thermostatic control and an accurate thermometer. Kettle operator shall be in attendance at all times during the heating to ensure that the maximum temperature specified is not exceeded. An asphalt tanker shall be treated as a kettle.
- 3.8 Asphalt Application: Asphalt shall be applied within 25 degrees F below or above the EVT, or 400 degrees F, whichever is higher. Application temperatures shall be measured at the mop bucket or mechanical applicator. Bitumen at a temperature below the recommended temperature shall be returned to the kettle.
- 3.9 Application of Base Sheet: Base sheet shall be applied, shingle fashion, in a continuous operation, with side laps in accordance with manufacturer's printed instructions. End laps shall be not less than 6 inches and staggered a minimum of 24 inches. Base sheets shall be applied at right angles to the slope (except on curved or steep deck) and laps shall be face down the slope. Venting base sheet shall be mechanically fastened in conformance with manufactured printed instructions. Non vented base sheet on insulation shall be applied in hot mopping of not less than 20 pounds nor more than 35 pounds of modified asphalt per square and shall be embedded in the hot asphalt with squeegee or broom to eliminate air pockets and ensure complete adhesion. Operator shall avoid heavy application of squeegee to glass-fiber sheets.
- 3.10 BUR Felts Application: Felt plies shall be installed as recommended by the membrane manufacturer. Each sheet in each ply shall be fully adhered to the underlying surface. Sheet edges shall lie flat, with no fish-mouths or wrinkles. Installation shall begin at the low point of the roof and progress to the high point with each sheet installed in shingle fashion. Each sheet shall be unrolled to provide 4 inch side laps and 6 inch end laps. End laps shall be staggered not less than 24 inches. Laps shall not coincide with laps of base layer except at lines of permanent termination. Sheets shall be adhesive-bonded in SBS/SEBS asphalt as specified in manufacturer's approved written instructions.
- 3.11 Termination at Perimeters: The BUR felts shall extend up abutting surfaces at least 4 inches or 2 inches above top of the cant.
- 3.12 Mechanical Fastening of Insulation: Nails and fasteners for securing base or membrane sheet to wood nailers or deck shall be flush driven through disk. Screw fasteners with disk as specified by the membrane manufacturer shall be used on concrete or metal deck. Nailers and fasteners shall be spaced to meet I-90 wind uplift requirements and within tolerance specified by the manufacturer. Penetration of nails and fasteners will not be permitted through the exposed surface of the membrane.
- 3.13 Protection of Applied Roofing: At end of day's work or whenever precipitation is imminent, the terminated edge of the roofing shall be sealed with two full width strips of roofing felt set in and coated with bitumen cement or hot mopped asphalt. One half-width of strip shall be extended up and over the finished roofing and other half-width extended out and onto the bare roof deck or existing membrane. Sealing strips shall be removed before continuing installation of the roofing. To facilitate sealing, termination edges may be straightened with pieces of insulation board and shall be removed when work is resumed.
- 3.14 Flashing: Flashing shall be provided over cants, in the angles formed at walls and other vertical surfaces, and where required to make work watertight. All penetrations shall receive flashing as required. Polymer mineral surfaced flashing shall be used, except where metal flashing is required or specified. Metal cap flashing shall have peal and stick rubber membrane (ice dam) flashing applied between cap wall and metal flashing.
- 3.15 Walkways: Walkways shall be mineral-surfaced asphalt planks, back mopped and embedded in the flood coat prior to aggregate surfacing and shall be located as indicated are as required.
- 3.16 Surfacing: After roofing membrane has been laid and flashing installed, the roof surface, except cants, shall be flood coated uniformly with 60 pounds SBS/SEBS hot asphalt per square, and while asphalt is still hot, aggregate surface material shall be spread on the hot bitumen at the rate of 400 pounds per square.
- 3.17 Inspection: The Contractor and applicator shall establish and maintain an inspection procedure to assure compliance of the installed roofing system. The materials manufacturer shall certify, inspect and issue written warranties. Any work found not in compliance shall be promptly removed or

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repaired in an approved manner. Inspection shall include, but not limited to, the following:

- 3.17.1 Observation of environmental conditions; number and skill level of roofing workers; start and end time of various tasks; condition of substrate.
- 3.17.2 Verification of compliance of materials before, during and after installation.
- 3.17.3 Inspection of condition of equipment and accuracy of thermometers and metering devices.
- 3.17.4 Inspection of flashing, cants, and curbs.
- 3.17.5 Inspection of membrane placement, widths of starter sheets, laps, proper use of squeegee, and mechanical fastening.
- 3.17.6 Inspection of application of bitumen, aggregate, and walkways.
- 3.17.7 Inspection of embedded aggregate for required weight and coverage.
- 3.17.8 Sampling and analysis as directed.
- 3.17.8 Inspection of all metal work to include flashing, gutters and downspouts.
- 3.17.9 Final inspection that roof system is watertight and complete.

Single Ply Roofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of single ply roofing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Roll Roofing: ASTM D 371, Type II, for mineral surfaced; ASTM D 224, Type II, for smooth surfaced.
 - 2.2 Elastic Sheet Roofing: Elastic sheet material shall be EPDM, hypalon, neoprene, polyvinyl chloride, chlorinated polyethylene, polyisobutylene, or modified bitumen (reinforced or unreinforced), as required. Provide products that are fully compatible with indicated substrates or provide separation materials as required to eliminate contact between incompatible materials. The elastic sheet roofing shall meet the following requirements based on type of installation.
 - 2.2.1 For Loose-Laid Ballasted System: Manufacturer's standard thickness but not less than 45 mils, 1,400 psi minimum tensile strength (ASTM D 412), 250 percent elongation (ASTM D 412), vapor permeable, ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746).
 - 2.2.2 For Mechanically Fastened System: Manufacturer's standard thickness but not less than 60 mils, 1,600 psi minimum tensile strength (ASTM D 412), minimum tear resistance of 150 lbs/lin in (ASTM D 624), 300 percent elongation (ASTM D 412), ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746), standard color.
 - 2.2.3 For Fully Adhered System: Manufacturer's standard thickness but not less than 60 mils, 1,400 psi minimum tensile strength (ASTM D 412), 250 percent minimum elongation (ASTM D 412), ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746), standard or special color, as required.
 - 2.3 Fluid-Applied Roofing: Fluid-applied materials shall be sprayed-in-place urethane roofing with two-coat elastomeric silicone rubber protective coating.

2.3.1 Urethane Foam:

PROPERTY	ASTM TEST METHOD	VALUE
Density, pcf overall	D 1622	2.5 min., 3.5max.
Compressive Strength psi parallel to rise	D 1621	40.0 min.
Thermal Conductivity (k factor) Btu/hr/ sq ft/degrees F/in.	C 177	new 0.11 max. aged 0.15 max. (6 months)

2.3.2 Elastomeric Protective Coating: Two-coat silicone rubber system, bonded to urethane foam:

PROPERTY	ASTM TEST METHOD	VALUE
Tensile Strength, psi	D 412	500-600
Elongation, percent	D 412	100-150
Hardness	D 2240	45

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2.4 Roofing Installation Accessories:

2.4.1 Roll Roofing:

2.4.1.1 Roofing nails shall be 12-gauge galvanized with minimum 3/8-inch diameter head and 7/8-inch long shank.

2.4.1.2 Cement shall be cold process asphalt as recommended by material manufacturer.

2.4.2 Elastic Sheet Roofing:

2.4.2.1 Ballast for loose-laid ballasted systems shall be washed round riverbed gravel, ranging in size from 3/4 inch to 1-1/2 inches in diameter.

2.4.2.2 Mechanical fasteners used with mechanically fastened system shall be screws, nails, battens, accessory components, and adhesives as appropriate for the substrate.

2.4.2.3 Adhesive for fully adhered system shall be compatible with substrate and project conditions and formulated to withstand a minimum 60 psf uplift force.

2.4.2.4 Protective color coat as required for mechanically fastened and fully adhered systems shall be ozone-resistant, liquid-applied hypalon.

2.4.2.5 Flashing material shall be compatible with the membrane.

2.4.2.6 Membrane seaming system shall be of manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges.

2.4.2.7 Cant strips and flashing accessories shall be compatible with membrane, including adhesive tapes, flashing cements, and sealants.

2.4.2.8 Slip sheet for protection of membrane from incompatible substrate shall be as recommended by membrane manufacturer.

2.4.2.9 Walkway protection boards, where required, shall be prefabricated concrete pavers containing no asphalt or coal-tar derivatives, suitable for use without cracking or breaking.

2.4.3 Fluid-Applied Roofing: Ceramic granules shall be No. 11 screen size dry and free from dust.

2.5 UL Listing: Single ply roofing systems and component materials that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Single ply roof covering materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

2.6 FM Listing: Single ply roofing systems and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Single ply roofing systems and component materials bearing FM approval marking on bundle, package, or container indicating that the material has been subjected to FM's examination and follow-up inspection service shall be provided.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Roll Roofing: Clean wood deck completely. Ensure that all nails are driven flush with or below deck surface. Surface must be dry before placing any roofing material.

3.1.2 Elastic Sheet Roofing: Clean of dust, debris, or other substances detrimental to work. Remove sharp projections. Prime substrate as required.

3.1.3 Fluid Applied Roofing: Clean all debris from roof surface, new or existing. On existing roof, repair any roof damage to provide a clean smooth surface.

3.2 Installation:

3.2.1 Roll Roofing: Install in accordance with the National Roofing Contractors Association Steep Roofing Manual application instructions.

3.2.2 Elastic Sheet Roofing and Fluid Applied Roofing: Install in accordance with manufacturer's instructions.

Inverted Roof Systems

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of inverted roof systems. Materials shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to

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support the work.

2.0 PRODUCTS:

- 2.1 Asphalt Primer: ASTM D 41.
 - 2.2 Fiberglass Base Sheet: Glass fiber mat coated with weathering grade asphalt to provide a nonporous ply.
 - 2.3 Fiberglass Felt: ASTM D 2178, Type IV.
 - 2.4 Sheathing Paper: Single ply 5 lb/100 sq ft, rosin-sized sheathing paper.
 - 2.5 Base for built-up membrane applied over steel deck shall be one of the following with mechanical attachment:
 - 2.5.1 Mineral Fiberboard: ASTM C 726, 3/4 inch thick.
 - 2.5.2 Wood Fiberboard: Organic fiberboard roof insulation in accordance with ASTM C 208, 1 inch thick.
 - 2.5.3 Gypsum Wallboard: 1/2 inch thick, ASTM C 36.
 - 2.6 Steep Asphalt: ASTM D 312, Type III.
 - 2.7 Extruded Rigid Polystyrene Insulation: ASTM C 578, Type IV, 24-inch by 48-inch standard size, with drainage channel on bottom of each board.
 - 2.8 Galvanized Roofing Nails: 11 gauge, barbed, galvanized with 7/16-inch to 5/8-inch diameter heads or other approved type.
 - 2.9 Fabric for Application Above Insulation: 3 oz/sq yd black polyester or 3 oz/sq yd black polypropylene approved by inverted roof system manufacturer.
 - 2.10 Ballast: Gravel or crushed stone shall be in accordance with ASTM D 448, Gradation No. 57.
 - 2.11 UL Listing: Inverted roof systems and component materials that have been tested for application and slopes and are listed by Underwriters' Laboratories, Inc. (UL) for Class A or Class B external fire exposure shall be provided. Inverted roof systems and component materials shall bear the Classification marking (UL) on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-Up Service.
 - 2.12 FM Listing: Inverted roof systems and component materials that have been evaluated by Factory Mutual system for fire spread, wind uplift, and hail damage are listed in the "Factory Mutual Approval Guide" for Class 1 construction. Inverted roof systems and component materials bearing FM approval marking on bundle, package, or container indicating the material has been subjected to FM's examination and follow-up inspection service shall be provided.
- 3.0 EXECUTION:
- 3.1 Installation on Various Deck Materials:
 - 3.1.1 On lightweight insulating concrete decks, prime concrete surface with asphaltic primer.
 - 3.1.2 On poured gypsum decks, lay one ply of approved fiberglass base sheet with edges lapped and nailed with nails approved for use with gypsum deck materials.
 - 3.1.3 On precast concrete plank deck or precast concrete tee deck, prime concrete surfaces with asphalt primer. Prior to applying built-up roof membrane, apply 18-inch wide slip sheet of 2-ply dry-applied fiberglass felt to cover end joints where concrete planks or tees meet.
 - 3.1.4 On wood decks, cover the deck with sheathing paper lapping and mechanically fastening each sheet to the deck. Over sheathing paper, apply one ply of approved fiberglass base sheet, lapping joints and nailing, using galvanized roofing nails driven through flat metal disks not less than 1 inch in diameter.
 - 3.2 Built-up Roof Membrane Installation:
 - 3.2.1 Starting at low point of roof, uniformly mop the surface of the nailed fiberglass base sheet or primed deck surface with steep asphalt at the rate recommended for substrate (25 +/- 5 to 30 +/- 5 lbs per square). While hot, embed 3 plies of approved fiberglass felts in shingle fashion, lapping each sheet 24-2/3 inches.
 - 3.2.2 Interply moppings shall be continuous and applied at the rate listed above for substrate. Complete embedment of felts is required and is accomplished by dragging a broom or squeegee over the felt; no more pressure is required than that exerted by the weight of the "brooming" utensil. During cold weather, effective brooming is essential to eliminate voids and to ensure adhesion. As the work progresses, full mop the top surface of the membrane using a minimum coverage of 25 +/- 5 lbs per square. A second flood coat shall be applied at the rate of 45 lbs per square.
 - 3.2.3 At no time shall felts be left exposed overnight or in inclement weather. All mopping bitumen shall

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- be steep asphalt (Type III, 185-205 F softening point).
- 3.2.4 Bitumen temperature at the kettle shall be controlled so as not to exceed the bitumen manufacturer's recommendations. The roof membrane shall not be staged. Temporary membranes are not acceptable as a part of a completed membrane. Install completed membrane in final form on a day-to-day basis.
- 3.3 All flashing shall be completed in each area prior to installing roof insulation. Details and installation shall conform to standard inverted roof system specifications.
- 3.4 Unadhered Insulation Installation:
- 3.4.1 General: Rigid polystyrene insulation shall be placed on the membrane as the membrane is completed to provide immediate protection. Flood coats of steep asphalt shall be allowed to cool completely prior to rigid insulation installation to ensure unadhered foam.
- 3.4.2 Rigid polystyrene insulation shall be placed directly on membrane with channel side down. End joints shall be staggered and all boards shall be tightly abutted. The maximum acceptable opening between boards shall be 3/8 inch. Install insulation to within 3/4 inch of all projections and cant strips. For multilayer installations, install subsequent layers unattached over the unadhered first layer. Stagger all joints in relation to underlying layer. The bottom layer shall be as thick or thicker than the top layer and must be a minimum of 2 inches thick.
- 3.4.3 Fabric Installation: Place fabric over rigid insulation, unadhered and unattached. Fabric shall be wetted to hold it in place until ballast is installed. Edges shall be overlapped a minimum of 1 foot. Install so that there are no parallel joints within 6 feet of the perimeter. Extend fabric 2 to 3 inches above the stone at perimeter and penetrations.
- 3.4.4 Thickness of Insulation: Installed thickness shall provide a U-value through completed roof structure, air-to-air, not in excess of that required by job location, as determined for winter conditions in accordance with recognized methods in agreement with ASHRAE Handbook Fundamentals.
- 3.5 Ballast Installation:
- 3.5.1 General: Fabric shall be covered with gravel or crushed stone ballast as the fabric is being installed. The stone top covering shall be 3/4 inch with not less than 10 percent nor more than 60 percent of fines smaller than 1/2 inch. 3.5.2 Stone or Gravel Ballast shall be applied at a minimum average rate of 1,000 lbs per square and shall be approximately 1-1/4 inches thick. Around roof perimeter and at penetrations and drains, 20 lbs/sq ft of stone ballast over a 4 foot wide area shall be applied. A continuous row of pavers constituting 22 lbs/lin ft can be substituted for the extra ballast around perimeter, penetrations and drains. Pavers shall be used in high traffic areas near roof and equipment access areas.

Modified Bitumen Roofing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of a Class "A" Fire rated 12 Year modified bitumen roofing system conforming to a manufacturer's standard, prefabricated, reinforced polymer-modified bitumen membranes (base sheet, 1 or 2 ply heavy weight plies and cap sheet), SEBS asphalt, with insulation, flashing, and accessories as specified and indicated. The manufacturer shall have a minimum of 10 years experience in manufacturing of the proposed modified bitumen sheet roofing for similar applications. Roofing Contractor shall warrant workmanship for a period of two (2) years from date work is accepted in addition to all manufacturer's or supplier warranties. Demolition and removal of materials shall be as specified and as required to support the work. Work shall conform to NRCA, SMACNA industry standards and material manufacturer's recommendations.
- 2.0 PRODUCTS:
- 2.1 Primer: Asphalt, ASTM D 41.
- 2.2 Bitumen:
- 2.2.1 Asphalt: Modified-Asphalt (SEBS), ASTM D 312, Type III for slopes up to 25 percent (1/4 inch per foot vertical/horizontal) and Type IV for slopes up to 50 percent (1/2 inch per foot vertical/horizontal) or as specified by roof materials manufacturer.
- 2.2.2 Mastic: Cement shall conform to ASTM D 4586 and as recommended by roof materials manufacturer.

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- 2.3 Cants: Treated fiberboard, ASTM C 208; wood blocking treated with waterborne preservative, AWPA C9 listed in AWPA P5. Cants shall have maximum 5-1/2 inch face dimensions at a 45 degree incline to roof plane and lengths as long as practical. Field cut ends of wood cants shall be field treated with AWPA M4.
- 2.4 Felts:
 - 2.4.1 Fiberglass Felts:
 - 2.4.2 Plies: ASTM D 2178, Type IV or VI as recommended by the manufacturer.
 - 2.4.3 Modified Bitumen Base Sheet: ASTM D 4897, Type II for vented sheets or ASTM D 4601, Type II for non-vented sheets. Sheets shall be a bitumen modified asphalt with styrene butadiene styrene (SBS); or SBS that has been further modified with styrene ethylene butadiene styrene (SEBS). Sheets shall be reinforced with fiber made from glass, polypropylene, or polyester manufactured by Allied Signal, Johns Manville, GAF Corporation, Siplast or equal.
- 2.5 Flashing:
 - 2.5.1 Base Flashing: Flashing shall be White or Metal Clad finish as specified, SEBS modified Bitumen cap ply as recommended by material manufacturer.
 - 2.5.2 Metal Flashing: Metal flashing as specified and as required.
 - 2.5.3 Flashing Cement: MBR type only (asbestos free), compatible for use with SEBS modified bitumen roof system.
 - 2.5.4 Cap Flashing Underlayment Membrane: Protective underlayment, SEBS modified asphalt flashing material with polyester face, paper backed, with adhesive. TAMKO, Moisture Guard Plus or equal.
- 2.6 Nails and mechanical Fasteners:
 - 2.6.1 Roof Nails: Galvanized or non-ferrous type, size as required to suite application and as recommended by roof materials manufacturer.
 - 2.6.2 Mechanical Fasteners for Flexible Flashing: Masonry, specially heat treated, stress relived, I-1/4 inch; Masonry nails manufactured by Simplex Nails, Inc. or equal. Wood blocking, high carbon, zinc coated steel, annular threaded shank nails; with minimum 1 inch x 30 gauge metal disk; Roofing nails manufactured by Simplex Nails, Inc or equal.
 - 2.6.3 Mechanical Fasteners for Insulation to Steel Deck: #14 screw with corrosive resistant coating (able to pass 30K cycles) with compatible plastic disk; sufficient screw shank length to penetrate steel deck in accordance with manufacturer's instruction for base layer of insulation. Plastic disks shall have provision for recessed fastener head.
 - 2.6.4 Mechanical Fasteners for Metal Flashing: As recommended by materials manufacturer.
- 2.7 Surfacing Materials: Surfacing shall factory applied granules requiring no further coating.
- 2.8 Adhesive: Adhesive shall be approved type recommended by the roofing membrane manufacturer.
- 2.9 Walkway Surfaces: Walkways shall be mineral asphalt planks, minimum inch thick, as specified or as recommended by roof membrane manufacturer.
- 2.10 Wood Nailers and Edge Blocking: As specified and as required, Non-stress graded wood members, treated with waterborne preservative in compliance with AWFB LP-2.
- 2.11 Insulation: As specified and as required, insulation shall be compatible with roof membrane as recommended by material manufacturer and installed in accordance with FM I-90, NRCA and manufacturer recommendations.
- 2.12 Metal Flashing, Gravel Guards, Gutters, and Downspouts and accessories: As specified and as required.
- 2.13 Coating: As specified; aluminum coating shall conform to ASTM D 2824 Type I or III, or shall be as recommended by roof membrane manufacturer.
- 2.14 Pitch Pan: As specified and required; Pitch pans shall have rain cap and shall be filled with a 2 part pourable sealant. Sealant shall conform to ASTM D 529, Firestone Rubberguard pourable sealer S-10 or equal.
- 3.0 EXECUTION
 - 3.1 Preparation Requirements: The substrate construction of any bay or section of building shall be clean before roofing work is begun thereon. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Nailers, curbs and other items attached to roof surface shall be in place before roofing is begun.
 - 3.2 Installation of Cants: Cants shall be installed in the angles formed between the roof and walls or

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other vertical surfaces. Cants shall be laid in a solid coat of bituminous cement just prior to laying the base sheet or membrane. Cants shall be continuous, and shall be installed in lengths as long as practicable.

- 3.3 Condition of Surfaces: Surfaces shall be inspected and approved immediately prior to application of roofing and flashing. The roofing and flashing shall be applied to a smooth and firm surface free from ice, frost, visible moisture, dirt, projections, and foreign materials. Prior to application of primer on pre-cast concrete decks, joints shall be covered with 4 inch strip of roofing felt, embedded in and coated with bituminous cement.
- 3.4 Application of Roofing System: Application shall be in accordance with NRCA specifications and roofing materials manufacturer recommendations and warranties.
- 3.5 Mechanical Application Devices: Mechanical application devices shall be mounted on pneumatic-tired wheels, and shall be designed and maintained to operate without damaging the insulation, roofing membrane, or structural components.
- 3.6 Priming: Concrete, masonry and metal surfaces to receive bitumen shall be uniformly coated with primer at a rate of not less than 0.4 liters per square meter, 1 gallon per square and allowed to dry.
- 3.7 Heating of Bitumen: Asphalt shall not be heated higher than 75 degrees F above EVT or 50 degrees F below the flash point or 525 degrees F (maximum) whichever is lower. EVT and flash point temperatures of asphalt in the kettle shall be conspicuously posted on the kettle. Heating kettle shall be provided with automatic thermostatic control and an accurate thermometer. Kettle operator shall be in attendance at all times during the heating to ensure that the maximum temperature specified is not exceeded. An asphalt tanker shall be treated as a kettle.
- 3.8 Bitumen Application: Asphalt shall be applied within 25 degrees F below or above the EVT, or 400 degrees F, whichever is higher. Application temperatures shall be measured at the mop bucket or mechanical applicator. Bitumen at a temperature below the recommended temperature shall be returned to the kettle.
- 3.9 Application of Base Sheet: Base sheet shall be applied, shingle fashion, in a continuous operation, with side laps in accordance with manufacturer's printed instructions. End laps shall be not less than 6 inches and staggered a minimum of 24 inches. Base sheets shall be applied at right angles to the slope (except on curved or steep deck) and laps shall be face down the slope. Venting base sheet shall be mechanically fastened in conformance with manufactured printed instructions. Non vented base sheet on insulation shall be applied in hot mopping of not less than 20 pounds nor more than 35 pounds of modified asphalt per square and shall be embedded in the hot asphalt with squeegee or broom to eliminate air pockets and ensure complete adhesion. Operator shall avoid heavy application of squeegee to glass-fiber sheets.
- 3.10 Modified Bitumen Membrane Application: Membrane shall be three plies as recommended by the membrane manufacturer. Each sheet in each ply shall be fully adhered to the underlying surface. Sheet edges shall lie flat, with no fishmouths or wrinkles. Installation shall begin at the low point of the roof and progress to the high point with each sheet installed in shingle fashion. Each sheet shall be unrolled to provide 4 inch side laps and 6 inch end laps. End laps shall be staggered not less than 24 inches. Laps shall not coincide with laps of base layer except at lines of permanent termination. Sheets shall be adhesive-bonded as specified in manufacturer's approved written instructions.
- 3.11 Termination at Perimeters: The modified bitumen membrane shall extend up abutting surfaces at least 4 inches or 2 inches above top of the cant.
- 3.12 Mechanical Fastening: Nails and fasteners for securing base or membrane sheet to wood nailers or deck shall be flush driven through disk. Screw fasteners with disk as specified by the membrane manufacturer shall be used on concrete or metal deck. Nailers and fasteners shall be spaced to meet I-90 wind uplift requirements and within tolerance specified by the manufacturer. Penetration of nails and fasteners will not be permitted through the exposed surface of the membrane.
- 3.13 Protection of Applied Roofing: At end of day's work or whenever precipitation is imminent, the terminated edge of the roofing shall be sealed with two full width strips of roofing felt set in and coated with bitumen cement or hot mopped asphalt. One half-width of strip shall be extended up and over the finished roofing and other half-width extended out and onto the bare roof deck or

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existing membrane. Sealing strips shall be removed before continuing installation of the roofing. To facilitate sealing, termination edges may be straightened with pieces of insulation board and shall be removed when work is resumed.

- 3.14 Flashing: Flashing shall be provided over cants, in the angles formed at walls and other vertical surfaces, and where required to make work watertight. All penetrations shall receive flashing as required. Modified bitumen flashing shall be used, except where metal flashing is required or specified. Metal cap flashing shall have peal and stick rubber membrane (ice dam) flashing applied between cap wall and metal flashing.
- 3.15 Walkways: Walkways shall be mineral-surfaced asphalt planks, back mopped and embedded in the flood coat prior to aggregate surfacing and shall be located as indicated or as required.
- 3.16 Surfacing: Surface material shall be mineral surfaced or metal clad as specified.
- 3.17 Inspection: The Contractor and applicator shall establish and maintain an inspection procedure to assure compliance of the installed roofing system. The materials manufacturer shall certify, inspect and issue written warranties. Any work found not in compliance shall be promptly removed or repaired in an approved manner. Inspection shall include, but not limited to, the following:
 - 3.17.1 Observation of environmental conditions; number and skill level of roofing workers; start and end time of various tasks; condition of substrate.
 - 3.17.2 Verification of compliance of materials before, during and after installation.
 - 3.17.3 Inspection of condition of equipment and accuracy of thermometers and metering devices.
 - 3.17.4 Inspection of flashing, cants, and curbs.
 - 3.17.5 Inspection of membrane placement, widths of starter sheets, laps, proper use of squeegee, and mechanical fastening.
 - 3.17.6 Inspection of application of bitumen, aggregate, and walkways.
 - 3.17.7 Inspection of embedded of aggregate for required weight and coverage.
 - 3.17.8 Sampling and analysis as directed.
 - 3.17.8 Inspection of all metal work to include flashing, gutters and downspouts.
 - 3.17.9 Final inspection that roof system is watertight and complete.

Wood Traffic Topping

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood traffic topping. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Lumber: Standard grade or No. 2 grade, nonstress grade lumber. Lumber and material sizes shall conform to requirements of the rules or standards under which produced.
 - 2.1.1 Species of Nontreated Wood: Walkway members shall be fabricated of cypress or redwood.
 - 2.1.2 Preservative Treated Wood: Walkway members shall be fabricated of preservative treated lumber, treated by pressure method in compliance with AWPB LP-2 and so marked in compliance with AWPB standard. Preservative treated members shall be air-dried or kiln-dried and marked "DRY." Treated wood that is cut after treatment shall be brush-coated with preservative used in original treatment.
 - 2.1.3 Bitumen: Type used in roofing system.
 - 2.1.4 Bituminous Cement: Fed. Spec. SS-C-153, bituminous plastic cement.
 - 2.1.5 Type I: For use with asphalt roofing system.
 - 2.1.6 Type II: For use with coal-tar roofing system.
 - 2.1.7 Premolded Filler Strip: ASTM D 1751, minimum 3/8 inch thick.
 - 2.1.8 Cap Sheet: Fed. Spec. SS-R-630, asphalt saturated roofing felt, coated with strip asphalt both sides and surfaced on weathering side with mineral granules. Cap sheet shall weigh not less than 70 pounds per square.
 - 2.1.9 Prepared Roll Roofing: ASTM D 249, No. 90 asphalt saturated organic fiber felt, coated on both sides with asphalt and surfaced on weathering side with mineral granules.
- 3.0 EXECUTION:

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- 3.1 Preparation:
 - 3.1.1 Membrane Roofing:
 - 3.1.1.1 Bitumen Coating: Before installing walkways, areas to be covered shall be coated with 40-inch wide continuous path of bitumen used for roofing system.
 - 3.1.1.2 Cap Sheet Protection Course: Embed cap sheet strips in solid coat of roofing cement. Set strips at right angles to direction of walkway and 48 inches apart.
 - 3.1.1.3 Premolded Filler Strip: Embed premolded filler strip in solid coat of roofing cement. Set filler at right angles and direction of walkway and 48 inches on center.
 - 3.1.1.4 Sloping Roofs: Cover areas to be covered with wood walkways with one continuous ply of prepared roll roofing material, embedded in steep asphalt applied at rate of 25 pounds per square. Roofing sheet shall be of width to extend minimum of 4 inches beyond both sides of walkway area.
- 3.2 Installation:
 - 3.2.1 Installation of Walkways on Flat Surfaces:
 - 3.2.1.1 Wood Bases: Nominal 2-inch by 6-inch wood base members, maximum of 32 inches long, shall be set into solid uniform layer of bituminous cement, 12 inches wide and spaced 48 inches apart. Apply cement over protection course or premolded filler when applied.
 - 3.2.1.2 Securing in Place: Fasten runners to wood base members with metal angle braces or nail in place. Fasteners shall not penetrate through base units into roofing material. Runners shall be 12 feet minimum length, and joints shall occur over wood bases.
 - 3.2.1.3 Walkways: Nail 1-inch by 4-inch boards, spaced maximum 1/2 inch apart, to 2-inch by 4-inch wood runner members standing on edge, spaced maximum 26 inches apart. Walkway boards shall extend maximum of 4 inches over runners at each side. Nail walkway boards to runner with minimum two nails per board.
 - 3.2.1.4 Roof Surfacing: Apply roof surfacing material to roof surface after wood bases are installed and before walkways are fastened in place. Do not apply surfacing material over wood bases, only between and around.
 - 3.2.2 Installation of Walkways on Sloped Surfaces:
 - 3.2.2.1 Runners: Run nominal 2-inch by 4-inch runners, spaced 24 inches apart maximum, directly over prepared roofing strip, and fasten to roof deck with angle fasteners or nailed directly into deck.
 - 3.2.2.2 Walkway Boards: Nail nominal 1-inch by 4-inch boards to runners. Space walkway boards 6 inches on center, nail flush with outside edge of runners, and fasten to each runner with two nails.

Composition Traffic Topping

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of composition traffic topping. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Composition Panels: ASTM D 517.
 - 2.2 Adhesive: ASTM D 2822, asphaltic roofing cement.
 - 2.3 Bitumen: Type used in roofing system.
- 3.0 EXECUTION:
 - 3.1 Preparation: Cut panels at the project site only when necessary to obtain sizes of panels different from those furnished.
 - 3.2 Installation:
 - 3.2.1 Spaced Panels: Space panels maximum of 6 inches apart.
 - 3.2.2 Butted Panels: Butt panels together to form continuous walkway areas.

Precast Concrete or Tile Traffic Topping

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast concrete or tile traffic topping. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required

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to support the work.

2.0 PRODUCTS:

2.1 Precast Concrete Tiles:

2.1.1 Compressive Strength: Precast concrete tiles shall have a strength of 3,000 pounds per square inch at 28 days.

2.1.2 Quality Assurance: Absorption shall not exceed 8 percent by weight when tested in compliance with cold water absorption tests specified in ASTM C 1195.

2.2 Quarry Tile: ANSI A137.1.

2.3 Drainage Bed: ASTM D 1863, crushed stone, maximum size 1/2 inch.

2.4 Mortar Materials:

2.4.1 Portland cement: ASTM C 150, Type I, low alkali content.

2.4.2 Sand: ASTM C 144.

2.4.3 Hydrated Lime: ASTM C 207, Type S.

2.4.4 Setting Bed Mortar Mix: One part Portland cement, three parts damp sand.

2.4.5 Pointing Mortar: One part Portland cement, two parts fine graded sand, 1/5 part lime.

2.5 Sealant: Fed. Spec. TT-S-00227, Type I, two-component elastomeric type compound.

3.0 EXECUTION:

3.1 Preparation: Prior to installing any roof traffic tiles, coat areas to receive tiles with a solid application of bitumen used in roofing system.

3.2 Installation:

3.2.1 Drainage Bed: In areas to receive traffic roof tiles, install 1-1/2 inch thick drainage bed.

3.2.2 Tiles: Lay tiles in 1-inch thick mortar bed. Provide 3/16-inch to 1/4-inch wide joints between tiles.

Sheet Metal

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sheet metal. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: Materials and fabrication shall comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual.

2.1 Shop- and Job-Fabricated Sheet Metal Items may include the following:

a. Downspouts with clips, anchors, straps, and leaders.

b. Edge strip.

c. Flashings, including base, cap, eave, stepped, valley, apron, collar, through-wall and coping flashings.

d. Gravel stops and fasciae, extruded or formed.

e. Gutters, with continuous cleats, hangers, and cover plates.

f. Louvers.

g. Pitch pans.

h. Reglets.

i. Scuppers.

j. Splash pans.

k. Roofing, including batten seam, flat seam, standing seam, and bermuda seam types.

2.2 Aluminum:

2.2.1 Mill Finished Sheets: ASTM B 209, Alloy 3003, temper H14.

2.2.2 Colored Sheets: ASTM B 209, alloy Alclad 3003, temper H14.

2.3 Brass: ASTM B 36, copper alloy No. 260, rolled half-hard temper.

2.4 Copper: ASTM B 370, light cold-rolled temper, mill finish.

2.5 Lead Coated Copper: Cold-rolled sheet copper complying with ASTM B 370, coated with not less than 0.06 pounds per square foot of lead per side. Lead coating shall comply with ASTM B 101, Type I.

2.6 Stainless Steel: ASTM A 167, corrosion-resistant steel, annealed, AISI Type 301, No. 1 finish.

2.7 Copper Clad Stainless Steel: ASTM B 506, stainless steel sheet metal, coated with metallurgically-bonded cladding of copper on each face amounting to 10 percent of thickness (80 percent stainless

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- steel, 20 percent copper). Core shall comply with ASTM A 176, AISI Type 430. Copper cladding shall have mill finish.
- 2.8 Lead-Coated Copper Clad Stainless Steel: ASTM B 506, copper clad stainless steel sheet metal, coated on one side with 0.06 pounds per square foot of lead complying with ASTM B 101, Type I.
- 2.9 Terne-Coated Stainless Steel: Stainless steel core complying with ASTM A 167, AISI Type 304, with terne coating of 20 percent tin and 80 percent lead on both faces.
- 2.10 Terne-Coated Steel: Fed. Spec. QQ-T-201, Type 1 commercial quality steel sheet core with 1.45 ounces coating of 20 percent tin and 80 percent lead on both faces.
- 2.11 Galvanized Steel: ASTM A 526, commercial quality carbon steel sheets with minimum 0.20 percent copper content, hot-dipped galvanized to comply with ASTM A 525, G 90 coating designation. Galvanized steel designated to be finished shall be mill phosphatized and coated with manufacturer's standard baked-on finish.
- 2.12 Zinc-Alloy: ASTM B 69, containing not less than 0.6 percent copper and 0.14 percent titanium, standard temper.
- 2.13 Lead Sheet: Fed. Spec. QQ-L-201, Grade B, formed from common desilverized pig lead, complying with ASTM B 29.
- 2.14 Fasteners:
- 2.14.1 General Use Fasteners: Same material as sheet metal to which attached, or as recommended by sheet metal manufacturer.
- 2.14.2 Fasteners for Copper Items: Bronze, brass, or copper types.
- 2.14.3 Fasteners for Aluminum:
- 2.14.3.1 Rivets: ASTM B 316, alloy 1100, temper H14, minimum shank diameter of 0.187 inch, length as required to form a head.
- 2.14.3.2 Screws and Bolts: ASTM B 211, alloy 6061, temper as appropriate for particular use.
- 2.14.3.3 Washers: Alloy 1100, temper H18 or same aluminum alloy as aluminum sheet or fasteners being used.
- 2.14.3.4 Noncorrosive Fasteners: Stainless steel, AISI Type 304.
- 2.14.3.5 Cleats: Formed of same material and thickness as sheet metal being installed, minimum 2 inches wide and long enough to be fully incorporated into work.
- 2.15 Solder: ASTM B 32, of type best suited for intended purpose.
- 2.16 Welding Electrodes:
- 2.16.1 Aluminum: Welding electrodes and filler alloy of type best suited for alloy of aluminum being welded. Paste flux shall be used in welding aluminum.
- 2.16.2 Stainless Steel: Type recommended by stainless steel producer for type of metal sheet furnished.
- 2.17 Burning Rods for Lead shall be same composition as lead sheet.
- 2.18 Miscellaneous Materials:
- 2.18.1 Felt: ASTM D 226, No. 15 asphalt-saturated organic felt, unperforated.
- 2.18.2 Sheathing Paper: Rosin-sized paper weighing not less than 6 pounds per square.
- 2.18.3 Bituminous Plastic Cement: Fed. Spec. SS-C-153, Type I for use with asphaltic roofing materials and Type II for use with coal-tar roofing materials.
- 2.18.4 Bituminous Coating: Fed. Spec. TT-C-494, Type II, cold-applied solvent type bituminous mastic coating for application in minimum dry film thickness of 12 mils per coat.
- 2.18.5 Primer Paint: Fed. Spec. TT-P-645, alkyd type zinc chromate.
- 2.18.6 Zinc Dust Paint: Mil. Spec. MIL-P-21035 galvanized sheet metal touchup paint.
- 2.18.7 Sealants: Non-drying mastic type as recommended for particular joint being sealed and anticipated movement within joint. One-part sealant shall be Fed. Spec. TT-S-00230, Type II, Class A. Two-component sealant shall be Fed. Spec. TT-S-00227, Type II, Class A.
- 2.18.8 Wood Nailers and Edge Blocking: Non-stress graded wood members, moisture-resistant, treated with waterborne preservative in compliance with AWPB LP-2 standard. Nominal dimensions of nailers shall be 1 inch by 3 inches, unless otherwise required.
- 2.18.9 Nonmetallic Through-Wall Flashing: Nonreinforced, homogeneous, waterproof, impermeable elastomeric sheeting having not less than 1,000 psi tensile strength nor more than 7 percent tension set at 50 percent elongation when tested in accordance with ASTM D 412. Sheetting shall resist exposure without visible deterioration when tested not less than 400 hours in accordance

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- with ASTM D 822. Sheet metal shall not crack or flake when exposed to low temperatures.
- 2.18.10 Miscellaneous Sheet Metal Roofing Materials:
- 2.18.10.1 Wood Batten Strips shall be non-stress graded wood members of nominal 2 inches by 2 inches, pressure-treated with waterborne preservatives in compliance with AWPB LP-2, or other material that is compatible with sheet metal.
- 2.18.10.2 Polyethylene Underlayment shall be a minimum of 6 mil chlorinated polyethylene film.
- 3.0 EXECUTION: Installation of sheet metal materials shall comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual.
- 3.1 Nailing Strips and Edge Blocking: When deck surface is non-nailable, nailing strips and edge blocking shall be installed over surface of deck for anchorage of sheet metal materials.
- 3.2 Substrate Conditions: Surfaces to receive sheet metal materials shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect application.
- 3.3 Fasteners shall be concealed wherever possible in exposed work.
- 3.4 Dissimilar Surfaces:
- 3.4.1 Separate dissimilar metals by painting each metal surface in areas of contact with bituminous coating, or provide a layer of waterproof sheathing paper or asphalt-coated felt between contact surface.
- 3.4.2 Separate metal items from treated wood and cementitious materials with bituminous coating, applied either to substrate or metal.
- 3.4.3 Aluminum shall not be used when it will be in contact with copper or where it will contact water that flows over copper surfaces. Protect aluminum surface in contact with wet or pressure treated wood, cementitious materials, or ferrous metals from galvanic or corrosive action by applying one coat of zinc chromate primer and one coat of aluminum paint, or by placing layer of nonabsorptive tape or gasket between adjoining surfaces.
- 3.4.4 Where asphalt-saturated felt has been applied under sheet metal that will be soldered or welded, cover felt with one layer of sheathing paper before installing sheet metal.
- 3.5 Sheet Metal Roofing:
- 3.5.1 Removing Existing Sheet Metal Roofing: Remove sheet metal roofing in full sections or cut damaged sections where possible to make watertight joints between existing roofing and new materials to be installed.
- 3.5.2 Preparing Existing Surfaces: Bent or raised portions of existing roofing shall be nailed down and repaired to extent necessary to provide smooth surface for sheet metal roofing.
- 3.5.3 Application of Underlayment:
- 3.5.3.1 Felt Underlayment: Apply one layer of asphalt-saturated roofing felt over deck surface and cover with one layer of sheathing paper. Underlayment plies shall be installed with mechanical fasteners spaced 6 inches in center at laps or adhesives as appropriate for substrate conditions.
- 3.5.3.2 Polyethylene Film Underlayment: Install one layer of polyethylene film underlayment over deck surface with adhesive. Cover polyethylene film with one layer of sheathing paper applied with adhesive. Mechanical fasteners shall be installed only where deck surface presents nailable conditions.
- 3.5.4 Coating Backside of Metal Sheets:
- 3.5.4.1 Bituminous Coating: Coat back side of metal roofing with bituminous coating wherever metal will be in contact with wood, ferrous metal, or cementitious construction.
- 3.5.4.2 Painting: Paint back side of metal roofing with zinc chromate type primer, minimum 2-mil dry film thickness.
- 3.5.5 Expansion Seams: Provide loose lock or slip seams, as designated. Seams shall allow 1/2-inch for expansion and shall be sealed with sealant.
- 3.5.6 Penetrations through roofing shall be flashed with sheet metal material to match roofing material.

Roof Accessories

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of heat and smoke vents, roof hatches, gravity ventilators, prefabricated curbs and equipment supports, and curb-set expansion joints. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product

Attachment 1: Specifications for the Work

- manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Comply with SMACNA Architectural Sheet Metal Manual details for fabrication of units, including flanges and capflashing to coordinate with type of roofing indicated.
 - 2.1 Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.
 - 2.2 Stainless Steel: AISI Type 302/304, ASTM A 167, 2D annealed finish except as otherwise indicated, tempered as required for forming and performance.
 - 2.3 Aluminum Sheet: ASTM B 209, Alloy 3003, tempered as required for forming and performance; AA-C22A41 clear anodized finish, except mill finish prepared for painting where designated for field painting.
 - 2.4 Extruded Aluminum: Alloy 6063-T52; 0.078 inch minimum thicknesses for primary framing and curb member legs, 0.062 inch for secondary legs; AA-C22A41 clear anodized finish on exposed members, except as otherwise designated.
 - 2.5 Insulation: Rigid or semi-rigid board of glass fiber.
 - 2.6 Wood Nailers: Softwood lumber, pressure-treated with water-borne preservatives for above ground use, complying with AWPB LP-2; not less than 1-1/2 inches thick.
 - 2.7 Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal. Match finish of exposed fasteners with finish of material being fastened. Where removal of exterior exposed fasteners affords access to building, provide non-removable fastener heads.
 - 2.8 Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.
 - 2.9 Bituminous Coating: Fed. Spec. TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.
 - 2.10 Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
 - 2.11 Elastomeric Sealant: Type that is compatible with joint surfaces; Fed. Spec. TT-S-00227, TT-S-00230, or TT-S-001543.
 - 2.12 Roofing Cement: ASTM D 2822, asphaltic.
 - 2.13 Prefabricated Heat/Smoke Vents: Provide units that have been tested, listed, and labeled by UL (Class A) or FM, as designated. Except as otherwise designated, fabricate for 40 lbs/sq ft external loading and 20 lbs/sq ft internal loading pressure. Fabricate framing of the following materials as designated, with manufacturer's standard welded or sealed mechanical corner joints, including cap flashing:
 - a. Formed or extruded aluminum.
 - b. Zinc-coated steel.
 - c. Formed or extruded aluminum or zinc-coated steel.
 - 2.13.1 Hatch-Lid Type Units: Fabricate with single or double aluminum covers with 1 inch integral insulation and gaskets. Equip units with automatic self-lifting mechanisms and fusible links or other heat-sensitive or smoke-sensitive release devices as indicated, and with complete hardware including hold-open devices and independent manual release devices for inside and outside operation of covers.
 - 2.13.2 Fusible-Dome Type Units: Provide manufacturer's standard shrinkback/drop-out polyvinyl chloride sheet dome unit for 210 F activation; with light transmittance of 40 percent, proven 10-year weather resistance, exterior acrylic protective coating, and maximum flame spread rating of 25 (UL 723). Equip each unit with external safety grid capable of supporting 200 pound loading. Provide glazing system for easy replacement of activated domes and for drainage of condensation to exterior.
 - 2.14 Prefabricated Roof Hatches: Fabricate units as single leaf type unless otherwise directed, for 40 lbs/sq ft external loading and 20 lbs/sq ft internal loading pressure. Frame with 9-inch high integral-curb double-wall construction with 1-1/2 inch insulation, cant strips, and cap flashing, with welded or sealed mechanical corner joints. Provide double-wall cover construction with 1 inch insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide gasketing. Fabricate units of

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following materials as designated:

- a. Aluminum sheets and extrusions.
 - b. Zinc-coated steel sheets.
 - c. Zinc-coated steel sheet curbs and aluminum covers.
 - d. Aluminum or zinc-coated steel, or in combination.
- 2.15 Louvered Penthouse Gravity Ventilators: Provide units fabricated with weatherproof aluminum extrusion louvered walls with mitered or boxed corner construction; with aluminum sheet cover and 1 inch insulation adhesively applied on underside; and with extruded aluminum base and cap flashing for mounting on curbs which are not integral with units. Equip units with manual dampers designed for operation from floor directly below ventilator unit. Equip unit with bird or insect screens as directed, located internally to discourage nesting.
- 2.16 Prefabricated Vertical-Type Gravity Ventilators: Provide units fabricated from the following materials and including the following features, as designated:
- a. Zinc-coated steel sheet, prime painted.
 - b. Aluminum sheet, prime painted.
 - c. Aluminum sheet, mill finish.
 - d. Equip with bird screens.
 - e. Equip units with dampers, with manual operation device extended to 6 ft 6 in above floor.
- 2.17 Prefabricated Curbs/Equipment Supports: Comply with loading and strength requirements designated where units support other work. Coordinate dimensions with rough-in sheets or shop drawings of equipment to be supported. Fabricate of structural quality sheet steel (ASTM A 570) that has been prepared for painting, factory-primed, and painted with 2-mil thickness of baked-on synthetic enamel, after fabrication. Fabricate with welded or sealed mechanical corner joints and with cant strips and base profile coordinated with roof insulation thickness. Except as otherwise designated or required for strength, fabricate units of minimum 14-gauge metal and to minimum height of 12 inches.
- 2.18 Curb-Set Expansion Joints: Provide extruded aluminum expansion joint units designed for installation on raised curbs. Equip with curb cap, cap flashing, and waterproof bellows of 30- or 60-mil elastic flashing sheet of neoprene, EPDM, butyl rubber, or chlorinated polyethylene. Provide mineral-fiber insulation, concealed under curb cap between curbs, to form a waterproof, airtight, insulated, expansion joint system. Provide units in styles required for roof-to-roof, roof-to-wall, and wall-to-wall applications as required; complete with prefabricated corner and intersection units as required; equipped with special field-splice provisions to ensure permanent continuous waterproof installation of expansion joint system.
- 3.0 EXECUTION: Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Except as otherwise designated, install roof accessory items in accordance with construction details of NRCA Roofing and Waterproofing Manual.
- 3.1 Isolation: Where metal surfaces of units are to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces or provide other permanent separation.
- 3.2 Flange Seals: Except as otherwise directed, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- 3.3 Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant, except where overlap is required to be left open for ventilation.

Plastic Skylights

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of plastic skylights. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Single thickness plastic skylights shall be formed to a standard dome profile.
- 2.2 Double thickness plastic skylights shall have an average 1-inch minimum air space between sheets formed to a standard dome profile, with a standard hermetic edge seal.
- 2.3 Color: Exterior sheets shall be colorless transparent sheet or bronze tinted transparent sheet, 25-30 percent light transmittance in accordance with ASTM D 1003. Interior sheets shall be colorless transparent sheet.
- 2.4 Glazing frame, dome retainers, and trim shall be extruded aluminum.
- 2.5 Curb frame shall be extruded aluminum including cap flashing to receive roofing counterflashing.
- 2.5.1 Curb-mounted units shall be designed for installation on nominal 1-1/2 inch thick wood curbs.
- 2.5.2 Insulated curb units shall be self-flashing units with integral, self-supporting double wall formed or extruded or combination aluminum curb 0.040-inch minimum sheet thickness enclosing minimum 1-inch glass fiberboard or equivalent insulation and with minimum 3-inch roof flanges; welded or sealed mechanical joints at corners.
- 2.5.3 Curb height shall be 9 inches minimum above line of roofing or custom height as required. For decks that slope 1/4 inch per ft., tapered curb heights shall match slope to provide a level installation of domes.
- 2.6 Glazing systems of neoprene, closed cell sponge neoprene, PVC gasketing, partially vulcanized butyl tape, or liquid-applied elastomeric sealant shall be provided.
- 2.7 Condensation control on inside of domes shall be provided using fabricated units with integral internal gutters and nonclogging weeps.
- 2.8 Plastic for skylights shall be cast acrylic with abrasion-resistant coating on exterior surface, for 2 percent maximum haze increase of 100 revolutions on 500 g Taber abraser in accordance with ASTM D 1044; 14,500 psi flexural strength; 180 F continuous service temperature or cast polycarbonate with 13,500 psi flexural strength; 240 F continuous service temperature; 16 ft-lb IZOD impact strength. Skylights shall meet AAMA 1601.1 recommendations for thickness of plastic domes to maintain 40 psf loading (for support of ice and snow only).
- 2.9 Bituminous coating shall be in accordance with Fed. Spec. TT-C-494 solvent type bituminous mastic, nominally free of sulphur, compounded for 15-mil dry film thickness per coating.
- 2.10 Roofing cement shall be asphaltic complying with ASTM D 2822.
- 2.11 Mastic sealant shall be polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- 3.0 EXECUTION:
- 3.1 Installation of skylights shall be coordinated with installation of roof deck or other substrates and with vapor barriers, roof insulation, roofing, and flashing as required to ensure that combined elements are waterproof and weathertight. Units shall be anchored securely to supporting structural substrates to withstand lateral and thermal stresses including inward and outward loading pressures.
- 3.2 Isolation: Where metal surfaces of units are required to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- 3.3 Flange Seals: Where required, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- 3.4 Cap Flashing: Where cap flashing is required, install to provide adequate waterproofing overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- 3.5 Cleaning: Clean exposed metal and plastic surfaces.

Metal-framed Skylights

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal-framed skylights. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Metal-framed skylight panels shall be 2-1/4 inch thick double-faced panels consisting of glass fiber reinforced polymer, with interior and exterior faces bonded under controlled heat and pressure to a mechanically interlocked aluminum grid core. Exterior face shall have a special erosion protective surfacing.
 - 2.1.1 Panel Performance Characteristics:
 - 2.1.1.1 Color Stability from Weathering: Exterior face shall not change more than 3.5 adams units (Delta E by ASTM D 2244) as determined by an average of three samples after a minimum of outdoor exposure of 60 months in south Florida at 7 degrees facing south.
 - 2.1.1.2 Interior fire resistance characteristics shall be in accordance with ASTM E 84, with flame spread of 45 maximum and a smoke developed rating of 350 maximum. Burn extent shall be 1 inch or less by ASTM D 635.
 - 2.1.1.3 Exterior face impact resistance shall be 60 ft-lb minimum.
 - 2.1.1.4 Coefficient of linear expansion shall be 1.24×10^{-5} in./in./F.
 - 2.1.2 Laminate adhesive shall be heat and pressure resin type. Minimum strength shall be 750 psi tensile strength by ASTM C 297 after two exposures to six cycles each of aging conditions prescribed by ASTM D 1037 and 500 psi shear strength average by ASTM D 1002 after five prescribed exposures.
 - 2.1.3 Grid Core shall be 6063-T6 aluminum I-beams with 7/16-inch flange width, mechanically interlocked to ensure even muntin to muntin intersection.
 - 2.1.4 Aluminum frame shall be 6063-T5 aluminum with mill finish or corrosion-resistant finish as required with mitered and heli-arc welded corners. Clamp fasteners shall be stainless steel.
 - 2.1.5 Panel U-values determined by ASTM C 236 shall be as designated.
- 2.2 Pre-engineered self-supporting roof systems shall be one of the following standard types as required:
 - 2.2.1 Continuous vaulted type shall be semi-circular.
 - 2.2.2 Pyramid type shall be self-supporting.
 - 2.2.3 Grid type shall be 4-foot minimum width by 16-foot maximum length as required.
 - 2.2.4 Preformed Acrylic
 - 2.2.5 Structural roof design loads shall be based on location of installation. Joint and structural systems shall be manufacturer's standard types or special designed systems as required. Roof systems shall be fastened to supports as recommended by the roof system manufacturer.
 - 2.2.6 Flashings shall be aluminum, 0.040 inch thick minimum.
- 2.3 Optional face sheet material for metal-framed skylight panels shall be 1/8-inch thick clear acrylic panels assembled in accordance with manufacturer's recommendations. Panel assemblies shall be limited to 4-foot by 4-foot modules composed of 12 inches by 24 inches or 8 inches by 20 inches nominal grid size as required.
- 2.4 Panels may be 1-9/16 inch thickness where required.
- 3.0 EXECUTION: (Section not used.)

Sealants

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sealants. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Oil-Based Caulking Compound shall conform to Fed. Spec. TT-C-00598, Type I.
 - 2.2 Two-component polyurethane sealant shall be an elastomeric type compound conforming to Fed. Spec. TT-S-00227, Type II, Class A or B as required. The compound shall be supplied in pre-measured kit form for on-the-job mixing.
 - 2.3 Butyl rubber sealant shall conform to Fed. Spec. TT-S-001657, Type I or II as required.
 - 2.4 Single-component polysulfide sealant shall be an elastomeric type compound conforming to Fed. Spec. TT-S-00230, Type II, Class A or B as required.
 - 2.5 Polyisobutylene-Based or Isoprene-Isobutylene-Based Pressure-Sensitive Tape or Bead: When applied between two clean, dry surfaces of specified thicknesses and under conditions of continuous pressure that will be encountered in use, the sealant shall seal the joint from water and

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- shall be weather-resistant. The material shall be nonbleeding at 160 F and below, shall withstand temperature ranges from minus 30 F to 200 F without loss of adhesion and without slipping, and shall have properties allowing the compound to move with the expansion and contraction of structure. The tape or bead shall be plain or contain a cloth or fiber insert. The tape or bead shall be supplied in rolls with a removable paper for cloth backing.
- 2.6 Silicone rubber based sealant shall be an elastomeric type compound conforming to TT-S-001543, Class A or B as required.
 - 2.7 Preformed Strip Sealants:
 - 2.7.1 Preformed butylene strip sealant shall be foamed-urethane strip saturated with a butylene waterproofing material.
 - 2.7.2 Preformed asphalt impregnated strip shall be asphalt-impregnated foamed-polyurethane strip.
 - 2.8 Acoustical Sealant: Synthetic rubber or polymeric-based material shall conform to the following:
 - 2.8.1 Consistency: ASTM D 217, 190 to 310.
 - 2.8.2 Aging: Slightly tacky at 160 F after 50 days.
 - 2.8.3 Accelerated Aging: No significant change after 260 hours in weathermeter.
 - 2.8.4 Nonstaining.
 - 2.8.5 Solids Content: Approximately 80 to 90 percent.
 - 2.8.6 No Oil Migration.
 - 2.9 Silicone RTV foam firestop sealant shall be a medium-density two-part product supplied as liquid components. When components are thoroughly mixed in a one-to-one ratio by either weight or volume the sealant shall expand and cure to a foamed elastomer at room temperature in 1 to 3 minutes. Sealants for fire-rated penetration seal designs shall bear UL classification for 1, 2, or 3-hour fire-rating, as required to match rating of the penetrated construction.
 - 2.10 Sealer: Sealer for use with oil-based caulking compound shall be aluminum paint.
 - 2.11 Primer: Primer for two-component polyurethane sealant, butyl rubber sealant, and single-component polysulfide sealant shall be as recommended by the sealant manufacturer. Primer shall have been tested for durability with the sealant to be used and on samples of the surfaces to be sealed.
 - 2.12 Backstop Material: Backstop material shall be resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, preformed neoprene, neoprene rod, oilless dry jute, or rope yard. Backstop material shall be nonabsorbent, nonstaining, and compatible with the sealant used. Tube or rod stock shall be rolled into the joint cavity. Preformed support strips for ceramic and quarry tile control joint and expansion joint work shall be polyisobutylene or polychloroprene rubber.
 - 2.13 Bond-preventive materials shall be pressure-sensitive adhesive polyethylene tape, aluminum foil, or wax paper. Backstop material with bond-breaking characteristics may be installed in lieu of bond-preventive materials specified.
 - 3.0 EXECUTION:
 - 3.1 General Surface Preparation: The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from all joint surfaces to be sealed. Oil and grease shall be removed with solvent and surfaces shall be wiped with clean cloths.
 - 3.2 Concrete and Masonry Surfaces: Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence, and loose mortar shall be removed from the joint cavity.
 - 3.3 Steel Surfaces: Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.
 - 3.4 Aluminum Surfaces: Aluminum surfaces of windows and door frames in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coatings shall be as recommended by the manufacturer of the aluminum work and shall be nonstaining.

DIVISION 8-OPENINGS

Hollow Metal Doors and Frames

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hollow metal doors and frames. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: All hollow metal doors and frames shall comply with Recommended Specifications: Standard Steel Doors and Frames (SDI-100), Steel Door Institute.
 - 2.2 Hollow Metal Doors: Doors shall be SDI-100 standard types, styles, and sizes as designated. Doors shall be reinforced to receive builder's hardware in compliance with the requirements of ANSI A115. Provide glazing beads and stops for glass panels and sightproof louvers as required. Doors shall be galvanized. Doors to be field-finished shall receive a shop prime coat. A baked-on finish coat shall be provided for factory-finished doors.
 - 2.3 Hollow Metal Frames: Hollow metal frames for doors, transoms, side lights, borrowed lights, and other openings shall be SDI-100 standard types, styles, and sizes as designated. Frames shall be provided with mitered corners and welded construction for exterior applications and knocked down for field assembly for interior applications. Frames shall be reinforced to receive builder's hardware in compliance with the requirements of ANSI A115. Provide plaster guards or mortar boxes where required. Finish shall be as specified for doors.
 - 2.4 Fire-Rated Assemblies: Fire doors and frames shall be identified with recognized testing laboratory labels indicating the applicable fire rating. The constructed and installed assemblies shall comply with the requirements of NFPA 80.
 - 2.5 Soundproofing Metal Doors: Soundproofing metal doors shall be identified with recognized testing laboratory labels indicating the applicable STC soundproofing rating. Soundproofing rating shall be STC 45 or as required.
 - 2.6 Hollow Metal Combination Storm and Screen Doors: Doors shall be flush foam insulated panels capable of receiving removable screen or glass inserts. Doors shall be not less than 20-gauge steel, minimum 1-3/8 inch thick, and minimum 3-1/2 inch stiles and rails. Screen insert shall be aluminum wire-cloth screening. Glazing shall be 1/4 inch thickness. Doors shall be reinforced to receive, and shall be provided with a spring-loaded chain door stop, a latch with a night lock, a hydraulic closer, 1-1/2 pair butts, door pull, and an adjustable sweep with a vinyl seal. Doors shall be finished as specified for hollow metal doors.
- 3.0 EXECUTION:
 - 3.1 Frame Installation: Installation of frames shall comply with the provisions of SDI-105, Recommended Erection Instructions for Steel Frames. Provide three wall anchors per jamb at hinge and strike levels. Fire-rated frames shall be installed in compliance with NFPA 80.
 - 3.2 Door Installation: Hollow metal doors shall be fit accurately in frames within clearances specified in SDI-100. Fire-rated doors shall be installed within clearances specified in NFPA 80.
 - 3.3 Soundproofing Metal Door and Frame:
 - 3.3.1 Frames shall be set plumb and true and fully insulated. The floor under the sill, if poured, shall be level and smooth.

Aluminum Doors and Frames

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hinged aluminum doors and frames. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Glazed aluminum stile-and-rail doors and frames shall be manufacturer's standard type. Adjacent

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glass enclosures, transoms, and/or sidelights shall be of the same style and design as the doors and frames.

- 2.1.1 Screws, nuts, washers, rivets, and other miscellaneous fastening devices shall be of hardened aluminum, stainless steel, or other corrosion-resistant material.
- 2.1.2 Nominal wall thickness for doors shall be not less than 0.125 inch except that the molding shall be not less than 0.05 inch.
- 2.1.3 Frames shall be extruded tube or open channel shapes not less than 0.125 inch thick for frames 1-3/4 inches by 4 inches and not less than 0.093 inch thick for frames 1-3/4 inches by 4-1/2 inches. Doors shall have extruded aluminum snap-in glass stops with vinyl insert.
- 2.2 Flush Aluminum Doors:
 - 2.2.1 Doors shall be constructed of tubular frame members, fabricated with reinforced mechanical or welded joints. Limit frame exposure to 3/4 inch maximum width on door faces.
 - 2.2.2 Core shall be resin-impregnated Kraft paper with honeycomb, rigid closed-cell polyurethane insulation, or rigid noncombustible mineral insulation board.
 - 2.2.3 Faces shall be of aluminum sheet of 0.064-inch minimum thickness, mechanically interlocked with frame members or laminated to core and framing with waterproof glue to form door thickness of 1-3/4 inches.
 - 2.2.4 Lights (glazed openings in doors) shall have aluminum moldings and stops, with inside removable stops.
 - 2.2.5 Frames shall be of tubular and channel frame assemblies, with either welded or mechanical joints, reinforced as necessary to support required loads and door hardware.
- 2.3 Aluminum combination storm and screen doors: Doors shall consist of a master frame with two intermediate horizontal rails, one fixed metal panel, and two glass and two screen removable insert panels. Master frame shall be a minimum 1 inch thick and stiles shall be a minimum 2-3/4 inches wide. Doors shall have a mill finish and shall be provided with a springloaded chain door stop, a latch with a night lock, a hydraulic closer, and an adjustable door sweep with a vinyl seal. Screen inserts shall have aluminum wirecloth screening secured with a vinyl spline.
- 2.4 Weatherstripping: Weatherstripping shall be door manufacturer's standard applied to stiles, heads, and bottoms of exterior doors and shall be easily replaced without special tools.
- 2.5 Finishes: Aluminum surfaces shall be provided with one of the following finishes. The coating shall have a minimum film thickness of 0.0004 inch with a minimum weight of 17 milligrams per square inch when tested in accordance with ASTM B 137. Coating shall be sealed with hot water.
 - 2.5.1 Anodic Coating (0.4 mil to 0.7 mil): AA-M12-C22-A31, Architectural Class II, Clear-Anodized or AA-M12-C22-A32, AA-M12-C22-A34, Architectural Class II, Color-Anodized.
 - 2.5.2 Organic Coating (minimum 0.8 mil): AAMA 603.8, Baked-Enamel finish.
- 2.6 Special Finishes:
 - 2.6.1 Anodic Coating (minimum 0.7 mil): AA-M12-C22-A41, AA-M12-C22-A42, or AA-M12-C22-A44, Architectural Class I, Color-Anodized.
 - 2.6.2 Organic Coating (minimum 1.2 mil): AAMA 605.2, High-Performance finish.
- 3.0 EXECUTION: Aluminum surfaces in contact with dissimilar materials shall be backpainted with alkali-resistant paint before erection.

Wood Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: Top and bottom edges of doors shall be sealed prior to shipment. Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door.
 - 2.2 Flush Doors: Solid core and hollow core flush doors shall conform to NWWDA I.S.1. For stain or natural finish, doors shall be of Good Grade veneer in accordance with NWWDA I.S.1. For paint finish, doors shall be Standard Grade in accordance with NWWDA I.S.5 or Sound Grade or hardboard-faced in accordance with NWWDA I.S.1. Unless otherwise required for fire safety, solid

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- core doors shall have wood block core or mat-formed particleboard core conforming to NWWDA I.S.1. Hollow core and mat-formed particleboard solid core doors shall have lock blocks. Openings in exterior doors shall be weatherproof.
- 2.3 Paneled doors shall conform to NWWDA I.S.5 or FHDA/7. For stain or natural finish, doors shall be Premium Grade in accordance with NWWDA I.S.5 or Selected Grade in accordance with FHDA/7. For paint finish, doors shall be Standard Grade in accordance with NWWDA I.S.5. When laminated panels are furnished, they shall not be less than three ply. Flat panels shall have a minimum finished panel thickness of 5/8 inch. Raised panels shall have a minimum finished panel thickness of 3/4 inch.
- 2.4 Fire Doors: Fire doors shall be constructed of materials and in a manner that will conform to the requirements of Underwriters' Laboratories. Doors shall bear the identifying label of Underwriters' Laboratories for the desired resistance rating.
- 2.5 Storm doors shall be manufacturer's standard solid core door not less than 1-3/4 inches thick with 5-inch minimum stiles and top rail. Upper panel shall be arranged to receive removable glass and screen inserts. Screen insert shall be aluminum wire-cloth screening. Glazing shall be 1/4 inch thickness. Door shall be provided with 1-1/2 pair butts, a latchset with a night lock, a spring-loaded chain door stop, a hydraulic closer, and an adjustable door sweep with a vinyl seal.
- 2.6 Screen doors shall be manufacturer's standard solid wood door not less than 1-3/8 inch thick with 3-1/2 inch minimum stiles, mid-rail and top rail, and 7-1/2 inch bottom rail. Screen shall be aluminum wire-cloth screening secured with wood stops and vinyl splines. Doors shall be provided with 1 pair butts, 1 pull, 1 hook and eye, and 1 spring closer.
- 2.7 Preservative Treatment: Exterior softwood doors shall be water-repellent preservative treated and so marked at the plant in accordance with NWWDA I.S.4.
- 2.8 Adhesives: Adhesives shall be in accordance with NWWDA I.S.1, using requirements for Type I doors for exterior doors and requirements for Type II doors for interior doors. Adhesive for doors to receive a natural finish shall be nonstaining.
- 2.9 Accessories: All doors shall have cutouts, stops, beads, or other accessories as required to receive builder's hardware, glazing, louvers, or other design specialties and penetrations.
- 3.0 EXECUTION: Installation and operation characteristics of fire doors shall conform to NFPA 80, 80A, and 101.

Aluminum and Wood Sliding Glass Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sliding glass doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aluminum sliding glass doors shall be complete units with safety glass, weatherstripping, hardware, and integral tracks and rollers for smooth operation and installation. Sliding glass door panels shall conform to AAMA 101. Classification of sliding glass doors shall be AAMA type SGD-A3 (monumental grade) provided for high performance (HP) designation.
- 2.2 Wood sliding glass doors shall consist of wood frame sliding and fixed safety glass panels and casings of selected West Coast hardwood treated with water repellent and factory-primed for exposed wood exterior frame parts and door panels. Sill facing shall be extruded anodized aluminum with PVC thermal barrier. Operating door track shall have stainless steel cap. Each unit shall include door panels, head and sill, track rollers (ball-bearing sheaves), weatherstripping, glazing channels, hardware, and accessories.
- 2.3 Hardware shall include door pulls and keyless locking with interior locking lever on operating door panel.
- 2.4 Glazing in door panels shall be safety glass in compliance with ANSI Z97.1.
- 2.5 Screen doors shall be manufacturer's standard furnished with sliding doors. Insect screen shall be 18 x 16 mesh aluminum wire conforming to Fed. Spec. RR-W-365 or glass fiber screen conforming to Fed. Spec. L-S-125.

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- 3.0 EXECUTION: Installation of door units shall be complete with all necessary anchors, inserts, and hardware.

Sliding Fire Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sliding fire doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Composite sliding fire doors shall be standard steel face sheets bonded to and supported by rigid, dimensionally stable inorganic core, with steel reinforced edges. Finish shall be factory-primed.
- 2.2 Hollow metal (sheet metal) sliding fire doors shall be standard flush design with not less than 20-gauge steel faces over steel stiffeners or honeycomb core materials. Finish shall be factory-primed.
- 2.3 Tin-clad sliding fire doors shall be standard design wooden core construction with 14-inch by 20-inch maximum size, 30-gauge galvanized steel sheets not over 48 inches wide with venting as required by NFPA 80. Finish shall be galvanized.
- 2.4 Horizontal sliding steel doors shall be standard design consisting of two thicknesses of 24-gauge galvanized corrugated sheet steel with an asbestos core and framed with galvanized structural steel shapes. Sheets shall be applied with exposed face corrugations vertical and wall side corrugations horizontal. Finish shall be galvanized.
- 2.5 Vertical lift sliding steel doors shall be standard design consisting of two thickness of 24-gauge galvanized corrugated sheet steel with an asbestos core and framed with galvanized structural steel shapes. Sheets shall be applied with exposed face corrugations vertical and wall side corrugations horizontal. Door shall be uprising on vertical tracks. Finish shall be galvanized.
- 2.6 Metal-clad (Kalamein) doors shall be standard horizontal sliding metal covered wood core or stiles and rails and insulated flush panels covered with steel. Finish shall be factory-primed.
- 2.7 Fire door assemblies shall be provided as complete units produced by one manufacturer.
- 2.7.1 Fire doors, frames, and fire door hardware shall be types that have been fire-tested and rated in accordance with ASTM E 152. Doors shall bear labels of the Underwriters' Laboratories, Incorporated or Factory Mutual Laboratories as evidence of rating.
- 2.7.2 Components for rated door assembly shall be listed in UL Building Materials Directory or Factory Mutual Approval Guide.
- 2.8 Finish: Galvanized finish shall be hot-dip galvanized minimum 0.6 ounce per square foot and shall not be factory-primed.
- 2.9 Fire Door Hardware: Hardware shall be labeled, automatic closing type sliding fire door assemblies complete with adjustable roller guides, binders, floor stops, cables, sheaves, counterweight, and fusible links. Fusible links shall be UL listed, 165 F for ordinary temperature classification.
- 2.10 Accessories: The following items shall conform to the requirements of NFPA 80: Astragal, chafing strips, bumper shoes, rear binder, stay rolls, wedge, and automatic closer.
- 3.0 EXECUTION:
- 3.1 Installation: Fire doors shall be installed in accordance with NFPA 80.
- 3.2 Temporary Fire Protection: During the execution of this work, temporary fire barriers, alarms, or watchmen shall be provided to the degree of opening protection required by the local authority until the permanent work is completed and operational.

Coiling (Rolling) Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coiling doors, coiling grilles, and coiling counter shutters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Doors shall be the manufacturer's standard type. Doors shall be spring counterbalanced, overhead coiling type; coiling grilles shall be overhead or side coiling type. Door

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- shall be complete with all guides, tracks, hardware, fastenings, operating mechanisms, and accessories. Guides at jambs shall be set back a sufficient distance to provide a clear opening when doors are in the open position.
- 2.1 Roller Shaft: The roller shaft shall be constructed of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of the curtain. Deflection shall not exceed 0.03 inch per foot of span. Ends of roller shall be closed with cast-iron plugs, machined to fit the pipe. An oil-tempered, helical, counter-balancing steel spring, capable of producing sufficient torque to ensure easy operation of the door curtain from any position, shall be installed within the roller. Spring shall be easily adjustable.
 - 2.2 Brackets: Brackets shall be fabricated of heavy cast iron or steel, designed to close the ends of roller-shaft housing and to form a supporting ring for hood. The bracket hubs or shaft plugs shall be equipped with prelubricated ball bearings, shielded or sealed.
 - 2.3 Hoods: Each hood shall be constructed of steel not lighter than No. 24-gauge, formed to fit the contour of end bracket gear assembly and reinforced with steel rods or rolled beads at top and bottom edges. A weather baffle shall be provided at the lintel.
 - 2.4 Gears: Gears shall be of the best grade gray iron, cast iron teeth machine-molded from machine-cut patterns, enclosed and protected by the hood and brackets.
 - 2.5 Guides: The guides shall consist of steel shapes not less than 2-1/2 inches deep and not less than 3/16-inch thick and shall form a channel pocket of sufficient depth to retain the curtain in place under the wind pressure specified. Provisions for removal of the door shall be included in the design.
 - 2.6 Head Track: Head track for side coiling grilles shall be of extruded aluminum and shall be provided with adjustable hangers spaced not more than 2 feet-6 inches on center.
 - 2.7 Floor Track: Floor track for side coiling grilles shall be of extruded aluminum with replaceable bronze strips, flush with finish floor and shall provide a floor slot with a maximum width of 1/4 inch.
 - 2.8 Bottom Rail: The curtain shall have a rolled-steel bottom bar consisting of two angles of equal weight, one on each side, fastened to the bottom of the curtain.
 - 2.9 Endlocks and Windlocks: The ends of each slat shall have malleable iron endlocks of the manufacturer's standard design. The door shall have windlocks at the ends of each slat. Windlocks shall prevent curtain from leaving the guide as a result of deflection from wind pressure or other forces.
 - 2.10 Weatherstripping: Doors exposed to weather shall have manufacturer's standard weatherstripping on jambs, top, and sill for weathertight installation.
 - 2.11 Curtains:
 - 2.11.1 Curtains for coiling service doors shall be formed of insulated interlocking galvanized steel slats of No. 20- gauge minimum thickness or of flat steel interlocking slats. The curtains shall be designed to resist designated wind pressure without damage. The curtains shall roll up on a drum supported at the head of the opening on brackets and be balanced by helical springs.
 - 2.11.2 Curtains for coiling grilles shall consist of 5/16-inch diameter mill finish aluminum, galvanized steel, or stainless steel rods spaced 2 inches on center to form brick pattern grille, with interlocking links to form a network of vertical and horizontal lines. Links shall be 9 inches apart.
 - 2.12 Counter Doors (Roll-Up Shutters): Integral counter shutter/frame shall be manufacturer's standard. Curtains shall be aluminum, minimum 22-gauge galvanized steel, or stainless steel, minimum 22-gauge Type 302 No. 4 finish as designated. Frame shall be fully welded into a single assembly, complete with anchors; the jambs and head shall be minimum 16-gauge stainless steel or plain steel, and the sill shall be formed of 14-gauge stainless steel No. 4 finish.
 - 2.13 Fire Doors: Doors, frames, hardware, and other accessories shall be in accordance with NFPA 80.
 - 2.14 Operation:
 - 2.14.1 Push-Up Operation: Doors shall have one lifting handle on each side of the door and shall be counter balanced to provide ease of operation while raising or lowering the curtain by hand. The maximum exertion or pull required shall not exceed 25 pounds. Doors over 7 feet high shall be provided with pull down straps or pole hooks.
 - 2.14.2 Chain-Gear Operation: Chain shall be galvanized, endless type, operating over a sprocket and shall extend to within 3 feet of floor. Gears shall be high grade gray iron, cast from machine-cut

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- patterns. Gear reduction shall be calculated to reduce chain pull required to not exceed 35 pounds.
- 2.14.3 Crank-Gear Operation: Crank shall be removable and located approximately 34 inches above the floor. Gears shall be of high grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce pressure exerted on crank to not over 35 pounds.
- 2.14.4 Motorized Operation: Electric power-operated doors shall be complete with electric motors, operators, controls, switches, and safety devices. Control equipment shall comply with NEMA ICS 2.
- 2.15 Finish:
- 2.15.1 Galvanizing: Curtain and bottom rail shall be hot-dipped galvanized with a zinc coating not less than 1.25 ounces total per square foot of flat metal, coating class 1.25 in accordance with ASTM A 525. Hood shall have either class 1.25 galvanizing as described above or be fabricated from electrolytic zinc-coated sheets conforming to ASTM A 591. Hardware items shall be galvanized according to ASTM A 153. Items galvanized after assembly shall comply with ASTM A 123.
- 2.15.2 Pretreatment: All zinc-coated surfaces shall be given a phosphate coating prior to application of prime paint.
- 2.15.3 Shop-Applied Prime Paint: All ferrous surfaces, including galvanized curtain, hood, and slats, but excluding wearing surfaces, shall be given one shop-applied prime coat of the manufacturer's standard primer in accordance with Fed. Spec. TT-P-86. Primer shall be compatible with the specified finish paint and shall not contain lead. Non-galvanized surfaces shall be wire brushed to bare metal prior to primer application.
- 3.0 EXECUTION: Guides shall be securely attached to adjoining construction. Doors shall be installed with all anchors and inserts for brackets, tracks, hardware, and other accessories located accurately. Upon completion, door shall be weathertight and shall be lubricated and adjusted to operate freely.

Folding Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of folding doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Door shall be full pantograph or "x-accordion" type with flexible fabric panels. Materials shall have a flame spread rating of 25 or less, fuel contributed rating of 10 or less, and a smoke developed rating of 5 or less, in compliance with ASTM E 84. Each new door unit shall be a complete unit produced by one manufacturer including hardware, accessories, mounting, and installation components.
- 2.2 Framework for door including posts, pantographs, hinges and hinge plates, and support rods shall be ferrous metal. All enclosed metal shall be galvanized ASTM B 633, or cadmium-plated ASTM B 766. Posts and exposed metal items shall have phosphate treatment complying with Fed. Spec. TT-C-490.
- 2.3 Folding Mechanism:
- 2.3.1 Flexible panels shall be fabricated with not less than 16-gauge metal. Provide one row at top for doors up to 12 feet high, two rows at top for doors over 12 feet high, single row at bottom, and intermediate rows not over 4 feet center to center. Provide vertical rods of a minimum 3/16-inch diameter for connecting hinges in non-rigid type panels.
- 2.3.2 Rigid panels shall be fabricated with not less than 14-gauge metal, pantograph top and bottom.
- 2.4 Lead Posts and Jamb Posts shall be fabricated of not less than 16-gauge steel ASTM A 525 for doors up to 10 feet high and not less than 14-gauge for doors over 10 feet high.
- 2.5 Carriers: Carriers shall be nylon, ball-bearing, wheeled type.
- 2.6 Door Covering: Covering shall be attached to frame in a manner that will permit onsite removal and repair. Covering shall be treated to be flame-resistant and shall not peel, craze, crack, or fade. Fabric covering shall be vinyl-coated fabric complying with Fed. Spec. CCC-W-408, 30 ounces per linear yard, 54 inches wide.
- 2.7 Acoustical-rated door shall be manufacturer's standard construction complying with ASTM E 90 to provide a STC rating of 40. Door assembly shall include perimeter seal sweep strips for each side,

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- top, and bottom, and sound liner of door manufacturer's standard for door panels. Door shall have light and sound seal at door lead posts and jamb posts.
- 2.8 Track: Track shall be steel with factory-applied corrosion-resistant finish. Track shall be recess mounted with necessary sub-channel or trim units to form pocket for ceiling mounting. Sections shall be provided in the maximum lengths practicable.
- 2.9 Accessories shall be provided as follows: Center stop for bi-parting doors, track switches for door operation, and ceiling contact guard for sound-rated door units.
- 2.10 Hardware:
- 2.10.1 Components shall be heavy-duty metal pulls and latches of brass or steel with dull chromium-plated finish.
- 2.10.2 Latch shall be operable from both sides of closed door.
- 2.10.3 Deadlock shall be provided to receive cylinder, operable from both sides.
- 2.10.4 Miscellaneous Items shall be provided as follows: pendant pull in lead post, upper draw latch with grip handle, center molding or strike for bi-parting door, and foot bolts on lead post.
- 3.0 EXECUTION: (Section not used.)

Accordion Folding Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of accordion folding doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Vinyl Covering: Fed. Spec. CCC-W-408, Type II or III, wood grain or textured.
- 2.2 Plastic Laminate: NEMA LD 3, 1/16-inch minimum thickness, wood grain, patterned, or solid color finish.
- 2.3 Wood Veneer: Good grade, premium grade, or book matched hardwood, as designated.
- 2.4 Framework including posts, pantographs, hinges, hinge plates, and support rods shall be either extruded aluminum or ferrous metal. Ferrous metal shall be either cadmium-plated or zinc-coated, except posts at the option of the door manufacturer shall have phosphate treatment and manufacturer's shop finish paint.
- 2.5 Pantographs: The frames on doors requiring pantographs shall be arranged for horizontal pantograph action with pantographs located at top and bottom of the frame. Intermediate pantographs spaced not over 4 feet center-to-center shall be provided for doors more than 8 feet in height. An intermediate pantograph shall be provided at the center of doors less than 8 feet high unless the door has vertical metal reinforcing. The pantographs shall operate smoothly with positive folding action and shall have a control device to prevent flattening of the folds when the panel is fully extended.
- 2.6 Hardware: Units shall be complete with grip handles, a positive latching system, and an upper latch with extended pulls if unit is over 11 feet high. Hardware shall be anodized aluminum with a natural finish or chrome plated brass.
- 2.7 Sweep strips shall be vinyl or other material that will not crack or craze with severe usage.
- 2.8 Track shall be recessed or surface-mounted and of extruded aluminum or enamel finish steel, not less than 16-gauge steel or 14-gauge aluminum. Track sections shall be provided in the maximum lengths practicable, not less than 6 feet long except for narrow doors and at ends of runs where short length is required. Suitable joint devices such as interlocking keys shall be provided at each joint to provide permanent alignment of track.
- 2.9 Metal soffit shall be provided when track is recessed. Soffit shall be of metal of adequate thickness to protect the ceiling from damage by door operation and shall be provided with the door manufacturer's standard neutral-color applied finish. Soffits may be integral elements of ceiling track.
- 2.10 Fire Hazard Classification: Vinyl coverings, plastic laminates, and wood veneers shall have a fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.

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3.0 EXECUTION: (Section not used.)

Flexible Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flexible doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: Each new door unit shall be a complete unit produced by one manufacturer including hardware, accessories, mounting, and installation components.
 - 2.2 Door Panels: Door panels shall be constructed of the following materials.
 - 2.2.1 Heavy-Duty, Abrasive-Resistant Rubber, 60 durometer, roto-cured process, 2,200 psi tensile strength. Panel thickness shall be 1/2 inch.
 - 2.2.2 Flexible Polycarbonate transparent panels 1/2 inch thick.
 - 2.2.3 Flexible Polyvinylchloride (PVC) transparent panels 0.196 inch (5mm) thick.
 - 2.2.4 Flexible Polyvinylchloride (PVC) opaque panels 0.196 inch (5mm) thick.
 - 2.3 Door Panels shall be single or double-acting, as required.
 - 2.4 Panel Frame: Framing materials to which door panels shall be secured shall be galvanized steel, ASTM A 525, 11 gauge. Door panels shall be suspended between L-shaped rolled formed rails and stiles by removable bolt and nut connectors.
 - 2.5 Hardware shall conform to the requirements of ASTM B 633, ASTM B 766, or ASTM A 123, as required.
 - 2.5.1 Hinges shall be adjustable spring-type gravity self-lubricating hinges.
 - 2.5.2 Magnetic catch shall be provided at door overlap at pair of door panels to give positive closure.
 - 2.5.3 Header and jamb seals shall be door mounted PVC seals at head and jamb.
 - 2.5.4 Bumpers shall be center or bottom bumpers.
 - 2.5.5 Jamb guards shall be formed steel guards to enclose and protect lower hinge hardware and closures.
 - 2.6 Door jamb shall be constructed of steel tube, ASTM A 500, with integral wall anchors, galvanized in compliance with ASTM A 386 or stainless steel bent plate, Type 304, with integral wall anchors, as required.
 - 2.7 Finish: All ferrous metal parts shall be finish-coated with polyurethane paint.
 - 2.8 Fire Hazard Classification: All door panel materials shall have a fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.
- 3.0 EXECUTION: (Section not used.)

Overhead Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of overhead doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Doors shall conform to the requirements of NAGDM 102 and shall be metal or wood overhead or vertical lift sectional type flush panel doors as indicated or required and shall be the products of a recognized manufacturer of the doors and accessories specified.
 - 2.2 Door assemblies shall be furnished with operating mechanisms, tracks, hardware, and all other necessary accessories required for complete installation and perfect operation.
 - 2.3 Exterior doors shall be metal sandwich construction filled with foamed-in-place insulation of sufficient density to attain the designated U-value or R-value. Doors shall have flexible neoprene weatherstripping at jambs, top, and sill.
 - 2.4 Door locks where required shall be five-pin cylinder locks and locking devices and shall be keyed as directed. Chain operators shall have standard devices for securing chain.

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- 2.5 Fire Rated Doors: Where designated, doors, frames, hardware, and accessories shall bear the identifying label of the Underwriters' Laboratories, Inc., or a nationally recognized testing agency qualified to perform certificate programs indicating that units conform to the requirements of the Underwriters' Laboratories, Inc. Certificates of inspection shall be submitted in accordance with the requirements of NFPA 80 and 80A for fire doors exceeding the sizes for which label service is offered by Underwriters' Laboratories, Inc.
- 2.6 Manual Operation:
 - 2.6.1 Push-Up Operation: Doors shall have one lifting handle on each side of the door and shall be counterbalanced to provide ease of operation while raising or lowering the curtain by hand. The maximum exertion or pull required shall not exceed 25 pounds. Doors over 7 feet high shall be provided with pull down straps or pole hooks.
 - 2.6.2 Chain-Gear Operation: Chain shall be galvanized, endless type, operating over a sprocket and shall extend to within 3 feet of floor. Gears shall be high-grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce chain pull required to not exceed 35 pounds.
 - 2.6.3 Crank-Gear Operation: Crank shall be removable and located approximately 34 inches above the floor. Gears shall be of high-grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce pressure exerted on the crank to not over 35 pounds.
- 2.7 Motorized Operation:
 - 2.7.1 Electric Operators: Operators shall be furnished complete with electric motor, reduction gears, magnetic brake, friction clutch, emergency release for manual operation, heavy-duty roller chain, controls, limit switches, and other accessories.
 - 2.7.2 Motor: Motor shall be totally enclosed, constant duty type, instantly reversible, capable of moving door at not less than 3/4 foot per second and designed for high frequency operation.
 - 2.7.3 Controls: Each door motor shall have an enclosed reversing across-the-line type magnetic starter having thermal overload protection, solenoid-operated brake, limit switches, and one or more remote-control switches as required. The starter shall conform to NEMA ICS 2. Remote-control switches shall be of the three-button type with the buttons marked "OPEN", "CLOSE", and "STOP." CLOSE buttons shall be momentary-contact type requiring constant pressure to maintain motion of the door.
 - 2.7.4 Safety Device: The bottom edge of electrically operated doors shall have a safety device that will immediately reverse the door movement upon contact with an obstruction. The safety device shall be installed across the entire width of the door and shall not substitute for a limit switch.
- 2.8 Hot-dipped galvanized sheet steel surfaces shall be finished according to the requirements of ASTM A 525, G-90. Hardware items shall be galvanized according to ASTM A 153. Items galvanized after assembly shall comply with ASTM A 123.
- 2.9 Shop prime coat of rust-inhibiting paint shall comply with Fed. Spec. TT-P-86.
- 2.10 Tracks for overhead doors shall be designed to accommodate 2-inch or 3-inch diameter galvanized steel rollers. Tracks shall be fabricated of 13-gauge galvanized steel. Track shall have springs at the end of track to cushion the door at the end of the opening motion.
- 2.11 Track supports shall be angle iron, galvanized, and installed with cross-bracing to form a rigid construction.
- 2.12 Counterbalance shall be torsion-spring type for standard counter-balancing with tempered spring wire and continuous steel shaft. Provide cast aluminum and smooth cable drums with galvanized steel lift cables. Entire counterbalance assembly shall be mounted on ball bearings.
- 3.0 EXECUTION: Panels and frames that are field repaired shall be cleaned sufficiently for good paint adherence then primed to prevent further deterioration. Galvanized coatings that are damaged shall be repaired by the application of a high zinc dust content paint formulated for regalvanizing welds in galvanized steels.

Sound Retardant Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of material for sound retardant doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to

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support the work.

2.0 PRODUCTS:

2.1 General:

- 2.1.1 Each door location shall be complete with frame and integral acoustical type hardware accessories, mounting, and installation components.
- 2.1.2 Door unit shall conform to ASTM E 90 to achieve the required Sound Transmission Classification (STC).
- 2.2 Steel Sound Retardant Doors: Door assembly shall conform to SDI-100 and ANSI A115.
- 2.3 Wood Sound Retardant Doors: Door assembly shall conform to NWWDA I.S.1, ASTM E 90, AWI.
- 3.0 EXECUTION: Door units shall be installed complete with all necessary anchors and inserts, hardware, and other accessories. Upon completion of installation, doors shall be free from warp, twist, or distortion.

Aluminum Safety Glass Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum safety glass doors. Products shall match existing materials and/or as shall be directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aluminum safety glass doors shall be manufacturer's standard and shall comply with the requirements of ANSI Z97.1, Fed. Spec. DD-G-1403, and the Safety Glazing Certification Council (SGCC) standards for heat strengthened and fully tempered safety glass.
- 2.2 Safety glass doors shall have clear tempered safety glass and shall be manufacturer's stock design in standard sizes. Glazing for door tolerance shall be dimension plus 1/16 inch, minus 1/8 inch. All door glazing shall be set in aluminum frames of sufficient strength to withstand heavy duty use.
- 2.3 Finish for aluminum frames shall be anodized AA-C22A 41RIX or AA-M21C22A 42RIX, as required, minimum 0.7 mil thickness with clear methacrylate lacquer coating, minimum 0.5 mil thick.
- 2.4 Hardware shall be manufacturer's standard finish to match aluminum frame door stiles and rails. Push-pull set shall be manufacturer's stock design flat plate units, approximately 6 inches by 10 inches, engraved with "push" and "pull." Custom designed push-pull (handles) set and required fittings shall be provided where required.
- 2.4.1 Lockset with deadbolt in lower rail engaging cut-out in threshold shall be keyed from both sides. Where required, provide a lockset with deadbolt in lock side of glass door, keyed from both sides.
- 2.4.2 For pairs of doors, provide a deadbolt in lower rail of each door that will engage a cut-out in the threshold and key from both sides.
- 2.4.3 Where floor recessed checking floor hinges are required, provide top pivot hardware. Where overhead closers are required, provide bottom pivot hardware. Provide checking floor hinges with sealed floor box, finished cover plate, separate adjustment screws for checking speed, and hold open device.
- 2.5 Threshold shall be manufacturer's standard, finished to match door rails and sized to suit door opening.
- 2.6 Anchorages and fastenings shall be manufacturer's standard concealed. Finish heads of exposed fasteners shall match finish of adjacent metal surfaces. 2.7 Locate and Provide Holes and Cutouts to receive hardware before tempering safety glass. Do not permit any cutting, drilling, or other glass alterations after tempering operation.
- 3.0 EXECUTION: (Section not used.)

Wood Safety Glass Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood safety glass doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

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2.0 PRODUCTS:

- 2.1 Safety glass shall be clear, heat-strengthened, and fully tempered plate or float glass in compliance with the requirements of ANSI Z97.1 and the Safety Glazing Certification Council. Provide tinted or reflective tempered safety glass as required.
- 2.2 Wood for door frame, stiles, and rails shall be Douglas fir, redwood, cedar or select hardwood. Exposed wood surfaces shall be sanded, cleaned, and factory-primed ready for final finish coat. PVC clad wood safety glass doors shall be provided as required.
- 2.3 Provide factory-primed and finish-painted wood surfaces when no other field painting is required.
- 2.4 Hardware shall be manufacturer's standard style and designed for the door swing, door size, glass thickness, door weight, and area for access and egress. Hardware fittings of door shall match the hardware finish of the adjacent area.
 - 2.4.1 Provide heavy-duty hardware in heavy pedestrian or high traffic areas.
 - 2.4.2 Door push-pull sets or handles and hardware accessories shall be manufacturer's standard design. Provide floor closer with selective hold-open feature. Locks and deadbolts shall be keyed from both sides of bottom door rail or strike side of door stile.
 - 2.4.3 Where aluminum hardware finish is required, aluminum finish shall be anodized.
 - 2.4.4 Panic exit devices or electric strikes shall be furnished where required.
- 3.0 EXECUTION: (Section not used.)

Screen and Storm Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of screen and storm doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 The manufacturer shall be a recognized producer of screen and storm doors. See Hollow Metal Doors and Frames, Aluminum Doors and Frames, and Wood Doors.
 - 2.2 All work performed shall meet the requirements of local codes and regulations.
- 3.0 EXECUTION: (Section not used.)

Entrances

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of entrance assemblies. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Entrance shall be a complete unit produced by one manufacturer recognized as producer of glass entrance panels with glass doors, weatherstripping, and hardware on operating door panel.
 - 2.1.1 Finishes Class I finish AA-M10C2231 or AA-M10C2241 for clear (natural) anodized, Class II finish AA-M10C2244 for color anodized, coating finish shall be fluoropolymer coatings contain at least 70% by weight Kaynar 500 resin (polyvinylidene fluoride)
 - 2.2 Extrusions for door construction shall be AA 6063-T5 alloy with clear anodized 204-R1-A1 finish and 22,000 psi ultimate tensile strength. Main member extrusions shall be not less than 0.125 inch in wall thickness.
 - 2.3 Aluminum sheet material for door construction shall be plain flat sheet for exposed faces of flush and panel doors of not less than 0.062-inch thickness.
 - 2.4 Fasteners shall be aluminum, stainless steel, or other non-corrosive metal fasteners compatible with the framing material. Exposed fasteners shall be Phillips flat-head screws matching fastened material.
 - 2.5 Steel reinforcement and brackets shall be manufacturer's special formed units with 2.0 ounce hot-dip zinc coating complying with ASTM A 153, applied after fabrication. 2.6 Frames shall be extruded tube sections manufactured from AA 6063-T5 alloy with clear anodized 204-R1-A1 finish, not less

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- than 0.125 inch in thickness. Frames to receive fixed glass shall have removable glass stops and beads.
- 2.7 Door shall be fabricated from extruded aluminum seamless tubular shapes. Top and bottom rails shall be welded to stiles with corner reinforcement. Joints shall be milled to hairline watertight fit. Welding shall be done on concealed surfaces and shall not blemish exposed surfaces. Door shall have extruded aluminum snap-in type glass stop with integral vinyl glazing insert.
 - 2.8 Weatherstripping shall be manufacturer's standard compression type neoprene gasket. Weatherstripping shall be easily replaced without special tools. Weatherstripping at meeting rails of pairs of doors shall be adjustable. Weatherstripping shall be applied to stiles, heads, and bottoms of doors.
 - 3.0 EXECUTION: Entrance assemblies shall be installed or repaired by the manufacturer or an authorized representative.

Revolving Doors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of revolving doors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Door units shall be fabricated from extruded aluminum tube sections of AA 6063-T5 alloy, clear 204-RI-A1 anodized finish. Door framing members shall be 0.375-inch minimum wall thickness. Enclosure framing members shall be 0.125-inch minimum wall thickness. Snap-in type glass stops shall be minimum 0.050-inch thickness.
- 2.1 Fabricate assembly with welded and mechanical construction; concealed, reinforced joints; and corners with flush hairline joints.
- 2.2 Provide weatherstripping at stiles, head, and bottom of door wings.
- 2.3 Door wings shall be arranged to collapse and fold to the emergency exit position when a pressure of not less than 100 pounds nor more than 140 pounds is applied to the outer door stile at the push bar height of 3 feet, 10 inches. No visible external braces or collapsing plates will be permitted.
- 2.4 Door unit shall be provided with a mechanical floor-mounted speed control sealed unit to control the revolving door up to a maximum of 12 revolutions per minute.
- 2.5 All work performed shall meet the requirements of local codes and regulations.
- 3.0 EXECUTION: Doors shall be installed or repaired by the manufacturer or an authorized representative.

Metal Windows

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel, stainless steel, and bronze windows. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fixed Windows, Hopper Vent: Window units shall comply with SWI-01, The Specifier's Guide to Steel Windows, for standard intermediate windows with bottom hinged, swing-in type ventilator hopper sash. Bottom rails of ventilators shall have an outside drip. Hardware shall be manufacturer's standard type for each window. Ventilator shall have one pair of hinges or pivots, two stay arms, and a cam-type lever handle latch. Sash and hardware shall be designed to permit easy removal of sash from inside the building.
- 2.2 Fixed Windows: Fixed windows shall comply with the requirements of SWI-01, for standard intermediate windows.
- 2.3 Projected Windows: Projected windows shall comply with the requirements of SWI-01, for commercial projected windows, with project-out type ventilators, top-hinged.
- 2.4 Continuous Top-Hinged Windows: Continuous windows shall comply with SWI-01 continuous type

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- with manual operation.
- 2.5 Casement Windows: Casement windows shall comply with SWI-01, for standard intermediate windows. Hardware for operative sash shall provide for cleaning of both sides of the sash from the inside. Operating devices shall include underscreen type rotary operators of the worm-gear type with adjustable operating arms. A continuous drip molding shall be provided above operable sash. Abutting units or combination units shall have manufacturer's stock standard mullion.
 - 2.6 Awning Windows: Awning windows shall comply with the SWI-01, for architectural awning intermediate type frame and ventilator members. Ventilators in same frame shall operate in unison. Hardware for operative sash shall provide for cleaning of both sides of the sash from the inside. Operating devices shall include underscreen type rotary operators of the worm-gear type, with adjustable operating arms. The operator shall securely close the ventilators without using additional locking devices. Ventilators shall be designed to close and be weathertight to adjoining ventilators or frame. Window frame shall be designed with rebate to receive screens.
 - 2.7 Reversible Windows: Reversible horizontal pivoted windows shall comply with SWI-01, for commercial type.
 - 2.8 Hinged Emergency Windows: Hinged emergency type windows shall comply with SWI Recommended Specifications for Steel Windows, for commercial type, with manual operation side- or hinged for swing-out emergency exit, pivots or hinges for 90 degrees swing-out. Window shall be equipped with push-release type lever operator on window latch, complying with the requirements of local regulations for "panic hardware".
 - 2.9 Double/Single Hung Windows: Double and single hung windows shall comply with SWI Recommended Specifications for steel windows for commercial type. Two spiral type removable sash balances shall be provided for each sash. Balances shall be adjustable without removing sash from frame and without use of special tools. Each window 40 inches wide or less shall be provided with one sweep sash lock. Each window over 40 inches wide shall be provided with two sweep sash locks. Lower sash shall have one continuous integral lift at the bottom of the sash. The upper sash shall have a continuous integral pull down member on the meeting rail.
 - 2.10 Operating Hardware: Hardware shall be provided for all operable, ventilating sash units of manufacturer's standard for the function of each individual window type specified. All operable sash shall have a latch or locking device. Hardware shall be securely attached to the window with noncorrosive bolts or machine screws.
 - 2.11 Miscellaneous hardware shall comply with ANSI A156.16. All metal hardware for stainless steel windows shall be non-corrodible. All hardware items for bronze windows shall match window finish.
 - 2.12 Screens: Insect screens shall be full size of the operable unit. Screens shall comply with SWI-01 and shall have removable splines of steel or vinyl. Screening shall be 18 x 14 mesh, complying with Fed. Spec. RR-W-365 for wire fabric or Fed. Spec. L-S-125, Type II.
 - 2.13 Weatherstripping shall be the standard type for use with the window unit supplied and shall be easily replaceable.
 - 2.14 Materials for steel windows shall comply with the requirements of the following:
 - a. Sheet steel: Fed. Spec. QQ-S-700.
 - b. Zinc-coated steel: ASTM A 90 or A 123.
 - c. Zinc-coating on hardware: ASTM A 153.
 - d. Corrosion-resistant steel: Fed. Spec. QQ-S-766.
 - 2.15 Materials for stainless steel windows shall comply with the requirements of ASTM A 167.
 - 2.16 Materials for bronze frames shall comply with the requirements of ASTM B 96, ASTM B 100, ASTM B 150 or ASTM B 169.
 - 3.0 EXECUTION: Window units shall be installed complete with all necessary anchors, hardware, and other accessories and shall be plumb, square, and level in alignment, and braced and stayed properly to prevent distortion and misalignment.

Aluminum Windows

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum windows. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product

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manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

- 2.1 Windows shall be furnished as a complete assembly including frame, sash, hardware, mullions, and anchorage devices. Windows indicated to have screen or storm units shall be designed to accommodate the items to be furnished. Aluminum extrusions shall be not less than 22,000 psi ultimate tensile strength and not less than 0.062 inch thickness at any location for main frame and sash members. Window sash and frames shall be designed for outside glazing of vision glass. Weatherstripping shall be easily replaceable. All operable sashes shall have a latch or locking device. Hardware shall be securely attached to the window with noncorrosive bolts or machine screws. Hardware finishes shall match window finishes. Where operating hardware is located 6 feet-6 inches or more above the floor, poles and pole-operated handles shall be provided to operate the windows.
- 2.2 Aluminum prime windows shall be fabricated and assembled in compliance with AAMA 101.
- 2.3 Double glazed windows shall have a minimum condensation factor in accordance with AAMA 1503.1-98.
- 2.4 Awning windows shall conform to AAMA 101, Commercial Grade. Hardware for top ventilators shall be designed to drop sash down in such a manner to permit cleaning of the outside glass from inside the building. All operating hardware except ventilator arms and rotary operators shall be concealed within frame and sill. Ventilator arms shall be concealed when unit is closed.
- 2.5 Basement windows shall conform to AAMA 101, Commercial Grade, single project-in at top vent.
- 2.6 Casement windows shall conform to AAMA 101, Commercial Grade. Each side hinge ventilator shall have non-friction type extension hinges, underscreen type rotary operator, and locking handles. Rotary operators shall be heavy-duty worm-gear type with machine cut case hardened steel gears.
- 2.7 Double-hung and single-hung Windows shall conform to AAMA 101, Commercial Grade.
- 2.8 Fixed windows and semi-circular head windows shall conform to specification P-A2, without ventilator sections.
- 2.9 Horizontal-sliding windows shall conform to AAMA 101, Commercial Grade.
- 2.10 Projected windows shall conform to AAMA 101, Commercial Grade. Where screens are specified, underscreen operators shall be provided for ventilators that open out.
- 2.11 Top-hinged windows shall conform to AAMA 101, Commercial Grade.
- 2.12 Vertically-pivoted windows shall conform to AAMA 101 Commercial Grade.
- 2.13 Storm windows shall be triple-track, self-storing, combination storm-and-screen type, conforming to AAMA 1002.10. Storm units shall be designed for the type of windows with which they will be used and shall provide a rigid unit in place, to permit all sashes to be removed from the inside and to lock into the open and closed positions. An interlocking scribe piece of the same material as the frame shall be provided at bottom edge. Units shall be complete with all mounting and operating accessories required to provide a weathertight installation.
- 2.14 Insect screens shall be provided for sash or ventilators of designated windows. Screens shall conform to AAMA 101. Insect screens shall be designed for the type of window with which they will be used and shall be interchangeable with other units of the same size and type. Screens for hopper ventilators shall be stationary type attached directly to the outside of the window unit.
- 2.15 Forced-entry resistant windows shall be in accordance with the recommendations specified in AAMA 1032.5.
- 2.16 High performance windows shall be in accordance with the requirements of AAMA 101.
- 2.17 Window cleaning anchors shall be of stainless steel and shall conform to ASME A39.1. Windows shall be reinforced for the reception of window cleaning anchors, if necessary to provide the required strength. Window frames shall be reinforced as may be required to receive the window cleaning anchors, and the window frames shall be anchored securely to the wall construction at point of application of the window cleaning bolts.
- 2.18 Finish: All exposed members shall be free of scratches and other serious surface blemishes. Prime windows shall have anodized finish or paint finish. Anodized finish shall be AA-M12C22A31 clear in accordance with AA Designation System for Aluminum Finishes. Paint finish shall conform to AAMA 603.8. Storm windows shall be mill finish or paint finish, white. Window unit finishes, cleaning, and

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chemical treatments shall comply with the requirements of NAAMM Metal Finishes Manual and AAMA 603.8.

- 3.0 EXECUTION: Final adjustment for proper operation of ventilating unit shall be made after glazing. Where aluminum surfaces are in contact with or fastened to dissimilar materials, except stainless steel or zinc, the aluminum surface shall be protected from dissimilar materials as specified in the Appendix of AAMA 101. Surfaces in contact with sealants after installation shall not be coated with any type of protective material.

Wood Windows

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood windows, general. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Awning replacement window units shall comply with NWWDA I.S.2.
- 2.2 Single hung replacement window units shall contain one fixed sash and one balanced vertically-sliding sash and shall comply with NWWDA I.S.2.
- 2.3 Double hung replacement window units shall contain two balanced vertically-sliding sashes and shall comply with NWWDA I.S.2.
- 2.4 Horizontal-sliding replacement window units shall comply with NWWDA I.S.2.
- 2.5 Fixed replacement window units shall consist of sashes complying with NWWDA I.S.2 and frames complying with NWWDA I.S.1, or NWWDA I.S.2.
- 2.6 Window, screen, and storm sash units shall be manufactured from kiln-dried ponderosa pine, Idaho white pine, Northern white pine, or sugar pine.
- 2.7 Preservative Treatment: All wood parts shall be water repellent preservative-treated in compliance with NWWDA I.S.4. 2.8 Weatherstripping shall be manufacturer's standard nonferrous spring metal or vinyl gasket.
- 2.9 Insect Screens: Frames shall be manufacturer's standard formed aluminum or extruded aluminum frames. Insect screening shall be either nonferrous metal or plastic-coated fibrous glass insect screen cloth complying with Fed. Spec. L-S-125, Type II.
- 2.10 Window operations shall meet or exceed the minimum operating requirements as specified in NWWDA I.S.2. Each window unit shall be supplied with all operating devices required for easy operation and with suitable locks or latches.
- 2.11 Window Classification (Grade): Window units shall comply with Class A requirements as specified in NWWDA I.S.2.
- 2.12 Fabrication:
- 2.12.1 Sizes and profiles shall match existing work and shall be coordinated with actual measurements of window openings.
- 2.12.2 The scope of each replacement window unit, except as otherwise indicated, shall include the sash or sashes, frame, sill (including undersill or nosing, if any), exterior and interior trim, integral mullion and muntins (if any), hardware, and accessories.
- 2.12.3 Removable insect screens shall be provided for each operating sash.
- 2.12.4 Glazing stops (beads) shall be provided, nailed or snap-on, and coordinated with glass selection and glazing system as indicated.
- 2.13 Finishes:
- 2.13.1 Painting: Shop prime coat shall comply with Fed. Spec. TT-P-25, color white.
- 2.13.2 Vinyl cladding shall be manufacturer's standard bonded vinyl cladding with permanent paintable finish.
- 2.13.3 Aluminum cladding shall be manufacturer's standard formed sheet or aluminum cladding with baked-on acrylic coating.
- 2.14 Woven glass cloth shall weigh not less than 2.0 oz./sq. yd. and shall withstand 120 lbs. of pull per square inch. Resin and hardener catalyst shall be as recommended by the manufacturer of the resin.

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3.0 EXECUTION: (Section not used.)

Finish Hardware

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of finish hardware. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Labeled fire doors shall have fire rated hardware, including smoke seals where required by code, in accordance with NFPA 80. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Hardware finishes shall conform to those identified under ANSI/BHMA A156.18. Finish of fasteners shall match finish of hardware items on which they are applied.
- 2.1 Locks and Latches: To the maximum extent possible, locksets, latchsets, and deadlocks shall be the products of a single manufacturer. Mortise type locks and latches for doors 1-3/4 inches thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Lock fronts for double-acting doors shall be rounded. Mortise locks shall have armored fronts. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes. Trim for mortise locks and latches shall be escutcheon, minimum 7 inches by 1-3/4 inches or sectional, as required, with wrought knob and cast shank and shall conform to the requirements for wrought trim in accordance with ANSI A156.2. Manufacturers' standard plain design shall be used. Keying system shall match remainder of building system (if applicable) or shall be as specified.
 - 2.1.1 Cylinder Locks: Cylinder shall have either six or seven pins with paracentric keyway, as required. Cylinders and the locks in which they are used shall be the product of the same manufacturer. Cylinders shall be provided with removable type single key cores, where required.
 - 2.1.2 Deadlocks: ANSI A156.5, mortise type, cylinder-operated, E16000 series.
 - 2.1.3 Interconnected Locks and Latches: ANSI A156.12, Grade 1 or 2.
 - 2.1.4 Locksets and latchsets shall conform to the following types, as required: ANSI A156.2, series 1000, Grade 2; 2000, Grade 1; 4000, Grade 1; A156.13, Operational Grade 1 or 2; and Security Grade 1, 2, 3, or 4. 2.1.5 Locksets for Lead-Shielded Doors shall be provided with factory-installed lead linings. Lead linings shall not be less than the thickness of the lead in the door in which the lockset is required.
 - 2.1.6 Cipher Locks: Cipher locks shall be mechanically operated push button units, with or without master key bypass capability, and changeable by authorized access key.
 - 2.1.7 Padlocks: ASTM F 883.
- 2.2 Door Trim: ANSI A156.6.
 - 2.2.1 Armor plates shall be category J100, plastic, aluminum, brass, or stainless steel, as required, 40 inches in height, 2 inches less in width than the width of the door for single doors, and 1 inch less for pairs of doors. Edges of metal plates shall be beveled where required. Where the door has a louver panel, the armor plate shall be omitted if top of louver frame is more than 20 inches above the bottom of the door.
 - 2.2.2 Arm pulls shall be Category J400, double base, aluminum, brass, or stainless steel.
 - 2.2.3 Combination push-pull plates shall be Category J300, 1/8 inch minimum, aluminum, brass, or stainless steel beveled four edges.
 - 2.2.4 Drop ring pulls shall be Category J400, aluminum, brass, or stainless steel.
 - 2.2.5 Kick plates shall be Category J100, plastic, aluminum, brass, or stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Height shall be 10 inches, except where the bottom rail is less than 10 inches, the plate shall extend to within 1/2 inch of the panel mold or glass bead. Edges of metal plates shall be beveled, where required.
 - 2.2.6 Armor plates and mop plates shall be Category J100, plastic, aluminum, brass, or stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. The height of mop plates shall be 4 inches. Edges of metal plates shall be beveled, where required.
 - 2.2.7 Push and pull bars shall be Category J500, aluminum, brass or stainless steel, where required. Edges of mounting plates shall be beveled.
 - 2.2.8 Push plates shall be Category J300, aluminum, brass, stainless steel, or plastic, in color as required,

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- size as required. Edges of metal plates shall be beveled, where required.
- 2.2.9 Sectional door pulls for metal or Kalamein doors shall be Category J400 brass, thru-bolted type of plain modern design. Door pulls on plates for wood doors shall be Category J400 aluminum, brass, or stainless steel with beveled edges, as required.
 - 2.3 Exit Devices and Exit Device Accessories: ANSI A156.3.
 - 2.3.1 Door coordinator shall be Type 21 and shall be provided for each pair of doors with closers and equipped with an overlapping astragal.
 - 2.3.2 Removable mullions shall be Type 22 of the box type and shall be used only with those exit devices for which the mullions were manufactured. Mullions shall be furnished with mullion stabilizers of the same manufacturer.
 - 2.4 Door Controls: Overhead holders conforming to ANSI A156.8.
 - 2.5 Auxiliary hardware, including door surface bolts, door holders, door stops, and roller latches, of the types required, shall conform to ANSI A156.16.
 - 2.5.1 Lever Extension Flush Bolts: Type L14081, installed at the top and bottom of the inactive leaf of pairs of doors, and mortised in the lock edge of the door.
 - 2.5.2 Dust-Proof Strikes: Type L04011.
 - 2.5.3 Garment Hooks: Type L03111.
 - 2.5.4 Hand Rail Brackets: Type L03061, L03081, L03091, or L03101.
 - 2.5.5 Garment Rods: Type L03131 or L03141.
 - 2.5.6 Coat Hook: Type L03111.
 - 2.5.7 Door Stop, Adjustable Hinge Type: Type L02223.
 - 2.5.8 Door Stop, Wall Type Flexible, 3 inch: Type L02051, L02052, L02053.
 - 2.5.9 Door Stop, Wall Type Flexible, 4 inch: Type L02061, L02062, L02063.
 - 2.5.10 Door Stop, Floor Mounted, Type L02143.
 - 2.6 Hinges: ANSI A156.1. Hinges used on metal doors and frames shall also conform to ANSI A156.7.
 - 2.6.1 Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.
 - 2.6.2 Hinges with anti-friction bearings may be furnished in lieu of ball bearing hinges, where required. Fire door hinges shall be in accordance with NFPA 80.
 - 2.7 Door Closing Devices: ANSI A156.4.
 - 2.7.1 Surface type closers shall be Series C01000, C02000 Standard Cover, C02000 Full Cover with option PT-4C, or C03000 with options PT-4A and PT-4D, where required. Mounting details for the type closers to be used shall be in accordance with manufacturer's standards. Closers for screen and storm doors shall be Type C09353. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb-mounted. Closers for interior doors close to a wall shall be of narrow projection so as not to strike the wall at the 90 degree open position or shall have parallel arms.
 - 2.7.2 Floor closers and pivots shall have cement boxes. Floor closers and pivots used on the same door shall be the product of one manufacturer only. Floor plates are not required where thresholds cover the closer cement box. Setting tools shall be furnished for use in installing floor closers.
 - 2.8 Smoke Detectors and Magnetic Holders: ANSI A156.15. Door closers with integral holders connected to a separate detection device or closers with integral holders and detector units, sensing particles of combustion that when activated will release the holder mechanism causing the closer to close the door may be used in lieu of separate closers, detectors, and magnetic holders. Closers shall be listed or labeled by a nationally recognized independent testing laboratory.
 - 2.9 Key Control Storage System: ANSI A156.5, type and capacity as required, properly labeled for key identification.
 - 2.10 Metal Thresholds: Thresholds for exterior metal doors with weatherstripping shall be extruded aluminum or bronze, flat type with fluted top and shall provide proper clearance and an effective seal with specified weatherstripping. Thresholds for use with floor closers shall conform to ANSI A156.4. Latching thresholds shall conform to ANSI A156.3, Type 26, and of such height that the bottom of the door shall be 1/8 inch over the tread of the threshold and 1/8 inch below the top of the stop.
 - 2.11 Door Silencers: Molded rubber, ANSI A156.16, Type L03011 for metal doors and Type L03021 for wood doors.

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- 2.12 Exit Control or Exit Locks: ANSI A156.5, activated by arm and push plate or paddle. Outside key control shall be provided where required. Units shall be battery-powered. Alarm horns or mechanical bell, when set by inside key, shall sound when door is opened. Units shall have dead bolts or protected latches with either surface or mortised strike. Where required, furnish with silent alarm for indication at a remote panel or a low voltage system. Exit control locks or exit locks shall be as follows.
 - 2.12.1 Single Door: Type E 0421.
 - 2.12.2 Double Door: Type E 0421 (One leaf to have top and bottom bolt activated by cross bar. Other leaf to have Type E 0431 exit lock.)
- 2.13 Electric Strikes: ANSI A156.6. Rim-mounted strikes shall be Type E09312 for use with rim latches or rim or surface vertical rod exit devices. Mortised strikes shall be Type E 09322 for use with locks not having dead bolts and with mortise exit devices, all with or without auxiliary dead latch.
- 2.14 Bored Auxiliary Deadlocks: ANSI A156.5. Dead locking latch bolts operated by key from either side shall be Type E2141.
- 2.15 Mortised Deadlocks: ANSI A156.5. Dead bolts operated by key from either side shall be Type E16061.
- 2.16 Weatherstripping: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer. Provide fasteners that are exposed when door is either open or closed to match finish of stripping and seals.
 - 2.16.1 Weatherstripping at Jambs and Heads of Doors:
 - 2.16.1.1 Bumper-type Resilient Inserts and Metal Retainer Strips: Surfaced-applied unless required to be mortised or semi-mortised; anodized retainer strips; resilient bumper material to be neoprene or vinyl. Adjustable insert of extruded metal and captive adjustment screws designed to act as combination door stop and seal.
 - 2.16.1.2 Spring-Metal Type Stripping: Bronze, 0.009 inch minimum thickness for sliding compression, 0.006 inch minimum thickness for direct compression; aluminum, 0.008 inch minimum thickness; stainless steel, 0.005 inch minimum thickness.
 - 2.16.1.3 Self Adhesive Strips: Ribbed sponge neoprene. Adhesive shall be reinforced with glass fibers. Strip size shall be 3/16 inch by 3/8 inch minimum.
 - 2.16.2 Astragal Stripping On One Active Leaf:
 - 2.16.2.1 Metal Astragal Bar: Not less than 1/8 inch x 1-3/4 inches, for exposed flat-head screw mounting one leaf of extruded aluminum, anodized finish.
 - 2.16.2.2 Closed-Cell Neoprene Astragal Bar: Approximately 3/8 inch x 1-1/4 inches with metal retainer strip for mounting on one leaf of extruded aluminum, 0.094 inch, anodized finish.
 - 2.16.3 Meeting Seals, Both Leaves Active:
 - 2.16.3.1 Metal Housing Strips (Door Centers): With adjustable insert plunger strips retained in housing with captive screws; mortised, semi-mortised, or surface-mounted, as required; double units applied to both leaves and single units applied to only one leaf; extruded aluminum, 0.062 inch thick, anodized finish. Seal materials shall be metal faces on both adjustable inserts or metal face on one adjustable insert, pile insert on the other. Provide pile insert of wool, polypropylene, or nylon pile with aluminum strip backing complying with AAMA 701.2.
 - 2.16.3.2 Metal Strips: To retain hollow extrusions or sheets forming flexible plastic seals; extruded aluminum, 0.062 inch thick, anodized finish. Seal materials shall be one of the following:
 - a. Heavy neoprene sheet, light grey.
 - b. Light neoprene sheet, light grey, filled with soft cellular plastic or neoprene backing.
 - c. Heavy neoprene sheet, black, complying with Mil. Spec. MIL-R-6855, Class II, Grade 40.
 - d. Heavy flexible vinyl plastic sheet, light grey.
 - e. Heavy, fabric-reinforced rubber, black.
 - 2.16.3.3 Surface-Mounted Metal Strips: To retain flexible seal strips acting as sweeps or wipers; extruded aluminum, 0.062 inch thick, anodized finish; seal material to be extruded neoprene wiper or sweep, flexible vinyl wiper or sweep, flexible vinyl bulb, or wool or polypropylene pile wiper or sweep.
 - 2.16.3.4 Pile-Type Stripping: Wool, polypropylene, or nylon woven pile with aluminum stripbacking, complying with AAMA 701.2, mounted in manufacturer's standard aluminum housing (non-

Attachment 1: Specifications for the Work

- adjustable type) in edge rail. Mount units in meeting edges of both leaves of pairs of doors or in meeting edge of only one leaf of pairs of doors.
- 2.16.3.5 Spring-Metal Type Stripping: Mounted in meeting edges of only one leaf of pairs of doors; formed of spring bronze, 0.009 inch thick or spring stainless steel, 0.008 inch thick, as required.
- 2.16.4 Automatic Door Bottoms:
- 2.16.4.1 Door sill protection shall be weatherproof automatic door bottoms. Plunger shall automatically seal with delayed action when door closes and shall retract when door opens. Automatic door bottoms shall be surface-mounted, fully mortised, or semi-mortised types.
- 2.16.4.2 Metal: Extruded aluminum, 0.070 inch thick, anodized finish.
- 2.16.4.3 Seal: Sponge neoprene, Mil. Spec. MIL-R-6130, Type II, Grade A, B, or C, as required.
- 2.16.5 Door Bottom Sweeps: Retainer of extruded aluminum, 0.070 inch thick, anodized finish; seal of solid neoprene, Mil. Spec. MIL-R-6855, Class II, Grade 40, soft, oil-resistant, which shall remain flexible down to -60 F.
- 2.17 Automatic Entrance Door Operators: ANSI A156.10 and UL 325. Size shall be as recommended by manufacturer's published data for door size, weight, movement, and condition of exposure for operation under normal traffic load for the type of occupancy as required. Exposed housing for operators shall be extruded or formed aluminum, 0.062 inch minimum thickness, with provisions for maintenance access, and with fasteners concealed in door when door is in closed position. Operators shall be fully adjustable for opening, closing, and checking speeds, as well as length of time door remains open without removal of doors. Operators in hazardous areas shall have explosion-proof motors, operators, and control devices. Door operators shall be provided that will open and close doors and maintain them in fully closed position when subjected to a wind velocity or equivalent inward pressure differential of 20 mph.
- 2.17.1 Swing Door Operators: Hydraulic, pressurized unit, with separate cylinders for power and checking. Provide spring action for closing under normal operation and provide emergency release for manual swing-out action on swing-in doors, which are indicated to function as exits. Operator actions such as swing-in, swing-out, double swing, or pairs shall be as required. Provide overhead concealed, surface-mounted, or floor-recessed operators, self-contained with connections for power and control wiring, where required.
- 2.17.2 Sliding Door Operators:
- 2.17.2.1 Hydraulic door operators for sliding doors shall be a pressurized unit with hydraulic cylinder power opening and either power or spring closing with safety release clutch for obstructed closing and with hydraulic checking for both opening and closing cycles. Provide for manual sliding when power is off. Operator actions such as single slide, bi-parting, and emergency break-away swing feature shall be as required. Provide overhead concealed operators where required. Provide self-contained units, where required, with connections for power and control wiring. Provide remote unit, where required, with interconnecting tubes and connections at power unit for power and control wiring.
- 2.17.2.2 Pneumatic door operators for sliding doors shall be air-opened and either air- or spring-closed with safety release clutch for obstructed closing and with pneumatic checking in both cycles. Provision shall be made for manual sliding when power or air pressure is off. Operator actions such as single slide, bi-parting and emergency breakaway features shall be as required. Provide overhead concealed operators where required. Power unit shall be remote compressor unit.
- 2.17.3 Door Operator Controls and Accessories:
- 2.17.3.1 Floor Mat Control Panels: Provide units complete with extruded aluminum mat, frames, recessed to fit flush with floor; concealed anchorage, manufacturer's standard synthetic rubber; or flexible plastic, safety ribbed surface pattern, standard color; containing pressure switches for low-voltage control wiring and intended for either sliding or single acting swing door control, with "Opening" section and "Safety" section switches. Mats shall be 1/2 inch thick. Where required to be installed over existing floor finish, provide surface-mounted frame with tapered safety edge.
- 2.17.3.2 Photo-Cell Control System: Horizontal beam system.
- 2.17.3.3 Electrical Interlocks: Interlocks that prevent operation of unit when door is locked latched, door bolted are required unless units are equipped with self-protected devices or circuits.
- 2.17.3.4 Sliding Door Opening Width Control Switch: Two-position switch that, in normal position, allows

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sliding doors to travel to full opening width and, in alternate position, reduces opening to a selected partial opening width.

2.18 Finishes: Exposed surfaces of hardware shall have one of the following finishes:

- 2.18.1 Bright Brass, Clear Coated: ANSI/BHMA A156.18.
- 2.18.2 Satin Brass, Clear Coated: ANSI/BHMA A156.18.
- 2.18.3 Satin Bronze, Clear Coated: ANSI/BHMA A156.18.
- 2.18.4 Bright Chromium Plated: ANSI/BHMA A156.18.
- 2.18.5 Satin Chromium Plated: ANSI/BHMA A156.18.
- 2.18.6 Bright Stainless Steel: ANSI/BHMA A156.18.
- 2.18.7 Satin Stainless Steel: ANSI/BHMA A156.18.
- 2.18.8 Primed Paint Finish.

3.0 EXECUTION:

3.1 Application: Hardware shall be located on doors in accordance with DHI publication, Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI publication, The Installation of Commercial Steel Doors and Steel Framing, Insulated Steel Doors in Wood Frames, and Builders' Hardware. Door control devices for exterior doors such as closers and holders, shall normally attach to doors with thru-bolts such as sex bolts and nuts.

3.1.1 Hardware for labeled fire doors shall be installed in accordance with the requirements of NFPA 80 and

3.1.2 Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the devices. Insofar as practicable, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.

3.1.3 Floor Closers: Setting tools shall be used in the installation of floor closers.

3.1.4 Kick plates shall be installed on the push side of single acting doors and on both sides of double-acting doors.

3.1.5 Door operators shall be installed in accordance with manufacturer's instructions, including piping, controls, control wiring, and remote power units. Air supply for pneumatic operators shall provide regulated air pressure for each door as required for equipment purchased. In areas subject to extreme cold, dehydrating equipment shall be furnished.

Glass and Glazing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of glass and glazing materials. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Glazing Compounds and Preformed Glazing Sealants: A suitable type of glazing compound or preformed glazing sealant in compliance with section Glazing Materials of the FGMA Glazing Manual shall be provided.

2.1.1 Gunnable Polymer Glazing Sealants shall be as follows:

2.1.1.1 Acrylic (one-part): Fed. Spec. TT-S-00230.

2.1.1.2 Butyl (one-part): Fed. Spec. TT-S-001657.

2.1.1.3 Polysulfide (one- or two-part): Fed. Spec. TT-S-00230 and TT-S-00227.

2.1.1.4 Polyurethane (one- or two-part): Fed. Spec. TT-S-00230 and TT-S-00227.

2.1.1.5 Silicone (one-part): Fed. Spec. TT-S-001543 and TT-S-00230.

2.1.2 Glazing Preformed Tapes shall be butyl or polyisobutylene/butyl and shall be manufacturer's standards.

2.1.3 Knife Grade Glazing Sealants shall be as follows:

2.1.3.1 Wood Sash Putty: Fed. Spec. TT-P-00791.

2.1.3.2 Face Glazing Compound: ASTM C 669.

2.1.3.3 Steel Sash Putty: Manufacturer's standard.

2.1.3.4 Channel Glazing Compound: Manufacturer's standard.

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- 2.1.4 Gaskets for Glazing shall be as follows:
 - 2.1.4.1 Dense Neoprene: ASTM C 542 (lock-strip gaskets).
 - 2.1.4.2 Foam Neoprene: ASTM C 509.
 - 2.1.4.3 PVC: ASTM D 2287.
 - 2.1.4.4 Mullion Sections shall be manufacturer's standard for glass size provided.
- 2.2 Glazing Accessories: Glazing points, chips, shims, angles, beads, setting blocks, spacer strips, and other glazing accessories shall be provided where required to provide a complete installation.
- 2.3 Float, Plate or Glass:
 - 2.3.1 Clear Glass: ASTM C 1036, Type I, Class 1, Quality q3.
 - 2.3.2 Heat-Absorbing Glass: ASTM C 1036, Type I, Class 2, Quality q3, Style A.
 - 2.3.3 Light-Reducing Glass: ASTM C 1036, Type I, Class 3, Quality q3.
 - 2.3.4 Greenhouse Glass: ASTM C 1036, Type I, Class 1, Quality q6.
- 2.4 Tempered Glass: ASTM C 1048, Kind FT, Condition A; Type I, Quality q3 or Type II, Quality q8. All tempered glass shall be purchased to meet field dimensions and shall not be altered in the field.
- 2.5 Wired Glass: ASTM C 1036, Type II, Class 1, Form 1, Mesh M1, 1/4 inch thick and in compliance with ANSI Z97.1. Wired glass for fire doors and windows shall comply with NFPA 80.
- 2.6 Figured Glass: ASTM C 1036, Type II, Class 1, Form 3, Quality q8, 1/8 inch thick.
- 2.7 Rough Glass: Rolled, translucent, flat, glazing quality, one side rough and the other polished, 7/32 inch thick.
- 2.8 Laminated Glass: Laminated glass shall be fabricated from two pieces of clear, heat-absorbing, light-reducing, or wired glass, as designated and previously specified, laminated together with a clear vinyl inter-layer. Laminated glass shall comply with ANSI Z97.1.
- 2.9 Insulating Glass:
 - 2.9.1 Hermetically sealed glazing units shall be fabricated of two lites of glass, separated by a dehydrated air space that is 1/2 inch unless otherwise designated and sealed permanently at the edges. Clear, light-reducing, heat-absorbing, figured, wired, and tempered glass shall be as previously specified.
 - 2.9.2 Manufacturer's standard fused-glass edge construction shall use double-strength clear sheet glass and shall only be provided in small applications under 30 sq ft.
- 2.10 Mirror Glass: Plate or float glass complying with ASTM C 1036, Type I, Class 1, Quality q2, and 1/4 inch thick except as otherwise indicated with a silver coating and protective electrolytic copper coating not less than .0002 inch thick, complying with Fed. Spec. DD-M-411. The protection of the mirror back shall conform to Fed. Spec. DD-M-411.
- 2.11 Glazing Plastics:
 - 2.11.1 Cast acrylic glazing plastic sheets of 1/4 inch thickness, of clear transparent acrylic plastic with a light transmittance of 92 percent for a 1/4-inch sheet, impact resistance to withstand a 16-foot drop of a 1/2-pound steel ball on a 12-inch x 12-inch x 1/4-inch edge-supported sheet, modulus of elasticity of approximately 450,000 psi, flexural strength of 16,000 psi, and 180 F allowable continuous service temperature.
 - 2.11.2 Cast polycarbonate glazing plastic sheets of 1/4-inch thickness of clear transparent polycarbonate plastic, with a minimum light transmittance of 82 percent for a 1/4-inch sheet and free of significant dimensional change for exterior exposure. Drop ball impact resistance of 200 foot-pounds, for a 12-inch x 12-inch x 1/8-inch edge-supported sheet, modulus of elasticity of 340,000 psi, flexural strength of 13,500 psi, and 250 F allowable continuous service temperature.
 - 2.11.3 Reinforced polyester glazing plastic sheets of 1/8-inch thickness of clear translucent acrylic-modified polyester plastic sheet with invisible glass fiber reinforcement compounded specifically for exterior exposure with U.V. absorbers with a light transmittance of 92 percent for an 1/8-inch sheet, manufacturer's standard figured or textured surfaces, a modulus of elasticity of 721,000 psi, flexural strength of 17,800 psi, and 180 F allowable continuous service temperature.
 - 2.11.4 Reinforced polyvinyl chloride sheets of 0.12 inch thickness of clear transparent rigid polyvinyl chloride with .011-inch galvanized steel mesh woven to 10 mesh screening and located in the center of the sheet thickness. The sheet shall have a light transmission of 85 percent for a 1/4-inch sheet, tensile strength of 8,500 psi, flexural modulus of 550,000 psi, and flexural strength of 15,000 psi.

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- 2.12 Bullet-Resisting Glass: Glass shall be fabricated from Type I, Class 1, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass. The thickness of each layers of glass shall be in accordance with the manufacturer's standard practice. The total nominal thickness of the laminated glass shall be 1-3/16 inches. Glass shall meet the test requirements of the Underwriters' Laboratory for bullet-resisting materials. Listing in Underwriters' Laboratory Guide COGT will be accepted as evidence of compliance with this requirement in lieu of a certificate.
- 2.13 One-Way Vision Glass: Glass shall be fabricated from Type I, Class 1, Quality q2, 1/4-inch thick glass. One face shall be coated with a hard adherent film of chromium or other approved coating of proven equivalent durability. The glass shall transmit not less than 5 percent or more than 11 percent of total incident light in the visible region and shall reflect from the front surface of the coating not less than 45 percent of the total incident light in the visible region.
- 2.14 Spandrel Glass: ASTM C 1048, Kind HS, Condition B, Type I, Quality q5. 2.15 Reflective Glass: ASTM C 1048, Kind HS or FT, Condition C, Type I, Quality q3, with minimum 10 percent visible light transmission and maximum 25 percent solar energy transmittance.
- 3.0 EXECUTION:
 - 3.1 Preparation: Preparation of glazing and surrounding area shall comply with the details and general conditions governing glazing in the FGMA Glazing Manual unless otherwise specified.
 - 3.1.1 Glazing: Remove broken glazing and putty from frames.
 - 3.1.2 Frames: Clean existing frames. Replace missing or inoperative gaskets and glazing beads.
 - 3.2 Installation:
 - 3.2.1 General: The Contractor shall determine glazing dimensions by measuring the actual opening to receive the glass. Install sheet glass with the visible lines or waves running with the horizontal dimensions. Leave labels in place until the installation is approved.
 - 3.2.2 Glass Setting: Items shall be glazed using glass of the quality and thickness specified or indicated. Doors and windows may be glazed in compliance with one of the glazing methods described in the standards under which they are produced, except the face puttying method will not be permitted.
 - 3.2.3 Wired Glass: Install wire glass for fire doors and fire windows in compliance with the requirements of NFPA 80.
 - 3.2.4 Cleaning: Glass surfaces shall be thoroughly cleaned, with labels, paint spots, putty, and other defacements removed and shall be clean at the time the work is accepted.

Aluminum Window Walls/Curtain Walls

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum window walls. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 System Performance:
 - 2.1.1 Load-bearing strength (wind resistance) shall be in accordance with ASTM E 330, ANSI A58.1, and AAMA CW 1-9.
 - 2.1.2 Deflections and thermal movements shall be as recommended by the wall manufacturer for the project site.
 - 2.1.3 Leakage Resistance: Air leakage shall be in accordance with ASTM E 283. Water penetration shall be in accordance with ASTM E 331.
 - 2.1.4 Condensation shall be in compliance with AAMA 1502.7 for the project site.
 - 2.1.5 Sound transmission classification (STC) shall be as designated by the Authorized Member Representative and in accordance with ASTM E 90.
 - 2.1.6 The wall system shall comply in general with applicable provisions of the AAMA Metal Curtain Wall, Window, Store Front, and Entrance Guide Specifications Manual (GSM-1).
 - 2.2 System Components:
 - 2.2.1 Aluminum members (extrusions, formed members, sheet, and plate) shall be in compliance with requirements of ASTM B 221 for extrusions and ASTM B 209 for sheet/plate.
 - 2.2.2 Insulated panels shall be laminated aluminum-faced panels finished to match window wall framing.

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Face sheets shall be not less than 0.0249 inch thick. Concealed back sheets shall be of aluminum or galvanized steel. Edge condition of panels shall be prepared for installation into framing, and either sealed or vented to exterior only. Panels shall be flat, with no deviations exceeding 5 thousands of an inch in 12 inches. Insulated core shall meet the designated k-value.

- 2.2.3 Brackets and reinforcements shall be high-strength aluminum units where feasible. Otherwise, nonmagnetic stainless steel shall be used, except at fabricator's option. Brackets not exposed to weather or abrasion may be hot-dipped galvanized steel complying with ASTM A 386. Provide nonstaining, nonferrous shims for installation and alignment of window wall work.
- 2.2.4 Window cleaner's bolts, if required, shall be nonmagnetic stainless steel complying with ASME A39.1.
- 2.2.5 Concealed flashing shall be dead-soft stainless steel, 26 gauge.
- 2.2.6 Fasteners and accessories shall have exposed portions matching finish of window wall system. At joints where movement must be accommodated, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or similar material recommended by manufacturer.
- 2.2.7 Inserts for concrete masonry shall be cast iron, malleable iron, or hot-dipped galvanized steel complying with ASTM A 386.
- 2.2.8 Firestopping materials shall be mineral fiber insulation or other noncombustible material suitable for permanent placement and complying with applicable regulations.
- 2.2.9 Finishes shall comply with NAAMM AA-M32C21A31 (0.4 mil) for natural aluminum color and NAAMM AA-M32C21A32 (0.4 mil) for integral color anodized finish.
- 3.0 EXECUTION: (Section not used.)

DIVISION 9-FINISHES

Plaster Repairs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plaster for repairs. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: Materials shall comply with ASTM C 841 and C 842 unless otherwise specified.
 - 2.2 Finish Plaster shall be gypsum plaster or Keene's cement.
 - 2.3 Lath and Furring shall be wood, gypsum, or metal to match existing. Paper backing shall be used on metal lath except when applied over masonry or concrete. Lath for Portland cement plaster shall comply with ASTM C 1063.
 - 2.4 Portland cement: ASTM C 150, Type I or Type II. Only one type and brand shall be used in the work.
 - 2.5 Portland cement Plaster: CSI 09220.
 - 2.6 Metal Trim: New metal trim required for replacement of damaged or deteriorated trim shall be compatible with the existing metal trim.
 - 2.7 Gypsum Wallboard for repair of solid but severely cracked plaster shall be 1/4 inch thick, 4-foot by 8-foot sheets.
 - 2.8 Color: FED. STD. 595.
- 3.0 EXECUTION:
 - 3.1 Preparation: Appropriate measures shall be taken to contain dust and protect adjacent surfaces during removal and replacement. Damaged or deteriorated plaster and accessories shall be removed and disposed of as required. Surfaces to which old plaster was applied shall be cleaned of all loose or foreign materials, which might inhibit bonding or proper fitting of new plaster, lathing, and accessories. Concrete or masonry surfaces to be replastered shall be coated with a continuous film of bonding agent.
 - 3.2 Environmental Conditions: A temperature of not less than 55 F shall be maintained in the building for 24 hours before, during, and after plaster application.
 - 3.3 Plaster Installation: Plaster shall be installed in compliance with ASTM C 842. Portland cement

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plaster shall be installed for all exterior surfaces and all interior surfaces subject to high humidity. Gypsum plaster shall be installed for all remaining interior surfaces. Color, texture, finish, and thickness of plaster shall match adjacent, undamaged plaster or designated areas.

- 3.3.1 Plaster over Existing Work: Where replacement of the top or finish coat only is required, only the damaged or deteriorated finish coat shall be removed. New finish coat shall be applied, allowed to dry, and sanded to bring smooth with existing adjacent surfaces.
- 3.3.2 Ornamental Plaster: New plaster shall be run full, straight, and true with molding plaster using clean cut metal conforming to the existing profiles. Rough spots shall be sanded and left ready for painting.
- 3.3.3 Restoration: The Contractor shall replace or reinstall to the original condition all materials removed to get to the repair work. Materials damaged during removal or reinstallation shall be replaced with similar new materials.

Gypsum Drywall and Metal Studs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum drywall. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
 - 2.1 Gypsum Panel - Sheetrock fire code gypsum panels (single layer).
 - 2.2 Fasteners - Self-tapping steel screws with rust inhibited coating.
 - 2.3 Insulation - 11/2- inch termafiber sound attenuating blankets or as circumstance dictates.
 - 2.4 Metal Accessories - Corner Beads, trim, etc. shall be galvanized steel.
 - 2.5 Joint Treatment - As recommended by manufacturer.
 - 2.6 Perimeter Caulking - Acoustical as recommended by manufacturer.
 - 2.7 Control Joints - Zinc.
 - 2.8 Joint compound shall be asbestos free type.
 - 2.9 Acoustical Sealant -As recommended by Manufacturer.
 - 2.10 Metal Studs
 - 2.10.1 Steel studs shall be hollow type spaced 16-inches on centers of sizes indicated, built up with diagonal wire web of No. 7 gauge cold drawn wire, diagonally spaced and welded at 8-inch intervals between outer chords on 1/2- inch x 1/2-inch angles, No. 16-gauge cold rolled steel.
 - 2.10.2 Place steel studs approx. 2-inches from abutting partitions and 2-inches from each side of interior angle of all corners.
 - 2.10.3 Steel studs shall be secured to top tracks with 22-ga. Galvanized steel adjustable stud shoes. •09260
 - 2.11 STUD TRACKS
 - 2.11.1 Floor and ceiling stud tracks shall be 22-ga. cold rolled steel with 1/2-inch legs and securely fastened to beams, slabs or partitions with 1/2-inch stud bolts or other method approved by manufacturer spaced not more than 24 inches on centers.
 - 2.11.2 In locations where drawings indicate partitions on an existing floor (wood, asphalt tile, etc.), remove existing floor to allow partition to be secured to a sound concrete sub-surface.
 - 2.12 STUD SHOES
 - 2.12.1 Stud shoes shall be wire tied to studs with two double strands of 18-ga. galvanized tie wire.
 - 2.13 HORIZONTAL BRACING
 - 2.13.1 Shall consist of 3/4-inch steel furring channels fastened to inside of stud with webs in a horizontal position. Spacing of channels shall not exceed 6 feet.
- 3.0 EXECUTION:
 - 3.1 Gypsum ceiling panels screw attached to metal furring channels clipped or wire tied to suspended main runner channels or wire tied to main support members.
 - 3.2 Provide control joints where ceiling abuts dissimilar wall or ceiling or a structural element.
 - 3.3 Gypsum wall panels shall be screwed to metal studs or furring channels and to and bottom metal track.

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- 3.4 All joints of ceiling or wall panels shall be taped with at least two coats of joint compound. See manufacturers instructions for applicable installation.
- 3.5 Align stud track accurately to the partition layout @ Both floor and Ceiling.
- 3.6 Adjust all members for straight and proper alignment.

Tile Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic tile flooring, ceramic mosaic tile flooring, conductive ceramic tile flooring, quarry tile flooring, slate flooring, and quarry tile by the acid-resistant installation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Glazed Ceramic Tile: ANSI A137.1.
 - 2.2 Ceramic Mosaic Tile: ANSI A137.1.
 - 2.2.1 Natural Clay Tile.
 - 2.2.2 Porcelain Body Tile.
 - 2.2.3 Slip-Resistant Tile: ANSI A137.1.
 - 2.2.4 Pregrouted Sheets of ceramic tile, factory-assembled and grouted with manufacturer's standard polyurethane material.
 - 2.3 Conductive Ceramic Tile: Complying with Type I, Class F.
 - 2.4 Quarry Tile: ANSI A137.1. Wax-coated top surface for acid-resistant installation.
 - 2.4.1 Slip-Resistant Quarry Tile shall comply with TCA ANSI A137.1, Section 5.2.1.2.9.
 - 2.5 Slate: Grade A, unfading slate flooring.
 - 2.6 Base Units: Cove type, round top.
 - 2.7 Trim Pieces: For base shall be cove or bullnose.
 - 2.8 Mortar and Grout Materials:
 - 2.8.1 Portland cement: ASTM C 150, Type 1.
 - 2.8.2 Aggregate: Sand, ASTM C 144.
 - 2.8.3 Dry-Set Mortar and Grout: ANSI A118.1, TCA Formula 759 or 763 (as applicable).
 - 2.8.4 Conductive Dry-Set Mortar: Conforming to ANSI A118.2.
 - 2.8.5 Conductive Latex Mortar: Conforming to ANSI A118.2.
 - 2.8.6 Liquid Latex: ANSI A118.4 except latex shall be non-remulsifiable in water.
 - 2.8.7 Epoxy Mortar and Grout: TCA Formula AAR-II, two-component epoxy resin, hardener, and mineral filler complying with ANSI A118.3.
 - 2.8.8 Furan Mortar.
 - 2.8.9 Furan Grout.
 - 2.8.10 Water shall be clean, fresh, potable water approved by Public Health authorities for domestic consumption.
 - 2.8.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives, factory-blended to decrease shrinkage.
 - 2.9 Adhesives:
 - 2.9.1 Epoxy Adhesive: TCA Formula C150, two component epoxy resin and hardener.
 - 2.9.2 Organic Adhesive: ANSI A136.1 with TCA certification of conformance.
 - 2.10 Sealants:
 - 2.10.1 Polysulphide: Fed. Spec. TT-S-00230, Type I, single component, synthetic-rubber base.
 - 2.10.2 Polyurethane: Fed. Spec. TT-S-00230, Type I, single component.
 - 2.10.3 Silicone: Fed. Spec. TT-S-001543 Class A and TT-S-00230, single component.
 - 2.11 Adhesive and Joint Sealant: Fed. Spec. TT-S-00230, Type 2, Class B.
 - 2.12 Cleavage Membrane: One of the following:
 - 2.12.1 Saturated Felt: ASTM D 250, 15-pound type.
 - 2.12.2 Polyethylene Film: ASTM D 2103, Type O, 0.004 inch thick.
 - 2.13 Marble Thresholds: Group A per Marble Institute of America MIA-01, with rounded edges and sand rubbed finish.

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- 2.14 Reinforcing Mesh: ASTM A 185.
- 2.15 Plywood: DOC PS 1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA," 3/4 inch thick unless otherwise noted.
- 2.16 Nails: Fed. Spec. FF-N-105 annular, screw or ring type, zinc-coated.
- 2.17 Backer Rod: Closed cell polymeric foam, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623 and water absorption less than 0.02 gms/cc per ASTM C 1083.
- 2.18 Elastomeric Sheet: 40 mil complying with ASTM D 2103.
- 3.0 EXECUTION:
- 3.1 General: Comply with ANSI A108.1 through A108.7 except as otherwise indicated and with TCA Handbook for Ceramic Tile Installation.
- 3.2 Portland Cement Mortar Bed: Install in accordance with ANSI A108.1, as modified herein.
 - 3.2.1 Mix Mortar in proportion on one part Portland cement to five parts dry sand or six parts damp sand.
 - 3.2.2 On wood and framed concrete slab floors provide a cleavage membrane before placing setting bed, with edges of sheets lapped.
 - 3.2.3 On cleavage membrane lay welded wire mesh reinforcing, lapping three inches at all edges.
 - 3.2.4 Install mortar and tamp heavily to compact bed to depth of 3/4 inch to 1-1/4 inches.
- 3.3 Dry-Set Portland cement Mortar Bed: Install in accordance with ANSI A108.5 except as modified below.
 - 3.3.1 Carefully work sufficient water into dry-set mortar to obtain desired consistency.
 - 3.3.2 Mix mortar ingredients thoroughly before adding latex. Carefully work in sufficient latex to obtain desired consistency.
 - 3.3.3 Rework mixes from time to time to maintain proper consistency, but do not add additional ingredients.
 - 3.3.4 Apply layer of mortar to form a thickness of at least 1/8 inch.
- 3.4 Organic Adhesive Application: Install in accordance with ANSI A108.4.
- 3.5 Install conductive ceramic tile in accordance with ANSI A108.7.
 - 3.5.1 Testing: Conductive ceramic tile floors shall be tested in accordance with NFPA 99.
 - 3.5.2 Replacement: Floors that have not met requirements of NFPA 56 within six months after they are installed shall be removed and replaced with properly conductive floor by this Contractor at no additional cost to the Member.
- 3.6 Install quarry tile and slate in accordance with ANSI A108.3.

Ceramic Wall Tile

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic wall tile. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Tile:
 - 2.1.1 Ceramic Tile: Tile shall be standard grade conforming to ANSI A137.1. Containers shall be grade-sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate.
 - 2.1.2 Ceramic mosaic tile and trim shall be unglazed natural clay or porcelain with cushion edges. Tile size shall be 1 inch by 1 inch, 1 inch by 2 inches, 2 inches by 2 inches, or a mixture of standard sizes in a stock pattern, as selected.
 - 2.1.3 Glazed wall tile and trim shall be cushion-edged with bright or matte glaze. Tile shall be 4-1/4 inches by 4-1/4 inches, 4-1/4 inches by 6 inches, or 6 inches by 6 inches and, as selected.
 - 2.1.4 Accessories: Accessories shall be the built-in type of the same materials and finish as the wall tile.
 - 2.2 Setting Bed: Metal lath shall be flat expanded type conforming to ANSI A42.3 or A42.4, and weighing not less than 2.5 pounds per square yard.
 - 2.3 Water shall be potable.
 - 2.4 Mortar, grout, and adhesive shall conform to the following:
 - 2.4.1 Dry-Set Portland cement Mortar: ANSI A118.1.
 - 2.4.2 Organic Adhesive: ANSI A136.1, Type I.
 - 2.4.3 Epoxy Resin Grout: ANSI A118.3.

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- 2.4.4 Furan Resin Grout: ASTM C 395.
- 3.0 EXECUTION:
- 3.1 Preparation: Surface to receive tile shall conform to the requirements ANSI A108.1 for surface conditions for the type setting bed required and for workmanship.
- 3.2 Installation:
- 3.2.1 General: Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation.
- 3.2.2 Installation of Wall Tile:
- 3.2.2.1 Plastic or Cured Mortar Bed: Tile shall be installed over a plastic mortar bed or a cured mortar bed. A 4-mil polyethylene membrane, metal lath, and scratch coat shall also be installed. Plastic mortar bed, materials, and installation of tile shall conform to ANSI A108.1. Cured mortar bed and materials shall conform to ANSI A108.1. Dry-set mortar method of installing tile over a cured mortar bed shall conform to ANSI A108.5.
- 3.2.2.2 Dry-Set Mortar: Dry-set mortar shall be used to install tile directly over clean, sound, dimensionally stable masonry in accordance with ANSI A108.5.
- 3.2.2.3 Organic Adhesive: Organic adhesive installation of ceramic tile shall conform to ANSI A108.4.
- 3.3 Cleaning: Upon completion, tile surfaces shall be thoroughly cleaned in accordance with ANSI A108.1. Acid shall not be used for cleaning glazed tile.

Terrazzo

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for terrazzo floors and stairs. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Terrazzo materials and installation shall comply with specifications and recommendations of The National Terrazzo and Mosaic Association, Inc. (NTMA)
- 2.2 Underbed reinforcement shall be 2-inch by 2-inch by 16-gauge welded wire mesh, ASTM A 185, galvanized.
- 2.3 Isolation membrane shall be polyethylene film, complying with ASTM D 2103, not less than 4.0 mils thick.
- 2.4 Cast-In-Place Terrazzo Materials:
- 2.4.1 Portland cement shall conform to ASTM C 150, Type I, except as modified to comply with NTMA requirements for compressive strength. Provide non-staining white cement for terrazzo matrix. Provide standard gray cement for underbed.
- 2.4.2 Sand shall conform to ASTM C 33.
- 2.4.3 Aggregate shall be natural, sound, crushed marble chips without excessive flats or flakes, complying with NTMA requirements.
- 2.4.4 Monolithic terrazzo shall be 1/2-inch total thickness over concrete slab.
- 2.4.5 Bonded terrazzo shall be 1/2-inch terrazzo over a 1-1/4 inch minimum underbed.
- 2.5 Thinset Epoxy and Polyester Materials:
- 2.5.1 Polyacrylate-Modified Cementitious Terrazzo Matrix: Polyacrylate and color pigment complying with NTMA "Guide Specification for Polyacrylate Modified Terrazzo."
- 2.5.2 Polyester Resin Terrazzo Matrix: Two-component polyester resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Polyester Terrazzo."
- 2.5.4 Epoxy Resin Terrazzo Matrix: Thermosetting, amine-cured epoxy resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Epoxy Terrazzo."
- 2.5.5 Conductive Terrazzo with Resinous Matrix: Electricity conductance shall conform to resistance levels established by the UL 779.
- 2.6 Precast Terrazzo: Precast terrazzo base and stair units shall comply with NTMA.
- 2.7 Sealer: Colorless, slip-and stain-resistant, non-yellowing penetrating sealer that will not disturb color or physical properties of terrazzo surface; pH factor between 7 and 10.
- 2.8 Plywood: DOC PS 1, "C-C EXT-APA" or "Underlayment C-C Plugged EXT-APA", 3/4 inch thick unless

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otherwise noted.

- 2.9 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.
- 2.10 Elastomeric Sheet: 40 mil thick extruded, homogeneous, waterproof, impervious, nonplasticized chlorinated polyethylene sheet, complying with ASTM D 2103.
- 2.11 Curing Materials:
 - 2.11.1 Polyethylene Film: Non-staining type.
 - 2.11.2 Paper: Non-staining, heavy building paper.
 - 2.11.3 Curing Compound: Liquid membrane-forming compound, complying with ASTM C 309, Type I.
- 2.12 Cleaner: Neutral liquid chemical cleaner, biodegradable, free from crystalline salts, phosphate or water soluble alkaline salts, formulated for terrazzo, pH factor between 7 and 10.
- 3.0 EXECUTION:
 - 3.1 Preparation: Clean and prepare substrate to comply with NTMA specifications for type of terrazzo application indicated. Clean area to receive terrazzo of loose chips and all foreign matter. Grind concrete substrate as required to provide surfaces within tolerances required by NTMA.
 - 3.2 Installation:
 - 3.2.1 Comply with NTMA and manufacturer's recommendations for proportioning mixes, for installation of strips, and for placing, curing, grinding, grouting, and finishing.
 - 3.2.2 Provide terrazzo bases, thresholds, stair treads, and landings as required.
 - 3.2.3 Install divider and accessory strips in an adhesive setting bed, without voids below strips. Provide mechanical anchorage for adequate attachment of strips to substrate.
 - 3.2.4 Provide control joints by installing angle type divider strips back-to-back with neoprene rubber filler cemented between strips, flush with finish floor.
 - 3.2.5 Provide for expansion joints by installing angle type divider strips back-to-back, with removable filler of the width shown (but not less than 1/4 inch wide) between strips.
 - 3.2.6 Install abrasive inserts where required.

Acoustical Ceilings

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical units in suspended ceilings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Acoustical units shall conform to ASTM E 1264, Class A, and the following requirements:
 - 2.1.1 Acoustical panel units for exposed grid system shall be the type and pattern required, NRC grade of 55 minimum when tested on mounting No. 7, trimmed and butt, with a LR coefficient of .75 and a STC range of 40-44. Nominal size shall be 24 inches by 48 inches or 24 inches by 24 inches. Finish shall be factory-applied white finish.
 - 2.1.2 Acoustical panel units for semi-exposed grid system shall be the type and pattern required, NRC grade of 55 minimum when tested on mounting No. 7, trimmed and butt, with a coefficient of .75 and a STC range of 40-44. Nominal size shall be 12 inches by 24 inches or 12 inches by 12 inches. Finish shall be factory-applied white finish.
 - 2.1.3 Acoustical tile units for concealed grid system shall be the type and pattern as required, NRC grade of 55 minimum when tested on mounting No. 7. LR grade shall be 1, and STC range shall be 40-44. Edge detail shall be beveled or square, and joint detail shall be kerfed and rabbeted or as required. Nominal size shall be 12 inches by 12 inches, and finish shall be factory-applied white finish.
 - 2.1.4 Metal Ceiling System: Pans shall be type required, and acoustical insulation pads shall be NRC grade 55 minimum when tested on mounting No. 7. The pattern shall be "c," with a nominal size of 12 inches by 24 inches. Edge detail shall be manufacturer's standard, and joint detail shall be beveled or cross-scored to simulate 12-inch by 12-inch units. Finish shall be factory-applied white baked enamel, two coats on exposed surfaces, one coat on edges and backs. Pads shall be completely enclosed, of material and thickness required for acoustical and fire test ratings, with a LR grade of 2.
 - 2.1.5 Fire Resistive Ceilings: Acoustical fire resistive ceiling systems shall be rated for fire endurance

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when tested in accordance with ASTM E 119. Suspended ceiling shall have been tested with a specimen roof and/or floor assembly representative of the construction, including 09510-mechanical and electrical work within ceiling space openings for light fixtures, air outlets, and access panels.

- 2.1.6 Ceiling sound transmission class and test: STC range of acoustical units, when required, shall be determined in accordance with Ceiling Sound Transmission Test by Two-Room Method and reported in accordance with the appendix to ASTM E 90 for 11 frequency data or ASTM E 413 for 16 frequency data.
- 2.2 Suspension system shall be of the type required and shall conform to ASTM C 635 for intermediate- or heavy-duty systems. Surfaces exposed to view shall be aluminum or steel with a factory-applied white baked enamel finish, aluminum with a clear anodized finish as required or aluminum with colored factory-applied vinyl paint finish. Wall molding shall have a flange of not less than 15/16 inch and shall be provided with inside and outside corner caps.
- 2.3 Hangers shall be galvanized steel wire. Hangers and attachment shall support a 300-pound vertical load without failure of supporting material or attachment.
- 2.4 Access panels shall match adjacent acoustical tiles and shall be designed and equipped with suitable framing and fastenings for removal and replacement without damage. Panel shall be not less than 12 inches by 12 inches or more than 12 inches by 24 inches. An identification plate of 0.032-inch thick aluminum, 3/4 inch in diameter, stamped with the letters "AP" and finished the same as the unit shall be attached near on corner on the face of each access panel.
- 2.5 Fire Hazard Classification: All acoustical unit materials shall bear the UL label and marking, indicating fire hazard classification of acoustical unit materials as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.
- 3.0 EXECUTION:
- 3.1 Acoustical work shall be provided complete with all necessary fastenings, clips, and other accessories required for a complete installation. 3.2 Suspension System shall be installed in accordance with ASTM C 636 and as specified herein.
- 3.3 Wall molding shall be provided where ceilings abut vertical surfaces.
- 3.4 Ceiling Tiles: Panels in exposed-grid system shall be held in place with manufacturer's standard hold-down clips.

Acoustical Insulation and Barriers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical insulation and barriers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Lead vinyl shall be a loaded vinyl sound barrier product composed of lead, vinyl, and fiberglass reinforcing intended for use as a sound attenuation material. The material shall weigh either 72 or 120 ounces per square yard as required. Material thickness shall be 0.025 inch and 0.050 inch for 72 ounce and 120 ounce material, respectively.
- 2.2 Foil-reinforced, Kraft-faced, mineral-fiber insulation shall be a faced insulation product designed to be used for thermal and acoustical insulation. Mineral fiber insulation shall be in accordance with Fed. Spec. HH-I-558, Form A, Class 1 or 2. Noise reduction coefficient (NRC) shall be not less than 0.55 for 1-inch thickness. Vapor transmission rate shall be not more than 0.02 perms. Surface burning characteristics shall be not more than a flame spread classification of 25, a fuel contribution of 50, and a smoke developed rating of 50, when tested in accordance with UL 723.
- 2.3 Vapor barrier facing material shall be in accordance with ASTM C 1136, Type I or II as required. Facing material shall be a laminate of aluminum foil and reinforced-reinforced mineral fiber scrim.
- 2.4 Sheet lead shall be in acoustical attenuating product weighing 1 pound per square foot, with a thickness of not less than 1/64 inch. Lead sheet shall conform to Fed. Spec. QQ-L-201, Grade B.
- 2.5 Fire Hazard Classification: All acoustical insulation and barrier materials shall bear markings

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indicating the fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.

3.0 EXECUTION: (Section not used.)

Sound Absorbing Panels

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound absorbing panels. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Perforated steel panels shall be modular units, fabricated of 22 gauge zinc-coated steel, and perforated with holes comprising not less than 10 percent of the panel area. Panels shall be suitably stiffened in both directions in accordance with panel size. Panels shall be filled with 2 inch thick, 1.5 lbs/cu ft acoustical insulation meeting Fed. Spec. HH-I-558, Form B, Type 1, Class 7. Installed panel units with acoustical insulation shall have a minimum Noise Reduction Coefficient (NRC) of .70 when tested in accordance with ASTM C 423. Panel units shall be furnished with two coats of white baked-on polyester paint on exposed surfaces and one coat on non-exposed surfaces.
 - 2.2 Fiberglass wall panels shall be modular units, fabricated of 1-1/8 inch glass fiber board laminated to a nonwoven needle-punched fabric. The panels shall have a minimum NRC of .80 according to ASTM C 423. Panels shall be furnished with suitable wall fastening system.
 - 2.3 Sound attenuation blankets shall be composed of mineral fiber of 4 lbs/cu ft density for 1 inch thickness, and 3 lbs/cu ft density for greater than 1 inch thickness conforming to ASTM C 665. Blanket R-value shall be 4 per inch.
 - 2.4 Fire Hazard Classification: A sound absorbing panel unit and sound attenuation blankets shall have a fire hazard classification as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.
- 3.0 EXECUTION:
 - 3.1 Perforated steel panels shall be installed on ceiling suspension systems and wall furring systems that are compatible with perforated steel panels and that are already in place.
 - 3.2 Fiberglass wall panels shall be installed on substrate wall surfaces that are clean, dry, and continuous, with no surface irregularities.

Wood Strip Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood strip flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Wood strip flooring shall be manufactured from kiln-dried, plain-sawed, red oak lumber. Flooring shall be select grade, tongue and groove, end-matched, with manufacturer's standard channeling of back face of each strip. Size shall be 3/4 inch thick, 2-1/4 inches wide.
 - 2.2 Maximum moisture content shall be 9 percent for wood strip flooring and 14 percent for other wood members.
 - 2.3 Finishing Materials for Job Finished Flooring:
 - 2.3.1 Stain: Penetrating type non-fading wood stain.
 - 2.3.2 Wood Filler: Fed. Spec. TT-F-336.
 - 2.3.3 Sealer: Penetrating type, pliable, wood-hardening finish/sealer.
 - 2.3.4 Varnish: Alkyd resin varnish.
 - 2.3.5 Urethane Finish: Fed. Spec. TT-C-542.
 - 2.3.6 Floor Wax: Liquid, solvent-type, slip-resistant, conforming to Fed. Spec. P-W-158.

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- 2.4 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 2.
- 2.5 Nails shall be Fed. Spec. FF-N-105 screw or ring type, zinc coated.
- 2.6 Asphalt primer shall comply with ASTM D 41.
- 2.7 Asphalt saturated felt shall be organic, 15-pound, unperforated, complying with ASTM D 226.
- 2.8 Membrane shall be 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.
- 2.9 Wood sleepers shall be No. 1 common, fir, hemlock, spruce, or yellow pine complying with requirements of the rules or standards under which produced with preservative treatment complying with AWPB LP-2.
- 2.10 Plywood subflooring shall be DOC PS 1, "C-D INT- APA," with exterior glue, or "C-C EXT-APA."
- 2.11 Hardboard shall comply with ANSI/AHA A135.4, specially made for underlayment, 1/4 inch thick.
- 3.0 EXECUTION:
- 3.1 Preparation:
 - 3.1.1 Wood subfloors shall be renailed where loose. Where unsatisfactory wood subflooring is removed, replace with new exterior or underlayment grade plywood. Apply hardboard underlayment just before finish floor is to be installed. Nail plywood subfloors with screw-type nails. Cover ground in crawl space with lapped and sealed 4 mil polyethylene or 55-pound rolled roofing, and cover subfloor with a lapped layer of 15-pound asphalt saturated felt.
 - 3.1.2 Concrete Subfloors: Fill large cracks and holes in concrete structural floor slabs with a one part nonshrinking cement to three part sand grout with a latex or epoxy additive. Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent). Sand or trowel smooth irregularities to within allowable tolerances of NOFMA-01. Apply primer to concrete subfloors avoiding separating the emulsion. Apply two applications of hot asphalt mastic and asphalt saturated felt, then apply an additional layer of asphalt mastic. Provide flat 2 x 4 sleepers, 18 to 30 inches long impregnated with an approved wood preservative and laid in additional asphalt mastic; or apply a polyethylene sheet moisture protection system consisting of two courses of 1 x 2 nailing strips with a layer of polyethylene between, the first course being treated with preservative and adhered to the slab in rivers of mastic supplemented by a 1-1/2 inch concrete nail every 24 inches.
 - 3.1.3 Treated wood cuts shall be treated with the original preservative.
- 3.2. Installation of Wood Strip Flooring:
 - 3.2.1 General: Comply with NOFMA-01.
 - 3.2.2 Expansion Space: For straight running pattern flooring and depending upon the width of pattern to be laid (usually the width of the room), provide approximately 1/2 inch of expansion space under base and base shoe along length of stripping, with approximately half as much space at ends of pattern.
 - 3.2.3 Machine sand installed unfinished flooring to remove offsets and non-level conditions.
 - 3.2.4 Field finish floors by applying a coat of wood paste filler and stain, if needed.
 - 3.2.4.1 Natural Finish: Apply two coats of sealer and two coats of floor wax.
 - 3.2.4.2 Varnish Finish: Apply three coats of floor varnish.
 - 3.2.4.3 Urethane Finish: Apply multiple coats of urethane finish to build a dry film thickness of 1.0 mil.

Wood Block Industrial Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood block industrial flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Wood block creosoted flooring shall be yellow pine, Douglas fir, or upland oak, preservative-treated, and in accordance with ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2, 2 1/2, or 3 inches thick, 3 inches wide, and 6 inches long.
 - 2.2 Wood block natural finish flooring shall be yellow pine or upland oak, preservative-treated. Wood blocks shall be of the species, quality, and size described in ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2 inches thick, 3 inches wide, and 6 inches long.
 - 2.3 Primer, adhesive, and filler shall be provided for wood block creosoted flooring.

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- 2.4 Flexible filler and clear industrial sealer and finish coating shall be provided for wood block natural finish flooring.
- 3.0 EXECUTION:
- 3.1 Preparation: Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected and all damaged portions of concrete slabs shall have been repaired. If concrete curing compounds or surface sealers have been applied to the concrete slabs, they shall have been entirely removed from the slabs.
- 3.2 Installation:
 - 3.2.1 For wood block creosoted flooring, a coat of priming oil shall be applied to the concrete slab. After the priming oil has dried, a squeegee coat of hot adhesive shall be applied. When the adhesive has hardened, the blocks shall be laid tightly together with the grain vertical. After the floor has been laid, two coats of filler shall be applied by squeegee. Expansion joints shall be provided.
 - 3.2.2 For wood block natural finish flooring, the joints shall receive filler and multiple coats of clear sealer and finish coating. Number of coats and method of application shall be adjusted to seasonal conditions.
- 3.3 Marking Lines: Floor surface in areas to receive lines shall be cleaned by scarification or by wire brushing. At least two coats of a marking material compatible with flooring materials shall be applied with suitable brush or spraying machine. The minimum total thickness of the marking lines shall be 4 mils.

Wood Parquet Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood parquet flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Wood parquet flooring shall be kiln-dried, plain-sawed, red oak.
 - 2.2 Laminated (plywood) wood block flooring shall be prime grade, 12-inch x 12-inch x 1/2-inch nominal size, with manufacturer's standard urethane floor finish. Flooring shall be tongue and grooved as required for laying in checkerboard pattern.
 - 2.3 Slat block flooring shall be clear grade, factory-prefinished with manufacturer's standard penetrating floor sealer treatment. Flooring shall be 9 inches x 9 inches x 5/16 inch, square pattern, tongue and groove, square edge matching. Pattern units of flooring shall be factory-assemble and adhered to removable paper facing for shipment to the project, or with slats fastened together with metal splines on backs.
 - 2.4 Solid Block Flooring: Wood parquet flooring shall be prefinished in factory. Flooring shall be prime grade, tongue and groove, square edge, matching.
 - 2.5 Plastic impregnated parquet flooring shall be manufacturer's standard fabrication of solid hardwood slat-block parquet flooring, which has been impregnated with acrylic plastic and treated by gamma radiation and factory-finished. Flooring shall be composed of 5/16-inch thick x 6-inch squares fabricated into 12-inch square blocks, square edged, tongued and grooved, with tongue and groove matching.
 - 2.6 Adhesive/mastic shall be polyvinyl acetate (PVA) or special mastic of type recommended by the flooring manufacturer and complying with flammability and environmental control regulations.
 - 2.7 Finish Materials for Unfinished Flooring:
 - 2.7.1 Stain: Penetrating type non-fading wood stain.
 - 2.7.2 Wood Paste Filler: Fed. Spec. TT-F-336, pigmented if required.
 - 2.7.3 Sealer: TT-S-176, Class I, for white oak and red oak, Class II for beech, birch, and hard maple.
 - 2.7.4 Varnish: Alkyd resin varnish conforming to Fed. Spec. TT-V-109.
 - 2.7.5 Polyurethane Finish: Moisture curing type, polyurethane finish conforming to Fed. Spec. TT-C-542.
 - 2.7.6 Floor Wax: Slip-resistant, conforming to Fed. Spec. P-W-158, Type I, Class 2.
 - 2.8 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 2.

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- 2.9 Nails and Screws shall be recommended by NOFMA-01.
- 2.10 Concrete Primer: ASTM D 41.
- 2.11 Asphalt-Saturated Felt: ASTM D 226.
- 2.12 Hardboard Underlayment: ANSI/AHA A135.4.
- 3.0 EXECUTION:
- 3.1 Preparation:
 - 3.1.1 For Adhesive Application on Concrete Slab: Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent), examine concrete surfaces and grind irregularities to within allowable tolerances of NOFMA-01, and apply primer to concrete subfloors.
 - 3.1.2 For Adhesive Application on Wood Subflooring or Underlayment: Preparation of subflooring or underlayment shall be in compliance with the printed instructions of the flooring manufacturer.
 - 3.1.3 For Nailed Application on Wood Subflooring or Underlayment: Cover subflooring with a layer of 15-pound asphalt-saturated felt, lap all edges at least 2 inches, and turn felt up at least 2 inches behind baseboards.
 - 3.1.4 For Plastic Impregnated Parquet Flooring: Patch and level concrete subfloors with porous latex cement patching compound. If parquet is to be installed over existing synthetic floor or tongue and grooved subfloor wider than three and one quarter inches, a 1/4-inch plywood or untempered hardboard underlayment.
- 3.2 Installation:
 - 3.2.1 General: Comply with recommendations and instructions by NOFMA in "Hardwood Flooring Installation Material" and by recommendation of American Parquet Flooring Association, Inc. Where flammable adhesives are used, provide safety sparkproof fans when natural ventilation is inadequate; prohibit smoking, lighting matches, metal heel caps, or any other flame or spark producing device.
 - 3.2.2 Installation of wood-block flooring on concrete slabs shall be by adhesive method.
 - 3.2.3 Installation on Wood Subflooring or Underlayment: Apply one layer of saturated felt over wood or underlayment in troweled adhesive, and apply wood blocks with at least two 7-penny spiral or screw type flooring nails per block.
 - 3.2.4 Installation of Plastic Impregnated Parquet Flooring: Install with special adhesive.
 - 3.2.5 Sanding: Machine sand installed unfinished flooring to remove offsets and non-level conditions.
 - 3.2.6 Field Finishing:
 - 3.2.6.1 Base Finish: On same day that final sanding, buffing, and sweeping have been completed, apply a coat of wood paste filler. Apply stain if needed, then apply two coats of sealer.
 - 3.2.6.2 Natural Finish: When floors are dry apply two coats of wax.
 - 3.2.6.3 Varnish Finish: Apply 3 coats of floor varnish.
 - 3.2.6.4 Urethane Finish: Apply urethane finish to build a dry film thickness of 1.0 mil.

Softwood Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of softwood flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Douglas Fir Wood Strip Flooring, kiln-dried, vertical grain, complying with the requirements of WCLB for Grade C and better flooring.
 - 2.2 Southern Pine Wood Strip Flooring, kiln-dried, edge grain, complying with the requirements of SPIB for Grade C and better.
 - 2.3 Matching: Tongued and grooved, and end matched.
 - 2.4 Pressure Treatment: Where flooring is exposed to the exterior, provide AWPB LP-2 pressure treatment after manufacture of flooring, followed by drying to required moisture content.
- 3.0 EXECUTION:
 - 3.1 Plank Flooring: For strip flooring of face width over 3-1/4 inches (plank flooring), install two counter-set nails at each end of each piece and spaced not more than 32 inches along length of

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each piece. Fill holes with matching wood filler.

- 3.2 Treated Wood: Whenever treated wood flooring must be cut for installation, treat the cut with the preservative used in the original treatment immediately after cutting.

Resilient Flooring: Cementitious Underlayment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious underlayment for resilient flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Cementitious underlayment shall be one of the following factory-mixed types.
 - 2.1 Magnesium Type: Mixture of sand, magnesium, cement, and/or gypsum. Add water before using.
 - 2.2 Latex Type: Mixture of sand, cement, and latex in dry form to which water is added on the job, or two component type in which latex is added as a liquid on job.
 - 2.3 Polyvinyl Acetate Type: Polyvinyl acetate resins, cement, gypsum, and sand mixtures.
 - 2.4 Epoxy Type: Two-component epoxy type that merely requires mixing of the two parts in compliance with manufacturer's instructions.
 - 2.5 Oxychloride Type: Mixture with cement and with or without magnesium.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 On wood subfloors, lay 15-pound saturated felt in opposite direction to floor boards. Lap edges three inches.
 - 3.1.2 Place metal lath nailed at 6-inch centers over felt.
 - 3.2 Installation:
 - 3.2.1 Install cementitious underlayment in strict compliance with instructions for the type of system used.
 - 3.2.2 Where feather edges less than 1/4 inch thick are required, use a latex type underlayment for such thin parts of the underlayment.
 - 3.2.3 On concrete surfaces apply latex or polyvinyl acetate liquid as a bonding agent before installing underlayment.

Resilient Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of resilient flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Critical Radiant Flux: Resilient flooring material shall have an average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with NFPA 253.
 - 2.2 Resilient Tile Flooring:
 - 2.2.1 Asphalt Tile: Fed. Spec. SS-T-312, Type I, 9 inches by 9 inches by 1/8 inch thick.
 - 2.2.2 Homogeneous Vinyl Tile: Fed. Spec. SS-T-312, Type III, 12 inches by 12 inches by 1/8 inch thick.
 - 2.2.3 Rubber Tile: Fed. Spec. SS-T-312, Type II, 12 inches by 12 inches by 1/8 inch thick.
 - 2.3 Resilient Sheet Flooring:
 - 2.3.1 Sheet Vinyl Flooring: Fed. Spec. L-F-475, Type II, Grade A, thickness 0.085 inch, with organic backing, not less than 72 inches wide.
 - 2.3.2 Sheet Rubber Flooring: Solid, integrally colored, 36-inch wide; thickness 1/8 inch.
 - 2.4 Base: Provide base complying with Fed. Spec. SS-W-40, either Type I rubber or Type II vinyl with matching end stops and preformed or molded corner units, with a 4 inch height, 1/8-inch gauge thickness, and standard top-set cove style.
 - 2.5 Resilient Stair Treads: Provide rubber or vinyl stair tread units, full tread width, not less than 1/8 inch at tapered end and 1/4 inch at nosing, with two abrasive strip inserts full width of treads, and curved nosings 1-1/2 inches high.
 - 2.5.1 Resilient Stair Base: Provide rubber or vinyl base, 7-inch cove type, for stair risers to match treads.

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- 2.5.2 Resilient Stringer Skirt: Cut to match riser and tread profile to meet wall base height.
- 2.6 Resilient edge strips shall be 1/8 inch thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, not less than 1 inch wide.
- 2.7 Metal edge strips shall be of width shown and of required thickness to protect exposed edge of resilient flooring. Provide units of maximum available length to minimize number of joints.
- 2.8 Adhesives:
 - 2.8.1 Asphalt Emulsion: Clay type, Fed. Spec. MMM-A-115, Class 1.
 - 2.8.2 Asphalt Emulsion: Chemical type, Fed. Spec. MMM-A-115, Class II.
 - 2.8.3 Asphalt: Cutback type, Fed. Spec. MMM-A-110.
 - 2.8.4 Adhesives (Cements): As recommended by flooring manufacturer to suit material and substrate conditions.
 - 2.8.5 Cove Base Adhesive: Resin base waterproof adhesive with high initial tack.
 - 2.8.6 Lining Felt Adhesive: Fed. Spec. MMM-A-137.
- 2.9 Concrete Slab Primer: Non-staining type.
- 2.10 Asphaltic Slab Primer: Fed. Spec. SS-A-701.
- 2.11 Wax: Fed. Spec. P-W-155.
- 2.12 Latex Underlayment: One-component or two-component factory mixed product containing powdered or liquid latex, cement, and other powders.
- 2.13 Smooth-Lining Felt:
 - 2.13.1 Semi-Saturated Felt: Designed for application with vinyl floor covering materials, minimum weight of 0.75 lbs./sq. yd.
 - 2.13.2 Asphalt Saturated Organic Felt: ASTM D 226, 15-pound plain.
- 2.14 Crack Filler: Type and brand recommended by floor covering manufacturer.
- 2.15 Hardboard: AHA A135.4, untempered type specially made for use as underlayment, 3/16 inch or 1/4 inch thick.
- 2.16 Plywood: DOC PS 1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA," 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.
- 2.17 Nails: Fed. Spec. FF-N-105, annular, screw, or ring type.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Concrete Floor Surfaces: Fill large cracks and holes in concrete structural floor slabs with one part nonshrinking cement to three part sand grout with a latex or epoxy additive. Level floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.
 - 3.1.2 Wood Floor Surfaces: Fill knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch in diameter with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planed, scraped, or sanded smooth. Nail heads shall be set. Renail wood underlayment and subfloors where loose using annular or ring type coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials with new exterior grade plywood of equivalent thickness.
 - 3.2 Installation:
 - 3.2.1 Environmental Conditions: Spaces in which flooring work is to be performed shall be maintained between 70 F and 90 F at the floor level for at least 48 hours prior to starting the work, during the time work is performed, and for at least 48 hours after the work is completed. A minimum temperature of 55 F shall be maintained thereafter. Adequate ventilation shall be provided to remove moisture and fumes from the area.
 - 3.2.2 Lay Tile From Center Marks established with principal walls, discounting minor offsets, so that tiles at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise indicated.

Fluid-applied Resilient Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied resilient flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product

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manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Polyurethane Elastomer Flooring:

2.1.1 Polyurethane elastomer flooring shall be a poured-in-place urethane recreational type flooring surface system composed of a two-part urethane component system. Components shall be blended and poured as a liquid onto a prepared base. Primer material to provide adhesion of the polyurethane to the base shall be as recommended by the flooring manufacturer. Line paints shall be polyurethane. Flooring color, thickness, durometer hardness, and painted lines shall be as required.

2.1.2 Physical Properties: Material weight shall be approximately 0.83 pound per square foot per 1/8-inch thickness. Tensile strength shall be 200-600 psi in accordance with ASTM D 412. Hardness range shall be 55-65 Shore A-2 in accordance with ASTM D 2240. Elongation shall be limited to 150-350 percent in accordance with ASTM D 412. Compression set shall be 90 percent immediate recovery after 72 hours at 50 percent compression at 72 F in accordance with ASTM D 395. The material shall provide complete resistance to fungus.

3.0 EXECUTION: Base surface preparation shall be in strict accordance with polyurethane flooring manufacturer's recommendations. Cracks and construction joints shall be filled flush with materials recommended by the manufacturer.

Conductive Vinyl Tile Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive vinyl tile flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Certificate of Conductance: Submit one copy of certificate signed by the Contractor, stating: "Conductive floors were tested by method prescribed in ANSI/UL 779 and were found to have a resistance of less than 1,000,000 ohms and greater than 25,000 ohms."

2.2 Conductive Vinyl Tile: Floor covering shall be of solid, un laminated construction, manufactured from highest grade materials, with surface smooth, and free from foreign matter. Tile shall be resistant to the action of acids and other materials normally encountered in operating rooms. Tile shall comply with Fed. Spec. SS-T-312, Type III and shall be listed by Underwriters' Laboratories, Inc. Elements of tile shall be so proportioned that the electrically conductive components will not be more than 1/4 inch apart on the top surface. The tile flooring shall have an average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with NFPA 253.

2.2.1 Tile Size: 1/8 inch by 12 inch by 12 inch tiles, micro- squared to ensure tight joints.

2.2.2 Slab Size: 1/8 inch by 36 inch by 36 inch slabs.

2.3 Conductive Adhesive: A two-part chemically setting, water- resisting, epoxy adhesive specially formulated for installing conductive vinyl tile. Adhesive shall form a conductive field under tile without use of copper foil strips.

2.4 Epoxy caulking cement used to seal the perimeter joint shall be a material recommended by the manufacturer of the flooring.

3.0 EXECUTION:

3.1 Conductive tile shall be installed by experienced mechanics under the supervision of factory-approved personnel. Install with conductive adhesive. Complete electrical grounding in compliance with the manufacturer's instructions.

3.2 Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise directed.

3.3 Cleaning: Three days after installation, conductive vinyl tile flooring shall be cleaned thoroughly. Do not apply wax to conductive flooring.

3.4 Testing: After completion of installation, conductive vinyl tile floors shall be tested by qualified

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technicians employed by the Contractor. Test shall be done in presence of the Authorized Member Representative. Testing procedure shall comply with ANSI/UL 779.

Carpeting

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of carpeting. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Carpet Cushions:
 - 2.1.1 Rubberized Fiber-Hair Cushion: Burlap fabric reinforcing between top and bottom feltings of blended India jute fiber and new animal hair, less than 90 percent fiber and more than 10 percent hair, 5 oz/sq yd or more of rubberized coating on top surface and on bottom surface complying with Fed. Spec. DDD-C-001023, Type II. Weight shall be 39 oz/sq yd.
 - 2.1.2 Ripple-Type Rubber: Sponge or foam rubber, molded with a rippled or waffled bottom surface, with an adhered top reinforcement of burlap or other fabric complying with Fed. Spec. ZZ-C-00811, Type I, Class 1 (firm), 1/4 inch thick.
 - 2.1.3 High-Density Foam: Open-cell, homogenized latex-rubber, compounded for maximum moisture and aging resistance with ash and filler content not exceeding 50 percent, skinned-over on bottom surface, reinforced on top surface with an adhered fabric. Waffle pattern shall comply with Fed. Spec. ZZ-C-00811, Type I, Class 1, 1/4 inch thick.
 - 2.1.4 Rebonded Polyurethane: Manufacturer's standard formulation of polyurethane foam and binders, to produce a flat carpet cushion complying with Fed. Spec. L-C-001676, Class I, 3/8 inch thick.
 - 2.2 Carpet:
 - 2.2.1 Carpet Fiber (Filament) and Yarn: Fed. Spec. DDD-C-95.
 - 2.2.1.1 Wool: Natural, long staple, virgin wool carpet fiber, not less than 97 percent pure; permanently treated for resistance to insects and mildew.
 - 2.2.1.2 Continuous Hollow Nylon: Continuous multiple hollow-core filament, of manufacturer's standard denier, texturized or crimped for "bulk", delustered with maximum of 15 percent delustrant.
 - 2.2.1.3 Continuous Multilobal Nylon: Continuous nylon filament, of approximately 18 denier, in tri-lobal or similar cross section (not round or ovular), texturized for "bulk."
 - 2.2.1.4 Continuous Round Nylon: Continuous round nylon filament, of not less than 15 denier, texturized or crimped for "bulk," delustered with maximum of 15 percent delustrant.
 - 2.2.1.5 Continuous Nylon: Continuous nylon filament of type recommended by carpet manufacturer, approximately 15 denier, texturized or crimped for "bulk," delustered.
 - 2.2.1.6 Staple Nylon: Long staple (approximately 7 inches) nylon fiber, of varying denier and crimp to resemble natural wool, delustered.
 - 2.2.1.7 Acrylic: Long staple (approximately 7 inches) acrylic fiber, of not less than 15 denier average, crimped to increase "bulk."
 - 2.2.1.8 Modacrylic: Long staple (approximately 7 inches) modified acrylic fiber, modified to increase melting temperature, of not less than 15 denier average, crimped to increase "bulk."
 - 2.2.1.9 Bi-Component Acrylic: Long staple (approximately 7 inches) 2-component acrylic fiber with differential shrinkage characteristic, which imparts spiral crimp for very high "bulk."
 - 2.2.1.10 Polypropylene: Continuous polypropylene (olefin) filament, of 15 denier minimum, textured for "bulk."
 - 2.2.1.11 High-Denier Polypropylene: Continuous filament or long staple polypropylene (olefin) fiber, of 75 denier minimum, textured for bulk, produced specifically for felted or needle punched construction of carpet.
 - 2.2.1.12 Polyester: Long staple (approximately 7 inches) fiber, of 15 denier minimum, textured for "bulk," specifically compounded for high stain resistance.
 - 2.2.1.13 Nylon-Reinforced Vinyl: Continuous filament nylon thread, coated with vinyl to form a carpet yarn, produced specifically for woven (non-pile) carpet construction.
 - 2.2.1.14 Stain-Resistant Polyester: Long staple (approximately 7 inches) fiber, of 15 denier minimum, unless otherwise indicated, textured for "bulk," specifically compounded for high stain resistance.

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- 2.2.1.15 Destatic Fiber: Metallic carpet fiber, of stainless steel, aluminum, or other metal, either coated or plain, proven by test of round nylon filament pile carpet to be effective in controlling the static buildup in persons to below 3,000 volts when used in one of the following blends of fiber with ambient condition of 20 percent relative humidity and 70 F temperature, with oak-tanned, leather-soled shoes: a. 0.33 percent of stainless steel filament. b. 3.0 percent blend of plastic coated aluminum filament.
- 2.2.1.16 Pile Yarn, General: Provide yarn spun in manner recommended by yarn manufacturer and carpet manufacturer.
- 2.2.2 Carpet Construction:
 - 2.2.2.1 General: Fabricate carpet by the construction method used in manufacturer's standard process.
 - 2.2.2.2 Pile Density; Pitch and Rows: Fabricate carpet with the spacing of tufts both ways, uniformly spaced by manufacturer's standard method.
 - 2.2.2.3 Variation of Yarn and Density: Wherever the texture or pattern of the completed carpet is not affected and also wherever the effect produced is acceptable to the Authorized Member Representative, the carpet manufacturer may (at his option) vary both the denier of the yarn and the density of the tufts, provided the product of the two remains constant and equal to the product of yarn denier and tuft density indicated (equal density factor maintained.)
 - 2.2.2.4 Pile Height: Provide pile height as designated.
 - 2.2.2.5 Primary Backing for Tufting: Provide manufacturer's standard backing material, but not less than one of the following:
 - 2.2.2.5.1 Polypropylene: Woven polypropylene fabric weighing not less than 3.2 oz/sq yd.
 - 2.2.2.5.2 Plastic Fabric: A non-woven fabric of 75 percent polypropylene fibers and 25 percent other plastic fibers, weighing not less than 4.0 oz/sq yd.
 - 2.2.2.5.3 Jute: Woven jute fabric, weighing not less than 9.0 oz/sq yd.
 - 2.2.2.6 Adhesive Binding for Tufting: Provide manufacturer's standard liquid latex or other resinous coating as required to produce the tuft bind strength indicated, but not less than 20 oz coating/sq yd.
 - 2.2.2.7 Backing for Woven Carpet: Provide manufacturer's standard shot (weft), chain (warp), filler, and stuffer yarns, of jute, Kraft cord, cotton, or synthetic fibers. Provide the number of yarns per row or pitch of pile as indicated or, if not indicated, provide manufacturer's standard arrangement as needed for strength and to make up the required carpet weight, but provide not less than 2 shot yarns (3 Axminster) and double chain yarn. Provide woven-through-the-back construction.
 - 2.2.2.8 Back Coating for Woven Carpet: Provide manufacturer's standard liquid latex or other resinous coating, but not less than 10 oz/sq yd.
 - 2.2.2.9 Backing for Knitted Carpet: Provide manufacturer's standard chain (warp) yarns of cotton or synthetic fibers and filler yarns of jute or Kraft cord. Provide the number of yarns per row or pitch as indicated or, if not indicated, provide manufacturer's standard arrangement as needed for strength and to make up the required carpet weight, but not less than double chain yarns and double overlapping filler yarns.
 - 2.2.2.10 Back Coating for Knitted Carpet: Liquid latex or other resinous coating, shall be more than 14 oz/sq yd.
 - 2.2.2.11 Backing for Fusion-Bonded Carpet: Provide manufacturer's standard jute or synthetic fabric backing with latex or vinyl plastic coating for fusion-bonding of face pile.
 - 2.2.2.12 Backing for Needle-punched Carpet: Type and weight designated or, if not designated, manufacturer's standard backing fabric produced specifically for needle-punching and felting of staple fibers to produce carpet, complying with Fed. Spec. DDD-C-001173 for construction of needle-punched carpet.
 - 2.2.2.13 Secondary Fabric Backing: Provide, as a minimum, 8-ounce burlap or jute fabric, laminated to carpet with liquid latex adhesive, to achieve a stripping bond of not less than 2.0 lbs in. (Fed. Std. 191).
- 2.2.3 Dyeing Method: Carpet shall meet the requirements of both the wet-method color fastness rating of "Good" or better, per Fed. Spec. DDD-C-95, evaluated by Method 5610 of Fed. Std. 191 and the fade resistance established by the Association of Textile Chemists and Colorists for carpet when tested on the Atlas Fadeometer for the number of hours indicated. If method of dyeing and fade

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- resistance are not indicated, use manufacturer's standard method, as needed to achieve a fade resistance of 40 hours.
- 2.2.4 Flame Spread: Carpet shall comply to UL 992 flame propagation index of less than 4.0 and Fed. Std 372, minimum average critical radiant flux of 0.50 watts per square centimeter. Carpet shall pass the methamine tablet test per DOC-FF-1-70 (pill test).
- 2.3 Bonded Cushion Carpet:
- 2.3.1 High Density Foam Backing: Open-cell homogenized latex-rubber compound for maximum moisture and aging resistance, with ash or filler content not exceeding 50 percent, skinned-over on exposed surface, complying with Fed. Spec. DDD-C-95, Class I, 38 oz/sq yd, 1/8 inch thick. Compression resistance shall be 5 pounds minimum. Compression set shall be 15 percent maximum. Provide special formulation, tested with carpet for flame spread rating of less than 75 when by the tunnel test of ASTM E 84, or flame propagation index of less than 4.0 when tested by the UL chamber test, UL 992. Carpeting and cushion shall be tested together.
- 2.3.2 Primary Backing: Polypropylene weighing 3.5 oz/sq yd minimum.
- 2.3.3 Bonded Cushion Backing: Provide cushion bonded to carpet to achieve a stripping bond of not less than 2.0 lbs/in (Fed. Std. 191A), either cured-in-place or laminated sheet stock. At manufacturer's option, back coating used as tuft binding may be decreased or eliminated with the use of cured-in-place backing, provided required tuft bind strength is achieved.
- 2.4 Adhesive for Carpet: Waterproof, release type adhesive as recommended by the carpet manufacturer or cushion manufacturer. Provide adhesive that complies with flame spread rating required for the carpet installation, if any.
- 2.5 Adhesive for Seams: Waterproof, nonstaining adhesive furnished or recommended by the carpet manufacturer that complies with flame spread rating required for the carpet.
- 2.6 Carpet Edge Guard: Bend-down type of formed or extruded aluminum carpet edge guard stripping. Form units with concealed teeth to grip the carpet from below.
- 2.7 Tackless Carpet Stripping: Water-resistant plywood stripping, with angular pins protruding from the top. Provide stripping with 2 rows of pins wherever the carpet width is less than 20 feet and with 3 rows of pins wherever carpet width is 20 feet or more. Provide prenailed stripping, ready for anchorage to concrete or similar substrate.
- 2.8 Tape:
- 2.8.1 Cushion Tape: Singel Face cloth, 2 inches wide.
- 2.8.2 Carpet Tape: Double-face cloth, 2 inches wide.
- 2.8.3 Seam Tape: Paperback, for latex sewing, 4 inches wide.
- 2.8.4 Seam Tape: Heat bonding, 4 inches wide.
- 2.9 Seam Thread: No. 18 waxed linen.
- 2.10 Masonry Nails: No. 9 (0.148 inch x 1 inch) hardened masonry nails, Fed. Spec. FF-N-105.
- 2.11 Latex Underlayment: One- or two-component, factory-mixed product containing powdered or liquid latex, cement, and other powders.
- 2.12 Crack Filler: Type and brand recommended by carpeting manufacturer.
- 2.13 Hardboard: AHA A135.4, untempered type specially made for use as underlayment, 3/16 inch or 1/4 inch thick.
- 2.14 Plywood: DOC PS 1, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA", 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.
- 2.15 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Fill large cracks and holes in concrete structural floor slabs with a one-part, nonshrinking cement to three-part sand grout with a latex or epoxy additive. All ridges or other uneven surfaces shall be ground smooth; chalky or dusty surfaces shall be primed.
- 3.1.2 Level floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.
- 3.1.3 Wood Floor Surfaces: Knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch in diameter shall be filled with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planed, scraped, or sanded smooth.
- 3.1.4 Wood underlayment and subfloors shall be renailed where loose.

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- 3.1.5 Rotted, broken or otherwise unsatisfactory wood subflooring and all other defective materials shall be removed and replaced with new.
- 3.1.6 Undercut wood door bottoms as required to allow clear door swing over newly carpeted areas.
- 3.2 Installation:
 - 3.2.1 Install carpet edge guard at every location where edge of carpet is exposed to traffic, except where another device, such as an expansion joint cover system or threshold, is indicated with an integral carpet binder bar.
 - 3.2.2 Installation On Stairs: Install carpet by nailing or other secure method recognized to be durable and safe for traffic on stairs. Conceal edges. Avoid seams at points of high wear (nosings and treads). Cushion on stairs shall be twice the thickness of cushions on floor.

Magnesium Oxychloride Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of magnesium oxychloride flooring and base. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Magnesium Oxychloride Composition: Manufacturer's standard product shall comply with Mil. Spec. MIL-D-16680. Color to be used will be selected by the Authorized Member Representative from manufacturer's standard colors.
 - 2.1.1 Mixing Solution: Magnesium chloride flake in a 22 degree Baume solution.
 - 2.1.2 Physical Properties when tested in compliance with Mil. Spec. MIL-D-16680:
Fire Resistance: Incombustible
Water Absorption: Less than 7 percent
Abrasion Resistance: 0.072 inch
Impact Resistance: 0.031 inch; no chipping, crackling or detachment.
 - 2.2 Saturated Felt: ASTM D 250, 15-pound type.
 - 2.3 Expanded Metal Lath: Fed. Spec. QQ-L-101, diamond mesh pattern, expanded copper alloy steel, weighing 3.4 pounds per square yard.
 - 2.4 Bonding Agent: Trowel-applied bonding medium made by manufacturer of magnesium chloride.
- 3.0 EXECUTION:
 - 3.1 Environmental Conditions: Installation shall not be started unless ambient temperature of area in which the work occurs is at least 50 F and rising and is maintained above 50 F without interruption while the work is being done and for at least three days after the completion of the work.
 - 3.2 Preparation:
 - 3.2.1 Concrete floors shall be clean and free from all grease, dirt, paint, and all other foreign matter and shall be completely dry prior to flooring installation.
 - 3.2.2 Wood Floors shall be structurally sound, firmly nailed, free of vibration, and broom clean. Lay felt over wood in opposite direction to joints in wood and overlap edges 3 inches.
 - 3.3 Installation: Apply flooring and base to a uniform 1/2-inch thickness and steel-trowel to a uniform smooth density. Where cover base is installed over wood, trowel material on metal lath. Light traffic may be permitted 24 hours after installation and heavy traffic after 3 to 5 days.

Epoxy Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of epoxy flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: Component materials for any one flooring type shall be from a single manufacturer. Cove bases of flooring material shall be provided if required.
 - 2.2 Epoxy quartz chip flooring shall be decorative floor surfacing system consisting of primer; topping including epoxy resin, hardener, and ceramic-coated quartz aggregate; and finish coat or coats.

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Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,800 psi (ASTM C 579), a flexural strength of 6,000 psi (ASTM C 580), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.06 percent (ASTM C 413). Tests of chemical resistance of cured resin, when immersed for 7 days in reagents, shall show no effect from ammonium hydroxide, carbon tetrachloride, citric acid, dimethyl formamide, formaldehyde (3 percent), heavy-duty detergent, heptane, hydrogen peroxide (28 percent), lactic acid, oleic acid, phenol solution, sodium carbonate (20 percent), sodium chloride (10 percent), sodium hydroxide (60 percent), sodium hypochlorite, sulfuric acid (30 percent), and urine.

- 2.3 Epoxy flooring shall be industrial floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Physical properties of topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 7,500 psi (ASTM C 579), a tensile strength of 1,750 psi (ASTM C 307), a flexural strength of 3,000 psi (ASTM D 790), and a maximum thermal coefficient of linear expansion of 20 by 10⁻⁶ in/in/degrees F (ASTM D 696). The extent of burning shall be 0.25 inches maximum (ASTM D 635). Minimum bond strength shall be 200 psi, with 100 percent concrete failure (ACI 503, Appendix A). Abrasive resistance shall be 0.20 grams maximum (ASTM D 1044, 1,000 Grams, 1,000 Cycles). Impact strength, except topping bonded to concrete, shall be 0.05, with no chipping, cracking, or detachment of surfacing from concrete (MIL-D-3134, Para. 4.7.3). Tests of chemical resistance of cured resin when immersed 7 days in reagents, shall show no effect from acetic acid (5 percent), ammonium hydroxide (10 percent), citric acid (50 percent), cola syrup, fatty acid, motor oil (20W), hydrochloric acid (10 percent), salt water, sodium hydroxide (10 percent), sulfuric acid (10 percent), trisodium phosphate (5 percent), and water (distilled). There shall be only slight softening from ethyl alcohol (95 percent), jet fuel JP-4C, and mineral spirits. There shall be no effect but slight stain from nitric acid (10 percent).
- 2.4 Chemical-resistant epoxy flooring shall be chemical-resistant floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,500 psi (ASTM C 579), a flexural strength of 2,080 psi (ASTM C 580), an impact strength of 120 in. lbs (ASTM D 2794), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.04 percent (ASTM C 413). Tests of chemical resistance of cured floor surfacing system, when immersed for 7 days in reagents listed, shall show no effect from acetic acid (100 percent), chromic acid (10 percent), citric acid (20 percent), formaldehyde (37 percent), heavy-duty detergent, hydrochloric acid (37 percent), hydrogen peroxide (28 percent), lactic acid (85 percent), mineral spirits, nitric acid (40 percent), oleic acid, oxalic acid (10 percent), phosphoric acid (85 percent), potassium hydroxide (50 percent), sulfuric acid (75 percent), tannic acid (20 percent), tartaric acid (10 percent), and urine.
- 2.5 Epoxy terrazzo flooring shall be decorative floor surfacing consisting of primer, thermosetting epoxy resin matrix, decorative mineral aggregate, epoxy grout, and sealer. Heavy brass, 1/4-inch divider strips, and expansion joints shall also be provided as required. Materials shall conform to applicable National Terrazzo and Mosaic Association (NTMA) publications. Flooring, when tested in accordance with the standards, shall show no toxicity. Epoxy terrazzo flooring shall be self-extinguishing when tested in compliance with ASTM D 635.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Concrete surfaces shall comply with ASTM C 811 unless otherwise indicated or required by manufacturers' instructions.
 - 3.1.2 Wood floors shall have contaminants removed by sanding, solvent cleaning, detergent cleaning, or other methods as required.
 - 3.1.3 Primer shall be applied over prepared substrate.
 - 3.2 Installation:
 - 3.2.1 Epoxy quartz chip flooring, epoxy flooring and chemical-resistant epoxy flooring shall have a topping mix of aggregates and/or fillers trowel-applied to the following thicknesses:
 - a. Epoxy quartz chip flooring: 1/4 inch.

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- b. Epoxy flooring: 3/16 inch.
 - c. Chemical-resistant epoxy flooring: 1/4 inch.
- Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations indicated to form base with cove of radius and height designated. All interior and external corners of base shall be rounded.
- 3.2.2 Epoxy terrazzo flooring shall be applied according to NTMA recommendations and as follows. A 1/4-inch thick aggregate/filler topping mix and recommended curing compound shall be applied and the surface shall then be ground, rinsed, grouted, and reground. Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations designated to form base with cove of radius and height indicated. All interior and external corners of base shall be rounded.

Conductive Elastomeric Liquid Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive elastomeric liquid flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Carbon black shall comply with ASTM D 561.
 - 2.2 Acrylic/urethane shall be water dispersed acrylic resin mixed with dry components and aggregates. Material shall comply with Mil. Spec. MIL-D-3134. Factory pre-mixed with carbon black.
 - 2.3 Acrylic shall be modified high strength acrylic resin mixed with dry component powders with tensile strength of 4,890 psi, bond strength of 290 psi, and flexural strength of 1,650 psi, minimums, complying with Mil. Spec. MIL-D-3134.
 - 2.4 Neoprene rubber shall be water-phase neoprene rubber composition complying with NTMA Specifications, with tensile strength of 245 psi, bond strength to concrete of 255 psi, and compressive strength of 2,600 psi, minimums.
 - 2.5 Latex shall be specially formulated, emulsion resin mixed with dehydrated powders. Comply with Paragraphs 3.4 through 3.22 of Mil. Spec. MIL-D-3134, except Paragraph 3.7 shall not apply.
 - 2.6 Epoxy emulsion shall be 100 percent non-volatile, thermosetting, two-part epoxy resin matrix with tensile strength of 4,000 psi, bond strength of 200 psi, and compressive strength of 14,000 psi.
 - 2.6.1 Water-emulsified epoxy resin shall have the following characteristics:
 - Viscosity: 180 centipoises at 25 C.
 - Specific weight: 9.2 pounds per gallon.
 - Color: opaque white.
 - Solids (minimum): 59 percent.
 - Stable after five freeze-thaw cycles.
 - 2.6.2 Water emulsified hardener shall have the following characteristics:
 - Viscosity: 160-190 centipoises at 50 C.
 - Specific weight: 8.6 pounds per gallon.
 - Solids (minimum): 75.0 percent.
 - Stable after five freeze-thaw cycles.
 - 2.7 Polyacrylate: A polyacrylate hydraulic cement copolymer and dry coreactant composite shall comply with requirements of Mil. Spec. MIL-D-3134.
 - 2.8 Polyester: Thermosetting polyester topping resin, catalyst, and premixed fillers shall have tensile strength of 5,000 psi, compressive strength of 14,000 psi, and bond strength of 200 psi, minimums.
 - 2.9 Fillers: Inert mineral or cellulosic material best suited for the resin binders shall be used. Filler in quantity necessary to impart required physical characteristics shall be furnished with particle size not greater than 3/16 inch in any dimension and shall contain sufficient fines to provide an even-textured, nonslip type of surface on the finished topping.
 - 2.10 Primer shall be material that will penetrate into pores of substrate. Primer shall bond with topping to form a permanent monolithic bond between the substrate and the topping.

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3.0 EXECUTION:

- 3.1 Environmental Conditions: Elastomeric liquid flooring installation shall not be started unless ambient temperature of area in which the work occurs is at least 50 F. and rising, and is maintained above 50 F. without interruption while the work is being done and for at least three days after the completion of the work.
- 3.2 Installation Over Wood Floors: Renail wood subfloors where loose, using annular or ring type zinc-coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials.
- 3.3 Installation Over Concrete Floors: Roughen surfaces that are glossy, painted, or have loose surface material. Fill large cracks and holes.
- 3.4 Cleaning: Thoroughly clean all surfaces to receive flooring to remove all grease, oil, wax, dirt, dust, and other foreign matter.
- 3.5 Topping: Install topping 1/8 inch thick for epoxy type and 1/8 to 3/8 inch thick for other types.
- 3.6 Bases shall be cover type cast-in-place with 1-inch radius cove and shall be 6 inches high.
- 3.7 Finish or sealer coat shall be applied.
- 3.8 Testing: After completion of installation, test conductive floors. Test must prove that conductive floors comply with all requirements of ANSI/UL 779.

Heavy-duty Concrete Floor Topping

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of heavy-duty concrete floor topping. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Portland cement: Comply with ASTM C 150, Type I or Type III.
 - 2.2 Aggregate: Selected, clean, hard, and tough material, either crushed or natural, as approved by the Authorized Member Representative. Trap rock, granite, quartz, corundum, or manufactured products such as silicon carbide or heat-treated aluminum oxides are acceptable. They shall comply, in all respects except gradation, with ASTM C 33.
 - 2.3 Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.
- 3.0 EXECUTION:
 - 3.1 Preparation: Roughen surfaces of present concrete that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.
 - 3.2 Installation: Nominal mixture shall be one part of Portland cement, one part of fine aggregate, and two parts of coarse aggregate by volume. Not more than four gallons of mixing water shall be used for each bag of Portland cement in the mixture. Mixing of concrete shall continue for at least one minute after all ingredients are in mixer.

Brick Flooring

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brick flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Brick Materials:
 - 2.1.1 Light Traffic Paving Brick: ASTM C 902, Class SX, MX, or NX, Type I, II, or III, Application PS, PX, or PA.
 - 2.1.2 Chemical-Resistant Brick: Solid brick, ASTM C 279, Type H or L.
 - 2.1.3 Industrial Floor Brick: Solid brick, ASTM C 410, Type T, H, M, or L.
 - 2.1.4 Base: Matching base shall be provided at walls and vertical elements, including stretcher units, internal and external corners, stops, and other locations as required. Type shall be square-top

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- cove, round-top cove, or turn-up base.
- 2.1.5 Lining units shall be brick units matching floor brick for lining pits and trenches and for curbs and pads occurring in floor brick field. Provide special trim shapes for continuous coverage of substrates.
- 2.1.6 Temporary Coating: Wax shall be compatible with cleaning method required to remove wax without damage to grout or brick.
- 2.2 Setting Materials:
 - 2.2.1 Mortarless Applications:
 - 2.2.1.1 Roofing Felt: ASTM D 226, 15-pound asphalt-saturated felt.
 - 2.2.1.2 Fine Aggregate for Setting Bed: ASTM C 144 or stone screenings.
 - 2.2.1.3 Sand for Joints: ASTM C 144, free of clay particles. •09750
 - 2.2.2 Portland cement Applications:
 - 2.2.2.1 Portland cement: ASTM C 150, Type I, natural color or white, to produce the required color of mortar or grout.
 - 2.2.2.2 Aggregate: ASTM C 144 or C 404, or both.
 - 2.2.2.3 Liquid Admixture for Setting Bed and Grout: Liquid latex mortar additive with a compressive strength of 3,000 psi, bond strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at an ozone concentration of 200 pphm and water absorption of 4 percent maximum.
 - 2.2.2.4 Bond Coat Admixture: High strength liquid latex mortar additive with a compressive strength of 5,000 psi, bond strength of 500 psi, tensile strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at 200 pphm, and water absorption of 4 percent maximum.
 - 2.2.2.5 Pigments: Commercial iron oxide, manganese dioxide, ultra-marine blue, chromium oxide, or carbon black, suitably compounded for use in mortar mixes.
 - 2.2.2.6 Water: Clean and free of deleterious materials that would impair strength or bond.
 - 2.2.3 Chemical-Resistant Mortar and Grout:
 - 2.2.3.1 Sulfur Mortar: ASTM C 287, with silica or carbon filler.
 - 2.2.3.2 Resin Mortar: Liquid resin and filler material shall comply with ASTM C 395. Resin shall be phenolic, furan, polyester, epoxy, or vinylester. Filler shall be silica or carbon.
 - 2.2.3.3 Resin Grout: ASTM C 658, epoxy or furan.
 - 2.2.3.4 Chemical-Resistant Membrane: Multiple component asphaltic system consisting of asphalt primer and bituminous-coated glass fiber cloth embedded in hot-melt asphalt compound.
 - 2.2.3.5 Expansion Joint Filler: Elastomeric sealant of type recommended and produced by mortar/grout manufacturer for type of application indicated. Include primer and backer rod where required.
 - 2.2.4 Miscellaneous Materials:
 - 2.2.4.1 Cleavage Membrane: 15-pound asphaltic felt, ASTM D 226, Type I, or 4-mil polyethylene sheeting, ASTM C 171.
 - 2.2.4.2 Setting Bed Reinforcement: 2 inches by 2 inches, 16/16, welded wire fabric.
 - 2.2.4.3 Sealer: Phenolic type or acrylic base non-slip material.
- 3.0 EXECUTION:
 - 3.1 Expansion and Control Joints: Provide sealant-filled joints at locations and widths required. Install expansion joint filler where sealant type joints are required in chemical-resistant flooring.
 - 3.2 Ungrouted Mortarless Brick Flooring:
 - 3.2.1 Cushioning Material: Install roofing felt, two layers with edges butted to achieve uniform thickness, and fine aggregate setting bed screeded to depth required.
 - 3.2.2 Lay bricks and fill joints with sand. After all bricks are in place and all joints are filled, remove excess sand.
 - 3.3 Latex-Modified Portland cement Applications:
 - 3.3.1 Apply cement slush coat not to exceed 1/16 inch thickness.
 - 3.3.2 Mix Portland cement, sand, and liquid admixture.
 - 3.3.3 Spread and screed setting bed to uniform thickness at sub grade elevations required.
 - 3.3.4 Place brick before initial set of cement occurs. Tamp and beat bricks to obtain full contact with setting bed.
 - 3.3.5 Grout joints as soon as possible after initial set of setting bed and cure grout.
 - 3.4 Chemical-resistant sulfur mortar applications shall comply with ASTM C 287 unless otherwise

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directed.

3.5 Chemical-Resistant Resin Mortar Applications:

3.5.1 Bricklaying: Except as otherwise directed, bricklaying shall comply with ASTM C 399.

3.5.2 Tile Setting: Except as otherwise directed, tile setting shall comply with ANSI/ASTM C 723.

3.5.3 Chemical-Resistant Membrane: Provide chemical-resistant asphaltic membrane system over concrete substrates under chemical-resistant mortar applications where directed.

3.5.4 Set Bricks on Vertical Surfaces in compliance with ASTM C 399, using either resin mortar or sulfur as bed joint material, as required.

3.6 Chemical-Resistant Cement Mortar and Resin Grout Applications:

3.6.1 Application of brick in hydraulic cement mortar setting bed shall comply with ASTM C 398. Grouting joints with resin grout shall comply with ASTM C 723, unless otherwise directed.

3.6.2 Install cleavage membrane as required.

3.6.3 Reinforce setting bed with welded wire fabric as required.

Light-duty Brick Flooring

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of light-duty brick flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Floor Brick (Brick Pavers): ASTM C 62, Grade SW, solid uncured brick, 1-1/4 inches thick by 3-1/4 inches by 8 inches.

2.2 Paving Brick: ASTM C 902, solid uncured brick of size selected by the Authorized Member Representative.

2.3 Masonry Mortar: ASTM C 270, Type M.

2.4 Portland cement: ASTM C 150, Type I.

2.5 Aggregate for Masonry Mortar: ASTM C 144.

2.6 Hydrated Lime: ASTM C 207, Type S.

2.7 Aggregate for Cement Setting Beds: Sand as recommended in ASTM C 404.

2.8 Aggregate for Grout: Sand as recommended in ASTM C 404.

2.9 Pigments: Inert mineral oxides or carbon black.

2.10 Sand Setting Bed: ASTM C 33.

2.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives.

2.12 Cleavage Membrane: 15-pound asphalt felt or 4-mil polyethylene sheeting.

2.13 Setting Bed Reinforcement: 2-inch by 2-inch, 16/16, welded wire fabric, ASTM A 185.

3.0 EXECUTION:

3.1 General Requirements: Do not use brick with chips, cracks, voids, discolorations, and other defects. Cut brick shall have clean, sharp, unchipped edges. Use full units without cutting wherever possible. Set brick with uniform joints.

3.2 UngROUTED Applications: Place sand setting bed and compact by tamping. Set brick closely together, and sweep fine sand over surface to fill joint irregularities.

3.3 Portland cement Applications:

3.3.1 Preparation of Subbase: Clean subbase to remove dirt, dust, debris, and loose particles.

3.3.2 Install cleavage membrane and provide folded membrane material at overlapping edges to form lock joints.

3.3.3 Apply slush coat of cement grout over surface of concrete subbase about 15 minutes prior to placing setting bed.

3.3.4 Setting Bed: Mix one bag of Portland cement to 3 cu. ft. of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of brick. Install reinforcing mesh if over a wood substrate.

3.3.5 Wet brick several hours before laying. Do not lay bricks with free water on the surface.

3.3.6 Set brick before initial set of cement bed occurs. Do not set brick on dry bed. Set and level each brick immediately.

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- 3.3.7 Grout joints as soon as possible after initial set of setting bed. Force grout into joints, strike flush, and tool slightly concave.
- 3.3.8 Use Portland cement Grout mixed in the proportion of one bag of Portland cement to 2 cu. ft. of sand mixed with water to the consistency of heavy cream.
- 3.4 Masonry Mortar Applications:
 - 3.4.1 Mix mortar to comply with ASTM C 270 proportion specifications for Type "M" mortar.
 - 3.4.2 Install Brick in bed joints of mortar with vertical joints filled with mortar. Remove excess mortar promptly as the work progresses.
 - 3.4.3 Strike joints flush with top surface of brick and tool slightly concave.
- 3.5 Pointing: During the tooling of joints, enlarge voids or holes and completely fill with mortar or grout.
- 3.6 Cleaning: Remove excess mortar/grout from exposed brick surfaces, wash, and scrub clean. Rinse with clean water.
- 3.7 Sealing and Waxing: After cleaning, apply a neutral sealer to brick flooring, and when dry, apply a suitable floor wax recommended for brick floors.

Standard Floor Treatment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for standard floor treatments for terrazzo, ceramic tile, oxychloride, concrete, and resilient flooring. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cleaning Compound: A liquid chemical cleaner containing non-ionic and anionic type detergents, non-reactive to flooring. Compound shall have no free metal alkalis, no artificial coloring, and no fatty acids. Compound shall be UL listed as "slip-resistant."
 - 2.2 Stripper: An ammoniated stripper that will penetrate and loosen wax films without damaging flooring. Stripper shall be non-flammable and phosphate-free with a flash point of none to boiling.
 - 2.3 Wax: Water-emulsion type, self polishing, made from 100 percent No. 1 prime Carnuba wax, UL listed as "slip-resistant."
 - 2.4 Polish: Metal cross-linked copolymer, slip-resistant polish. Polish shall dry to clear gloss without buffing.
 - 2.5 Sealer: Penetrating type seal that will fill pores and leave a clear, hard, non-flaking, non-tracking finish. Sealer shall be UL listed as to slip resistance.
- 3.0 EXECUTION:
 - 3.1 Preparation and Installation:
 - 3.1.1 Terrazzo and Oxychloride Floors:
 - 3.1.1.1 Clean floors with a neutral liquid cleaner with pH factor as near seven as possible.
 - 3.1.1.2 Apply two coats of sealer, and buff with electric polishing machine.
 - 3.1.2 Ceramic Tile Floors: Scrub thoroughly using a neutral liquid cleaner, and apply one coat of penetrating sealer.
 - 3.1.3 Concrete Flooring:
 - 3.1.3.1 Scrub thoroughly using a neutral liquid cleaner. Apply stripper to remove stubborn grease, waxes, and polishes.
 - 3.1.3.2 When floor is clean and dry, apply two coats of penetrating sealer.
 - 3.1.4 Resilient Flooring:
 - 3.1.4.1 Scrub with a light solution of neutral chemical cleaner. Use a stripper to remove build-up of old wax and polishes. Rinse clean, and allow to dry.
 - 3.1.4.2 Apply two coats of wax and machine polish.

Floor Treatment: Non-slip Coatings on Concrete Floors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for non-slip coatings on concrete floors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance

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with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

- 2.0 PRODUCTS: A combination of pigmented two-part high solids urethane resin and a select gradation of sand shall be used. Color shall be selected from manufacturer's standard colors.
- 2.1 Tensile Strength and Elongation: Tensile strength shall be 580 psi, and elongation shall be 57 percent, all complying with ASTM D 412.
- 2.2 Water Absorption: Coatings shall not absorb water, in accordance with ASTM D 570.
- 2.3 Coefficient of friction shall comply with ASTM D 1894.
- 2.4 Abrasion resistance shall be ASTM D 1044 Taber Abraser, H-18 wheel, 1 kg load. Weight loss shall be 0.20 grams after 1,000 cycles.
- 2.5 Impact shall be by a 2-pound falling ball at 150 inch-pounds pressure, 0.05 inch maximum indentation with no cracking.
- 2.6 Chemical resistance shall be non-staining to most common chemicals, such as 10 percent acetic acid, 10 percent citric acid, 10 percent sodium hydroxide, and ethyl alcohol.
- 3.0 EXECUTION: Concrete floors shall be either acid etched or sand blasted. Surface to be coated shall be clean, dry, and free from surface contaminants.

Exterior Painting

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint to exterior surfaces. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Painting materials for the exterior surfaces indicated shall conform to the following Federal and Military Specifications:
 - 2.1 Concrete: TT-P-19 Paint, Acrylic Emulsion, Exterior
 - 2.2 Concrete Masonry Units: TT-F-1098 Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.). TT-P-19 Paint, Acrylic Emulsion, Exterior. TT-P-96 Paint, Latex Base, Exterior. TT-P-97 Paint, Styrene-Butadiene Solvent Type, White (for Exterior Masonry).
 - 2.3 Stucco: TT-F-1098 Filler, Block, Solvent- Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.). TT-P-19 Paint, Acrylic Emulsion, Exterior. TT-P-96 Paint, Latex Base, Exterior. TT-P-97 Paint, Styrene-Butadiene Solvent Type, White (for Exterior Masonry).
 - 2.4 Asbestos Cement: TT-P-19 Paint, Acrylic Emulsion, Exterior
 - 2.5 Wood, Unpainted: TT-P-001984 Primer Coating, Latex Base, Exterior (Undercoat for Wood), White and Tints. MIL-P-28582 Primer Coating, Exterior, Lead Pigment-Free (Undercoat for Wood, Ready-Mixed, White and Tints).
 - 2.6 Wood, Primed: TT-P-19 Paint, Acrylic Emulsion, Exterior. TT-P-31 Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown. TT-P-37 Paint, Alkyd Resin, Exterior Trim, Deep Colors. TT-P-102 Paint, Oil, Alkyd Modified, Exterior, White and Tints. TT-P-1510 Paint, Latex, Exterior, for Wood Surfaces, White and Tints
 - 2.7 Wood, Decks and Porches, Primed and Unpainted: TT-E-487 Enamel: Floor and Deck.
 - 2.8 Wood, to Receive Stain: TT-S-708 Stain, Oil; Semi-Transparent, Wood, Exterior. TT-S-001992 Stain, Latex, Exterior for Wood Surface.
 - 2.9 Concrete Walls and Floors of Swimming Pools: TT-P-95 Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces. 2.10 Ferrous Metals, Ungalvanized and Unpainted. TT-P-86 Paint, Red-Lead-Base, Ready-Mixed. TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type.
 - 2.11 Ferrous Metals, Galvanized but Unpainted: TT-P-641 Primer Coating: Zinc Dust-Zinc Oxide (for Galvanized Surfaces). MIL-P-26915 Primer Coating, Zinc Dust Pigmented, for Steel Surfaces.
 - 2.12 Ferrous Metals, Primed: TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces). TT-E-1593 Enamel, Silicone Alkyd Copolymer, Gloss (for Exterior and Interior Use). TT-P-31 Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown. TT-P-37 Paint, Alkyd Resin, Exterior Trim, Deep Colors. TT-P-38 Paint, Aluminum, Ready-Mixed. TT-P-102 Paint, Oil, Alkyd Modified, Exterior, White and Tints.
 - 2.13 Aluminum or Aluminum Alloy, Unpainted: TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type.

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- 2.14 Aluminum or Aluminum Alloy, Primed: TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces). TT-E-1593 Enamel, Silicone Alkyd Copolymer, Gloss (for Exterior and Interior Use).
- 3.0 EXECUTION:
- 3.1 Preparation:
 - 3.1.1 Concrete, Concrete Masonry Units and Stucco: Remove all glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of iron, and other foreign matter. Apply a filler to areas of irregular surface profile.
 - 3.1.2 Asbestos Cement: Remove stains with solvent. Do not wire brush.
 - 3.1.3 Wood: Clean off foreign matter. On seasoned knots, scrape, clean, and apply thin coat of knot sealer. Scrape off or remove pitch with mineral spirits or turpentine. Set nails and prime and fill nail holes and other surface imperfections with putty, exterior spackling compound, or plastic wood filler. Allow to dry and sand smooth.
 - 3.1.4 Ferrous Metals, Ungalvanized: If not shop-coated, solvent clean. Remove loose rust, mill scale, and other foreign matter by power wire brushing or sandblasting to the degree specified on the drawings.
 - 3.1.5 Ferrous Metals, Galvanized, and Aluminum and Aluminum Alloy: Solvent clean and treat with vinyl type wash coat conforming to Mil. Spec. DOD-P-15328.
 - 3.1.6 Removal of Paints Containing Lead or Other Contaminants: All work associated with the removal of paints containing lead or other contaminants shall be in accordance with 29 CFR 1910 and 29 CFR 1926 (including all sub parts). The Contractor shall submit for approval a detailed lead protection program, accident prevention plan, respiratory protection plan, airborne sampling plan, and containment plan for all work involving lead paint removal. These submittals shall define all measures that are to be taken to ensure that workers and the environment will be protected during the progress of the work.
- 3.2 Application: Provide complete hiding and uniform thickness of coats. All paints shall be applied and allowed to cure in accordance with the manufacturer's recommendations. All surfaces not scheduled to receive paint shall be protected from overspray. Clean-up of over sprayed areas shall be at the contractor's expense.
 - 3.2.1 Concrete Masonry Units: Apply filler coat to bare concrete masonry units and allow to dry. Follow with finish coats.
 - 3.2.2 Wood to Receive Paint: Prime bare wood prior to application of finish coats.
 - 3.2.3 Ferrous Metals: Prime bare metal prior to application of finish coats. Vinyl paints shall be spray applied at a total coating thickness of 7 mils (3 coats minimum).
 - 3.2.4 Aluminum and Aluminum Alloy: Prime bare metal prior to application of finish coats.

Interior Painting

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint to interior surfaces. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Painting materials for the interior surfaces indicated shall conform to the following Federal and Military Specifications.
- 2.1 Concrete:
 - 2.1.1 Walls and Nontextured Ceilings: TT-E-508 Enamel, Interior, Semigloss, Tints and White. TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints. TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White). TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints. TT-P-30 Paint, Alkyd, Odorless, Interior, Flat, White and Tints. TT-P-95 Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces. TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).
 - 2.1.2 Textured Ceilings: TT-C-555 Coating, Textured (for Interior and Exterior Masonry Surfaces).
 - 2.1.3 Floors: TT-P-91 Paint, Rubber-Base, for Interior Use (Concrete and Masonry Floors).
- 2.2 Concrete Masonry Units: TT-C-535 Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete, and Masonry. TT-C-542 Coating, Polyurethane, Oil-Free, Moisture Curing. TT-C-550 Coating System Glaze, High Performance, (Solvent Base) for

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- Interior Surfaces. TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints. TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use). TT-E-508 Enamel, Interior, Semigloss, Tints and White. TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints. TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White). TT-F-1098 Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.). TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints. TT-P-30 Paint, Alkyd, Odorless, Interior, Flat, White and Tints. TT-P-95 Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces. TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).
- 2.3 Asbestos Cement: TT-E-508 Enamel, Interior, Semigloss, Tints and White. TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints. TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White). TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints. TT-P-30 Paint, Alkyd, Odorless, Interior, Flat, White and Tints. TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).
- 2.4 Gypsum Wallboard and Plaster: TT-C-535 Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete, and Masonry. TT-C-542 Coating, Polyurethane, Oil-Free, Moisture Curing. TT-C-550 Coating System Glaze, High Performance, (Solvent Base) for Interior Surfaces. TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints. TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use). TT-E-508 Enamel, Interior, Semigloss, Tints and White. TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints. TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White). TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints. TT-P-30 Paint, Alkyd, Odorless, Interior, Flat, White and Tints. TT-P-650 Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard). TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use). TT-S-179 Sealer Surface: Pigmented Oil for Plaster and Wallboard.
- 2.5 Wood Other Than Floors:
- 2.5.1 Painted Surfaces: TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints. TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use). TT-E-508 Enamel, Interior, Semigloss, Tints and White. TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints. TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White). TT-P-29 Paint, Latex Base, Interior, Flat, White and Tints. TT-P-1511 Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).
- 2.5.2 Stained, Varnished, or Natural Finishes Surfaces: TT-S-176 Sealer, Surface, Varnish Type, Floor, Wood and Cork. TT-S-711 Stain; Oil Type, Wood, Interior. TT-V-85 Varnish, Oil, Low Sheen, Brush or Spray Application. TT-V-109 Varnish, Spar, Alkyd-Resin. TT-V-119 Varnish, Spar, Phenolic-Resin. TT-V-121 Varnish, Spar, Water-Resisting.
- 2.5.3 Furniture: TT-S-711 Stain; Oil Type, Wood, Interior. TT-V-86 Varnish, Oil, Rubbing (for Metal and Wood Furniture).
- 2.6 Wood Floors:
- 2.6.1 Painted Surfaces: TT-E-487 Enamel: Floor and Deck.
- 2.6.2 Stained or Natural Finished Surfaces: P-W-155 Wax, Floor, Water-Emulsion. P-W-158 Wax, General Purpose, Solvent Type. TT-C-542 Coating, Polyurethane, Oil-Free, Moisture Curing. TT-S-176 Sealer, Surface, Varnish Type, Floor, Wood and Cork.
- 2.7 Ferrous Metals:
- 2.7.1 Ungalvanized and Unpainted: TT-P-86 Paint, Red-Lead-Base, Ready-Mixed. TT-P-615 Primer Coating: Basic Lead Silico Chromate, Ready Mixed. TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type. TT-V-51 Varnish: Asphalt.
- 2.7.2 Galvanized but Unpainted: DOD-P-15328 Primer (Wash), Pretreatment, (Formula No. 117 for Metals) (Metric).
- 2.7.3 Primed: TT-E-489 Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces). TT-E-505 Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints. TT-E-506 Enamel, Alkyd, Gloss, Tints and White (for Interior Use). TT-E-508 Enamel, Interior, Semigloss, Tints and White. TT-E-509 Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints. TT-E-545 Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White). TT-P-30 Paint, Alkyd, Odorless,

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Interior, Flat, White and Tints. TT-P-38 Paint, Aluminum, Ready-Mixed.

2.8 Fire Retardant Paint:

2.8.1 Non-Metallic Surfaces: TT-P-26 Paint, Interior, White, Tints and Black, Fire Retardant.

2.8.2 Metallic Surfaces: TT-P-001932 Paint, Latex Base, Interior, White, Tints and Black, Fire Retardant.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Concrete and Concrete Masonry Units: Remove all glaze, efflorescence, laitance, dirt, grease, oil, asphalt, and surface deposits of iron and other foreign matter.

3.1.2 Asbestos Cement: Remove stains with solvent. Do not wire-brush.

3.1.3 Gypsum Wallboard: Remove dirt and dust prior to application of first coat.

3.1.4 Plaster: Age at least 30 days. Clean, remove loose matter, and repair surface irregularities. Instrument-measured moisture content shall not exceed 8 percent.

3.1.5 Wood: Remove foreign matter. On seasoned knots, scrape, clean, and apply thin coat of knot sealer. Scrape off or remove pitch with mineral spirits or turpentine. Set nails, and prime and fill nail holes and other surface imperfections with putty or plastic wood filler. Allow to dry and sand smooth.

3.1.6 Ferrous Metals, Ungalvanized: If not shop-coated, clean with solvent. Remove loose rust, mill scale, and other foreign matter by proper wire brushing or sand blasting.

3.1.7 Ferrous Metals, Galvanized: Clean with solvent.

3.2 Application: Provide complete hiding and uniform thickness of coats.

3.2.1 Concrete Masonry Units: Apply filler coat to bare concrete masonry unit surfaces where required and allow to dry. Follow with finish coats.

3.2.2 Gypsum Wallboard and Plaster: Touch up suction spots or overall application of base coat or sealer to produce a uniform color or gloss prior to application of finish coats.

3.2.3 Wood to Receive Stain: Sand lightly after application of stain. On open-grain wood surfaces, apply wood filler after staining as required. Sand smooth. Sand lightly between coats of varnish.

3.2.4 Ferrous Metals: Prime bare metal prior to application of finish coats.

Painting of Water Storage Tank Interior Surfaces

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank interior surfaces. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS: The following materials form a part of this section of the specification: Mil. Spec. DOD-P-15328, SSPC Paint 8, and Mil. Spec. MIL-P-15930.

3.0 EXECUTION:

3.1 Preparation:

3.1.1 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).

3.1.2 Forced Ventilation: Whenever surface preparation or painting operations include the use of volatile organic solvents, the enclosed space shall be made safe at all times from fire and explosion as determined by a calibrated explosimeter or organic vapor analyzer. During the painting operation, sufficient exhaust ventilation shall be provided to exchange the air in the enclosed spaces with fresh air at the rate of 5,000 cfm for each spray gun in operation. All parts of the enclosed spaces shall be swept by moving air. Exhaust ducts shall discharge clear of working areas and away from sources of possible ignition. If the ventilation fails, operations shall be stopped and the compartment evacuated until sufficient exhaust ventilation is provided.

3.1.3 Blast Cleaning: Ferrous surfaces shall be dry blast cleaned to near white metal grade, which shall be in compliance with SSPC-SP 5, except that paragraphs 3.1, 3.2, 3.3, and 3.10 shall not be applicable and except that a limited relaxation from the uniform white metal grade of surface cleanliness will be permitted, as follows. The metal shall be cleaned to such a degree that were a large surface to be divided into 6-inch squares, at least 75 percent of the subdivisions would meet

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the white metal grade of cleanliness and the remaining subdivisions would be randomly distributed. Within these small, randomly distributed areas a minor relaxation from white metal cleanliness would be permitted, consisting only of very slight shadows, stains, and discolorations stemming from very thin, adherent, sparsely scattered residues of mill scale and corrosion products. No relaxation from the white metal grade will be permitted on surface irregularities such as edges, interior angles, welds, rivet lines, and junctions of joining members. The overall blasting effort expended shall be not less than two-thirds (2/3) of that which would be required to accomplish the white metal grade of cleanliness on the specific surfaces involved, but this limitation shall not be construed as a waiver of any of the requirements above. Remove weld spatter not dislodged by blasting with impact or grinding tools. Surfaces shall be dry at the time of blasting.

- 3.1.4 Surface Protection: Within 8 hours after cleaning but in any event prior to the deposition or formation of any detectable moisture, contaminants, or corrosion, all ferrous surfaces that have been blast cleaned to the near-white metal grade shall be cleaned of dust and abrasive particles by brushing, vacuum cleaning, and/or blowdown with clean, dry compressed air, and shall be given the pretreatment and first coat of paint.
- 3.1.5 Pretreatment: All sandblasted surfaces shall receive a washcoat pretreatment complying with Mil. Spec. DOD-P-15328. Application shall be by spray, and all requirements of the specification concerning mixing, thinning, application, and spreading rate shall be followed. All materials not applied within a maximum of eight hours after mixing shall be discarded and must not be used.
- 3.2 Installation:
 - 3.2.1 Primer Paint: All pretreated surfaces shall receive two coats of vinyl paint complying with Mil. Spec. MIL-P-15930. Application shall be by brush or spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding primer coat (or initial finish coat) shall not be applied until the primer is dry to touch. The color of alternate coats shall provide contrast to assist in obtaining complete coverage.
 - 3.2.2 Finish Paint: All primed surfaces shall receive a minimum of two coats of Aluminum Vinyl Finish Paint complying with SSPC Paint 8. The paint shall be formulated as specified except that high boiling solvents such as cyclohexanone shall not be used in the formulation. High boiling solvents may be substituted for the ketones specified in the thinner only if ambient temperatures at the time of application exceed 75 F (24 C). Application shall be by spray. All corners, angles, welds, rivets, and other surface irregularities shall receive one additional preliminary spray coat. The succeeding coat shall not be applied until the first coat is dry to touch.
 - 3.2.3 Thickness Requirements: Apply the washcoat pretreatment to a dry film thickness of at least 0.3 mils but not exceeding 0.5 mils. Apply the primer paint to produce a dry film of approximately 2.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement at no additional cost to the Member. Final thickness measurements shall be made by the Contractor in the presence of the Authorized Member Representative using a magnetic thickness gauge as specified in SSPC-PA 2.
 - 3.2.4 Final Drying Time: After the final coat of paint has been applied, the tank shall remain open and forced ventilation shall be continued for a minimum of three days prior to being flooded with water.
 - 3.2.5 Washing: After the final work has been completed in the tank, but prior to any disinfecting operations, wash the tank with clean water to remove all dust and overspray. Washing may take place during the final dry time provided the coating is sufficiently cured to withstand the abuse.
 - 3.2.6 Disinfection of Tank: After painting and all other interior work has been completed, disinfect the tank before it is replaced in service. If the local medical facility or health department requires a specific procedure for disinfection, follow that procedure. Otherwise the following procedure shall be followed: Place water containing 50 ppm chlorine in the tank to such a depth that when the tank is filled the resultant chlorine concentration shall be no less than 2 ppm. Hold the water containing 50 ppm chlorine in the tank for 24 hours before the tank is filled. Allow the full tank, in turn, to stand for 24 hours, after which the tank may be put into service without draining the water used to disinfect it.

Attachment 1: Specifications for the Work

Painting of Water Storage Tank Exterior Surfaces

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for painting water storage tank exterior surfaces. Product shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: The following materials form a part of this section of the specification: Fed. Spec. TT-P-86, TT-P-320, TT-V-81, and SSPC Paint 101.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 All exterior surfaces to be painted shall be cleaned using power tools in compliance with SSPC-SP 3 or, at the option of the Contractor, surfaces may be blast cleaned in compliance with SSPC-SP 7. In addition, the following operations shall be implemented.
 - 3.1.2 Mildew shall be removed from all surfaces to be painted by scrubbing the surface with a solution consisting of 1/2 pound of trisodium phosphate and 1 pound of hypochlorite bleach per gallon of warm water. Additional bleach may be beneficial in heavily mildewed areas. Rinse surfaces to remove cleaning materials and allow to dry completely before repainting.
 - 3.1.3 Surface glaze remaining on existing coatings shall be removed either by lightly abrading the surface or through the use of a chemical deglosser.
 - 3.1.4 Removal of Vines and Trimming of Plantings: Remove all ivy vines and tentacles interfering with the contract work from the exteriors of the structure and haul from the site of the work. Remove ivy in such a fashion that the remaining growth shall all be live and connected to the root system. Other types of plantings that interfere with the contract surfaces shall be trimmed or tied back.
 - 3.2 Installation:
 - 3.2.1 All paints shall be mixed, thinned, and applied in compliance with the procedures and requirements set forth in SSPC-PA 1. The following paint system shall be used.
 - 3.2.2 Primer: The primer shall consist of one coat of a material complying with Fed. Spec. TT-P-86, Type II.
 - 3.2.3 Finish Coats: The finish coats shall consist of a minimum of two coats of one of the following paints: Paint 1 - job-mixed alkyd aluminum paint in compliance with SSPC Paint 101 Type I or Paint 2 - aluminum paint consisting of aluminum paste and a mixing varnish in compliance with Fed. Spec. TT-V-81, Type II and mixed in the proportions of two pounds of aluminum paste complying with Fed. Spec. TT-P-320 per gallon of mixing varnish.
 - 3.2.4 Thickness Requirements: Apply the primer paint to a dry film thickness of approximately 1.5 mils. Apply the finish paint such that the resulting total system has a minimum dry film thickness of at least 3.5 mils at its thinnest point. If this thickness is not obtained in the specified number of coats, apply additional coats of the finish paint to meet the minimum thickness requirement. Final thickness measurements shall be made by the Contractor in the presence of the Authorized Member Representative, using a magnetic thickness gauge as specified in SSPC-PA 2.
 - 3.2.5 Respirators: Respirators shall be worn by all persons engaged or assisting in spray painting. Air-fed respirators will be worn by all persons engaged in spray painting in confined areas (water thinned coatings excluded).
 - 3.2.6 Lettering and Sign Painting: Building number signs, gauges, and other signs that are painted shall have lettering and numbering repainted. Design and color shall match existing.

Wall Coverings

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vinyl, cork, fabric, and flexible wood wall coverings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Vinyl Wall Covering: Wall covering shall conform to Fed. Spec. CCC-W-408, Type I, II, or III as required. A polyvinyl fluoride film, 1/2 mil thick, shall be factory-applied to the wall covering as

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- required. The film shall conform to Fed. Spec. L-P-1040, Type I, Grade B, Class 2.
- 2.2 Cork wall covering shall be either sheet cork in standard 24-inch by 36-inch sheet size, or sheeting composed of a cork sheeting material factory-bonded to a fabric backing. Wall covering material shall be either 20 ounces per lineal yard or 24 ounces per lineal yard and 36 inches wide, as required.
 - 2.3 Fabric wall covering shall be natural woven fabric bonded to a paper backing. Fabric materials shall be treated for stain and mildew resistance and shall be a minimum of 27 inches wide. All fabric wall coverings shall be Class A flame-rated and tested in accordance with ASTM E 84.
 - 2.4 Flexible wood sheets shall be composed of genuine wood veneer bonded to a clay-filled cotton backing fabric to form a flexible wall covering in sheets not less than 12 inches wide, factory matched and numbered in sequence for spaces as required.
 - 2.5 Primer and adhesive shall be mildew-resistant and non-staining, as recommended by the wall covering manufacturer.
 - 2.6 Wainscot caps shall be aluminum extrusions.
 - 2.7 Fire Hazard Classification: Provide wall covering materials bearing UL label and marking, indicating fire hazard classification of wall covering, as determined by ASTM E 84. Provide materials with the following fire hazard classifications: Flame spread not more than 25. Smoke developed not more than 50.
 - 3.0 EXECUTION:
 - 3.1 Wall covering materials shall be acclimatized by removing from packaging in area of installation not less than 24 hours before application.
 - 3.2 Prime and seal substrates in accordance with wall covering manufacturer's recommendations for type of substrate. Surface sealer shall be applied to gypsum wallboard to permit future removal of wall covering without damage to paper facing.

DIVISION 10-SPECIALTIES

Compartments and Cubicles for Shower and Toilet Rooms

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of laminated plastic and metal toilet partitions, urinal screens, and shower and dressing compartments. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Laminated Plastic Toilet Partitions and Urinal Screens:
 - 2.1.1 Plastic laminate shall be NEMA LD-3, minimum 0.062 inch thick.
 - 2.1.2 Core material for plastic laminate shall be manufacturer's standard particleboard or plywood, in thickness to provide a nominal dimension of 1 inch for doors, panels, and screens and 1-1/4 inches for pilasters.
 - 2.1.3 Pilaster shoes shall be ASTM A 167, Type 302 or 304, stainless steel not less than 3 inches high, 20 gauge, finished to match hardware.
 - 2.1.4 Stirrup brackets shall be manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy or anodized aluminum.
 - 2.1.5 Hardware and accessories shall be manufacturer's standard design heavy duty operating hardware and accessories of chromium-plated nonferrous cast alloy or chromium plated brass, as required.
 - 2.1.6 Overhead bracing shall be continuous extruded aluminum tubing in antigrip profile, with clear anodized finish.
 - 2.1.7 Anchorages and fasteners shall be manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.
 - 2.1.8 Fabrication:
 - 2.1.8.1 General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system. Furnish units with cutouts, 10155-drilled holes, and internal reinforcement to receive partition-

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- mounted hardware, accessories, and grab bars.
- 2.1.8.2 One-piece face sheets shall be pressure-laminated to core material with no splices or joints, and with edges straight and sealed. Seal exposed core material at cutouts to protect against moisture.
- 2.1.8.3 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.
- 2.1.8.4 Floor-Supported Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.
- 2.1.8.5 Ceiling-Hung Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit connection to structural support above finished ceiling. Furnish devices that are designed to support pilasters from structure without transmitting load to ceiling finish. Furnish 3 inch high stainless steel trim piece, finished to match hardware, at each pilaster.
- 2.1.8.6 Wall-Hung Screens: Furnish panel units of same construction and finish as partition system panels.
- 2.1.8.7 Floor-Supported Screens: Furnish pilasters not less than 1 inch in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.
- 2.1.8.8 Furnish hardware for each compartment in partition system, as follows:
- Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
 - Recessed or surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
 - Coat hook with combination hood and rubber-tipped bumper.
 - Door pull.
- 2.2 Metal Toilet Partitions and Urinal Screens:
- 2.2.1 Toilet enclosures shall conform to Fed. Spec. RR-P-1352, Type I, Style A, B, or C as required. Finish surface of panels shall be baked enamel, in color as required. Panels to receive toilet paper holders or grab bars shall be reinforced for the reception of the items required.
- 2.2.2 Room entrance screens shall conform to Fed. Spec. RR-P-1352, Type II, Style A. Finish surface of screens shall be baked enamel.
- 2.2.3 Urinal screens shall conform to Fed. Spec. RR-P-1352, Type III, Style A or D, as required. Finish surface of screens shall be baked enamel. Width of Style A screens shall be 24 inches or 36 inches, as required.
- 2.3 Shower and Dressing Compartments:
- 2.3.1 General: Materials shall be provided which have been selected for surface flatness and smoothness. Exposed surfaces, which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Shower compartments shall include a shower receptor for each compartment.
- 2.3.2 Steel Sheets for Baked Enamel Finish shall be ASTM A 591, Class C, galvanized-bonderized, of the following minimum thicknesses:
- Pilasters (overhead-braced): 20-gauge.
 - Panels and Screens: 20-gauge.
 - Doors: 22-gauge.
- 2.3.3 Concealed anchorage reinforcement shall be minimum 12-gauge galvanized steel sheet.
- 2.3.4 Concealed tapping reinforcement shall be minimum 14-gauge galvanized steel sheet.
- 2.3.5 Core material for metal partitions shall be manufacturer's standard sound-deadening honeycomb of impregnated Kraft paper, in thickness to provide finished dimension of 1 inch minimum for doors, panels, and screens and 1-1/4 inches minimum for pilasters.
- 2.3.6 Pilaster shoes shall be ASTM A 167, Type 302/304 stainless steel, not less than 3 inches high, 20-gauge, finished to match hardware.

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- 2.3.7 Stirrup brackets shall be manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy or anodized aluminum.
- 2.3.8 Hardware and Accessories shall be manufacturer's standard design, heavy-duty operating hardware and accessories of chromium-plated nonferrous cast alloy or chromium-plated brass, as required.
- 2.3.9 Overhead bracing shall be continuous extruded aluminum tubing in antigrip profile, with clean anodized finish.
- 2.3.10 Anchorages and fasteners shall be manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.
- 2.4 Solid Plastic(polymer resin) Toilet / Shower Enclosures and Urinal Screens:
 - 2.4.1 Toilet and shower enclosures shall conform to FS RR-P-1352, Type I, style A. Doors, panels, pilasters, and screens shall be solid Polymer resin. All doors, panels, pilasters and screens shall be protected with a plastic masking.
 - 2.4.2 Doors, panels, pilasters, and screens shall be one (1) inch thick with all edges uniformly machined to a 0.250 inch radius. Panels shall be anchored to walls and pilasters with continuous wall brackets made of extruded aluminum. Each panel shall contain a continuous aluminum strip on the bottom. Doors, Panels, pilasters and urinal screens shall be provided with the standard hardware. Doors shall be furnished with one (1) coat hook / bumper of manufacturer's standard.
- 2.5 Fabrication:
 - 2.5.1 Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as required.
 - 2.5.2 Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors.
 - 2.5.3 Pressure laminate seamless face sheets to core material and seal edges with continuous interlocking strip or with lapped and formed edges. Weld edges and corners, with exposed welds ground smooth.
 - 2.5.4 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.
 - 2.5.5 Floor-Supported Partitions: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.
 - 2.5.6 Furnish hardware for each dressing compartment as follows:
 - a. Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
 - b. Recessed or surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
 - c. Coat hook, with combination hook and rubber-topped bumper.
 - d. Door pull.
 - 2.5.7 Accessories: Each dressing compartment shall be provided with the following accessories: shower curtain rod, curtain, hooks, soap dish, and wood seat.
 - 2.5.8 Finish for compartments and showers shall be baked enamel. Clean galvanized steel surfaces after fabrication and before application of enamel coating system to remove processing compounds, oils, and other contaminants. Prime metal with baked-on rust-inhibitive primer. Apply two coats of thermosetting enamel finish, applied by electrostatic process, and baked in accordance with paint manufacturer's instructions.
 - 2.5.9 Shower receptor shall be pre-cast terrazzo, made of marble chips cast in white Portland cement. Provide wrought brass drain bodies cast integrally in receptor. Drain bodies shall provide for caulked lead connection not less than one inch deep to a two-inch pipe, with a removable type stainless steel strainer. Shower receptor curb shall be rabbeted 1 inch deep to receive steel shower walls. Receptors shall have an integral steel flange, 6-inch minimum height, on all sides except at threshold location.

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3.0 EXECUTION:

- 3.1 Installation: Partitions associated with compartments and cubicles shall be installed straight and plumb with all horizontal lines level and rigidly anchored to the supporting construction. Anchorage to walls shall be by through-bolting or toggle-bolting as required. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work.

Access and Pedestal Floors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of access and pedestal floors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Provide access flooring that, when installed, complies with NFPA 75, (components shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with NFPA 255 and ASTM E 84) unless otherwise directed.
- 2.1 Panels shall be 24 inches by 24 inches square (+/- 0.015 inch) and shall be capable of withstanding a concentrated load of 1,200 pounds with a deflection of not greater than 0.080 inches and a uniform load of 500 pounds per square foot with a deflection not to exceed 0.080 inches.
- 2.2 Pedestals shall be assemblies that are electrically conductive and corrosion-resistant. Each shall be capable of adjustments of 1/64-inch increments, have positive locking, and be capable of supporting a 5,000-pound axial load.
- 2.3 Stringers (on floors 18 inches in height or greater) shall be capable of individual removal and shall support 200 pounds.
- 2.4 Accessory ramps, handrails, and fascia plates shall be compatible with panels and pedestals.
- 3.0 EXECUTION:
- 3.1 Preparation: No installation of access flooring shall take place until structural floor surfaces are clean and dry.
- 3.2 Installation:
- 3.2.1 Completed system shall be rigid and free from vibration, with no rocking panels.
- 3.2.2 Floor shall be level within +/- 0.062 inch in any 10-foot area and +/-0.125 inch over the entire area.

Pest Control

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for pest control. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: One of the following materials shall be used for pest control:
- 2.1 Benzene Hexachloride, 0.8 percent gamma isomer concentration in a water emulsion.
- 2.2 Chlordane, 1.0 percent concentration in a water emulsion.
- 2.3 Heptachlor, 0.5 percent concentration in a water emulsion.
- 3.0 EXECUTION:
- 3.1 Immediately prior to placing concrete floor slabs on grade and basement slabs for structures and immediately prior to backfilling around foundation for structures with basements or crawl spaces, soil treatment shall be applied as hereinafter specified. Soil treatment agents shall be delivered to the jobsite in sealed and labeled containers. Labels shall bear the manufacturer's warnings to be observed in the handling and use of soil treatment materials.
- 3.2 Soil treatment shall be applied in accordance with the precautions on the label and in the following minimum quantities:
- 3.2.1 Under slabs on grade, 1-1/2 gallons per 10 square feet as overall treatment. In critical areas such as around utility openings for pipes, ducts, and conduits, 0.5 gallon per square foot shall be applied. Along the exterior perimeter of the slab and under expansion joints, 2 gallons per 5 linear feet in a strip 1 foot wide shall be applied.

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- 3.2.2 Foundation walls of structures with basements, 2 gallons per 5 linear feet per foot of depth from finished grade to top of footings in a strip 1 foot wide on exterior side at each elevation as follows: near level of top of footings before any backfill is placed, as each 1-foot lift of backfill is completed, and just below finished grade. Two gallons per 5 linear feet in a strip 1 foot wide shall be applied under the basement slab next to perimeter footings.
- 3.2.3 Foundation walls of structures with crawl spaces, 2 gallons per 5 linear feet per foot of depth from finished grade to top of footings in a strip 1 foot wide on exterior, with one-half of the application near level of top of footings before any backfill is placed, and the remainder just below finished grade. Two gallons per 5 linear feet in a strip 1 foot wide shall be applied adjacent to the interior side of the foundation of buildings.

Flagpoles

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flagpoles. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Steel flagpoles shall be constructed from standard weight steel pipe complying with ASTM A 53, Type S, Grade B, or better.
 - 2.2 Aluminum flagpoles shall be fabricated from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16 inch.
 - 2.3 Stainless steel flagpoles shall be seamless construction, fabricated of AISI 302/304 alloy.
 - 2.4 Bronze Flagpoles shall be fabricated from Copper Development Assoc. No. 230 bronze alloy seamless pipe.
 - 2.5 Flagpole style shall be cone-tapered, sectionally swaged, or entasis-tapered and shall be of designated height and diameter.
 - 2.6 Two continuous halyards shall be provided for each pole and furnished complete with all standard fittings.
 - 2.7 Provide anchors and base necessary for the particular installation requirements.
- 3.0 EXECUTION
 - 3.1 Flagpoles shall have a positive lightning ground for each installation.
 - 3.2 Portions of ground-set flagpoles shall be painted below ground with a heavy coat of bituminous paint.

Directory and Bulletin Boards

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of directories and bulletin boards. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Directory boards shall be grooved and covered with felt, vinyl, or rubber. Boards shall be fabricated of one piece of material. Space grooves at 1/4 inch O.C. to receive changeable letters or changeable name bases, as required.
 - 2.2 Chalkboard surfaces shall comply with Porcelain Enamel Institute specifications.
 - 2.3 Tack Board Surfaces shall be natural cork, plastic-impregnated cork, or vinyl fabric laminated under pressure to 1/4 inch thick exterior plywood or hardwood backing.
 - 2.4 Visual aid boards shall have a white porcelain enamel writing surface.
 - 2.5 Frames shall be constructed of hardwood, chrome-plated steel, aluminum, bronze, or stainless steel of designated design. All units located on the exterior shall be of weatherproof construction.
 - 2.6 Glass for encased boards shall be laminated glass, tempered glass, acrylic sheeting, or polycarbonate sheeting.
 - 2.7 Locks and keys for glass-encased boards shall be of the disk tumbler type with two keys.
- 3.0 EXECUTION:

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- 3.1 Mounting surface preparation, and product installation shall be in accordance with the product manufacturer's written recommendations.
- 3.2 The work shall be protected against damaged during construction. During construction hardware shall be adjusted for proper operation. Products that are damaged or improperly installed shall be removed and reinstall or replaced with new products as directed. Glass, frames and other discolored surfaces shall be cleaned in accordance with manufacturer's instructions.

Signs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of signs. Materials shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cast-aluminum letters shall have a satin, polished, clear anodized, colored anodic, or enameled finish.
 - 2.2 Cast-bronze letters shall have a satin, polished, or oxidized finish.
 - 2.3 Special medallion construction shall be of cast bronze or aluminum, free from pits, scale, second holes, or other defects.
 - 2.4 Adhesive door signs shall be fabricated from individually die cut-to-shape letters that are pre-spaced and pre-masked on a high-quality plastic film coated with a pressure-sensitive adhesive backing.
 - 2.5 Hard plastic door signs shall be made from high-pressure plastic laminate engraving stock with face and core plies in contrasting colors.
 - 2.6 Frames for plastic door signs shall be made of solid extruded aluminum with an anodized gold or silver finish and concealed mounting holes. Frames shall be designed to allow signs to slide in from the side.
- 3.0 EXECUTION
 - 3.1 Signs shall be installed in accordance with approved manufacturer's instructions. Signs shall be installed plumb and true at mounting heights. Locations and mounting heights shall be as directed by the Authorized Member Representative. Signs mounted on other surfaces shall not be installed until the finishes on such surfaces have been completed.
 - 3.1 Anchorage shall be in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.
 - 3.2 The work shall be protected against damage during construction. Hardware shall be adjusted for proper operation. Glass, frames and other sign surfaces shall be cleaned in accordance with manufacturer's instructions.

Metal Lockers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal lockers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Materials and Finishes:
 - 2.1.1 Stainless Steel: ASTM A 167, Type 302, 304, or 316 alloy. Exposed surfaces shall have a satin finish or a minimum of no. 4 polished finish.
 - 2.1.2 Carbon Steel: ASTM A 366, baked enamel finish.
 - 2.2 Wardrobe Lockers:
 - 2.2.1 Backs and sides of lockers shall be fabricated of minimum 24-gauge steel with double flanged connections extending full height. Top and bottom shall be of not less than 24 gauge steel with flanged edges. Exposed ends of non-recessed lockers shall be of a minimum 16-gauge steel. Provide one 24-gauge steel hat shelf in single tier units.

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- 2.2.2 Doors shall be one-piece construction of minimum 16-gauge sheet steel, flanged at all edges. Provide extra bracing or reinforcing on inside of doors over 15 inches wide.
- 2.2.3 Ventilation: Provide stamped, louvered vents in door face. Single tier lockers shall have not less than 6 louver openings top and bottom. Double-tier lockers shall have not less than 3 louver openings top and bottom. Multi-tier lockers shall have not less than 2 louver openings top and bottom, or 3 louver openings top or bottom.
- 2.2.4 Hinges shall be heavy-duty, not less than 0.050 inch thick steel, full-loop, 5-knuckle, tight pin, 2 inches high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners, which are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door 42 inches high and over, at least 2 hinges for each door less than 42 inches high.
- 2.2.5 Standard hardware items, including coat hooks, sequential number plates, and arrangements for locking devices, shall be provided.
- 2.3 Box Lockers:
 - 2.3.1 Tops and bottoms of lockers shall be fabricated from minimum 16-gauge steel sheet and backs from not less than 18-gauge steel. Sides and intermediate partitions shall be constructed of expanded metal welded to steel hemming. Provide 16-gauge steel shelf in single tier lockers.
 - 2.3.2 Doors shall be manufacturer's standard of either expanded metal in a steel frame or perforated steel sheet with flanged edges, minimum 16 gauge. Provide extra bracing or reinforcing on inside of doors over 15 inches wide.
 - 2.3.3 Hinges shall be heavy-duty, not less than 0.050 inch thick steel, full-loop, 5-knuckle, tight pin, 2 inches high. Weld to inside of frame and secure to door with not less than 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed. Provide at least 3 hinges for each door 42 inches and over, at least 2 hinges for each door less than 42 inches high, or continuous piano hinge at top for multi-tier units. Manufacturer shall provide all necessary hardware including sequential number plates and arrangements for locking devices.
- 2.4 Basket Locker: Rack shall have legs for fastening to the floor and sway braces. Racks shall be designed to allow bolting together to form double-faced racks.
 - 2.4.1 Uprights on Rack shall be a minimum of 13 gauge, shelves a minimum of 18 gauge, and dividers a minimum of 20 gauge, ribbed for stiffness.
 - 2.4.2 Baskets shall be all wire or wire and minimum 24 gauge steel front with perforations. All baskets shall be zinc plated with a bright finish. Pilfer guards shall be available for all styles of baskets.
 - 2.4.3 Hardware shall be provided as required for installation and functioning including sequential number plates and arrangements for locking.
- 3.0 EXECUTION: Lockers shall be installed in accordance with the designated arrangement, securely anchored in position, and accurately aligned vertically and horizontally.

Fire Extinguishers, Cabinets and Accessories

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire extinguishers, cabinets, and accessories. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Fire extinguishers shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in compliance with NFPA 10 and its appendices. Fire extinguishers shall be clearly marked to indicate extinguisher suitability according to class of fire.
 - 2.2 Fire extinguisher cabinets and accessories shall be in compliance with NFPA 10 and its appendices and shall be of sufficient size to house fire extinguishers of the type and capacity required.
- 3.0 EXECUTION:
 - 3.1 Fire extinguishers shall be distributed and maintained in compliance with NFPA 10 and its appendices.
 - 3.2 Fire extinguisher cabinets and accessories shall have the locations of fire extinguishers readily recognizable by the use of markings that are not part of the extinguisher itself.

Attachment 1: Specifications for the Work

Postal Specialties

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mail chutes and mail boxes. Materials shall match existing materials and/or as shall be directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: All products shall comply with U.S. Postal Service requirements for construction and installation of units serviced by USPS carriers.
 - 2.2 Mail chutes shall have sides and back that are of a continuous one-piece construction extending from floor to ceiling on each floor and extending 4 feet 6 inches above finish flooring on top floor. Back and sides shall be fabricated of aluminum with a 0.105-inch minimum thickness and alloy 6063-T5 extrusions with satin anodized finish complying with NAAMM-M31C21A31. Removable front panels shall be made of 3/16-inch tempered glass, 1/4-inch float glass, or transparent polycarbonate resin plate, set into continuous one-piece frames and covers. Frames and covers shall be fabricated from aluminum with a 0.125 inch minimum thickness, and alloy 6063-T5 extrusions with satin anodized finish complying with NAAMM-M31C21A31, or color anodized, bronze, or standard bronze statuary finish.
 - 2.2.1 Furnish manufacturer's standard cast-metal floor and ceiling fascia and lock band finished to match front frames and covers. Furnish lock band with acceptable locking device and keyed lock that prevents key removal if locking device is not secured.
 - 2.2.2 Mail slot shall be metal pocket with cigarette ejector and brass finish. Inscribe "U.S. MAIL" on face of mail slot.
 - 2.2.3 Bundled mail or package chute shall be constructed similarly to standard mail chutes. Furnish complete with removable frames, hinged lock band, bottom deflector or baffle slow-down, and mail openings on each floor. Fabricate chute size 14 inches wide and 7 inches deep, unless otherwise indicated. Bundled mail chutes will not require USPS approval.
 - 2.2.4 Locked receiving mail box shall be constructed of aluminum alloy 6063-T5 with satin anodized finish complying with NAAMM-M31C21A31 or bronze with statuary finish. Boxes shall be 36 inches by 20 inches by 12 inches.
 - 2.3 Mail Boxes:
 - 2.3.1 Letter slot shall be metal, designed for flush mounting. The legend "U.S. MAIL" must be plainly inscribed on every mail opening.
 - 2.3.2 Rural letter box shall be post-mounted type and shall have a heavy-duty piano hinge and red flag. Doors shall have legend "U.S. MAIL" plainly inscribed. Boxes shall have a polyurethane baked-on finish that resists rust.
 - 2.3.3 Apartment House Keyed Mail Boxes: Mail compartments and wall receptacles shall be of heavy galvanized steel or corrosion-resistant metal construction. Each compartment shall be designed to receive name card and shall bear identification numbers as directed.
 - 2.3.4 Letter Box with Combination Lock: Each compartment shall be equipped with a single dial, 3-digit combination lock and shall be provided with identification numbers.
 - 2.3.5 Letter Box with Keyed Lock: Each compartment shall be equipped with a 5-pin tumbler cylinder lock capable of at least 1,000 key changes, with 2 keys for each box door. Each box shall be keyed differently and a master key shall be provided. Provide identification numbers for each compartment.
- 3.0 EXECUTION: Install postal specialties so that they comply with U.S. Postal Service requirements.

Wire Mesh Partitions

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wire mesh partitions. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

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2.0 PRODUCTS:

- 2.1 Mesh shall be 10-gauge crimped steel wire woven into 1- 1/2 inch mesh, or heavy-duty type constructed of 6-gauge or 8-gauge steel woven wire woven into 2-inch mesh, securely clinched to frame members.
 - 2.2 Frames: Provide cutouts for pipes, ducts, beams, and other items necessary for partition installation.
 - 2.2.1 Vertical Members shall be 1-1/4 inch x 5/8-inch cold-rolled steel C-Section channels with 1/4-inch bolt holes approximately 15 inches on center.
 - 2.2.2 Horizontal members shall be 1-inch x 1/2-inch x 1/8-inch cold-rolled steel channels, mortised and tenoned to vertical members.
 - 2.2.3 Horizontal reinforcing members shall be 1-inch x 1/2-inch x 1/8-inch cold-rolled steel channel with wire woven through or two 1-inch x 3/8-inch channels bolted or riveted to each side of mesh and secured to vertical members. Provide number of horizontal reinforcing members to suit panel height.
 - 2.3 Stiffening Bar: For free-standing partitions over 8 feet -0 inches in height, provide flat bar stiffener posts between abutting panel frames.
 - 2.4 Top capping bars shall be 2-1/4 inch x 1-inch cold-rolled steel channels, secured to top framing channel with 1/4-inch U-bolts spaced not more than 28 inches on center.
 - 2.5 Corner posts shall be 1-1/4 inch x 1-1/4 inch x 1/8-inch angles with 1/4-inch bolt holes to align with bolt holes in vertical frame members and floor plate.
 - 2.6 Floor shoes shall be cast iron, sized to suit vertical framing and to provide approximately 3 inches clear space between finished floor and bottom horizontal frame members. Furnish units with set screw for leveling adjustment.
 - 2.7 Sheet metal base shall be panels formed to 16-gauge steel sheet, welded or bolted to frames.
 - 2.8 Hinged Door: Door frame shall be of 1-1/4 inch x 1/2-inch x 1/8-inch channels, with 1-1/4 inch x 1/8-inch flat bar cover plate on 3 sides and matching 1/8-inch thick angle strike bar and cover on lock side. Provide 1-1/2 pair butt hinges riveted or welded to door and frame and bronze mortise type cylinder lock operated by key outside with recessed knob inside. Provide cylinders for lock, keyed and master keyed, if required.
 - 2.9 Sliding Door: Door frame shall be of 1-1/2 inch x 3/4-inch x 1/8-inch channels with 1-1/2 inch x 1/8-inch flat bar cover plate on all 4 sides. Provide door with two 4-wheel roller bearing carriers, box track, bottom guide channel, and bronze mortise type cylinder lock operated by key outside and recessed knob inside. Provide cylinders for locks, keyed and master keyed, if required.
 - 2.10 Service Window: Fabricate of same mesh and frames as panel units, arranged to lock in open and closed positions with spring catches.
 - 2.11 Service Window Shelf: Fabricate of 12-gauge steel, flanged front and back, edges finished smooth, with side brackets for support.
 - 2.12 Line Posts: Where partition runs exceed 20 feet without intersection or connection to overhead framing, furnish standard line posts and base plates located at intervals to ensure partition rigidity and stability.
 - 2.13 Finish: Manufacturer's standard shop-applied enamel finish.
 - 2.14 Provide bolts, hardware, and accessories for complete installation.
- 3.0 EXECUTION:
- 3.1 Erect partitions plumb, rigid, properly aligned, and securely anchored in place.
 - 3.2 Provide additional field bracing as necessary for rigid, secure installation.

Demountable Partitions

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of demountable partitions. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General Requirements: Movable partitions shall be floor-to-ceiling type, designed for erection on

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- finished floors, and shall include doors, windows, fasteners, and accessories required for the installation. The partition system shall be capable of accommodating electrical wiring, outlets, and switches and shall be readily demountable without damage to panels, framing, electrical work, and other major components.
- 2.2 Fire-resistive rating and test: partitions shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Fire-resistance rating shall be determined in accordance with ASTM E 119.
 - 2.3 Sound Transmission Class and Test: Where sound-rated partitions are required, partition assemblies shall have a minimum STC of 40. STC range shall be determined in accordance with Sound Transmission Test by Two-Room Method and reported in accordance with the appendix to ASTM E 90 for 11 frequency data or ASTM E 413 for 16 frequency data.
 - 2.4 Panel units shall be manufacturer's standard construction except that gypsum wallboard shall be a minimum of 5/8 inch thick and shall conform to ASTM C 36. Gypsum backing board, if used, shall conform to ASTM C 442.
 - 2.5 Framing System: The framing system shall consist of extruded anodized aluminum or roll-formed steel components that include ceiling runners, floor track, starting units, studs or posts, post covers if applicable, bracing, and suitable treated fasteners to prevent corrosion. The framing system when assembled with panel units shall form a rigid, stable partition.
 - 2.6 Doors, Frames, and Hardware: Doors shall be 1-3/4 inch flush hollow metal of a size to provide 3/32-inch clearance at jambs and head. Door frames shall provide a compatible appearance with other trim components, shall be a minimum 18-gauge cold-rolled steel or extruded anodized aluminum constructed to incorporate a cushion door stop at the head and both jambs, and shall allow for variations in floor level. Door hardware shall be the manufacturer's standard type hardware, except all doors shall receive 1-1/2 pairs of 4-1/2 inch by 4-1/2 inch butts.
 - 2.7 Finishes: Exposed steel or aluminum surfaces shall be prefinished. Gypsum wallboard shall be painted or finished with a minimum 6-mil vinyl wall covering, as required.
 - 2.8 Base trim shall be 4-inch PVC without exposed fasteners, 4-inch vinyl cover base with snap-on capabilities, 4-inch vinyl cover base applied with adhesive, or 4-inch metal clip on base cover, as required.
 - 3.0 EXECUTION: Partitions shall be erected plumb and straight after floor covering and finished ceiling are in place. Doors shall be hung to swing freely and hardware shall be carefully fitted and adjusted. Glass for glazed openings shall be installed on shims in a vinyl or polyurethane foam gasket. Glass stops shall be installed without exposed fastenings.

Security Screens

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of security screens for doors and windows. Products shall match existing materials and shall be as directed by the Authorized Member Representative. Installations shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Mesh shall be 9-gauge crimped steel wire woven into 2-inch mesh securely clinched to frame members.
 - 2.2 Standard diamond pattern expanded metal shall be 1-1/2 inch, 9-gauge, carbon steel conforming to ASTM F 1267 Type I Class 1.
 - 2.3 Flattened diamond pattern expanded metal shall be 1-1/2 9-gauge carbon steel conforming to ASTM F 1267 Type II Class 1.
 - 2.4 Frame bars and center stiffeners shall be not less than 1/2-inch in diameter cold finished steel bars conforming to ASTM A 108.
 - 2.5 Frame channels shall be hot rolled low carbon bar channels not less than 1-inch by 1/2-inch by 1/8-inch conforming to ASTM A 29.
 - 2.6 Center stiffeners where frame channels are used, shall be not less than two 3/4-inch by 3/8-inch channels, conforming to ASTM A 29, bolted to each side.
 - 2.7 Subframes for hinged security screens shall be not less than 1-1/4 inch by 1-1/4 inch by 1/8-inch

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- medium carbon steel angles conforming to ASTM A 36.
- 2.8 Finish: Manufacturer's standard shop-applied enamel finish or hot dipped galvanized as directed.
 - 2.9 Provide bolts, masonry anchors, hardware, and accessories for complete installation. Hardware shall include all padlock hasps and staples, hinges, and locking devices. Provide cylinders for locks, keyed and mastered keyed, if required.
 - 3.0 EXECUTION:
 - 3.1 Erect security screens plumb, rigid, properly aligned, and securely anchored in place for a rigid installation.

Movable Metal Partitions

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of movable metal partitions. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Freestanding partition systems shall consist of individual panels, connector posts, and framing components. Nominal panel height shall be 5 feet-0 inches.
 - 2.2 Panels shall be of manufacturer's standard width and height, constructed of 1/8-inch S2S tempered hardboard facing laminated to a core material. Total thickness shall be 1-9/16 inches.
 - 2.3 Panel face coverings shall be vinyl, plastic laminate, fabric, natural hardwood, or baked enamel on steel substrate.
 - 2.4 Panels shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84 when tested as a composite unit.
 - 2.5 Framing members shall be extruded aluminum shapes in 6063-T5 Alloy and 22-gauge pre-finished steel.
 - 2.6 Exposed components shall have anodized or baked acrylic paint finish.
 - 2.7 Panel frame design shall provide connection and attachment of connector posts and various framing components with the use of simple hand tools. Each panel unit shall be able to be individually free-standing or connected to other panels.
 - 2.8 Sound-absorbing panels shall be constructed of flame-resistant decorator fabric applied over a reinforced wood frame and fiberglass core. Flame-resistant fiberglass insulation shall be held in place by galvanized steel wire netting. Total panel thickness shall be 2-1/2 inches providing a minimum noise reduction coefficient (NRC) of 0.75.
- 3.0 EXECUTION: Additional framing components shall be provided as required to assemble the freestanding partitions. Components include, but are not limited to, vinyl edge inserts and filler caps, individual panel supports, and wall connectors.

Metal Storage Shelving

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal storage shelves. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Metal Storage Shelving: Fed. Spec. AA-S-1048, Carbon Steel, baked enamel finish or ASTM A 167, stainless steel, a minimum no. 3 polished finish or a satin finish.
 - 2.1.1 Shelves: Form of 0.0478-inch thick steel with front and rear faces double flanged and box channeled.
 - 2.1.2 Brackets: Cantilever design, steel not less than 0.1046 inch thick and of hook-in-lift-off design, adjustable without use of tools.
 - 2.1.3 Anchorage: 1/4-inch size bolts with standard nuts and lock washers.
- 3.0 EXECUTION: Storage shelving shall be installed in accordance with the designated arrangement, securely anchored in position, and accurately aligned vertically and horizontally.

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Toilet Accessories

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of toilet accessories other than porcelain type tile wall accessories. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Finishes: Finishes on metal shall be provided as follows:
 - 2.1.1 On Stainless Steel: No. 4 general-purpose polished.
 - 2.1.2 On Carbon Steel, Copper Alloy, and Brass: Chromium-plated, bright.
 - 2.2 Miscellaneous Accessory Items:
 - 2.2.1 Mirror, Glass (MG): Glass mirror shall conform to Fed. Spec. DD-M-411.
 - 2.2.2 Mirror, Metal (MM): Metal mirror shall be stainless steel or chromium-plated steel, mirror quality, 0.037-inch minimum thickness, edges turned back 1/4 inch and recess fitted with fiberboard backing, mounted with concealed theftproof fastening. Size shall be as required.
 - 2.2.3 Grab Bar (GB): Grab bar shall conform to Fed. Spec. WW-P-541. Grab bar shall be form and length as required. Flange shall have screw mounting holes concealed on the lip of the flange. Installed bars shall be capable of withstanding a 500-pound vertical load without becoming loose from the fastenings and without obvious permanent deformation.
 - 2.2.4 Shelf, Glass (SG): Glass shelf shall conform to Fed. Spec. WW-P-541 and shall be supported between brackets or on brackets. Shelf shall be plate or float glass, width and length as required. Separate supports shall be stainless steel.
 - 2.2.5 Shelf, Metal, Heavy-Duty (SMHD): Heavy-duty metal shelf shall be stainless steel supported between brackets or on brackets not more than two feet on center. Thickness of shelf and brackets shall be not less than 0.07 inches. Shelf shall have rounded corners with minimum 1/2-inch lipped front edge, designed to support 60 pounds per linear foot. Width and length shall be as required.
 - 2.2.6 Shelf, Metal, Light-Duty (SMLD): Light-duty metal shelf shall conform to Fed. Spec. WW-P-541. Shelf shall be supported between brackets or on brackets. Width and length shall be as required. Shelf and separate supports shall be stainless steel.
 - 2.2.7 Soap and Grab Bar Combination, Recess-Mounted (SGR): Recess-mounted soap and grab bar combination shall conform to Fed. Spec. WW-P-541, stainless steel, modified to provide a grab bar. Plastic insert dish shall be furnished.
 - 2.2.8 Towel Bar (TB): Towel bar shall conform to Fed. Spec. WW-P-541, stainless steel, length as required. Bar shall be minimum 3/4 inch in diameter.
 - 2.2.9 Towel Pin (TP): Towel pin shall have concealed wall fastenings; pin shall be integral with or permanently fastened to wall flange, approximately 4-inch projection.
 - 2.3 Dispensers and Receptacles:
 - 2.3.1 Paper Towel Dispenser (PTD): Paper towel dispenser shall conform to Fed. Spec. WW-P-541.
 - 2.3.1.1 Mounting S, Surface: Style N or O.
 - 2.3.1.2 Mounting R, Recessed: Style P, Q, or T.
 - 2.3.2 Sanitary Napkin and Tampon Disposer (SND): Sanitary napkin and tampon disposer shall conform to Fed. Spec. WW-P-541, stainless steel. Reusable liner of the type standard with the manufacturer shall be provided.
 - 2.3.3 Sanitary Napkin and Tampon Dispenser (SNTD): Sanitary napkin and tampon dispenser shall conform to Fed. Spec. WW-P-541.
 - 2.3.4 Waste receptacle (WR) shall conform to Fed. Spec. WW-P-541.
 - 2.3.5 Facial tissue dispenser (FTD) shall conform to Fed. Spec. WW-P-541.
 - 2.3.6 Toilet tissue dispenser (TTD) shall conform to Fed. Spec. WW-P-541.
 - 2.3.7 Toilet paper holder (TPH) shall conform to Fed. Spec. A-A-2524, roller mounted, 2 support brackets.
 - 2.3.8 Toothbrush and tumbler holder (TTH) shall conform to Fed. Spec. WW-P-541.
 - 2.3.9 Soap dispenser (SD) shall be liquid type consisting of a stainless steel tank with hold capacity of 40 fluid ounces.

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- 2.3.10 Soap holder (SH) shall conform to Fed. Spec. WW-P-541.
- 2.4 Medicine cabinets:
 - 2.4.1 Medicine cabinet (MC) shall conform to Fed. Spec. WW-P-541. Width height, and depth of cabinet shall be as required.
 - 2.4.2 Sliding door cabinet, Class 1, assembly shall be surface-mounted vanity or recessed cabinet with design and lighting arrangement as required.
 - 2.4.3 Swinging door cabinet, Class 2, Design and assembly, including the lighting arrangement, shall be as required. Assembly shall be surface or recess-mounted.
- 2.5 Shower Curtains and Rods:
 - 2.5.1 Shower curtain (SC) shall conform to Fed. Spec. A-A-2398, size as required to suit conditions.
 - 2.5.2 Shower curtain rods (SCR) shall be stainless steel 1 inch OD by 0.049 inch minimum, straight or bent as required to meet installation conditions.
- 2.6 Hand dryer shall be electrically operated conforming to Fed. Spec. W-H-50. Unit shall be surface-mounted, semi-recessed or flush-mounted as required. Cover face shall be polished aluminum, cadmium-plated, polished chrome, stainless steel, or porcelain. Fan shall deliver a minimum of 150 cfm at the discharge end of the nozzle.
- 2.7 Ash urn shall be wall-mounted, paraboloidal shape, two quart capacity conforming to Fed. Spec. RR-A-1255. Urn shall be 22-gauge type 304 stainless steel with satin finish or satin bronze finish.
- 2.8 Janitorial Material:
 - 2.8.1 Mop and broom holder shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.
 - 2.8.2 Utility shelf with mop and broom holders shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.
 - 2.8.3 Pail or ladder hook shall be 12-gauge stainless steel, bright polished finish projecting 8 inches from wall, 6 inches high, and 1 inch wide.
- 2.9 Hospital Accessories:
 - 2.9.1 Foot Operated Soap Dispenser: Dispensing mechanism shall be non-corroding containing a stainless steel hood and shatter-proof container. The unit shall contain a molded rubber foot pump with non-slip base.
 - 2.9.2 Bed Pan Storage Rack: Rack shall be stainless steel surface-mounted providing storage for bed pans and urinals.
- 3.0 EXECUTION: Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory, except exposed fasteners in designated areas shall be of tamper-proof design.

Wardrobes

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood or steel wardrobes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacture's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Design: Wardrobes shall be constructed of either wood or steel at the Contractor's option except when necessary to match existing or where one type is better suited for locality and intended usage. The material selected shall be used throughout the project. Design of wardrobes shall be by the Contractor using specified requirements as a minimum of acceptability. Each wardrobe shall be a complete unit capable of relocation without modifying or adding components, except for anchors and scribes. Common sides or backs between adjacent units are not permissible. The dimensions indicated are for the purpose of establishing general layout. Minor variations necessary to coordinate the details of construction will be permitted. All parts shall be manufactured to standards that will permit replacement without modifying of remaining parts.
- 2.0 PRODUCTS
 - 2.1 Hardware:

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- 2.1.1 Hinges shall be brass or steel, not less than 0.062 inch thick, 5 knuckle, tamper-proof institutional type, joint length not less than 2-1/2 inches, chromium finish or primed for paint finish. When doors are closed, only a smooth beveled and rounded joint shall be exposed. Doors 42 inches and less on the hinged side shall have two hinges; doors more than 42 inches on the hinged side shall have three hinges.
- 2.1.2 Latches: The active door of double doors on the clothes hanging compartment shall be provided with a three-point latching and locking mechanism. The handle shall be of the lever type, of cast brass or bronze, and shall be designed to permit locking by padlocking the handle to a steel keeper with a matching hole. A 14-gauge rectangular corrosion resisting steel shield shall be provided to protect the door from damage at the handle and padlock area. The interior components of the mechanism shall include locking bars or rods not less than 1/2-inch thick, two steel upper guides and two steel lower guides, three-finger cam, and applied strikes or reinforced openings for latching. The handle, keeper, and locking bars or rods shall have a chromium finish, and all other components shall have a chromium, nickel, zinc, or cadmium plated finish. Doors to overhead storage compartment, when separate from clothes hanging compartment doors, shall be provided with a heavy-duty catch and strike which will latch automatically when the overhead storage compartment is closed and which can be released manually when the clothes hanging compartment doors are open.
- 2.1.3 Clothes hanging rods shall be chromium plated or zinc-coated steel tubing approximately 1 inch in diameter and with a minimum wall thickness of 0.083 inch. Clothes hanging rods with exposed ends shall be provided with plastic caps to prevent marring the finish on the inside of the wardrobe.
- 2.1.4 Drawer slides shall be heavy duty 14-gauge steel mating channels equipped with replaceable nylon-tired rollers or self-lubricating double-prong plastic glides located to insure that the drawer will operate freely and smoothly throughout its travel. Slides shall have integral cushioned stops at both ends of the travel, shall permit removal of drawers without tools, and shall be free of excessive play or sag.
- 2.1.5 Silencers of rubber or similar resilient material shall be provided on door frames at close proximity to each latching point to minimize noise when the door is closed. Silencers shall be replaceable.
- 2.1.6 Astragals: Active door of double doors shall be provided with an astragal, full height of the door.
- 2.2 Steel Sheets shall be cold-rolled, commercial quality, stretcher level degree of flatness and of manufacturer's standard gauges specified.
- 2.3 Steel Wardrobe Construction:
 - 2.3.1 Workmanship: Form bends accurately. Cut edges straight and smooth. Holes shall be accurately punched or drilled and have all burrs removed. Extend butt welds the full width of joining edges; grind smooth and flush with adjacent surfaces when on exterior of wardrobes. Resistance welds shall be 3/16-inch minimum diameter and maximum spacing of 8 inches on center. Welds shall be thoroughly fused and sound and free from cracks, fissures, pits, holes, gas pockets, porosity, and undercuttings. Leave no sharp corners or protrusions of any kind in the final assembled wardrobes. Use of mechanical fasteners exposed to exterior of unit shall be limited to those required for application of hardware and scribes.
 - 2.3.2 Base shall be closed type, formed to provide a bearing surface at the floor, and provided with floor mounting holes. Bases constructed as part of the framing and panel members shall be of the same gauge as those members. Bases constructed as separate components shall be not lighter than 16-gauge steel.
 - 2.3.3 Back and side panels shall each be formed of sheet steel not lighter than 22 gauge and shall be reinforced if necessary to impart rigidity to unbroken spans.
 - 2.3.4 Front shall be not lighter than 18-gauge steel and multichannel formed as required to provide strength and rigidity to side panels, top, and bottom without exposing fasteners. Front shall be reinforced as necessary to serve as a stable mount and frame for doors and hardware. Fronts formed as part of side panels shall be equivalent to the specified 18-gauge steel multichannel construction. With the door closed, clearance between door edge and frame shall be uniform and shall not exceed 1/8 inch and door face shall be flush with the face of the front.
 - 2.3.5 Top shall be not lighter than 22-gauge steel, flat exterior surface, and formed as required for

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- securing to back, front and sides.
- 2.3.6 Bottom shall be not lighter than 18-gauge steel and formed as required for securing to back, front and sides.
- 2.3.7 Hat shelf and upper storage shelf shall be not lighter than 18-gauge steel and formed as required for securing to back and sides.
- 2.3.8 Doors shall be of double-wall type with not lighter than 22-gauge steel inside panel and not lighter than 20-gauge outside panel separated by not less than 3/4 inch of rigid mineral insulation cemented between the panels. Doors shall be reinforced or otherwise prepared for the reception of hardware and to provide strength and rigidity to the doors.
- 2.3.9 Scribes and closures shall be not lighter than 20 gauge.
- 2.3.10 Chest Unit shall have top and side of not lighter than 20-gauge steel firmly attached to the wardrobe. Shelves shall be constructed of not lighter than 18-gauge steel. Drawer bodies shall be of not lighter than 22 gauge, and drawer fronts shall be of not lighter than 20 gauge with the top formed to provide a full length integral pull.
- 2.3.11 Finish shall be an approved factory-applied baked-enamel, semi gloss finish in accordance with manufacturer's standard finishes. Color will be selected from manufacturer's standard colors.
- 2.4 Wood Wardrobe Construction:
- 2.4.1 General: Except as otherwise shown or specified, wood wardrobes shall conform to AWI-02 and AWI-01. Plywood for transparent finish shall be hardwood plywood, and one species shall be used throughout. Plywood for paint finish shall be hardwood plywood, or have a medium density impregnated fiber overlay.
- 2.4.2 Wood scribes and closures shall be 3/8-inch minimum thickness and shall match wardrobes. Moldings used in conjunction with scribes and closures and for joints between adjacent wardrobes shall be 5/16- by 1-1/16 inch flat members or 3/4-inch quarter round.
- 2.4.3 Wood Finishes: Interior surfaces shall be given an approved transparent finish, and exterior surfaces shall be given an approved paint finish of the color as selected from manufacturer's standard colors or an approved transparent finish. Surfaces to receive a transparent finish shall be stained to an approved shade and all wood surfaces to be finished shall be filled, sanded smooth, and given not less than two coats of an approved finish coating. Finishing of interior and exterior surfaces shall be part of a continuous shop operation to and including at least the first finish coat in order to minimize warpage.
- 3.0 EXECUTION
- 3.1 Installation: Wardrobes shall be assembled and positioned in accordance with the layout shown, set level, and secured in place. Wardrobes with backs to walls shall be secured to the wall with not less than four fasteners, using one fastener near each corner. Free-standing or island-type installations shall be secured to the floor with not less than four fasteners, using one fastener near each corner. Back-to-back or side-to-side wardrobes shall be secured to each other. Securing of adjacent wardrobes shall be with three fasteners located high, low, and intermediate when a side is involved. Securing of adjacent wardrobes shall be with four fasteners located near the corners when a back-to-back installation is involved. Fasteners to secure metal wardrobes in place shall penetrate two thicknesses of metal at each wardrobe or shall be provided with washers. There shall be no sharp corners or protrusions in the final assembled wardrobes that could be considered harmful to the user or the stored items. Scribes over 14 inches wide shall be secured to the building construction with concealed fasteners at intervals not to exceed 12 inches on center. Hardware shall be adjusted and left in good working order. Doors and drawers shall not stick or bind, but shall operate smoothly and easily. Wardrobes shall be cleaned and protected from damage until acceptance.

DIVISION 11-EQUIPMENT

Platform and Dock Levelers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock levelers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation

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procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:**2.1 Replacement Components:**

2.1.1 General: Replacement components shall be new and of matching quality and construction. Every replacement part shall be made to definite standards, tolerances, and clearances and to fit in the existing equipment.

2.1.2 Structural Components: All replacement parts of the equipment to be repaired shall be of such design, size, material, and strength as required to carry and sustain the maximum allowable load placed upon it.

2.1.3 Hydraulic System Components: The hydraulic system shall consist essentially of a hydraulic pump, hydraulic rams, pressure relief valve, fluid reservoir, hydraulic control valves including necessary continuous-duty solenoid valves and check valves, and connections. The system shall be installed as a separate and complete system in each platform unit.

2.1.4 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. J-C-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall be not less than 1 megohm.

2.2 Permanent, Self-Forming, and Free Standing Adjustable Dock Levelers: Levelers shall comply with DOC ASME MH14.1 for Class A loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.

2.3 Permanent Manually Operated Dockboards: Permanent manually operated dockboards shall comply with DOC ASME 14.1 for Class B loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.

3.0 EXECUTION:

3.1 Repair: Repair shall consist of removal and replacement of various defective equipment components. Installation of hydraulic system components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.

3.2 Installation of Equipment: The equipment shall be installed by, or under the supervision of, the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and has the specified capacity.

Platform and Dock Lifts

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock lifts. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:**2.1 Replacement Components:**

2.1.1 Structural Components: All replacement parts of The equipment to be repaired shall be of such design, size, material, and strength as required to carry and sustain the maximum allowable load placed upon it.

2.1.2 Hydraulic System Components: Pipe, tubing, fittings, and hydraulic hose shall be designed and constructed with a minimum safety factor of three based on bursting pressure. Cylinders, pumps, and control valves shall be designed to withstand test pressures of 150 percent of the design operating pressure.

2.1.3 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. J-C-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall not be less than one megohm.

2.2 Dock lifts shall comply with ASME 14.1. The replacement lift shall have the same capacity, travel, minimum lowered level, and nominal raising and lowering speed as the existing lift.

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- 2.3 Truck Levelers: The truck leveler shall have a capacity of 40,000 pounds. Leveler shall have a total travel of 36 inches, divided as follows: 18 inches up, 18 inches down.
- 3.0 EXECUTION:
- 3.1 Repair: Installation of hydraulic system components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.
- 3.2 Installation of Equipment: The equipment shall be installed by, or under the supervision of the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and has the specified capacity.

Platform and Dock Enclosures

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock enclosures. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fabric shall be hypalon-coated nylon, 5.1 oz. per sq. yd. with 65 percent coating on front and 35 percent on back face. Total weight with coatings shall be 16 oz. per sq. yd.
- 2.2 Thread shall be polyester, heavy-duty minimum-size FF (Size 139) bonded, complying with Fed. Spec. V-T-285.
- 2.3 Wood Framing: Lumber shall be air-dried and well seasoned, to contain not more than 19 percent moisture at time of finishing, identified by official grade marks and shall be Douglas Fir-Larch No. 2 or better, Hemlock-Fir, No. 1 or better, or Southern Pine No. 2 or better. Lumber shall be smooth on all sides.
- 2.4 Pads shall be polyurethane foam with a minimum density of 1.25 pounds per cubic foot and a 35-pound compression factor, open cell construction of an ether base. Foam shall be resilient from -50 F to +180 F. Pads shall be bonded to framing members.
- 2.5 Bottom Pads and Bumpers: Three polyurethane foam pads with cover fabric and two laminated or extruded rubber dock bumpers mounted to a continuous 2-inch by 12-inch wood frame.
- 3.0 EXECUTION: (Section not used.)

Platform and Dock Bumpers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock bumpers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Timber bumpers shall be dense red oak. Ends shall be smooth and edges rounded to a radius of approximately 1/2 inch. All bolt holes shall be countersunk. Bumpers shall be treated in compliance with AWP A P5. Treating process and results shall comply with Fed. Spec. TT-W-571. Retention shall be a minimum of 0.23 pounds of oxide per cubic foot of treated wood.
- 2.2 Laminated rubber bumpers shall be resilient rubber material made from rubberized fabric truck tires cut to uniform size pads and punched to receive 3/4-inch supporting rods. The bumpers shall be closed with 3-inch by 2-1/2 inch by 1/4-inch structural steel angles under approximately 1,500 pounds of pressure. Angles shall be welded to 3/4-inch rods at one end and closed with threaded rod and nuts at the other end. Anchor leg of angle shall extend a minimum of 2-1/2 inches beyond rubber surface at either end and contain 2 or 3 anchor bolt holes.
- 2.3 Extruded rubber bumpers shall be manufactured of extruded ethylene propylene diene monomers (EPDM) hydrocarbon rubber of 70 durometer hardness or higher and with a minimum tensile strength of 2,400 psi. All mounting holes shall be countersunk.
- 3.0 EXECUTION:
- 3.1 Removal of Existing Bumpers: Remove existing bumpers in a manner to prevent damage to the

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surface on which they are mounted. All existing anchor bolts that have deteriorated or are not in proper position to facilitate mounting of new bumpers shall be cut off flush with the base surface. Existing bumpers that have been mounted by welding shall be removed by cutting torch and the resultant mounting surface power ground smooth and flush prior to installation of the new bumper.

- 3.2 Installation of New Bumper: All mounting hardware shall be new except existing expansion shields that are properly located and in suitable condition for reuse. Final installation shall be properly aligned, tight and flush against mounting surface.

Platform and Dock Warning Devices

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock warning devices. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Pavement marking paint shall comply with Fed. Spec. TT-P-115.
 - 2.2 Glass spheres shall have at least 42 percent reflectivity and shall comply with the State Standard Specifications.
 - 2.3 Reflectors shall be acrylic plastic prismatic reflectors complying with the State Standard Specifications.
- 3.0 EXECUTION:
 - 3.1 Preparation: Thoroughly clean all pavement areas to be painted by use of hand brooms, rotary brooms, air blast, scrapers, or other acceptable means that will not damage the surface.
 - 3.2 Installation:
 - 3.2.1 Pavement Marking: Apply paint and glass spheres with mechanical equipment. Apply the paint and glass spheres uniformly to form markings of the dimensions and shapes required. Lines shall be true with sharp edges and ends. The length of lines shall be within plus or minus 3 inches; width shall be within plus or minus 1/8 inch.
 - 3.2.2 Reflectors: Install reflectors at the locations and by the method required. Align and orient reflectors so that proper reflectivity is obtained.

Platform and Dock Guardrails and Posts

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock guardrails and posts. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Steel Guardrail: Steel plate beam guardrail, end sections, and splice plates shall comply with AASHTO M180. Steel posts, restraints, braces, and plates shall be galvanized.
 - 2.2 Materials for Timber Guardrail and Cable Guard Construction: Treated timber shall comply with the NFPA requirements for 1850F dense southern pine or 1900F dense Douglas fir. Wire rope cable and fastenings shall comply with AASHTO M30, Class A.
 - 2.2.1 Offset spring brackets shall have a deflection of one inch under a compression load of not less than 3,500 pounds and not more than 6,000 pounds applied for one minute perpendicular to the line of the cables with the cables in place. The offset spring brackets shall not collapse under a compression load of 10,000 pounds.
 - 2.2.2 Special offset spring brackets of the blunt, slotted, overlapping nose type shall be fabricated from spring steel, tempered, and drawn. The brackets with steel stay pins shall be slotted for 3 cables. Special offset spring brackets shall have a minimum deflection of one inch under a compression load of 15,000 pounds applied for one minute perpendicular to the line of the cables at the points of attachment of the cables and the bracket with the cables in all slots.
- 3.0 EXECUTION:
 - 3.1 Guardrail Removal: Sections of guardrail shall be removed as required to provide access to

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- damaged or deteriorated components.
- 3.2 Guardrail Fabrication and Erection: New guardrail shall be erected in compliance with AASHTO M180 and the construction requirements for the type of guardrail being erected.
 - 3.2.1 Steel plate beam fabrication shall comply with AASHTO M180. Roll or round the edges of the plates so that they present no sharp edges.
 - 3.2.2 Setting Timber and Steel Posts: Set posts in compacted soil to a minimum depth of 3 1/2 feet. Backfill the holes in minimum 6-inch layers with approved materials. Compact each backfill layer in a manner not to displace the posts from correct alignment.
 - 3.2.3 Painting: Steel surfaces that have not been galvanized shall be shop-coated with rust inhibitive primer paint. Give primed surfaces to be painted two coats of white or aluminum paint after erection. Where the surface will be inaccessible after erection, paint before installation.
 - 3.2.4 Cable Guard: The offset brackets shall be attached to each post by means of one or more bolts not less than 3/4 inch in diameter inserted through the bracket and the post with the threaded end of the bolts at the back of the post. All bolts except adjustment bolts shall be drawn tight, and all bolts shall be sufficiently long to extend at least 1/4 inch beyond the nuts. After the posts and offset brackets have been set, the cables shall be erected and stretched taut by an approved mechanical device. The completed assembly shall provide a smooth, continuous platform and dock guard conforming to the required line and grade. After the cable has been stretched in its final position, the takeup on adjustment bolts, intermediate anchors, and end anchors shall be made as necessary.

Mixing Chambers and Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant mixing chambers and equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Concrete repair material shall be epoxy type grout in compliance with Applicable standards and/or.
 - 2.2 Baffle Repair and Replacement Parts: Material and accessories for baffle repair or replacement parts shall be chemically resistant to the chemicals being mixed in the mixing chamber.
 - 2.3 Air agitation system repair and replacement parts such as diffuser, pipe, and fittings shall match the existing equipment.
 - 2.4 Mixing Chamber Drive Equipment: Multiple V-belt drives shall be furnished in matched sets.
- 3.0 EXECUTION:
 - 3.1 Preparation: Alternate Mixing Chamber and appurtenances shall be furnished, installed, and removed after completion of work by the Contractor.
 - 3.2 Installation:
 - 3.2.1 Static mixer shall be cleaned and repaired.
 - 3.2.2 Mixing chamber baffles: Drain the mixing chamber and repair or replace the baffles as required.
 - 3.2.3 Mixing Chamber Drive Equipment:
 - 3.2.3.1 Gear Drive: Maintenance and Repair Procedures shall be such that they will result in the equipment being able to operate at its rated capacity.
 - 3.2.3.2 Cleaning: Accumulated dirt, oil, grease, and debris shall be removed from the parts.
 - 3.2.3.3 Testing: Repaired equipment shall be tested ensure that it operates at design conditions and rated capacity. Replace and retest equipment failing to meet test conditions.

Clarifiers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant clarifiers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Epoxy filler compound for concrete surfaces shall comply with Applicable standards and/or.
- 2.2 Coal-tar epoxy shall comply with SSPC-PAINT 16.
- 2.3 Epoxy paint shall comply with Mil. Spec. MIL-P-24441.
- 2.4 Red-lead base paint shall comply with Fed. Spec. TT-P-86, Type 1.
- 2.5 Finish coat paint shall comply with Fed. Spec. TT-P-38.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Cleaning: Prior to removing parts or components of the clarifier or appurtenant equipment, clean dust, dirt, grime, and other foreign matter from the surfaces.
 - 3.1.2 Interior concrete surfaces of the clarifier tank shall be cleaned with high pressure water or steam to remove all dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.
 - 3.1.3 Interruptions of Treatment: Not more than one clarifier shall be taken out of service at a time.
 - 3.2 Installation:
 - 3.2.1 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. The surfacing materials shall be allowed to cure overnight, and then two coats of Coal-tar epoxy shall be applied.
 - 3.2.2 Submerged ferrous metal surfaces, such as piping, ladders, structural steel, equipment, and metal roof surfaces that are exposed to the sludge shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar epoxy.
 - 3.2.3 Clean exterior concrete surfaces of the clarifier by means of brush sandblast in compliance with SSPC-SP 7, blow down the surfaces with air to remove the blasting residue and dust, and apply two coats of epoxy-polyamide paint.
 - 3.2.4 Ferrous metal surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 6. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 3. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of Aluminum finish paint shall be applied.
 - 3.2.5 Startup: After completion of maintenance and repairs, the clarifier shall be started up and operating adjustments shall be made by the Contractor as required to achieve the design flow rate and quality of the effluent.

Aeration Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant aeration equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Media for tray type aeration equipment shall be coke, stone, or factory-made ceramic balls, 2 to 6 inches in diameter.
 - 2.2 Trays: Tray repair and replacement parts shall be of the same kind of material or shall be compatible with existing trays.
- 3.0 EXECUTION:
 - 3.1 Preparation: Pipe, valves, and fittings to install a bypass around the aerator shall be provided.
 - 3.2 Installation:
 - 3.2.1 Enclosure Repairs: Repair or replace screens, screen frames, and structural parts of the aeration equipment as required.
 - 3.2.2 Defective media shall be removed and new media added, or the defective media shall be replaced with new media.
 - 3.2.3 Repair and Replacement of Trays: Repair or replace trays as required. Drain and clean trays. Remove media, if necessary, to accomplish the repairs, and replace media after the repairs are complete.
 - 3.2.4 Flame Cutting: No cutting by torch or flame shall be done without written authorization from the Authorized Member Representative.
 - 3.2.5 Testing: After repairs are completed, test the equipment to ensure that it will operate at design

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conditions.

Chemical Bypass Feeders

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of chemical bypass feeders for water treatment systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Bypass feeders shall be used to control corrosion, inhibit lime scale formation, and remove dissolved iron in small water systems.
 - 2.1 In-line mount unit shall be equipped with built-in bypass and shutoff valves and hold pressures up to 125 psi.
 - 2.2 Floor mount unit shall be equipped with 5-, 10-, or 12-gallon capacity feeder tanks, lockable filler cap, one short and one long slotted strainer, flow indicator, drain cock, and shutoff valves. The flow indicator shall consist of a transparent pyrex glass cylinder. The unit shall hold pressures up to 175 psi.
- 3.0 EXECUTION:
 - 3.1 In-line mount unit feeder shall be installed before the pressure tank to prevent rust deposition. To prevent corrosion, the unit shall be installed on the inlet line to the heater.
 - 3.2 Floor mount unit feeder unit shall be installed in a bypass on the cold water line to the equipment to be protected against corrosion or lime scale problems.
 - 3.2.1 Water Heater Protection: Feeder shall be placed before a water heater but far enough away so that hot water will not flow back into the feeder.
 - 3.2.2 Private Well Systems: The feeder shall be installed before the water storage tank.
 - 3.2.3 Pressure Relief Valve: A pressure relief valve shall be installed on either the inlet or outlet line between the shutoff valve and the feeder when feeding chemicals that generate excess heat and pressure upon contact with water.

Chemical Storage Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant chemical storage equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Solution tank repair material shall be PVC in compliance with ASTM D 1784, polyethylene in compliance with ASTM D 1248, or fiberglass.
 - 2.2 Manhole gasket material shall be chemically resistant to the material stored in the bin.
- 3.0 EXECUTION:
 - 3.1 Repair and Replacement of Parts: The equipment shall be cleaned and repaired, parts shall be replaced as required, and the equipment lubricated and adjusted to operate properly.
 - 3.2 Stored material shall be removed from the chemical storage bin, the bin cleaned and repaired, and the stored material replaced in the bin.
 - 3.3 Manhole Cover and Gasket shall be removed, gasket sealing surfaces cleaned, new gasket installed, and the manhole cover reinstalled.
 - 3.4 Welding shall comply with AWS D1.1.
 - 3.5 Testing: After repairs are completed, the equipment shall operate at design conditions.

Water Treatment Plant Scales And Weighing Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant scales and weighing equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

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- 2.0 PRODUCTS: (Section Not Used.)
- 3.0 EXECUTION:
- 3.1 Testing and Adjustment: Test and adjust controls to have same accuracy as originally guaranteed by the manufacturer.
- 3.2 Sealing: After testing and adjustment, the scale shall be sealed by the Contractor to prevent unauthorized tampering that might affect its accuracy.

Ion Exchange Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant ion exchange equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Exchange Column Vessels: Welding rods and shell material that are compatible with the steel of the vessel shall be used for leak repair. Welding rods shall comply with ASME Boiler and Pressure Vessel Code, Section II.
- 2.2 Vessel lining or coating repair material shall be compatible with the existing lining or coating.
- 2.3 Ion exchange resins, cation, or anion used for replacement shall be as originally specified by the equipment manufacturer or approved equivalent.
- 3.0 EXECUTION:
- 3.1 Exchange Column:
- 3.1.1 Vessel repair welding shall comply with the applicable requirements of ASME Boiler and Pressure Vessel Code, Section IX.
- 3.1.2 Structural welding shall comply with the applicable requirements of AWS D1.1.
- 3.2 Controllers and Analyzers: The following equipment shall be cleaned and shall have defective ports repaired or replaced to restore the items to their original operating condition:
 - Flow Control
 - Totalizer
 - Sequence Controller
 - Time Delay Relay
 - Drum Controller
 - Automatic Analyzer
 - Conducting Meter
 - Sample Conditioning Equipment

Softening Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant softening equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Concrete repair material for chemical storage bins and sedimentation basins shall comply with Applicable standards and/or.
- 2.2 Manhole gasket material shall be as recommended by the bin fabricator and shall be chemically resistant to the material stored in the bin.
- 2.3 Bin vent system repair and replacement parts shall be as recommended by the manufacturer, or equivalent.
- 2.4 Replacement parts for the sedimentation tank mechanism, drive system, and appurtenances shall be as recommended by the manufacturer of the equipment, or equivalent.
- 3.0 EXECUTION:
- 3.1 Carbon Dioxide Diffusion System: Maintenance and repair shall result in the recarbonation system being restored to its design capacity.

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- 3.2 Manhole Gasket: Manhole cover and gasket shall be removed, seated surfaces shall be cleaned, a replacement gasket shall be put in place, and the manhole cover shall be reinstalled.
- 3.3 Bin Vent System: Parts shall be cleaned and repaired or replaced.
- 3.4 Testing: Mixers shall be tested to ensure that they operate at their rated capacity. The diffusion system shall be tested for leaks, carbon dioxide flow rate, and pH change in the water. Bin(s), vent system, and appurtenances shall be tested to ensure operation at design conditions. Tanks and connecting lines shall be examined for leaks after being filled to operating level, and leaks shall be repaired.
- 3.5 Access: Softening equipment parts or appurtenances that interfere with access to or performance of the work shall be removed and replaced after the work has been completed.

Chlorine Contact Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant chlorine contact tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Bolts, nuts, and screws removed due to repair work shall be replaced with new bolts or screws of the same type, size, and finish, complying with ASTM A 193, Grade B8. Replacement nuts of the same type, size, and finish shall comply with ASTM A 194, Class 8F.
 - 2.2 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished, shall be finished with like finish.
 - 2.3 Concrete repair material shall be epoxy type grout in compliance with Applicable standards and/or.
- 3.0 EXECUTION:
 - 3.1 Tank shall be cleaned and repaired with the corroded parts replaced as required.
 - 3.2 Testing: After repairs are completed, test the equipment to ensure that it operates at designed conditions.

Disinfection Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for water and sewage treatment plant disinfection equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Chlorinator: The chlorinator shall be wall- or cabinet-mounted, shall be a vacuum-operated solution-feed type, and shall include an integral manifold trap complete with a built-in electric heater. The manifold shall have a removable chlorine filter with a 5-square inch filtering area. A positive tight shutoff valve shall be provided within the chlorinator to isolate gas under pressure from the control system should there be a loss of vacuum. An easily removable basket with filter screen shall be included upstream of the inlet valve. A spring-operated pressure relief valve shall be provided to prevent the buildup of pressure within the gas control system. An excess vacuum shutoff valve, which isolates the regulator and gas supply system from the ejector on loss of gas pressure shall be supplied. Provisions for automatic changeover shall be incorporated within the vacuum regulator without the need for an external valve. An indicator shall provide a visual signal when the chlorine gas supply is exhausted or interrupted.
 - 2.2 Gas Injector: The injector or diffuser shall be polyvinyl chloride (PVC) in compliance with ASTM D 1784. The ejector shall be provided with dual check valves as well as an emergency drain valve to protect against flooding of the vacuum regulator.
 - 2.3 The unit shall be supplied with the following accessories: metering tube supply indicator, rate valve, 50 feet of 5/8-inch polyethylene tubing for vent and vacuum lines, insect screen, bottle of ammonia solution, spare gaskets, thread lubricant, a flexible connector, and a universal wrench.
- 3.0 EXECUTION:

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- 3.1 Installation: The chlorine feeding machines and all equipment appurtenances shall be installed in accordance with the Chlorine Institute, Inc. Chlorine Manual and Pamphlet 6 so as to provide a complete and integrated system.
- 3.2 Testing: After installation of the chlorine feeding machine and evaporators is complete, operating tests shall be carried out to ensure that the chlorine feeding installation operates properly. All piping shall be tested hydrostatically and for leaks. If any deficiencies are revealed during any tests, such deficiencies shall be corrected, and the tests shall be reconducted.

Gaseous Chemical Metering Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of gaseous chemical metering equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Gas injectors shall be PVC plastic in compliance with ASTM D 1784.
 - 2.2 Gas Evaporators:
 - 2.2.1 Electrical heating elements shall be flat rod, immersion type.
 - 2.2.2 Wiring, Switch, Thermostat, and Alarm Switch: Load rating of wiring, switch, thermostat, and alarm switch shall be equal to or greater than the load rating of the wiring, switch, thermostat, and alarm switch to be replaced.
- 3.0 EXECUTION:
 - 3.1 General: The gas injector, gas evaporator, and chemical metering equipment shall be cleaned and repaired.
 - 3.2 Testing: Each piece of equipment shall be tested and adjusted to operate properly over its capacity range.
 - 3.3 Leak Tests: Piping, tubing, vessels, or jackets that are part of the equipment being repaired shall be tested for leaks at one and a half times normal working pressure.
 - 3.4 Calibration: Metering equipment shall be calibrated in compliance with manufacturer's instructions.
 - 3.5 Safety precautions pertaining to chlorine shall be in compliance with the Chlorine Institute, Inc. Chlorine Manual.

Sewage Ejectors, Submersible

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of submersible sewage ejectors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: The sewage ejectors shall be of the simplex or duplex pneumatic type and shall be complete with receivers, compressors, electric motors, control equipment, piping, and all necessary accessories.
 - 2.1 Sewage Receivers: Sewage receivers shall be of cast-iron or welded-steel construction conforming to the ASME Code, Section VIII for Pressure Vessels. Sewage inflow and outflow pipe connections shall be flanged; air-supply and vent-piping connections shall be screwed. Pipe threads shall conform to Fed. Std. H28 and pipe flanges shall conform to ASTM A 53. The receiver shall be tested at a pressure 50 percent greater than the working pressure. Each receiver shall be provided with suitable support and a manhole or handhole conveniently located. Steel receivers shall be coated inside and outside with coal-tar primer and enamel conforming to the requirements of AWWA C203 in all respects of materials and application, or shall be coated with a Coal-tar Epoxy paint system conforming to the requirements of SSPC-PS 11.01.
 - 2.2 Air Compressor: Each compressor shall be equipped with suction silencer, complete automatic lubrication system, an air filter, and adequate means for cooling. The operating speed of the air compressors shall not exceed 1,800 rpm. Installation of the air compressor shall conform to ASME B19.1.

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- 2.3 Air Reservoir: If the equipment furnished requires a compressed air reservoir for proper operation, the tank shall be constructed in conformance with ASME Boiler and Pressure Vessel Code, Section VIII, with flanged or screwed inlet and outlet connections as required. The storage tank shall be tested at a pressure 50 percent greater than the working pressure. The tank shall be fitted with a pressure gauge, inspection openings, blowoff cock, and a safety valve. The connection to the compressor shall be provided with a check valve and a shutoff valve.
- 2.4 Electric Motor: Each electric motor shall conform to NEMA MG 1. Temperature rise shall be based on 40 C ambient temperature.
- 2.5 Controls: An automatic control system shall be provided for each ejector.
- 2.6 Piping: The sewage influent and effluent lines be flanged cast iron. The air piping shall be wrought iron or steel with malleable-iron units and fittings. Pipe hangers and supports shall be spaced at not more than 10 feet on center.
- 2.7 Check Valves: AWWA C508, except that valves on the discharge side of the receivers shall be provided with replaceable valve seats.
- 2.8 Gate Valves:
 - 2.8.1 Cast Iron: AWWA C500, Class 125, Grade A, Design NRS, flanged ends.
 - 2.8.2 Bronze: MSS SP-80, Type I, Class 125.
- 2.9 Motor Controls: NEMA ICS 2.
- 2.10 Pipe:
 - 2.10.1 Cast Iron: Fed. Spec. WW-P-421, Class 150, as applicable to pipe barrel only. AWWA C110/A21.10, Class 125, for pipe flange.
 - 2.10.2 Steel: ASTM A 53, Grade B, Type E or S, zinc coated.
- 2.11 Pipe Fittings:
 - 2.11.1 Cast Iron: ANSI B16.1.
 - 2.11.2 Malleable Iron: Fed. Spec. WW-P-521, Type II.
 - 2.11.3 Malleable Iron Unions: Fed. Spec. WW-U-531, Type B.
- 2.12 Pipe Hangers and Supports: MSS SP-58 and SP-69.
- 3.0 EXECUTION:
 - 3.1 Valves: Valves installed in the wrought-iron and steel pipeline shall be bronze with screwed ends and valves installed in the cast-iron pipeline shall have bronze-mounted iron bodies with flanged ends. Gate valves shall be opened by turning counterclockwise.
 - 3.2 Concrete foundations shall be integral with and of the same concrete as the building floor unless otherwise directed. 4,000 psi concrete shall be used in foundations that are entirely separated from the surrounding floor. Foundation bolts, as required, shall be provided for proper positioning during the placement of the concrete.
 - 3.3 Bolts, nuts, anchors, washers, and all other types of necessary supports shall be of wrought iron or steel galvanized according to ASTM A 153.

Centrifuges

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant centrifuges. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
 - 3.1 Preparation: Clean centrifuge thoroughly of sludge and residue prior to commencing maintenance and repair.
 - 3.2 Installation:
 - 3.2.1 Repair and Replacement of Parts: The equipment shall be cleaned and repaired, and parts shall be replaced as required.
 - 3.2.2 Lubrication: Friction parts shall be lubricated with proper lubricants. Oil and grease shall be removed from surfaces and parts not intended to be oiled or greased.

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Grit Chambers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant grit chambers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Epoxy filler compound for concrete surfaces shall comply with Applicable standards and/or.
 - 2.2 Coal-tar epoxy shall comply with SSPC-PAINT 16.
 - 2.3 Epoxy paint shall comply with Mil. Spec. MIL-P-24441.
 - 2.4 Red-lead base paint shall comply with Fed. Spec. TT-P-86, Type 1.
 - 2.5 Finish coat paint shall comply with Fed. Spec. TT-P-38.
- 3.0 EXECUTION:
 - 3.1 Interruption of Sewage Treatment: Not more than one grit chamber shall be taken out of service at a time.
 - 3.2 Installation:
 - 3.2.2 Dust Control: Adequate provisions shall be made to prevent the transfer of dust to other equipment and to areas occupied by Member personnel.
 - 3.2.3 Grit Chamber Cleaning and Coating: Grit chamber shall be cleaned and coated as follows:
 - 3.2.3.1 Interior concrete surfaces of the grit chambers shall be cleaned with high pressure water or steam to remove dirt and residue, allowed to dry, and brush sandblasted.
 - 3.2.3.2 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. Apply two coats of Coal-tar epoxy to the surface after the epoxy has cured.
 - 3.2.3.3 Submerged ferrous metal surfaces such as piping, ladders, structural steel, and equipment that are exposed to the sewage shall be sandblasted and coated with two coats of coal-tar epoxy.
 - 3.2.3.4 Exterior concrete surfaces shall be cleaned by means of brush sandblast, the surfaces blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide applied.
 - 3.2.3.5 Ferrous metal surfaces that are not submerged shall be cleaned by means of sandblasting. Coat surfaces with one coat of red-lead base paint. After the base paint has dried sufficiently, apply two coats of Aluminum finish paint.

Micro-Screens

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant micro-screens and filter screens. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Replacement parts shall have the same characteristics as the parts to be replaced, unless otherwise approved.
- 3.0 EXECUTION:
 - 3.1 General: Screen, wash pumps, controller, drive equipment, and appurtenances shall be repaired or replaced, lubricated, and placed in service as required.
 - 3.2 Waste outlet shall be flushed and cleaned with high pressure water or steam or by rodding.
 - 3.3 Stopping Screen Unit: If, for any reason, the unit must be stopped, it shall be carefully drained down and the fabric shall be cleaned. The drum shall never be left standing for any length of time in a tank of dirty water. To the extent feasible, the interior and exterior water levels shall be maintained nearly equal, the drum kept constantly turning, and the backwashing spray left on until the tank has been drained.
 - 3.4 Startup of Screen Unit: After testing for rotation, admit water at a slow rate to the micro-screen tank. Water levels on both sides of the screen shall be equalized during filling. Keep the drum rotating and turn the washwater supply on. Since initial filling of the tank may entrain many impurities, watch the operation of the unit carefully to avoid problems with backwashing and, if

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required, supplement washwater sprays with hose streams to keep the screen clean during the tank filling operation.

3.5 Cleaning Screen:

3.5.1 Cleaning of slime from the filter screen shall be accomplished by shock chlorination using sodium hypochlorite solution or other acceptable methods. After treatment, drain and flush the tank to waste prior to returning the micro-screen to service.

3.5.2 Cleaning of iron or manganese oxide film from the filter screen shall be accomplished by using an inhibited acid cleanser.

3.5.3 Clean grease from the surface of filter screen panels by the use of steam.

Comminutors and Bar Screens

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant comminutors and bar screens. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Motor: Unless otherwise directed, replacement motors shall be rated for continuous operation.

2.2 Electrical Work: Electrical wiring shall comply with the requirements of NFPA 70.

2.3 Cutter blades shall be cobalt-chromium-tungsten alloy faced.

2.4 Fasteners shall be stainless steel.

3.0 EXECUTION:

3.1 Motor bearings shall be lubricated or replaced.

3.2 Welding shall be done by qualified welders in compliance with AWS D1.1.

Rotating Biological Filters

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant rotating biological filters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Steel Parts: Steel parts shall be fabricated from new stock conforming to ASTM A 366.

2.2 Hardware:

2.2.1 Bolts and Nuts: ASTM A 307.

2.2.2 Washers, Flat and Lock Type: ANSI B18.22.1.

2.3 Rust Inhibitive Primer: Fed. Spec. TT-P-664.

2.4 Galvanizing: ASTM A 123 and A 153.

3.0 EXECUTION:

3.1 Welding: Welding shall be in conformance with the AWS D1.1. Galvanized or painted surfaces destroyed by welding shall be restored to original surface for corrosion protection.

3.2 Shop Coating: All structural and miscellaneous metal items shall be painted or galvanized as required.

3.3 Lubrication: Lubricate all motors, chains, drive units, and bearings in compliance with the equipment manufacturer's instructions.

Vacuum Filters

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant vacuum filters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Ferrous metal surfaces not exposed to sewage shall be coated with red-lead paint complying with

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- Fed. Spec. TT-P-86, Type 1, with finish coats of aluminum paint complying with Fed. Spec. TT-P-38.
- 2.2 Ferrous metal surfaces exposed to sewage shall be coated with a coal-tar epoxy-polyamide paint complying with SSPC Paint 16.
 - 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Cleaning: Prior to removing parts or components of the vacuum filter or appurtenant equipment, clean dust, dirt, grime, and other foreign matter from the surfaces.
 - 3.1.2 Interruption of Treatment: Provide temporary bypass piping required during the performance of the work, and remove when no longer required.
 - 3.2 Installation:
 - 3.2.1 Openings in exterior walls or floor left by removal of a piece of equipment shall be closed to the weather. Remove temporary closures upon installation of the equipment.
 - 3.2.2 Ferrous metal surfaces exposed to sewage shall be sandblasted in compliance with SSPC-SP 10. After the necessary surface preparation has been accomplished, apply two coats of Coal-tar epoxy to a dry film thickness of 10 mils per coat.
 - 3.2.3 Ferrous metal surfaces not exposed to sewage shall have a surface preparation in compliance with the manufacturer's instructions and be coated with a primer and finish coat.

Sludge Drying Beds

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant sludge drying beds. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Liner Repair Material: Plastic liner and bonding cement shall be compatible with the existing liner.
 - 2.2 Sand: Sand shall have an effective grain size of 0.3 to 0.75 mm and a uniformity coefficient of not over 40.
 - 2.3 Gravel shall be coarse, medium, and fine gravel suitable for supporting sand bed. Top three inches shall be 1/8 inch to 3/4 inch in size.
- 3.0 EXECUTION:
 - 3.1 Walls shall be restored to original condition. Minor repairs may be made with concrete repair material.
 - 3.2 Gate repair shall be done by qualified welders in compliance with AWS D1.1.
 - 3.3 Liner repair shall comply with liner fabricator's recommendations.
 - 3.4 Underdrain Repair: Clean, unplug, repair, or replace underdrains as required. •11365

Trickling Filter

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant trickling filters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Filter media shall be crushed traprock, granite, limestone, hard coal, coke, cinders, blast furnace slag, rot-resistant wood, ceramic, or plastic materials.
 - 2.1.1 Media shall be free of most fine material.
 - 2.1.2 Media size shall comply with ASCE-02, grading size 3-1/2 to 2-1/2 inches.
 - 2.2 Distribution Arms: Pipe, nozzles, and drive parts shall be as recommended by the equipment manufacturer.
 - 2.3 Underdrain System:
 - 2.3.1 Vitrified Clay Underdrain: ASTM C 159.
 - 2.3.2 Concrete Underdrain: ASTM C 654.

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- 2.3.3 Perforated Vitrified Clay Pipe and Fittings: ASTM C 700.
- 2.3.4 Vitrified Clay Pipe and Fittings: ASTM C 301.
- 3.0 EXECUTION:
- 3.1 Filter Media: Place media to avoid damage, displacement, or clogging of the underdrains, in layers not exceeding 18 inches in depth, to ensure uniform vertical and horizontal distribution of size throughout the filter.
- 3.2 Distribution Arms Seals: Replace mechanical seal parts as recommended by the manufacturer. Replace mercury seals with mechanical seals.
- 3.3 Underdrain Collection System:
- 3.3.1 Underdrain blocks shall be arranged in rows without anchoring and with space maintained by lug. Opening shall be free and unobstructed to the passage of water.
- 3.3.2 Perforated pipe shall be firmly supported with sand bedding.
- 3.3.3 Open-spaced pipe shall be installed in compliance with ASTM C 12.
- 3.3.4 Patented filter under drain systems shall be installed as detailed in the manufacturer's published data.

Aeration Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant aeration tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Coatings:
- 2.1.1 Epoxy filler compound for concrete surfaces shall comply with Applicable standards and/or.
- 2.1.2 Coal-tar epoxy shall comply with SSPC-PAINT 16.
- 2.1.3 Epoxy paint shall comply with Mil. Spec. MIL-P-24441.
- 2.1.4 Red-lead base paint shall comply with Fed. Spec. TT-P-86, Type 1.
- 2.1.5 Shall comply with Fed. Spec. TT-P-38.
- 2.2 Steel plate shall comply with ASTM A 827.
- 3.0 EXECUTION:
- 3.1 Interior concrete surfaces of the tank shall be cleaned with high pressure water or steam to remove all dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.
- 3.2 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. The surfacing material shall be allowed to cure overnight and coated with two coats of coal-tar epoxy.
- 3.3 Holes and cracks in steel tank surfaces shall be cut back to solid metal with a torch. Steel plate of thickness equal to, or greater than, the existing steel tank shall be welded to the surface in compliance with AWS D1.1.
- 3.4 Submerged ferrous metal surfaces that are exposed to liquids shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar.
- 3.5 The exterior concrete surfaces of the tank shall be cleaned by means of brush sandblast in compliance with SSPC-SP 7. The surfaces shall be blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint applied.
- 3.6 Ferrous metal surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 3. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 3. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of Aluminum finish paint shall be applied.

Surface Aerators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for surface aeration equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required

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- to support the work.
- 2.0 PRODUCTS: The floating power assembly shall consist of an aerator motor, motor support-deflector, drive shaft and coupling, replaceable shaft sleeve and bearing, weedless or nonfouling propeller, and mounting hardware to attach the power assembly to the float assembly. The power assembly shall be high or low speed, as required.
 - 2.1 Aerator Motor: The aerator motor shall be a vertical, totally enclosed, fan-cooled motor.
 - 2.2 Motor Support Deflector: Support for the aerator motor shall be provided by a conically shaped, all fiberglass or stainless steel structure designed to carry the static and dynamic forces imposed upon the rotating assembly and the propeller.
 - 2.3 Drive Shaft and Coupling: The propeller drive shaft shall be rigidly coupled with a compression type coupling to the standard motor shaft extension. Each drive shaft shall be equipped with a replaceable austenitic stainless steel shaft sleeve at the apex of the conical motor support-deflector.
 - 2.4 Propeller and Supporting Hardware: The propeller shall be manufactured of cast manganese bronze or stainless steel. Blade design shall be two- or three-blade anti-fouling, with sweptback leading edge.
 - 2.5 Float Assembly: The flotation unit shall be constructed of polyester resin reinforced with fiberglass matte and woven glass roving. It shall be internally filled with high-density polyurethane, foamed-in-place and completely sealed from the external environment.
 - 2.6 Mooring Cable: The aerators shall be moored with 1/4-inch stain-less steel mooring cable. The mooring cables shall be attached to eye bolts anchored into blocks of concrete.
 - 2.7 Electric Cable: Each aerator shall be furnished with the type and amount of underwater electric cable required.
 - 3.0 EXECUTION:
 - 3.1 Operating Performance: Each aerator shall be capable of high oxygenation by entraining and disbursing atmospheric oxygen at designated minimum rate under standard conditions and with the motor not loaded over 100 percent of its rated capacity. The rotating assembly and propeller of each unit shall be statically, dynamically, and hydraulically balanced so that under normal operating conditions, the motor and unit will operate smoothly, and the vibration measured at the top of the motor shall not exceed established limits for industrial equipment of the same horsepower and motor speed. Aerators shall remain stable and not whirl, process, or otherwise exhibit erratic behavior that may result in damage or fatigue to itself or its accessories.
 - 3.2 Maintenance: Aerator units shall be so designed as to require a minimum of maintenance consisting only of lubrications of the upper and lower motor bearings twice a year in accordance with the manufacturer's instructions.

Sludge Digesters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installing of materials for repair and maintenance of sewage treatment plant sludge digesters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Coatings:
 - 2.1.1 Epoxy filler compound for concrete surfaces shall comply with Applicable standards and/or.
 - 2.1.2 Coal-tar epoxy shall comply with SSPC-PAINT 16.
 - 2.1.3 Epoxy paint shall comply with Mil. Spec. MIL-P-24441.
 - 2.1.4 Red-lead base paint shall comply with Fed. Spec. TT-P-86, Type 1.
 - 2.1.5 Aluminum finish paint shall comply with Fed. Spec. TT-P-38.
- 3.0 EXECUTION:
- 3.1 Preparation:
 - 3.1.1 Protection required to prevent damage to adjacent materials, equipment, fixtures, and finishes shall be provided. Purge gas from anaerobic sludge digester tanks, covers, piping, equipment, and control buildings to prevent explosion, fire, or oxygen starvation of personnel.

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- 3.1.2 Interruption of treatment shall be held to a minimum. Not more than one sludge digester shall be taken out of service at a time.
- 3.2 Installation:
 - 3.2.1 Emptying digester: Specified sludge digester(s) shall be emptied. Sludge digester emptying procedure shall be as follows:
 - 3.2.1.1 Methane formation shall be stopped and existing methane purged from under the digester cover, in the cover, in gas lines, equipment, and control building. After discontinuing the sludge feed, allow 3 days for the partial digestion of the last sludge added. When the rate of gas production indicates that most of the sludge has been digested, sludge heating shall be stopped. The gas space under the cover shall be purged with nitrogen or carbon dioxide. When the methane concentration is well below the lower explosive limit of 5.3 percent by volume, open all cover manholes and withdraw the contents of the digester.
 - 3.2.1.2 When draining an anaerobic sludge digester with a floating or gasholder cover, the Contractor shall continuously observe the cover until the cover is resting on the corbels. If the cover should tilt or bind, withdrawal shall be stopped immediately and the problem corrected prior to resumption of the draining operation. As the cover contacts the corbels, the cover shall be watched for signs of structural failure that could damage piping and equipment in the sludge digester tank.
 - 3.2.2 Digester Cleaning and Coatings:
 - 3.2.2.1 Interior concrete surfaces of the sludge digester tank shall be cleaned with high pressure water or steam to remove dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.
 - 3.2.2.2 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. Epoxy shall be applied in compliance with the manufacturer's application instructions. Two coats of Coal-tar epoxy shall be applied after the surface material has cured.
 - 3.2.2.3 Submerged ferrous metal surfaces such as piping, ladders, structural steel, equipment, and metal roof surfaces that are exposed to the sludge shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar epoxy.
 - 3.2.2.4 Exterior Concrete Surfaces of the digester shall be cleaned by means of brush sandblast in compliance with SSPC-SP 7, the surfaces blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint applied.
 - 3.2.2.5 Ferrous metal surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 6. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 8. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of Aluminum finish paint shall be applied.
 - 3.2.3 Hydrostatic Pressure Test: A hydrostatic test shall be made to demonstrate that the sludge digester is gas tight. After a satisfactory test has been made, the digester drained, and maintenance and repair work completed, valves shall be returned to normal operating position, plugs shall be removed, and the sludge digester and appurtenances shall be left ready for use.
 - 3.2.4 Startup of Aerobic or Anaerobic Digester: After maintenance and repair work has been completed and approved, the Contractor shall return the sludge digester to service and operate it to design capacity.

Tertiary Sand Filters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant tertiary sand filters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Filter Media:
 - 2.1.1 Sand: Silica sand shall be inert to wastewater and bacterial attack and shall have the following characteristics:
 - 2.1.1.1 Sphericity: Not less than 9.0.

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- 2.1.1.2 Porosity: Not more than 0.4.
- 2.1.1.3 Hardness: Not less than 7.0.
- 2.1.1.4 Specific Gravity: Not more than 2.65 or less than 2.6.
- 2.1.1.5 Inertness: Not less than 97 percent of the sand shall remain insoluble after 24 hours in hydrochloric acid.
- 2.1.2 Support gravel shall be hard, durable, clean, and uniformly spherical particles, free of mica and other thin and flat particles. Depths and sizes shall be as designated.
- 2.2 Underdrain System:
 - 2.2.1 Vitrified Clay Underdrain: ASTM C 159.
 - 2.2.2 Concrete Underdrain: ASTM C 654.
 - 2.2.3 Perforated Vitrified Clay Pipe and Fittings: ASTM C 700.
 - 2.2.4 Vitrified Clay Pipe and Fittings: ASTM C 301.
- 2.3 Filter Housing:
 - 2.3.1 Grout shall be metallic, nonshrink type.
 - 2.3.2 Concrete repair material shall be epoxy type complying with Applicable standards and/or.
 - 2.3.3 Concrete Coatings:
 - 2.3.3.1 Outside and above grade shall be epoxy type complying with Mil. Spec. MIL-P-24441.
 - 2.3.3.2 Inside and below grade shall be coal-tar epoxy type complying with SSPC-PAINT 16.
 - 2.3.4 Steel repair material shall be steel plate, to match existing, epoxy cement, or fiberglass cloth.
 - 2.3.5 Steel coatings shall be red-lead base coat complying with Fed. Spec. TT-P-86, Type I and finish coats of aluminum paint complying with Fed. Spec. TT-P-38.
- 2.4 Loss of head switch shall be of the same model or type, range, and contact rating as the loss of head switch to be replaced.
- 3.0 EXECUTION:
 - 3.1 Media Placement for Gravity and Pressure Filters:
 - 3.1.1 The filter box or tank and under drain shall be thoroughly cleaned before starting gravel and media placement. Materials becoming dirty shall be removed and replaced.
 - 3.1.2 The bottom gravel layer shall be placed carefully by hand to avoid movement to the underdrain system and to assure free passage for water from the orifices. Each layer shall be completed before the layer above is started. Gravel of differing gradations shall not be mixed. Gravel becoming mixed shall be removed and replaced. Gravel shall be cleaned as necessary by backwashing. For sizes less than 1/2 inch, the gravel shall be leveled to +/- 1/4 inch of the water surface defining its limit. For sizes greater than 1/2 inch, the gravel shall be leveled to +/- 1/2 inch of the water surface.
 - 3.1.3 Media shall be placed in a manner similar to the gravel placement and processed as may be required to achieve the gradation recommended by the manufacturer.
 - 3.2 Underdrain Repair:
 - 3.2.1 Underdrain blocks shall be arranged in rows without anchoring and with space maintained by lug. Opening shall be free and unobstructed to the passage of water.
 - 3.2.2 Perforated pipe shall be firmly supported with sand bedding.
 - 3.2.3 Open-spaced pipe shall be installed in compliance with ASTM C 12.
 - 3.3 Filter Housing Repair:
 - 3.3.1 Filter material shall be removed and inside walls cleaned prior to grouting or coating application.
 - 3.3.2 Welding shall be done in compliance with AWS D1.1.
 - 3.4 Cleaning and Coating:
 - 3.4.1 Interior concrete surfaces of the tank shall be cleaned with high pressure water, steam, or sandblasted to remove all dirt and residue.
 - 3.4.2 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled with an epoxy filler. The surfacing material shall be allowed to cure overnight, and then two coats of Coal-tar epoxy shall be applied to a dry film thickness of 10 mils per coat.
 - 3.4.3 Submerged ferrous metal surfaces, such as piping, ladders, structural steel, equipment, and metal roof surfaces that are exposed to the sludge, shall be cleaned and coated with two coats of Coal-tar epoxy with dry film thickness of 10 mils per coat.
 - 3.4.4 Exterior concrete surfaces of the tank shall be cleaned and two coats of epoxy-polyamide paint shall be applied to a dry film thickness of 5 mils per coat.

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- 3.4.5 Ferrous metal surfaces that are not submerged shall be cleaned and coated with one coat of Red-lead base paint to a dry film thickness of 3 mils. After the base paint has dried sufficiently, two coats of Aluminum finish paint shall be applied to a dry film thickness of 2 mils per coat.
- 3.5 Manual scouring shall be done during backwash (bed expanding) cycle, using long tined rakes and high pressure hose streams directed at, and into, the expanded bed.
- 3.6 Chemical cleaning solution from the filter bed shall be discharged to the backwash return tanks.
- 3.7 Detergents and chemicals shall not be allowed in the maintenance of rapid sand filters. Purging of the underdrain system shall be with caustic detergents (2 to 5 percent caustic soda) or 50 parts per million chlorine solution in slow sand filters.
- 3.8 Defective wash nozzles shall be replaced in each filter.
- 3.9 Cleaning of Air or Water Wash Nozzles: Jet and cone shall be removed from each nozzle and punched clean with a wire or rod.
- 3.10 Distribution laterals shall be flushed for a few minutes by removing the nozzles at the end of laterals.
- 3.11 General Maintenance of Loss of Head Switch: Connecting tubing shall be purged with clean air or water. Contacts shall be burnished, as required.

Food Service Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of food service equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Food service equipment shall comply with applicable NSF Standards. Gas-burning equipment shall be designed for operation with the type of gas designated and shall be approved by AGAL. Electrically operated equipment shall be in accordance with applicable standards of the UL Electrical Appliance and Utilization Equipment Directory and UL 197.
- 2.1 Equipment:
 - 2.1.1 Vertical Steam Cooker: Mil. Spec. MIL-C-2354.
 - 2.1.2 Commercial-Type Range: Gas, Fed. Spec. A-A-50064; electric, Fed. Spec. A-A-50035.
 - 2.1.3 Ice Cube Machine: Mil. Spec. MIL-I-11867.
 - 2.1.4 Rinser-Sanitizer: Mil. Spec. MIL-R-19038.
 - 2.1.5 Fry Pan: Gas, ASTM F 1047; electric, ASTM F 1047.
 - 2.1.6 Automatic Coffee Urn: Mil. Spec. MIL-U-43263.
 - 2.1.7 Steam Kettles: Electric, Mil. Spec. MIL-K- 43359; gas, Mil. Spec. MIL-K-43943.
 - 2.1.8 Food Service Cabinets, Warmer-Refrigerator, Roll-Through, Roll-In: Mil. Spec. MIL-C-43427.
 - 2.1.9 Convection Ovens: Gas, Fed. Spec. A-A-50042; electric, Fed. Spec. A-A-50039.
 - 2.1.10 Sanitizing Hot Water Heater: Mil. Spec. MIL-H-43895.
 - 2.1.11 High Pressure Cleaning and Sanitizing Machines: Mil. Spec. MIL-C-43949.
- 2.2 Materials:
 - 2.2.1 Black Iron Pipe: ASTM A 53.
 - 2.2.2 Brass Pipe: Fed. Spec. WW-P-351, Class 1.
 - 2.2.3 Chromium Plating of Brass Pipe, Valves, and Fittings: Fed. Spec. WW-P-541.
 - 2.2.4 Copper Tubing: ASTM B 88, Type K or L, or ASTM B 75, as required.
 - 2.2.5 Stainless Steel, Nonmagnetic: ASTM A 167 or ASTM A 240.
 - 2.2.6 Stainless Steel Pipe and Tubing: Seamless or welded, of true roundness, and of material specified for stainless steel. Seamless tubing shall be thoroughly annealed, pickled, and ground smooth. Welded tubing shall be thoroughly heat-treated, quenched to eliminate carbide precipitation, and then drawn true to size, roundness, and ground. Tubing shall be given a No. 3 or 4 finish when exposed to view.
 - 2.2.7 Fittings for Copper Tubing: Solder-joint type. Flared joint fittings may be used in specific applications when approved. Cast bronze solder joint fittings shall conform to ANSI B16.22. Wrought copper and wrought bronze solder joint fitting shall conform to ANSI B16.22. Cast bronze fittings for flared joints shall conform to ANSI B16.26.

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- 2.2.8 Fittings for Brass Pipe: Fed. Spec. WW-P-460, Class A or B, as required.
- 2.2.9 Galvanizing Repair Compound: Mil. Spec. MIL-P-21035.
- 2.2.10 Silver Solder: Fed. Spec. QQ-B-654, class as applicable.
- 2.2.11 Steel Structural Shapes for Framing: ASTM A 36. Sections shall be galvanized by the hot-dip process, conforming to ASTM A 123, coating designation G-90.
- 2.2.12 Tin-Lead Solder: Fed. Spec. QQ-S-571, composition Sn50.
- 2.3 Garbage Disposal Machine: A floor supported type with cast alloy body supported on adjustable tubular legs. The upper housing shall be removable. The disposal shall be provided with a stainless steel cone with a water swirl inlet. Throat shall have a neoprene silver trap.
 - 2.3.1 The disposal shall be provided with magnetic starter with overload and under voltage protection, 5-minute timer, panel cover interlock, fused disconnect, prewired solenoid, vacuum breaker, water flow controls, positive flushing action and reversing action, or other positive means of preventing jamming. The rotor shall be cast alloy carrying rigid impact bars fixed directly onto motor shaft, or stainless steel swivel impellers and stainless steel undercutter. Disposal machines with a 5 hp or 7-1/2 hp motor shall have a minimum 8-inch diameter rotor.
 - 2.3.2 Control: Control panel box shall be waterproof stainless steel construction.
- 2.4 Hoods: Design, fabrication, and installation of hoods and duct systems shall conform to NFPA 96 and UL 710 where applicable. Hood duct systems, grease removal devices, and cooking equipment, which may be a source of ignition of grease in the hood or duct, shall be protected with fixed pipe systems and provided with portable fire extinguishing equipment in accordance with NFPA 96, NFPA 17, and as specified. Ducts and hoods shall be secured to building so as to be level and free from vibration under all conditions of operations. Hoods, exposed ducts, and enclosures over dishwashing machines and rinse compartment of pot washing sinks shall be constructed of 18-gauge stainless steel. Hood shall be fabricated so as to form a condensate gutter at the perimeter and shall be provided with a condensate drain terminating at the floor sink location. Exhaust outlet shall be connected to the exhaust system.
- 2.5 Prefabricated Walk-In Refrigerators: Commercial, walk-in type, intended for use in dining facilities, in accordance with Mil. Spec. MIL-R-43900 except insulation shall provide a maximum "U" factor of 0.0295 Btuh.
- 2.6 Gas burning equipment shall comply with the applicable requirements of AGAL and ANSI. Each gas-burning appliance shall be connected to the building piping by means of a quick-disconnect device and flexible connector. A manual shutoff valve shall be installed on the building piping, ahead of the supply side of each quick-disconnect device. The quick-disconnect device shall conform to ANSI Z21.41 and the flexible connector to ANSI Z21.45. The length of the flexible connector shall be as required but shall not exceed 72 inches. Flexible connector shall not be concealed and shall not extend from one room to another. Dust caps and plugs shall be provided for quick-disconnect fittings for use when fittings are uncoupled.
- 2.7 Backflow Preventers: Each item of food service equipment having water supply and waste connections, with the water inlet connected below the flood level of the equipment, shall be supplied with backflow preventer of size and proportions that will allow an ample flow of water to the equipment, but will prevent the backflow of waste or polluted water into the water supply system.
- 2.8 Paint shall be of a durable, nontoxic, nondusting, nonflaking, and mildew-resistant type, suitable for use with food service equipment and in conformance with NSF 2.
- 3.0 EXECUTION:
 - 3.1 Installation: Equipment shall be installed in accordance with NSF Installation Manual for Food Service Equipment. The Contractor shall make provision for the plumbing, heating, and electrical connections and for equipment indicated as being furnished and installed by the Member. Equipment connections shall be complete to wall or floor for all utilities. Unless otherwise specified, exposed piping shall be chromium-plated copper alloy or stainless steel. Gas equipment installation shall conform to ANSI Z21.15 and NFPA 54. Electrical work shall comply with NFPA 70.
 - 3.2 Painting: All exterior, galvanized parts, exposed members of framework, and wrought steel pipe, where specified to be painted, shall be cleaned, degreased, primed with rust inhibiting primer, and finished with two coats of epoxy-based grey hammertone paint.

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Refrigerators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential refrigerators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Refrigerators and Freezers: AHAM HRF-1.
 - 2.2 Cords and Plugs: UL 62 and UL 817
 - 2.3 General Electrical: NFPA 70.
 - 2.4 Compressors: UL 984.
 - 2.5 Condensers: UL 250.
 - 2.6 Motors: UL 73.
- 3.0 EXECUTION: (Section not used.)

Dishwashers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential dishwashers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Dishwashers: UL 749.
 - 2.2 Time Control: UL 917.
 - 2.3 Control Valves: UL 429.
 - 2.4 General Electrical: NFPA 70.
 - 2.5 Cords and Plugs: UL 62.
 - 2.6 Motors: UL 73 and UL 547.
 - 2.7 Safety-Interlock Switch: UL 749.
- 3.0 EXECUTION: (Section not used.)

Garbage Disposers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential garbage disposers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Household Garbage Disposal: Fed. Spec. OO-G-1513 and AHAM FWD-1.
 - 2.2 Cords and Plugs: UL 62 and UL 817.
 - 2.3 Motors: UL 73.
 - 2.4 General Electrical: NFPA 70.
- 3.0 EXECUTION: (Section not used.)

Ranges and Ovens

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential ranges and ovens. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Conduit: UL 1.
 - 2.2 Conductors: UL 62, UL 83, and UL 817.

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- 2.3 Switches: UL 20 and UL 917.
- 2.4 Fuses and Fuseholders: UL 198 and UL 512.
- 2.5 Connectors: UL 486.
- 2.6 Ranges: UL 858.
- 2.7 Thermal Cutoffs: UL 1020.
- 2.8 General Electrical: NFPA 70.
- 2.9 Pilot Lights: UL 496 and UL 542.
- 2.10 Range Hoods: Non-vented, two-speed fan, charcoal filter, light, UL listed.
- 3.0 EXECUTION: (Section not used.)

Clothes Dryers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential clothes dryers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cords and Plugs: UL 62 and UL 817.
 - 2.2 Thermal Cutoffs: UL 1020.
 - 2.3 General Electrical: NFPA 70.
 - 2.4 Motors: UL 73.
 - 2.5 Home Laundry Equipment: UL 560 and Fed. Spec. OO-W-860.
 - 2.6 Switches: UL 917 and UL 20.
 - 2.7 Lamps and Lamp Holders: UL 496 and UL 542.
 - 2.8 Vent Duct: Plastic wrapped, flexible wire duct of diameter to fit duct pipe of machine.
 - 2.9 Weather Hood: Aluminum construction with backdraft damper.
- 3.0 EXECUTION: (Section not used.)

Clothes Washers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of residential clothes washers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Cords and Plugs: UL 62 and UL 817.
 - 2.2 Electrically-Operated Valves: UL 429.
 - 2.3 Home Laundry Equipment: UL 560 and Fed. Spec. OO-W-860.
 - 2.4 Lamps and Lamp Holders: UL 496 and UL 542.
 - 2.5 General Electrical: NFPA 70.
- 3.0 EXECUTION: (Section not used.)

Unit Kitchens

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of unit kitchens. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Electrical components shall comply with applicable UL standards and bear appropriate UL labels. Gas-burning equipment shall comply with ANSI Z21.1 and shall bear the AGA seal of approval.
 - 2.1 Materials: Minimum 22-gauge steel sheet for component body parts, minimum 20-gauge steel sheet for door fronts and liners, and heavier-gauge steel for internal gussets and bracing.
 - 2.2 Components: Electrical components shall be wired for the voltage available and shall terminate at factory-installed terminal boxes. Gas-burning components shall be designed to operate on the

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designated fuel. Unit kitchens shall include the following, as required:

- 2.2.1 Top and sink shall be seamless, one-piece with integral back and end splashes fabricated from 18-gauge AISI Type 302/304 stainless steel with No. 4 brushed finish or 16-gauge minimum titanium steel with acid-resistant porcelain finish. Sink accessories shall include chrome-plated swing spout faucet with aerator, chrome-plated faucet handles, stainless steel cup strainer, and drain outlet with tailpiece.
- 2.2.2 Food Waste Disposer shall be complete with drain outlet and tailpiece.
- 2.2.3 Refrigerator and freezer compartments shall be the designated minimum capacity measured in accordance with AHAM HRF-1.
- 2.2.4 Range: Each cooktop burner shall be rated at not less than 1,250 watts, if electric, or 8,000 Btu, if gas.
- 2.2.5 Oven: Electric oven "Bake" operation shall be rated at 2,000 watts minimum and "Broil" operation shall be rated at 2,500 watts minimum; gas oven burners shall be rated at 18,000 Btu minimum.
- 2.2.6 Cabinets shall be under-counter and upper wall-mounted, with shelves, doors, drawers, and hardware.
- 3.0 EXECUTION: (Section not used.)

Gymnasium Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gymnasium equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Basketball backstops shall be ceiling-suspended forward-folding, backward-folding, side-folding, wall-braced or fixed type; wall-mounted up-folding, side-folding or fixed type; or floor-mounted portable type as required. Backstop shall come complete with backboard, goal, and all accessories. Backboard material shall be glass, fiberglass, steel or wood as required and rectangular or fan shaped. Movable backstops shall be manually or electrically operated. Backstops, goals, and their accessories shall meet the specifications of the National Collegiate Athletic Association.
 - 2.2 Gym divider curtains shall be constructed of vinyl for the first eight feet (8' 0") above the floor. The remainder shall be 1-3/4 inch mesh, white nylon netting. A chain or other ballast shall be sewn into the bottom hem. Curtains that are drawn shall be manually operated and glide along their own track. Roll-up curtains shall be power-operated.
- 3.0 EXECUTION:
 - 3.1 Basketball goals shall be securely attached to supporting construction and shall be installed at a height of 10 feet from the rim to the floor.
 - 3.2 Telescoping Bleacher Seating: Verify that areas to receive telescoping bleacher seating are free of impediments interfering with installation and operation. Securely attach to supporting construction.
 - 3.3 Gym Divider Curtains: Verify that areas to receive gym divider curtains are free from interferences and structurally capable of supporting the curtains.

Paint Spray Booth

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of paint spray booths. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the Fire Protection Engineering Branch for requirements of paint spray booth protection.
- 2.0 PRODUCTS: All products shall meet applicable OSHA and NFPA standards.
 - 2.1 Enclosure:
 - 2.1.1 Panels: 18 gauge, ASTM A 568.
 - 2.1.2 Stiffeners and Support Shapes: ASTM A 36.
 - 2.1.3 Exhaust Chamber: 18 gauge, formed to hold filters.

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- 2.1.4 Doors:
 - 2.1.4.1 Access Door: 2 feet 6 inches by 7 feet 0 inches, steel-clad.
 - 2.1.4.2 Entrance Doors for Vehicular Booths: Swing type, two-section, steel-framed with intake air filters, a minimum opening of 8 feet 9 inches in height by 9 feet 10 inches in width, leak-proof seals and a heavy-duty latch.
 - 2.1.4.3 Exit Doors for Vehicular Drive-Through Booths: Swing type, two-section, steel frame, metal-clad, solid, with a minimum opening of 7 feet 9 inches in height by 9 feet 10 inches in width, leak-proof seals, and a heavy-duty latch.
- 2.1.5 Factory Finish: Galvanized or painted.
- 2.2 Filtering Equipment:
 - 2.2.1 Arrestor: Disposable, expanded fiber or fiberglass, Class 2 listed by UL.
 - 2.2.2 Water Wash: Complete with pumps, spray nozzles, baffles, and controls.
- 2.3 Exhaust Fans shall be sized to maintain 100 fpm minimum across the cross sectional area of booth and shall have permanently lubricated bearings and enclosed belts. Fan motors shall be located outside of air stream.
- 2.4 Lighting: Fluorescent.
- 2.5 Fans, controls, and lights inside paint booths shall be explosion proof.
- 1.1 EXECUTION: Installation shall comply with applicable codes and environmental regulations.

DIVISION 12-FURNISHINGS (NOT USED)

DIVISION 13-SPECIAL CONSTRUCTION

Pre-engineered Structures

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pre-engineered metal buildings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Metal buildings shall be the design and product of a recognized metal building manufacturer who is regularly engaged in the fabrication of pre-engineered structures.
 - 2.1 Design Requirements:
 - 2.1.1 Metal buildings shall be designed for the dead load, designated live loads, and combinations of these loads as set forth in the MBMA Low Rise Building Systems Manual.
 - 2.1.2 Framing and Structural Members: Structural steel members shall be designed in accordance with AISC publication, Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Structural cold-formed steel framing members shall be designed in accordance with the AISI publication, Specification for the Design of Cold-Formed Steel Structural Members. Framed openings shall be designed to structurally replace the covering and framing displaced. Welding of steel shall be in accordance with AWS D1.1.
 - 2.1.3 Exterior Covering: Maximum wind load deflection for wall sheets shall not exceed 1/180 of the span between supports; Maximum live load deflection for roof sheets shall not exceed 1/180 of the span between supports. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect.
 - 2.2 Materials:
 - 2.2.1 Hot-Rolled Structural Shapes: ASTM A 36 or A 529.
 - 2.2.2 Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53.
 - 2.2.3 Members Fabricated from Plate or Bar Stock: 42,000 psi minimum yield strength; ASTM A 529, A 570, or A 572.
 - 2.2.4 Members Fabricated by Cold Forming: ASTM A 607, Grade 50.
 - 2.2.5 Galvanized Steel Sheet: ASTM A 446 with G 90 coating.
 - 2.3 Framing:
 - 2.3.1 Rigid frames shall be hot-rolled structural steel; factory-welded and shop-painted built-up "I" shape or open web rigid frame consisting of tapered or parallel flange beams and tapered columns. Furnish complete with attachment plates, bearing plates, and splice members. Frames shall be

Attachment 1: Specifications for the Work

- factory-drilled for bolted field assembly.
- 2.3.2 End wall columns shall be factory-welded, built-up "I" shape or cold-formed sections, fabricated of minimum 14-gauge material, and shop-painted.
 - 2.3.3 Wind Bracing shall be adjustable, threaded steel rods, 1/2 inch in diameter minimum; ASTM A 36 or A 572, Grade D.
 - 2.3.4 Secondary Framing: Purlins, eave struts, end wall beams, and flange and sag bracing shall be minimum 16-gauge rolled formed sections and shop-painted. Base channel, sill angle, end wall structural members (except columns and beams), and purlin spacers shall be minimum 14-gauge cold-formed steel, galvanized.
 - 2.3.5 Bolts shall be ASTM A 307 or A 325 as necessary for design loads and connection details. Bolts shall be shop-painted, except zinc- or cadmium-plated units shall be provided when in direct contact with panels.
 - 2.4 Roofing and Siding: Provide flashings, closers, fillers, metal expansion joints, ridge covers, fascias, and other sheet metal accessories, factory-formed of same material and finish as roofing and siding.
 - 2.4.1 Roof-covering assemblies shall have a wind uplift resistance rating of Class 90 in accordance with UL 580 and shall be listed in the UL Fire Resistance Directory for wind uplift resistance classification.
 - 2.4.2 Steel covering shall be zinc-coated steel conforming to ASTM A 446, Grade C, with G 90 coating complying with ASTM A 525. Steel sheets and panels shall be not less than 26-gauge.
 - 2.4.3 Aluminized steel sheets shall be aluminum-coated, ASTM A 463, Drawing Quality with T1-40 coating. Metal thickness shall be not less than 26-gauge.
 - 2.4.4 Aluminum sheets shall be fabricated from aluminum alloy 3003 or 3004 Alclad with tempering as required to suit forming operations, ASTM B 209. Aluminum sheet thickness shall be not less than 0.032 inch.
 - 2.4.5 Insulated wall panels shall be factory-assembled or field-assembled units, consisting of a central insulating core with metal interior and exterior face sheets securely fastened together with rivets, bolts, studs, "snap-on", or other approved methods of fastening, including interlocking with basic wall units.
 - 2.5 Insulation:
 - 2.5.1 Insulation shall be batts, blankets, and/or rigid material of required thickness and density to provide an overall tested heat transfer U-value as required. Insulation shall have a flame spread classification of 25 or less and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Exposed insulation shall be faced with a vapor barrier of vinyl film, vinyl reinforced foil, or foil reinforced Kraft.
 - 2.5.2 Rigid or semi-rigid board insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or Class 2. Insulation shall have a white non-dusting and non-shedding painted finish.
 - 2.5.3 Blanket insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6. Insulation shall have a white sheet vinyl facing.
 - 2.6 Accessories:
 - 2.6.1 General: Provide coated steel accessories with coated steel roofing and siding; aluminum accessories with aluminum roofing and siding.
 - 2.6.2 Gutters shall be formed in sections, complete with end pieces, outlet tubes, and special pieces that may be required. Finish to match roof fascia and rake.
 - 2.6.3 Downspouts shall be formed in sections, complete with elbows and offsets, and shall be finished to match wall panels.
 - 2.6.4 Circular gravity roof ventilators shall be low-profile, ridge type ventilators, complete with base, bird screen, hood, flashing, closures, and fittings, finished to match roof panels.
 - 2.6.5 Continuous ridge ventilators shall be factory-engineered and fabricated units of continuous heat valve type.
 - 2.6.6 Wall Louvers: Provide units fabricated of not less than 18-gauge steel, finished to match wall panels. Provide bird screens of 1/2-inch x 1/2-inch galvanized steel mesh in rewirable frames on exterior face of louvers. Secure screens with clips to ensure ease of removal for cleaning and rewiring.

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- 2.7 Hollow metal doors and door frames shall comply with Recommended Specifications for Standard Steel Doors and Frames (SDI-100), Steel Door Institute.
 - 2.7.1 Materials: Hot-rolled, pickled, and oiled in compliance with ASTM A 569 and A 568; cold-rolled in compliance with ASTM A 366 and A 568.
 - 2.7.2 Hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping, shall comply with ANSI A115. Locate finish hardware in compliance with BHMA Recommended Locations for Builder's Hardware.
 - 2.7.3 Hardware: Provide hardware for each door, as follows:
 - 2.7.3.1 Hinges: 1-1/2 pair, steel, template hinges, 4-1/2 inches x 4-1/2 inches.
 - 2.7.3.2 Lockset: Cylindrical, key in knob.
 - 2.7.3.3 Threshold: Extruded aluminum (exterior doors only).
 - 2.7.3.4 Weatherstripping: Sponge neoprene or extruded vinyl, enclosed in an aluminum housing. Bottom weatherstripping shall be an aluminum extrusion with vinyl sweep strip.
- 2.8 Overhead Doors:
 - 2.8.1 Overhead doors shall be industrial type of standard manufacture, fabricated of 24-gauge galvanized steel minimum or 0.032-inch thick aluminum. Accessories shall include galvanized steel track, torsion-spring mechanism, ball-bearing roller, cylinder lock, and weatherstripping. Doors shall be manually operated, except that doors over 144 square feet in area shall be chain hoist or electric motor operated.
 - 2.8.2 Overhead Coiling Doors:
 - 2.8.2.1 General: Provide operating door assemblies as a complete unit produced by one manufacturer, including door curtain, guides, counterbalance, hood, hardware, operators, and installation accessories.
 - 2.8.2.2 Door Curtain: Fabricate overhead coiling door curtain of interlocking slats designed to withstand required wind loading. Slats shall be structural quality, cold-rolled galvanized steel sheets complying with ASTM A 446, Grade A, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication, or aluminum slats, 5052 alloy, standard mill finish, not less than 0.04 inch thick.
- 2.9 Windows: Windows shall be of steel in accordance with the Steel Window Institute, The Specifier's Guide to Steel Windows, or of aluminum in accordance with the AAMA 101. Windows shall be complete with operating and locking hardware and glazing.
- 2.10 Fabrication: Shop fabricate to the required size and section, complete with base plates, bearing plates, and other plates as required for erection, welded in place, and with all required holes for anchoring or connections shop drilled or punched to template dimensions. Shop connections shall be power riveted, bolted, or welded. Field connections shall be bolted.
- 2.11 Shop Painting:
 - 2.11.1 Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.
 - 2.11.2 Prime structural steel primary and secondary framing members with rust-inhibitive primer having over 50 percent rust-inhibitive pigment, such as red-lead mixed pigment alkyd varnish (Fed. Spec. TT-P-86, Type II) or zinc chromate iron-oxide alkyd (Fed. Spec. TT-P-664).
 - 2.11.3 Prime galvanized members, after phosphoric acid pretreatment, with zinc dust-zinc oxide primer (Fed. Spec. TT-P-641).
- 3.0 EXECUTION: Erection shall be in accordance with the approved erection instructions. Dissimilar materials that are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, and other foreign materials.
- 3.1 Framing: Erect structural framing true to line, level, plumb, rigid, and secure. Provide rake or gable purlins with tight-fitting closure channels and fascias. Provide diagonal rod or angle bracing in both roof and sidewalls as required. At framed openings provide shapes of proper design and size to reinforce opening and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.
- 3.2 Roofing and Siding: Arrange and nest sidelap joints so that prevailing winds blow over, not into,

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- lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage. Provide weather seal under ridge cap; flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
- 3.2.1 Roof Sheets: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheeting and protruding equipment, vents, and accessories.
 - 3.2.2 Wall Sheets: Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Align bottoms of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws.
 - 3.3 Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories, for positive anchorage to building and weathertight mounting.
 - 3.4 Swing Doors and Frames: Install doors and frames straight, plumb, and level.
 - 3.5 Overhead Doors: Set doors and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports. Adjust moving hardware for proper operation.
 - 3.6 Windows: Anchor windows securely in place. Seal entire perimeter of each unit with elastomeric sealant used for panels. Adjust and lubricate operating sash (vents) and hardware for proper operation. Clean surfaces of window units. Mount screens directly to frames with tapped screw clips.
 - 3.7 Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Install setting blocks at quarter points, set in a bed of sealant if heel-bead is used. Install spacers inside and out, all around, wherever liquid or plastic mastic compounds are used.
 - 3.8 Thermal Insulation: Install blankets straight and true in one-piece lengths and both sets of tabs sealed to provide a complete vapor barrier.
 - 3.9 Field Painting: Apply finish coating to factory-primed items.

Swimming Pool Accessories

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of swimming pool equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Diving stands shall be fabricated of 1-1/2 inch Schedule 40 stainless steel pipe. Their use shall be directed by facility dimensional requirements and shall comply with APHA, USS, NCAA, AAU, and FINA.
 - 2.2 Diving boards shall be fabricated of all aluminum or of laminated wood and fiberglass. All upper surfaces shall be non-skid, and all edges shall be rounded and sealed.
 - 2.3 Ladders shall be fabricated from low carbon Type 304 stainless steel and have raised non-skid treads. Quantities, locations, and clearances shall comply with National Spa and Pool Institute standards.
 - 2.4 Lifeguard chairs shall be fabricated from Type 304 stainless steel (framework and handrails) and have raised non-skid treads and non-skid platforms. Units shall comply with Safety Requirements, published by the National Swimming Pool Institute, and OSHA standards.
 - 2.5 Underwater lights of not less than 0.5 watts per square foot of pool area shall be provided in accordance with Lighting and Wiring, published by the National Spa and Pool Institute, and Article No. 68D of the National Electrical Code.
 - 2.6 Pool covers shall be polyethylene, having a flame spread rating of "0" as per ASTM E 84. Materials shall be non-toxic, non-absorbent, non-permeable, chemical-resistant and have a upper service limit of 110 F. Storage reels shall be constructed of Type 304 stainless steel.
 - 2.7 Slides shall consist of fiberglass bodies with integral continuous flowing water supply, Type 304 stainless steel frames and raised non-skid ladder treads.
- 3.0 EXECUTION: (Section not used.)

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Sludge Incinerators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant incinerators. Products shall match existing materials and/or as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Refractory materials shall comply with ASTM C 27.
 - 2.2 Sand for fluidized bed shall be high silica sand having an effective size of 0.20 mm. and a uniformity coefficient of 1.8.
 - 2.3 Repair and replacement parts for burners shall be compatible with the existing burners.
- 3.0 EXECUTION:
 - 3.1 Cleaning, Lubrication, and Adjustments: Thoroughly clean fan, blower, motor, and damper of dirt, dust, and other foreign material. Parts shall be lubricated and adjusted for proper operation.
 - 3.2 Burner Parts shall be cleaned and primary and secondary air openings shall be adjusted as required for good combustion and to meet the design requirements for excess air to the burner. Adjustments shall be made with the incinerator in normal operation.
 - 3.3 Cleaning of Fuel and Atomizing Lines: Gas, oil, air, and steam lines connected to the burner shall be disconnected, cleaned, and reconnected.
 - 3.4 Startup: After completion of maintenance and repairs, the incinerator shall be started up and operating adjustments shall be made by the Contractor as required to achieve the design flow rate and emission quality of the incinerator.

Settling Chamber

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water treatment plant settling chambers and weirs. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
 - 3.1 Interruptions of Treatment: Not more than one settling chamber shall be taken out of service at a time.
 - 3.2 Installation:
 - 3.2.1 Painting: Exposed new surfaces and surfaces marred during the work shall be painted to match existing color.
 - 3.2.2 Startup: Final adjustments and startup shall be made in such a way as to ensure that all equipment operates at design conditions and rated capacity.
 - 3.2.3 Weir Adjustment: Adjust existing weirs that have a top edge elevation variation of more than 1/32 inch, and all new weirs, to be level throughout their length at the elevation specified.
 - 3.2.4 Weir Repair: Grind metal weir plates smooth and even, if grinding does not exceed amount of available equipment.

Water Treatment Plant Filters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of gravity and pressure filters for water treatment plants. Products shall match exiting materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Concrete repair materials shall be epoxy type grout in compliance with Applicable standards and/or.
 - 2.2 Steel plate, welding rods and welding electrodes shall be of a composition that complies with Section II of ASME Boiler and Pressure Vessel Code.

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- 2.3 Sequencing controls and solenoid valves shall comply with NEMA ICS and UL 508.
- 2.4 Filter media shall comply with the requirements of AWWA B100 and shall be equivalent to the existing filter materials.
- 2.5 Replacement weirs and troughs may be steel, conforming to ASTM A 36, or glass fiber reinforced plastic, in compliance with ASTM D 3841.
- 3.0 EXECUTION:
- 3.1 Tank and Trough Repair: Welding repairs shall comply with Paragraph UF-37 of Section VIII of the ASME Boiler and Pressure Vessel Code or AWS D1.1.
- 3.2 Weirs: Adjust weirs to the elevation required. Weirs may not have a top edge elevation variation of more than 1/32 inch throughout their length. Eroded top edges of metal weir plates shall be ground smooth and even, if grinding does not exceed amount of available adjustment.
- 3.3 Filter Media: Filtering materials shall be replaced in accordance with AWWA B100.
- 3.4 Testing: Test leak repairs by hydrostatic pressure or by pneumatic pressure if the leak is in the tank air space. Test sequence controls, solenoid valves, and backwash equipment to ensure that they operate at design conditions.
- 3.5 Cleaning: Clean tank interior of all sediment and foreign matter after completion of repair and testing. Clean sequence controls and associated electrical contacts.
- 3.6 Painting: Exposed metal surfaces shall be painted.
- 3.7 Disinfection: Disinfect piping and filters in accordance with AWWA B100.

Pressure Filters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of pressure filters for water treatment plants. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Steel plate, welding rods and welding electrodes shall be of a composition that complies with Section II of ASME Boiler and Pressure Vessel Code.
- 2.2 Relief valves shall be set to relieve at 15 psi above the normal operating pressure of the tank.
- 3.0 EXECUTION:
- 3.1 General: Welding repairs shall comply with Paragraph UF-37 of Section VIII of the ASME Boiler and Pressure Vessel Code or AWS D1.1.
- 3.2 Repair of Pin Holes: Weld holes of diameter less than half the plate thickness in compliance with AWS D1.1.
- 3.3 Repair of Cracks: Patch cracks or holes larger than one half the thickness of the tank shell plate.
- 3.4 Testing: Test leak repairs by hydrostatic pressure or by pneumatic pressure if the leak is in the air space of the tank.
- 3.5 Cleaning: Clean tank interior of all sediment and foreign matter after completion of repair and testing.

Backwash Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance for water treatment plant backwash tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Bolts and Screws: Existing bolts and screws removed due to repair work shall be replaced with new bolts or screws complying with ASTM A 193, Grade B8 and nuts complying with ASTM A 194, Class 8F of the same type, size, and finish.
- 2.2 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished shall be of like finish.
- 2.3 Steel tank repair parts shall be as specified in ASTM A 36, A 131, A 283, or A 573, depending upon

Attachment 1: Specifications for the Work

- required thickness.
- 2.4 Steel tank coatings shall be as specified in AWWA D102.
- 2.5 Concrete tank repair material shall be epoxy type grout in compliance with Applicable standards and/or.
- 2.6 Concrete tank coatings shall be a taste-free and odor-free, coal-tar base coating.
- 3.0 EXECUTION:
- 3.1 Preparation: Temporary backwash tank and accessories shall be furnished and installed as required to provide uninterrupted service.
- 3.2 Installation:
- 3.2.1 Flame Cutting: No cutting by torch or flame shall be done without written authorization from the Authorized Member Representative.
- 3.2.2 Testing: Test tanks by filling with water and inspecting for leaks. Test piping and valves hydrostatically at one and one half times normal working pressure or 50 psig, whichever is greater.

Sewage Treatment Plant Electrical Controls and Instrumentation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sewage treatment plant instrumentation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Applicable Data: Flow diagrams, loop diagrams, and installation drawings of the existing instruments and sampling systems for which maintenance and repair is to be provided should be requested from the Authorized Member Representative.
- 2.2 Instrumentation: All instrumentation shall be in accordance with the manufacturer's instructions.
- 3.0 EXECUTION:
- 3.1 Scheduling and Coordination: Contractor shall determine that arrangements have been made to take the equipment out of service for the duration of the work.
- 3.2 General: Perform listed maintenance procedures and repairs on meter and sampling system in compliance with the manufacturer's recommendations.
- 3.3 Calibration: Calibrate meter over the meter's range and adjust to read correctly.

Water Treatment Plant Electrical Controls and Instrumentation

- 1.0 Water treatment plant electrical controls and instrumentation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General: Items not specified but required for the proper installation or repair of a specified item of work shall be provided. Items shall be of proper type, size, design, and characteristics for the use intended. Parts shall be factory-made.
- 2.2 Finishes: Items replacing existing items that are galvanized, plated, painted, or otherwise finished shall be finished with like finish in compliance with the manufacturer's standard practice.
- 2.3 Electrical controls and instrumentation components for replacement purposes shall be designed for same service as the existing.
- 3.0 EXECUTION:
- 3.1 Coordination: Contractor shall determine that requirements for removal of the equipment from service, the bypassing of control valves, and installing of temporary replacements have been coordinated with the Authorized Member Representative. Bypassing of control valves or putting a control instrument in the Remote-Hand-Control mode will be done by the plant operators.
- 3.2 Power Supplies that may be a hazard during the performance of the work shall be locked out.
- 3.3 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.

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Flow Measurement Devices

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of current type, turbine type, compound type, and fire service type meters for the measurement of flow. Products shall match existing materials and/or shall be as directed by Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Current type meters in sizes ranging between 5/8 inch and 6 inches shall conform to AWWA C 700.
 - 2.2 Turbine type meter for customer services in sizes ranging between 1-1/2 inches and 12 inches shall conform to AWWA C 701.
 - 2.3 Compound type meters in sizes ranging between 2 inches and 10 inches shall conform to AWWA C 702.
 - 2.4 Fire service type meters in sizes ranging between 3 inches and 10 inches shall conform to AWWA C 703.
 - 2.5 Current type meters, propeller-driven in sizes ranging between 2 inches and 36 inches shall conform to AWWA C 704.
 - 2.6 Multi-Jet Type Meters in sizes ranging between 5/8 inch and 2 inches shall conform to AWWA C 708.
- 3.0 EXECUTION: Calibration shall result in the flow measurement device reading correctly over its normal operating range.

Solar Water Heating Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of solar water heating equipment. The solar energy system shall be arranged for preheating of service (domestic and/or process) water using flat plate liquid solar collectors. System components shall include a solar collector array, storage tank, pump[s], automatic controls, instrumentation, interconnecting piping and fittings, uninhibited food-grade propylene-glycol and water heat transfer fluid in a closed loop, potable water heat transfer fluid in an open loop, heat exchanger (for closed-loop), expansion tank (for closed-loop), and accessories required for proper operation of the system.
- 2.0 PRODUCTS:
 - 2.1 General Equipment Requirements:
 - 2.1.1 Standard Products: Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Authorized Member Representative, reasonably convenient to the site.
 - 2.1.2 Special Tools: One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of the equipment shall be provided.
 - 2.2 Piping System: Piping system shall be complete with pipe, pipe fittings, valves, strainers, expansion loops, hangers, inserts, supports, anchors, guides, sleeves, and accessories.
 - 2.3 Electrical Work: Electric motor-driven equipment specified shall be provided complete with motor, motor starters, and controls. Electrical characteristics shall be as specified or indicated. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control specified. Each motor shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided.
 - 2.4 Collector Subsystem: Collectors shall be of the flat plate, liquid, internally manifolded type. Each collector shall be provided with cover glazing, an absorber plate, heat transfer liquid flow tubes, internal headers, weep holes, insulation, and a casing. Collectors shall be of weather-tight construction. Solar collectors shall withstand a stagnation temperature of 350 degrees F and a working pressure of 125 psig without degrading, out-gassing, or warping. Collector net aperture area shall be a minimum of 28 square feet. Collector length, width, and volume shall be as shown.
 - 2.4.1 Collector Warranty: Contractor shall provide a minimum 10-year warranty against the following:

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- failure of manifold or riser tubing, joints or fittings; degradation of absorber plate selective surface; rusting or discoloration of collector hardware; and embrittlement of header manifold seals. The warranty shall include full repair or replacement of defective materials or equipment.
- 2.4.2 Solar Collector Performance: Thermal performance shall be plotted on the thermal efficiency curve in accordance with ASHRAE 93. The y-intercept shall be equal to or greater than 0.68, and the numerical value of the slope of the curve (FRUL) shall be between 0 and minus 5.7 watts per square meter per degree K (0 and minus 1.0 Btu per hour per square foot per degree F). Manufacturer's recommended volumetric flow rate and the design pressure drop at the recommended flow rate shall be as shown. Manufacturer's recommendations shall allow at least seven collectors to be joined per bank while providing for balanced flow and for thermal expansion considerations.
- 2.5 Solar Collector Array:
- 2.5.1 Net Absorber Area and Array Layout: Array shall consist of an assembly of solar collectors as shown. Solar collectors shall be assembled as shown in banks of equal number of collectors. Banks shall consist of no less than 4 and no more than 7 collectors each. Collector array shall be oriented so that all collectors face the same direction and are oriented within 20 degrees of true south and with respect to true south as indicated. Collectors arranged in multiple rows shall be spaced so that no shading from other collectors is evident between 1000 hours and 1400 hours solar time on December 21. Minimum spacing between rows shall be as shown.
- 2.5.2 Piping: The array piping shall include interconnecting piping between solar collectors, and shall be connected in a reverse-return configuration as indicated with approximately equal pipe length for any possible flow path. Flow rate through the collector array shall be as indicated. Automatic pressure relief valves shall be provided in the array piping system as indicated, and shall be adjusted to open when the pressure within the solar array rises above 125 psig. Each collector bank shall be capable of being isolated by valves, and each bank capable of being separated shall have a pressure relief valve installed and shall be capable of being drained. Manually operated air vents shall be located at system high points, and all array piping shall be pitched a minimum of 0.25 inch per foot as shown so that piping can be drained by gravity. Calibrated balancing valves shall be supplied at the outlet of each collector bank as indicated.
- 2.5.3 Supports for Solar Collector Array: Support structure for collector array shall be aluminum and shall secure collector array at the tilt angle with respect to horizontal and orientation with respect to true south as shown. Support structure shall withstand static weight of filled collectors and piping, wind, snow, seismic, and other loads as indicated. Support structure shall allow access to all equipment for maintenance, repair, and replacement.
- 2.6 Storage Tank: Solar system hot water storage tank shall have a storage volume between 1.5 to 2 gallons per square foot of collector area and shall be as shown. Solar system storage tank shall conform to specifications for hot water storage tanks in Section 15401 INTERIOR PLUMBING. Insulation shall have an R value of not less than 30. Tank penetrations shall be designed to allow for connections to copper piping without risk of corrosion due to dissimilar metals, and shall be factory installed as indicated.
- 2.7 Transport Subsystem:
- 2.7.1 Heat Exchanger: The heat exchanger construction and testing shall be in accordance with ASME BPV VIII Div 1. Minimum design pressure rating shall be 125 psig. Heat exchanger shall be capable of returning a hot-side exit temperature of 120 degrees F or less given a hot-side approach temperature of 140 degrees F and a cold-side approach temperature of 100 degrees F. Heat exchanger shall be capable of withstanding temperatures of at least 240 degrees F. Heat exchanger shall be capable of operation at the flow rates as shown.
- 2.7.1.1 Plate Heat Exchanger: Heat exchanger shall be constructed of multiple plates of 316 stainless steel, titanium, copper, copper-nickel, or brass. Plates shall be frame-mounted, mechanically bonded, welded, or brazed at edges. Plate-type heat exchanger shall be able to be cleaned. Gaskets shall be of EPDM rubber or Viton. All plate heat exchanger characteristics shall be as indicated.
- 2.7.1.2 Tube-in-Shell Heat Exchanger: Heat exchanger shall be [fixed] [removable] bundle, shell-and-tube type. Shell, tube sheets, and end plates shall be constructed of nonferrous, brass, copper-

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- nickel, or 316 stainless steel. Shell insulation shall have a minimum R value of not less than 12. Tubes shall be seamless copper or copper alloy and shall be mechanically bonded, welded, or brazed to the end tube plates. Tubes shall be straight and supported by tube sheets that maintain the tubes in alignment. Straight tube heat exchanger shall be arranged for mechanical cleaning. All tube-in-shell heat exchanger characteristics shall be as indicated.
- 2.7.2 Pumps: Circulating pumps shall be electrically-driven, single stage, centrifugal type. The pumps shall be supported on a concrete foundation or by the piping on which installed. The pumps shall have a capacity not less than that indicated and shall be either integrally-mounted with the motor or direct-connected by a flexible-shaft coupling on a cast-iron or steel subbase. The pump shaft shall be constructed of corrosion resistant alloy steel, sleeve bearings and glands of bronze designed to accommodate a mechanical seal. Pumps shall have stainless steel impellers and casings of bronze. The motors shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump, shall be suitable for the available electric service and for the heat transfer fluid used. The motors shall be controlled by suitable switches that can be activated by either the differential temperature controller or by manual override (Hand-Off-Automatic). Each pump suction and discharge connection shall be provided with a pressure gauge as specified.
- 2.7.3 Pipe Insulation: Array piping insulation shall be capable of withstanding 250 degrees F, except that piping within 1.5 feet of collector connections shall be capable of withstanding 400 degrees F.
- 2.7.4 Expansion Tank: Expansion tank shall be constructed and tested in accordance with ASME BPV VIII Div 1 and as applicable for a working pressure of 125 psig. Tank shall be provided with an elastomeric EPDM bladder which separates the system fluid from the tank walls and is suitable for a maximum operating temperature of 240 degrees F. Expansion tank acceptance volume shall be as a minimum the amount of fluid equal to the fluid volume of the collectors plus piping at the same height or above the collectors. Total tank size and arrangement shall be as shown. Tank shall be provided with 125 psi pressure relief valve. Tank shall be provided with precharge pressure as shown.
- 2.7.5 Heat Transfer Fluid: Solar collector loop fluid shall be uninhibited USP/food-grade propylene-glycol and shall be mixed with distilled or demineralized water to form a 30 or 50 percent by volume propylene-glycol solution with climates that commonly attain freezing temperatures (those above 4000 heating degree F days) receiving the 50 percent solution.
- 2.8 Control and Instrumentation Subsystem:
- 2.8.1 Differential Temperature Control Equipment: Differential temperature control equipment shall be supplied as a system by a single manufacturer. Controller shall be solid-state electronic type complete with an integral transformer to supply low voltage, shall allow a minimum adjustable temperature differential (on) of 8 to 20 degrees F, a minimum adjustable temperature differential (off) of 3 to 5 degrees F, and shall include a switching relay or solid state output device for pump control. Thermostat shall operate in the on-off mode. Controller accuracy shall be plus or minus 1 degree F. Controller shall be compatible with 10-kOhm thermistor temperature sensors. Differential control shall provide direct digital temperature readings of all temperatures sensed. Control shall indicate visually when pumps are energized. Control ambient operating range shall be a minimum of 32 to 120 degrees F.
- 2.8.2 Sensor and Control Wiring: 18 AWG minimum twisted and shielded 2, 3, or 4 conductor to match analog function hardware. Control wiring shall have 600 volt insulation. Multiconductor wire shall have an outer jacket of PVC.
- 2.8.3 Flowmeters: Flowmeters shall consist of a venturi, 6 inch dial differential pressure meter, valved pressure taps, and bar stock needle valves. Venturi flow nozzle shall have threaded bronze ends for pipe sizes up to 2 inches and flanged ends for pipe sizes 2-1/2 inches and above. Venturi length shall not be less than 1.6 times the pipe size. Venturi shall be selected to read differential pressure corresponding to 0.5 to 1.5 times the system flow rate. Venturi shall have an accuracy of plus or minus 1 percent of the range. Meter shall have an accuracy of plus or minus 2 percent of the full scale range.
- 2.8.4 Sight Flow Indicators: Sight flow indicators shall consist of a clear glass window or cylinder and a nonferrous or 316 stainless steel body and impeller. Indicator shall have threaded ends for pipe

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- sizes up to 2 inches and flanged ends for pipe sizes 2-1/2 inches and above. Maximum operating pressure shall be no less than 125 psi. Maximum operating temperature shall be no less than 250 degrees F.
- 2.9 Painting and Finishing: Equipment and component items, when fabricated from ferrous metal and located inside the building, shall be factory finished with the manufacturer's standard finish.
- 3.0 EXECUTION:
- 3.1 Installation:
- 3.1.1 Collector Subsystem:
- 3.1.1.1 Collector Array: Solar collector array shall be installed at the tilt angle, orientation, and elevation above roof as indicated. For installation on flat roofs with rack type collector mounting or for ground mounted collectors, bottom of collector shall be a minimum of 18 inches from roof or ground surface. For mounting on pitched roofs, back of collectors shall be installed a minimum of 2 inches above roof surface. Each solar collector shall be removable for maintenance, repair, or replacement. Solar collector array shall not impose additional loads on the structure beyond the loads scheduled on the structural drawings.
- 3.1.1.2 Array Piping: Collector array piping shall be installed in a reverse-return configuration so that path lengths of collector supply and return are of approximately equal length.
- 3.1.1.3 Array Support: Array support shall be installed in accordance with the recommendations of the collector manufacturer. Structural members requiring welding shall be welded in accordance with AWS D1.2 for aluminum and welders should be qualified according to AWS B2.1.
- 3.1.2 Storage Subsystem: Solar storage tank penetrations shall be installed as shown so that cold water inlet to storage tank and outlet from storage tank to collector array are located near the bottom of the tank, and inlet from collector array and outlet to load are located near the top of the tank.
- 3.1.3 Transport Subsystem:
- 3.1.3.1 Flow Rates: Flow rate in the collector loop shall be based on recommended collector flow rate, and shall be as shown. Storage loop flow rate shall be 1.25 times the collector loop flow rate. System flow rate shall be based on recommended collector flow rate, and shall be as indicated. All flow rates shall be below 5 feet per second.
- 3.1.3.2 Pumps: Pumps shall be installed on foundations, leveled, grouted, and realigned before operation in accordance with manufacturers instructions. Additional pipe supports shall be provided for close-coupled in-line pumps. All base mounted pumps shall have a straight pipe between the suction side of the pump and the first elbow. The length of this pipe shall be a minimum of five times the diameter of the pipe on the suction side of the pump, or a suction diffuser of the proper size shall be attached to the suction side of the pump. All in-line pumps shall have straight pipe between the suction side of the pump and the first elbow. The length of this pipe shall be a minimum of five times the diameter of the pipe size on the suction side of the pump. Drain line sizes from the pumps shall not be less than the drain trap or the pump dirt pocket, but in no case shall the drain line be less than 1/2 inch iron pipe size. Drain lines shall terminate to spill over the nearest floor or open sight drain.
- 3.1.3.3 Expansion Tank: Expansion tank shall be installed on suction side of pump as shown.
- 3.1.3.4 Piping, Valves, and Accessories: Piping shall be coded with fluid type and flow direction labels. When a food-grade uninhibited propylene-glycol solution is used to heat potable service water, tamper resistant seals must be attached to all fill ports. All propylene-glycol circuits must be labeled "CONTAINS UNINHIBITED FOOD-GRADE PROPYLENE-GLYCOL: INTRODUCTION OF ANY NONAPPROVED FLUID MAY CONSTITUTE A HEALTH HAZARD." All tamper resistant seals must carry the name of the registered engineer or licensed plumber who certifies that only a 30 or 50 percent food-grade uninhibited propylene-glycol and water solution has been installed in the system. Air vents shall be installed at the high points of the collector array and in the equipment room.
- 3.1.3.5 Pipe Expansion: Expansion of supply and return pipes shall be provided for by changes in the direction of the run of pipe or by expansion loops as indicated. Expansion loops shall provide adequate expansion of the main straight runs of the system within the stress limits specified in ASME B31.1. Loops shall be cold-sprung and installed where indicated. Pipe guides shall be provided as indicated. Expansion joints shall not be used in system piping.

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- 3.1.3.6 Valves: Valves shall be installed at the locations indicated and where required for the proper functioning of the system. Valves shall be installed with their stems horizontal or above. Gate or ball valves shall be installed at the inlet and outlet of each bank of internally manifolded collectors. Calibrated balancing valves with integral pressure taps shall be installed at the outlet of each bank and at the pump discharge. Final setting for each valve shall be marked on each valve. Ball valves shall be installed with a union immediately adjacent. Gate valves shall be installed at the inlet and outlet of each pump and also at the inlet and outlet of each heat exchanger. A check valve shall be installed at pump discharges. Discharges of relief valves shall be piped to the nearest floor drain or as indicated on system drawings.
- 3.1.3.7 Foundations: Concrete foundations or pads for storage tanks, Heat exchangers, pumps, and other equipment covered by this specification shall be constructed in accordance with manufacturer's recommendations and be a minimum of 6 inches high with chamfered edges.
- 3.1.4 Control Subsystem:
 - 3.1.4.1 Differential Temperature Controller: Automatic control equipment shall be installed at the location shown in accordance with the manufacturer's instructions. Control wiring and sensor wiring shall be installed in conduit. Unless otherwise indicated, operators, controllers, sensors, indicators, and like devices when installed on equipment casings and pipe lines shall be provided with stand-off mounting brackets, bases, nipples, adapters, or extended tubes to provide clearance, not less than the thickness of the insulation, between the surface and the device. These stand-off mounting items shall be integral with the devices or standard accessories of the controls manufacturer unless otherwise approved. Clamp-on devices or instruments where direct contact with pipe surface is required shall be exempted from the use of the above mounting items. All control wiring shall be color coded and identified with permanent numeric or alphabetic codes.
- 3.2 Inspection and Testing:
 - 3.2.1 Inspection: Contractor shall make system available for inspection at all times.
 - 3.2.2 Testing Prior to Concealment:
 - 3.2.2.1 Hydrostatic Test: Contractor shall demonstrate to Authorized Member Representative that all piping has been hydrostatically tested, at a pressure of 125 pounds per square inch for a period of time sufficient for inspection of every joint in the system and in no case less than 2 hours, prior to installation of insulation. Expansion tank and relief valves shall be isolated from test pressure. No loss of pressure shall be allowed. Leaks found during tests shall be repaired by replacing pipe or fittings. Caulking of joints shall not be permitted.
 - 3.2.2.2 Cleaning of Piping: System piping shall be flushed with clean, fresh water prior to concealment of any individual section and prior to final operating tests. Prior to flushing piping, relief valves shall be isolated or removed. Solar collectors shall be covered to prevent heating of cleaning fluid, unless cleaning is performed during hours of darkness. The solution shall be circulated through the section to be cleaned at the design flow rate for a minimum of 2 hours.
 - 3.2.3 Posting Framed Instructions: Framed instructions under glass or in laminated plastic shall be posted where directed. These instructions shall include a system schematic, and wiring and control diagrams showing the complete layout of the entire system. Condensed operating instructions explaining preventative maintenance procedures, balanced flow rates, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above, and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted for approval prior to posting. The framed instructions shall be posted before acceptance testing of the system.
 - 3.2.4 Acceptance Testing and Final Inspection: Contractor shall notify the Authorized Member Representative 7 calendar days before the performance and acceptance tests are to be conducted. Tests shall be performed in the presence of the Authorized Member Representative. Contractor shall furnish all instruments and personnel required for the tests. Electricity and water shall be furnished by the Member. A written record of the results of all acceptance tests shall be maintained, to be submitted in booklet form. The tests shall be as follows:
 - 3.2.4.1 As-Built Drawings: The Contractor shall provide as a condition of final acceptance a complete set of as-built system drawings. Drawings shall clearly indicate the actual condition of the installed solar energy system at the time of the final test.

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- 3.2.4.2 Final Hydrostatic Test: Contractor shall demonstrate to Authorized Member Representative that all plumbing has been hydrostatically tested at a pressure of 125 pounds per square inch for a period of time sufficient for inspection of every joint in the system and in no case less than 2 hours. Expansion tank and relief valves shall be isolated from test pressure. Gauges used in the test shall have been calibrated within the 6-month period preceding the test. Test shall be witnessed by Authorized Member Representative. No loss of pressure shall be allowed. Leaks found during tests shall be repaired by replacing pipe or fittings and the system retested. Caulking of joints shall not be permitted.
- 3.2.4.3 System Flushing: For the final inspection, the system shall be thoroughly flushed of all foreign matter until a white linen bag installed in a strainer basket shows no evidence of contamination and in no case for less than 2 hours. Authorized Member Representative shall inspect the linen bag prior to completion of flushing. System shall be drained prior to final filling.
- 3.2.4.4 System Filling: System shall be filled through indicated connections with propylene-glycol solution. Solution shall be mixed externally to the solar system and consist of 30 or 50 percent propylene-glycol and 70 or 50 percent water by volume. System pressure at the high point on the roof shall be 10 psig minimum.
- 3.2.4.5 Operational Test: Operational test shall occur over a period of 48 consecutive hours with sufficient solar insolation to cause activation of the solar energy system during daylight hours. With system fully charged so that pressure at the high point on the roof or the lowest system pressure is a minimum of 10 psig and with fluid and pump[s] energized, sight flow indicator must indicate flow floweret must indicate flow as indicated. Calibrated balancing valves with pressure taps shall indicate bank flow rate as shown.
- 3.2.4.6 Control Logic: By substituting variable resistors for collector and storage tank temperature sensors, Contractor shall demonstrate the differential temperature controller correctly energizes the system pump[s] when the collector sensor indicates a temperature of 15 degrees F greater than the storage tank temperature, as indicated on the controller display panel. The differential temperature controller shall de-energize the system pump[s] when the displayed temperature of the solar collectors is degrees 5 degrees F greater than the displayed temperature of the storage tank.
- 3.2.4.7 Temperature Sensor Diagnostics: Contractor shall demonstrate that the controller will correctly identify open and short circuits on both the solar collector temperature sensor circuit and the storage tank sensor circuit.
- 3.2.4.8 Overall System Operations: Contractor shall demonstrate that the solar energy system will operate properly while unattended for a period of at least 72 hours. The system must demonstrate that the controller will start pump[s] after being warmed by the sun, and that it will properly shut down during cloudy weather or in the evening over a minimum of three complete cycles. Contractor is permitted to manipulate the temperature of the storage tank by the introduction of cold water at local groundwater temperature.
- 3.3 Field Training: A field training course shall be provided for designated operating and maintenance staff members. Training shall be provided for a minimum period of 16 hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. The training shall include discussion of the system design and layout and demonstrations of routine operation and maintenance procedures. This training shall include: normal system operation and control; flow balancing; detection of a nonfunctioning system due to sensor, controller, and/or mechanical failure; filling, draining, and venting of the collector array; replacement of sensors, collectors, and collector components; collector cleaning and inspection for leaks; and heat exchanger cleaning and expansion tank charging if applicable.

Vehicle Barriers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of portable, semi-permanent, permanent, power-assisted or manually deployed vehicle barriers. Type, size and capacity shall be as indicated or shall match existing.
- 2.0 PRODUCTS:
- 2.1 Retractable Barriers: In the raised position, the total retractable barrier heights shall be no less

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- than 28 inches above the roadway surface and the width indicated. In the lowered position, the retractable barrier shall extend no more than 5/8 inch above the roadway surface. Retractable barriers in the lowered position shall be capable of supporting a 32,000-pound axle load or a 16,000-pound wheel load. Design for this load shall be in accordance with AASHTO-01.
- 2.1.1 Powered retractable barrier shall be capable of 240 complete up/down cycles per hour. Barrier motion shall be instantly reversible and shall be capable of raising the barrier from the lowered position to the raised position within 8 seconds during normal use, and within 2 seconds during an emergency. Barrier shall be capable of being closed from the raised position to the lowered position in not more than 3 seconds. Portable power-assisted retractable barriers shall be equipped with on and off ramps for smooth transition between surfaces.
 - 2.1.1.1 Failure Modes of Operation: The system shall be designed to prevent lowering of the barrier in the event of hydraulic, electrical, or mechanical failure. A manual pump shall be included for operation of hydraulic and/or mechanical barriers without power.
 - 2.1.1.2 Electric Motors: Unless otherwise indicated, electric motors shall have totally enclosed enclosures.
 - 2.1.1.3 System shall be designed to maintain the barriers in the raised position, without inspection, for periods of time of up to 1 week. Equip hydraulic systems with pressure relief valves to prevent overpressure.
 - 2.1.1.4 Hydraulic power unit shall contain hydraulic fluid which maintains its viscosity between 80 to 4000 saybolt universal seconds (SUS) even at constant heaviest use rate, for an ambient temperature range of 20 degrees F to 150 degrees F. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier shall be flexible and/or carbon steel pipe. Flexible and rigid hydraulic line working pressure shall exceed the maximum system relief pressure. PVC pipe and fittings for burial of hydraulic lines shall be in accordance with ASTM D 3034 Type PS 46 with minimum pipe stiffness of 46.
 - a. Flexible hydraulic lines shall be in accordance with SAE J517.
 - b. Seamless carbon steel pipe shall be in accordance with ASTM A 106.
 - 2.1.1.5 Hydraulic Power Unit Enclosure: A NEMA Type 3R enclosure as specified in NEMA 250 shall be provided to enclose the hydraulic power unit. The enclosure shall be designed for easy removal of the hydraulic power unit and other accessories without complete removal of the enclosure.
 - 2.1.2 Manual retractable barriers shall be capable of being raised and lowered by manual means such as levers or hydraulics requiring a maximum 60 pounds of force. The manual mechanism shall contain a locking pin that accepts a padlock for securing the barrier when it is in the "UP" position.
 - 2.2 Retractable Bollards: Total bollard height in the raised position shall be no less than 30 inches above the roadway surface and shall have an outside diameter of no less than 8 inches. Bollard system shall consist of a minimum of three bollards spaced no more than 32 inches from centerline to centerline of bollards across a 10-foot roadway. Bollards in the lowered position shall be capable of supporting a 16,000-pound wheel load each. Design for this load shall be in accordance with AASHTO-01.
 - 2.2.1 Powered retractable bollards shall be capable of 240 complete up/down cycles per hour. Bollards shall be capable of being raised or lowered within a 3 to 15-second range during normal use and within 2.5 seconds for emergency operations.
 - 2.2.1.1 Failure Modes of Operation: The system shall be designed to prevent lowering of the barrier in the event of hydraulic, electrical, or mechanical failure. A manual pump shall be included for operation of hydraulic and/or mechanical barriers without power.
 - 2.2.1.2 Electric motors shall have totally enclosed enclosures unless otherwise indicated.
 - 2.2.1.3 System shall be designed to maintain the barriers in the raised position, without inspection, for period of time of up to 1 week. If a hydraulic system is used, it shall be equipped with pressure relief valves to prevent overpressure.
 - 2.2.1.4 Hydraulic power unit shall contain hydraulic fluid which maintains its viscosity between 80 to 4000 saybolt universal seconds (SUS) even at constant heaviest use rate, for an ambient temperature range of 20 degrees F to 150 degrees F. For ambient temperatures below 20 degrees F, a hydraulic oil heater shall be provided so that the oil viscosity remains between 80 to 4000 SUS. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier shall be flexible and/or carbon steel pipe. Flexible and rigid hydraulic line working pressure shall exceed the

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- maximum system relief pressure. PVC pipe and fittings for burial of hydraulic lines shall be in accordance with ASTM D 3034 Type PS 46 with minimum pipe stiffness of 46.
- a. Flexible hydraulic lines shall be in accordance with SAE J517.
 - b. Seamless carbon steel pipe shall be in accordance with ASTM A 106.
- 2.2.1.5 Hydraulic Power Unit Enclosure: A NEMA Type 3R enclosure as specified in NEMA 250 shall be provided to enclose the hydraulic power unit. The enclosure shall be designed for easy removal of the hydraulic power unit and other accessories without complete removal of the enclosure.
- 2.2.2 Manual retractable bollards shall be capable of being raised and lowered utilizing a recessed handle on the top surface of the bollard, with a maximum force of 60 pounds or a manual hydraulic pump requiring a max 60 pounds of force. A recessed panel at the base of each bollard, adjacent to the bollard in the "DOWN" position, shall contain a spring actuated latching mechanism that automatically secures the bollard in either the full "UP" or full "DOWN" position. The panel shall have an access cover with provisions for a padlock to secure the access cover.
- 2.3 Crash gate shall consist of steel buttresses anchored into the ground and an above grade assembly consisting of a heavy steel structural or a combination of heavy steel and structural aluminum capable of being opened and closed. The height of the gate shall be a minimum of 84 inches from the road surface to the top of the gate frame. The length shall close and protect a minimum 120 inch clear opening. The maximum clear opening between the gate frame and end posts, between the bottom of the gate and finished grade, and between any grill work shall be 3 inches.
- 2.3.1 Powered Crash Gate: The gate movement shall be controlled by an electromechanical gate operator or a hydraulic gate operator consisting of an operator unit with required control circuits and operator station. The control and operating voltage shall be 24 VAC (nominal).
- 2.3.2 Failure Mode of Operation: The system shall be designed to prevent opening of the crash gate in the event of electrical or mechanical failure. A disconnect system for the gate drive shall be provided to allow manual operation of the barrier in the event of a power outage.
- 2.3.3 Manual crash gate shall be capable of being hinged from either side. Hinge points of both buttresses shall each contain a locking pin with padlock acceptance for securing the crash gate in the closed position. The crash gate shall withstand a 10,000-pound vehicle at impact speed of 50 miles per hour, with maximum gate deflection or vehicle penetration of 10 feet.
- 2.4 Crash beam shall be an above-grade assembly that, in the "DOWN" position, shall present a formidable obstacle to approaching vehicles. The height of the barrier shall be a minimum of 30 inches as measured from the roadway surface to the centerline of the crash beam. The crash beam shall be capable of blocking a minimum road width of 120 inches. The crash beam end shall contain a locking pin with padlock acceptance for securing the crash beam when it is in the "DOWN" position. Crash beam shall withstand a 10,000-pound vehicle at impact speed of 15 miles per hour, with a maximum beam deflection of 20 feet.
- 2.4.1 Powered crash beam shall be operated by means of a hydraulic power system. The crash beam shall be capable of being raised or lowered within an 8- to 15-second time range.
- 2.4.1.1 Failure Mode of Operation: A disconnect system for the crash beam shall be provided to allow manual operation of the barrier in the event of an electrical or mechanical failure.
- 2.4.2 Manual crash beam shall be manually raised and lowered with the aid of a counterbalanced end requiring approximately 60 pounds of force.
- 2.5 Electrical Work: Motors, manual or automatic motor control equipment except where installed in motor control centers, and protective or signal devices required for the operation specified herein, and wiring required for operation shall be provided in accordance with DIVISION 16 ELECTRICAL Section.
- 2.6 Control panel and control circuit shall be provided to interface between all barrier control stations and the power unit. The control station is defined as the main control panel and the remote control panel as shown. The control circuit shall contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. The control panel shall allow direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and gate limit switches. The enclosure shall be as indicated on the drawings. All device interconnect lines shall be run to terminal strips.
- 2.6.1 Voltage: The control circuit shall operate from a 120 volt 60 Hz supply.

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- 2.6.2 Main control panel shall be supplied to control barrier function. This panel shall have a key-lockable main switch with main power "ON" and panel "ON" lights. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. An emergency fast operate circuit (EFO) shall be operated from a push button larger than the normal controls. The EFO shall also be furnished with an EFO-active light and reset button. The main control panel shall have a key lockable switch to arm or disable the remote control panel. An indicator light shall show if the remote control panel is enabled.
- 2.6.3 Remote control panel shall have a panel "ON" light that is lit when enabled by a key lockable switch on the main control panel. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier. The EFO shall be operated from a push button larger than the normal controls. The EFO shall be interconnected with an EFO-active light. When the remote control panel EFO is pushed, operation of the barrier will not be possible from this panel until reset at the main control panel.
- 2.7 Miscellaneous Equipment:
 - 2.7.1 Safety Equipment: Red/yellow 8-inch traffic lights shall be supplied for each entrance and exit to alert motorists of the barrier position. Traffic lights are not required for manual barriers. The yellow light shall indicate that the barrier is fully open. All other positions shall cause the light to show red. Brackets shall be supplied to allow the light to be mounted a minimum 4.5 feet above the roadway pavement on a 3.5-inch outside diameter metal post or mounted directly on the crash gate.
 - 2.7.2 Heater: A waterproof barrier heater with a thermostat control and NEMA 4 junction box connection point shall be provided for de-icing and snow melting. The heater shall provide barrier operation to an ambient temperature of minus 40 degrees F. For retractable bollards, a 250-watt heater shall be provided for each bollard.
 - 2.7.3 Signage shall read "Axle Weight Limit 9 Tons" and shall conform to FHWA-01 sign (R12.2).
 - 2.7.4 Vertical arm gates (Traffic Arms) shall have an opening and closing time of less than or equal to 15 seconds. The gates shall be capable of 15 duty cycles per hour as a minimum. Gate shall operate the arm through 90 degrees. Gate operators shall be supplied with single phase 120 volt motors. Each gate shall be capable of being operated from a remote open-close push button station. Gates shall have a hand-crank mechanism that will allow manual operation during power failures. Each gate shall be supplied with a handcrank. Gate arms shall be constructed out of wood, steel, fiberglass, or aluminum, as specified by the manufacturer for the given lengths as shown on the drawings. Gate arms shall be covered with 16-inch wide reflectorized red and white sheeting. Each gate shall be furnished with a spare gate arm. Gate operator cabinets shall be constructed of galvanized steel and shall be painted manufacturers standard color as approved. Each gate operator shall be provided with an obstruction detector that will automatically reverse the gate motor when an obstruction is detected. The obstruction detector shall be any of the following three types: An electronic loop vehicle detector buried in the road, a photocell electric eye mounted on the gate operator, or a safety strip mounted on the lower edge of the arm. The detector system shall be automatically deactivated when the arm reaches the fully lowered position. Slab size and anchorage for gate operator shall be per manufacturer requirements.
- 2.8 Finish: Surfaces shall be painted in accordance with requirements of DIVISION 9 Section on painting except for materials supplied with manufacturers standard finish. The roadway plate shall have a nonskid surface. The barrier front shall have 6-inch wide reflective yellow stripes 4 inches apart. Bollards shall be painted reflective yellow with 3-inch wide black diagonal stripes. The barrier crash gate shall be painted white and the crash beam shall be painted reflective yellow with 3-inch wide black diagonal stripes.
- 2.9 Concrete shall conform to DIVISION 3 Concrete section.
- 2.10 Welding shall be in accordance with AWS D1.1.
- 2.11 Pavement: After placement of the vehicle barrier, the pavement sections shall be replaced to match the section and depth of the surrounding pavement. Pavement shall be warped to match the elevations of existing pavement. Positive surface drainage, away from the vehicle barrier, shall be provided by pavement slope.
- 3.0 EXECUTION
 - 3.1 Installation shall be in accordance with manufacturers instructions.

Attachment 1: Specifications for the Work

- 3.2 Buried hydraulic lines shall be placed in polyvinyl chloride (PVC) sleeves. Positive drainage shall be provided from the hydraulic power unit to the barrier for drainage of condensation within the PVC sleeve.
- 3.3 All controls shall be terminated with compression ring-style terminals. Roundhead screws and lockwashers shall be used to provide vibration-resistant connections. Connections between any printed circuit cards and the chassis shall be made with screw connections or other locking means to prevent shock or vibration separation of the card from its chassis.

DIVISION 14-CONVEYING EQUIPMENT

Passenger Elevators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of passenger elevators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Elevators shall be of size, type, and operation directed by the Authorized Member Representative. Elevators shall comply with the requirements of ANSI A17.1 and ANSI A117.1. Elevator cab shall be galvanized metal shell with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Walls of elevator shall have raised plastic laminate panels. Structural and non-exposed Ferrous metal surfaces shall receive two coats of structural grade primer. Elevator shall be complete with protective car pads and hooks.
 - 2.2 Operating Equipment: Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.
 - 2.3 Finishes:
 - 2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.
 - 2.3.2 Enamel: Shop-applied baked enamel of color as selected by the Authorized Member Representative.
 - 2.3.3 Plastic Laminate: Fed. Spec. L-P-508, color, texture, and pattern as selected by the Authorized Member Representative.
 - 2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.
- 3.0 EXECUTION:
 - 3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.
 - 3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.
 - 3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

Freight Elevators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of freight elevators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

Attachment 1: Specifications for the Work

2.0 PRODUCTS:

- 2.1 Elevators shall comply with the requirements of ANSI A17.1. When provisions for the handicapped are required, elevators shall comply with the requirements of ANSI A117.1. Elevator cab shall be galvanized metal shell with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Structural and non-exposed Ferrous metal surfaces shall receive two coats of structural grade primer.
- 2.2 Operating Equipment: Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.
- 2.3 Finishes:
 - 2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.
 - 2.3.2 Enamel: Shop-applied baked enamel.
- 2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.
- 3.0 EXECUTION:
 - 3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.
 - 3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.
 - 3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

Lifts

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of commercial lifts. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Lifts shall comply with ANSI A17.1.
- 2.1 Lifts shall be electrically operated traction type with counter-weights, winding drum type, or hand-operated chain or screw drive type for low-capacity, infrequent use as required. The lift shall be manufacturer's standard pre-engineered system.
- 2.2 Capacity rating shall be 100 pounds, 50 pounds, or as required.
- 2.3 Speed shall be 50 fpm, with travel distance as required.
- 2.4 Hoistway doors shall be 2 feet 6 inches wide by 3 feet 0 inches high, or as required.
- 2.5 Self-supporting Structure: Provide units with structural steel self-supporting hoistway framing that requires vertical-load support only at base and lateral support only at landing levels to coordinate car movement with hoistway doors.
- 2.6 Machine Locations: Locate lift machines inside the shaft at top or bottom of hoistway as required.
- 2.7 Electric Control System: Provide standard, fully automatic call-and-send operation that responds to momentary push-button signals at each landing.
 - 2.7.1 Pushbuttons shall be inoperative while car is in transit, for a predetermined time period after car arrival at any given landing, or when any doors are open. Delivery calls shall take precedence over calls for service.
 - 2.7.2 Provide adjustable limited period of time for receiving station to make its access to car, before responding to next station call-for-service. Post notice of limitation at each station.
 - 2.7.3 When delivery has been completed, doors are closed, and no calls-for-service are registered, return car automatically for parking at indicated "home" station.
- 2.8 Materials and Finishes:

Attachment 1: Specifications for the Work

- 2.8.1 Enameled Steel: Formed steel units with baked synthetic enamel finish.
- 2.8.2 Primed-for-Paint Steel: Formed steel units with baked metal primertion, free from sidesway, oscillation or vibration.
- 2.8.3 Stainless Steel: AISI Type 302/304, with directional polish or satin finish.
- 2.8.4 Plastic Laminate: High-pressure type complying with NEMA LD3, 0.05 inch thickness.
- 2.9 Car Construction:
 - 2.9.1 General: Provide car construction of either formed, reinforced, and sound-deadened sheet metal with welded joints; or of metal-clad plywood with mechanically riveted or bolted joints, with exposed edges of plywood covered with metal and with internal seams sealed by soldering. Provide shelves, compartments, gates and other features as required.
 - 2.9.2 Car Light: Equip car with recessed incandescent light fixture, located in ceiling near front of car. Provide perforations or glazed port through car gate and hoistway doors near light location, sufficient for observation that car is present at landing.
- 2.10 Car Gates:
 - 2.10.1 Manual car gates shall be of counterbalanced bi-parting vertical sheet steel with black enamel finish and electrical interlocks.
 - 2.10.2 Power-operated car gates shall be vertical bi-parting gates, equipped with power operator and connecting linkages to operate hoistway doors at landing when car is present.
- 2.11 Hoistway Doors: Provide flush hollow metal doors and frames of counterbalanced vertical bi-parting design.
- 2.12 Signal Equipment: Provide signal equipment at each landing hall push-button station; include call button, send button for each landing served, and illuminated "car-in-use" pilot light that flashes when car arrives at landing (until door is opened). Provide recessed station set in face of door jamb with surface-mounted stainless steel face plate.
- 2.13 Door Buttons: Where power operated doors are required, provide momentary pressure "door open" and constant pressure "door close" buttons.
- 2.14 Audible Arrival Signal: Provide standard bell or gong system on top of each car, equipped to sound as car approaches landing.
- 2.15 Audible Call Signal: Provide standard buzzer system on top of car, equipped to sound continuously when any call button is depressed and held, but only if car is located at a landing where hoistway door or car gate is open.
- 3.0 EXECUTION: (Section not used).

Personnel Lifts

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of personnel lifts. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Personnel Lifts: Personnel lifts shall be electrically operated, electronically controlled platform type. Capacity shall be as directed. Lift shall have a capacity safety factor of 5. Lift speed shall not exceed 30 feet per minute. Platform shall be welded and bolted steel construction. Drive belts and/or chains shall have safeties that automatically lock the carriage to the guide rails in the event of slack or lift belt/chain failure. Lifts shall conform to ANSI A90.1. Lifts shall be complete with necessary screens and guards for moving parts and floor openings.
 - 2.2 Controls: Personnel lifts shall be provided with normal and final limit switches at each stop. Lifts shall have emergency stop switch.
 - 2.3 Motor: Motors shall be sized for capacity of lifts. Motor shall be direct drive, gear type with electric brake. Power requirements shall be as directed.
 - 2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.

Attachment 1: Specifications for the Work

3.0 EXECUTION:

- 3.1 Preparation: Prior to installation of lifts, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.
- 3.2 Installation: Install machinery, guides, controls, lifts and equipment, and accessories in accordance with applicable codes and standards. Installation shall provide quiet, smooth operation free from sidesway, oscillation, or vibration.
- 3.3 Inspection: At completion of installation, lifts shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

Chair Lifts

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of chair lifts. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Chair lifts shall be of size, type, and configuration designated and shall be designed for the applicable stair configuration. Chairs applicable shall be padded, vinyl upholstered type. Chair lifts shall comply with the requirements of ANSI A90.1.
 - 2.2 Operating Equipment: Motors, controllers, casings, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide fully operational chair lift shall be provided.
 - 2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on chair lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed as to provide a proper size loop for the chair lift. Traveling cables shall have a fire resistant outer braid.
- 3.0 EXECUTION:
 - 3.1 Preparation: Prior to installation of chair lifts, ensure that installation surfaces are true to lines and levels. Check measurements of space for equipment and means of access for installation and operation.
 - 3.2 Installation: Install machinery, guides, controls, chair lifts, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smooth operation, free from sidesway, oscillation, or vibration.
 - 3.3 Inspection: At completion of installation, chair lift shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.

Vehicular Lifts

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vehicular lifts. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Vehicular Lifts: Lifts shall comply with ANSI B153.1. Lifts shall have automatic mechanical lift lock. Lift lock shall be automatically activated when lift is operated to full stroke to prevent accidental lowering.
 - 2.2 Operating Equipment: Motors, controllers, casings, pumps, hydraulic fluid reservoir, cylinder, plunger, piping, buffers, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.
 - 2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the lift shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs.
- 3.0 EXECUTION:

Attachment 1: Specifications for the Work

- 3.1 Preparation: Prior to installation of vehicular lifts, ensure that shafts and openings are plumb, level, and in line. Check measurements of space for equipment and clearances for operation.
- 3.2 Installation: Install machinery, controls, and lift and its equipment and accessories in accordance with manufacturer's instructions and applicable codes and standards, to provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.

Trash Chutes

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of trash chutes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the fire protection engineering branch for the specific requirements of fire protection.
- 2.0 PRODUCTS:
 - 2.1 General: Chutes shall be gravity type in accordance with the standards of NFPA 82. Intake doors shall bear the UL Class B, 1-1/2 hour, 250 F rating. Doors shall be tested in accordance with ASTM E 152 Fire Endurance Test.
 - 2.2 Chutes: Chutes shall be manufactured of galvanized steel, aluminized steel, or stainless steel, as directed. Galvanized steel and aluminized steel shall be minimum 18 gauge. Stainless steel shall be minimum 0.05 inch thick. Diameter of chute shall be as directed. Chutes shall be provided with necessary supports.
 - 2.3 Intake Doors and Frames: Chutes shall be equipped with Type 302 stainless steel, hand hopper type intake doors bearing the UL Class B, 1-1/2 hour rating. Surfaces of doors and frames shall have satin finish. Doors shall be sized in accordance with the requirements of NFPA 82. Frame trim shall be minimum 0.060 inch thick, Type 302 stainless steel. Doors shall be self-closing and positive latching.
 - 2.4 Outlet Doors: Outlet door shall be UL "B" label 1-1/2 hour fire rated, and equipped with a fusible link to be self closing and self latching.
 - 2.5 Vent: Trash chute shall be provided with a roof vent in accordance with NFPA 82. Vent shall extend 4 feet minimum above roof line and be provided with flashing as required to provide a watertight installation. Vent shall be same diameter and material as trash chute. Vent shall be provided with a rain cap and bird screen.
 - 2.6 Sprinklers: Sprinkler shall be provided as required by NFPA 82 and as directed. Sprinklers shall be installed in accordance with NFPA 13.
 - 2.7 Hopper: Each trash chute shall be provided with a hopper type receptacle.
- 3.0 EXECUTION:
 - 3.1 Preparation: Prior to installation of trash chute, ensure that shafts and openings are plumb, level, and in line. Check measurements of space for materials and means of access for installation.
 - 3.2 Installation: Install trash chute in accordance with applicable codes and standards. Ensure that installation procedures maintain required fire resistance ratings.

Water Treatment Plant Traveling Screens

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of traveling screens for water treatment intake structures. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Replacement motors and parts shall have the same characteristics and as the motors and parts to be replaced, unless otherwise approved.
 - 2.2 Replacement pumps shall comply with design specifications for head, capacity, material of construction, and motor characteristics of the pumps to be replaced.
 - 2.3 Finishes for items replacing existing items that are galvanized or painted shall be finished with like finish in compliance with manufacturer's standard practice.
 - 2.4 Screen wash nozzles shall be stainless steel, brass, or bronze. Stainless steel shall be Type 316. Brass shall comply with ASTM B 282. Bronze shall comply with ASTM B 255.

Attachment 1: Specifications for the Work

- 2.5 Screen metal fabric shall be stainless steel complying with ASTM A 580.
- 2.6 Screen frame shall be steel or stainless steel. Stainless steel parts shall comply with ASTM A 193, A 480, and A 564. Steel shall comply with ASTM A
- 36. Steel fasteners shall comply with ASTM A 307 or A 325.
- 3.0 EXECUTION:
- 3.1 General: Screen, wash pumps, controller, drive equipment, and appurtenances shall be repaired, lubricated, and placed back in service.
- 3.2 Welding shall be done in compliance with AWS D1.1.

Cranes and Hoists

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cranes and hoists. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Crane: Crane Manufacturers Association of America (CMAA) 70 for electric overhead traveling cranes or ANSI MH27.1 for underhung cranes and monorail systems.
- 2.2 Hoist: Electric wire rope type, ANSI/ASME HST-4M.
- 3.0 EXECUTION: The derrick shall be assembled and installed with the guy wires placed in position, hoisting ropes installed, and the derrick made ready for regular operation. Equipment installed outdoors shall be primed and finish-painted with a suitable corrosion-resistant paint on all parts and components not otherwise made of corrosion-resistant materials or otherwise protected.

Ash Hoists

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ash hoists. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Winches and Sheaves:
- 2.1.1 Wire rope sheaves shall be iron or steel with bronze bushings, furnished either plain or as an assembly of frame, sheave, swivel hook, and axle as required.
- 2.1.2 Winches shall be of steel construction with bronze bearings on rotating parts. Winches shall have a capacity of not less than 500 pounds, with band action handbrake and drum width adequate for the quantity and diameter of wire rope to be used. Winches shall be marine type with gear cover and shall have corrosion-resistant parts and finish suitable for outdoor use.
- 2.1.2.1 Power Winches: NEMA 3 weather-protected, with two speeds (30 or 60 fpm) for lifting and a single speed for lowering, automatic upper-limit switch for hook travel, with push-button control.
- 2.1.2.2 Hand wench shall have spring-operated holding dogs, free-spooling feature, and adjustable handles.
- 2.1.3 Wire Rope: Wire rope shall be flexible, hoisting grade composed of approximately 7 strands or bundles of small diameter steel wire with a fiber or independent wire rope core.
- 2.2 Mast and Boom: Mast, boom, and miscellaneous fabricated components shall be provided as required to complete the unit assembly. Boom shall rotate. Fabricated parts shall be finished with a corrosion-resistant paint.
- 2.2.1 Mast shall telescope where required. Fully extended mast shall allow transport of ash container from bottom of pit to bed of truck without handling container twice.
- 2.2.2 Ash-handling pit shall have watertight door covering where required. Doors shall be mechanically linked to mast so that they automatically open and close with the raising and lowering of the mast.
- 3.0 EXECUTION: The Contractor shall complete the assembly of any equipment furnished partially assembled and place the items in position as directed. The ash hoist shall be assembled and securely bolted in position, hoisting ropes installed, and the hoist made ready for regular operation. The Contractor shall furnish all miscellaneous hardware items required to complete the installation

Attachment 1: Specifications for the Work

of all equipment and components. Equipment shall be primed and finish painted with a suitable corrosion-resistant paint on all parts and components not made of corrosion-resistant materials or otherwise protected.

DIVISION 21-FIRE SUPPRESSION

Fire Protection Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire protection systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Fire protection system materials and components shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in accordance with all applicable National Fire Protection Association (NFPA) National Fire Codes.
 - 2.2 Test reports shall be submitted for all tests required by referenced publications applicable to the particular materials and components furnished for use in the work.
- 3.0 EXECUTION:
 - 3.1 The design, fabrication, installation, and testing of fire protection systems shall be in accordance with all applicable NFPA National Fire Codes and their respective appendices. These codes include but are not necessarily limited to the following:
 - NFPA 12 Carbon Dioxide Extinguishing Systems
 - NFPA 16A Closed-Head Foam-Water Sprinkler Systems
 - NFPA 17 Dry Chemical Extinguishing Systems
 - NFPA 1961 Fire Hose
 - NFPA 1962 Fire Hose, Care, Maintenance and Use
 - NFPA 1963 Fire Hose Connections
 - NFPA 20 Fire Pumps, Centrifugal
 - NFPA 30 Flammable and Combustible Liquids Code
 - NFPA 11 Foam Extinguishing Systems•15301
 - NFPA 11A Foam Systems, Medium and High Expansion
 - NFPA 16 Foam-Water Sprinkler and Spray Systems
 - NFPA 12B Halon 1211 Fire Extinguishing Systems
 - NFPA 12A Halon 1301 Fire Extinguishing Systems
 - NFPA 24 Private Fire Service Mains
 - NFPA 231C Rack Storage of Materials
 - NFPA 13A Sprinkler Systems, Care, Maintenance
 - NFPA 13 Sprinkler Systems, Installation
 - NFPA 14 Standpipe and Hose Systems
 - NFPA 26 Water Supplies, Valves Controlling
 - NFPA 22 Water Tanks for Private Fire Protection
 - 3.2 Scheduling Interruptions and Coordination: At least 48 hours before commencing work on any specific system, the Contractor shall notify the Authorized Member Representative of all interruptions, if any, that must be made to the system and the estimated period of time the system will be out of service during each interruption. Interruptions shall be made only at the time or times approved by the Authorized Member Representative. Equipment and standby systems shall be provided for building protection during interruption to the existing systems.
 - 3.3 Tests: All field tests required by applicable standards shall be performed in the presence of the Authorized Member Representative.

Sprinkler System

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wet and/or dry-pipe sprinkler system.. Products shall match existing materials and/or shall be as directed by

Attachment 1: Specifications for the Work

- the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: System shall interface with building fire and smoke alarm system. System shall meet NFPA 13 specifications.
- 2.1 Piping Materials: Buried Piping: Cast or Ductile iron. B. Above Ground Inside Building Piping: Steel, Schedule 40, black.
- 2.2 Gate Vales: Up to and Including 2 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge or disc, solder or threaded ends. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, solid wedge, flanged or grooved ends.
- 2.3 Check Valves: Up to and Including 2 Inches: Bronze swing disc, solder or screwed ends. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.
- 2.4 Drain Valves: Bronze compression stop with nipple and cap or hose thread. Brass ball valve with cap and chain, 3/4 inch hose thread.
- 2.5 Piping Specialties:
- 2.5.1 Wet Pipe Sprinkler Alarm Valve: Check type valve with electrically or hydraulically operated alarms, with pressure retard chamber and variable pressure trim.
- 2.5.2 Alarm Gong: Electrically operated vibrating type bell, 8" diameter with weatherproof backbox. To be activated by flow/pressure switch.
- 2.5.3 Fire Department Connection: Standard wall type; ductile iron; chrome plated finish; thread size to suit fire department hardware; two way threaded dust cap and chain of same material and finish, 3/4 inch (19 mm) automatic drip connected to drain; marked "Sprinkler - Fire Department Connection".
- 2.5.4 Water flow switch: Vane type with delay adjustments and two contacts (for wet systems only). Provide type as permitted by NFPA 13 for dry systems.
- 2.5.5 Dry Pipe Valve: Provide dry pipe system in areas subject to freezing. U.L. listed low differential type with protection against accumulation of water above the clapper by an automatic draining device. Provide drains suitable for dry pipe systems according to NFPA 13. Provide dry pendent heads in areas where pendants are used.
- 2.5.6 Air Compressor: Automatically maintained pressure system capable of restoring normal air pressure in the system within 30 minutes. Provide domestically manufactured assembly. Air compressor shall be single stage for motors below 1-1/2 hp and two stage for 1-1/2 hp and above, capable of producing air at 150 psi. Sixty gallon tanks and larger shall be ASME stamped. Pumps shall be cast iron with metal belt guard, intake air filter, pressure switch control, tank gauge, check valve, tank drain, pressure relief valve and outlet valve. Motor speed shall not exceed 1200 rpm. Magnetic starters and overloads shall be provided for all three phase motors.
- 2.5.7 Gate Valve and Indicator Post: Gate valves for underground installation shall be of inside screw type with counter-clockwise rotation to open. Indicating valves shall be gate valves with approved indicator post of length to permit the top of the post to be located 35" above finished grade. Gate valves and indicator posts shall be UL or FM listed.
- 2.5.8 Double Check Valve Assemblies: ASSE 1015, AWWA C510-89; stainless steel body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with test cocks and two OS&Y shutoff valves. Approved for use in fire protection systems and approved for installation in the vertical position.
- 2.6 Sprinkler Heads:
- 2.6.1 Suspended Ceiling Type: Standard pendant type with chrome plated finish, with matching escutcheon.
- 2.6.2 Exposed Area Type: Standard upright type with chrome plated finish.
- 2.6.3 Sidewall Type: Chrome plated finish with matching escutcheon.
- 2.6.4 Fusible Link: Temperature rated for specific area hazard.
- 3.0 EXECUTION
- 3.1 Coordinate work of this Section with other affected work and reflected ceiling plan.
- 3.2 Ream pipe and tube ends to full inside diameter. Remove burrs.

Attachment 1: Specifications for the Work

- 3.3 Remove scale and foreign material, inside and out, before assembly.
- 3.4 Installation:
 - 3.4.1 Install buried shut-off valves in valve box. Provide post indicator.
 - 3.4.2 Provide vertical type double check valve assembly in sprinkler system riser. Provide tamper switches for each valve and connect to the alarm panel.
 - 3.4.3 Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
 - 3.4.4 Locate outside alarm gong on building wall.
 - 3.4.5 Place pipe runs to minimize obstruction to other work.
 - 3.4.6 Place piping in concealed spaces above finished ceilings.
 - 3.4.7 Center heads in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements.
 - 3.4.8 Slope piping and arrange systems to drain at low points.
 - 3.4.9 Route piping in orderly manner, plumb and parallel to building structure.
 - 3.4.10 Exposed Areas: Paint piping with one coat zinc chromate primer and two coats alkyd enamel to match wall/ceiling color. Provide stencils or pipe markers.
 - 3.4.11 Mechanical Rooms and Concealed areas: Paint piping with one coat zinc chromate primer and two coats red Alkyd enamel.
 - 3.4.12 Connect water flow switch to alarm panel.
 - 3.4.13 Locate outlet of test valve outside building 2'-0" above grade with splash block.
 - 3.4.14 Piping for inspectors test shall **not** be visually installed on exterior walls or in finished areas. Install piping concealed in wall or construct furred out space to conceal piping. Provide access door where needed for access valves.
- 3.5 Cleaning: Flush entire piping system of foreign matter.
- 3.6 System Acceptance:
 - 3.6.1 System acceptance shall be in accordance with NFPA 13.
 - 3.6.2 Test shall be witnessed by member.
 - 3.6.3 Test control sequence for operation.
 - 3.6.4 At time of the systems acceptance the contractor shall fill out the Contractor's Material and Test Certificate and submit for final approval.
 - 3.6.5 Backflow preventer assemblies shall be tested in accordance with the International Plumbing Code at the time of installation.

DIVISION 22-PLUMBING

Plumbing

- 1.0 DESCRIPTION OF WORK: This specification covers the installation, repair or replacement of plumbing systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 All work shall comply with the manufacturer's instructions, industry standards and the Arizona Uniform Plumbing Code (UPC).
- 2.1 Unless approved by the architect or construction manager, provide related products and accessories from one manufacturer.
- 2.2 Contractor will provide and install plumbing as shown on drawings and/or as specified by the Mohave member
- 2.3 The contractor will confirm the following: 1) there is no conflict between the scope of work and building codes, safety codes, and the Arizona UPC; 2) there is no conflict between this work and other trades; 3) what work (if any) that other trades must accomplish prior to this work; 4) that all requirements to meet warranties are being met.
- 2.4 Contractor agrees to: deliver, store, and transport materials to avoid damage to product or to any other work; reject and return any products or materials delivered damaged or in an unsatisfactory condition.

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- 2.5 Store materials indoors or in a storage facility, protected from vandalism, theft, dirt, dust, moisture, contaminants, etc.
- 2.6 Sanitary sewer piping within the building line shall be: Polyvinyl Chloride (PVC) pipe, solvent weld joints; Acrylonitrile butadiene styrene (ABS) pipe, solvent weld joints; cast iron pipe, service weight, neoprene gaskets; cast iron pipe, hubless, neoprene gaskets, stainless steel clamps.
- 2.7 Water supply pipe below grade beyond the building line shall be: 1) copper tubing, type K annealed, wrought copper fittings, compression joints; 2) cast iron pipe, ductile iron fittings, rubber gaskets, mechanical joints, 3/4 inch diameter rods; 3) PVC pipe, schedule 40, minimum 150 psi pressure rating, solvent weld joints.
- 2.8 Water supply pipe above grade and within the building line shall be: 1) copper tubing, type M, hard drawn, cast brass or wrought copper fittings, soldered joints; 2) Chlorinated Polyvinyl Chloride (CPVC) pipe, CPVC fittings, solvent weld joints; 3) PB pipe, PB, or copper fittings, copper compression rings.
- 2.9 Natural gas pipe below grade level and beyond the building line shall be steel, schedule 40, black with polyethylene jacket, welded joints.
- 2.10 Natural gas pipe above grade and within the building line shall be steel, schedule 40 black, malleable iron or forged steel fittings, screwed or welded.
- 2.11 Provide clearly marked, easily accessible, and tested shut off valves for natural gas as required by the building code.
- 2.12 Fuel oil pipe below grade shall be steel, schedule 40 black, polyethylene jacket and welded joints.
- 2.13 Fuel oil piping above ground shall be steel, schedule 40 black, malleable iron or forged steel fittings, screwed or welded.
- 2.14 Provide clearly marked, easily accessible, and tested shut off valves for fuel oil as required by the building code.
- 2.15 Water heater(s) will be identified as to size, manufacturer, model number, flue passage, baffle and draft hood, insulation, finish, thermostat, pressure regulator, and safety devices.
- 2.16 The architect or construction manager will specify gas or electric water heaters. Tie downs as specified by the building code or architect will be installed.
- 2.17 All work conditions must be as per manufacturer's instructions, trade and workmanship standards, governing building and safety codes, and the Arizona UPC.
- 2.18 Prepare all vents and related support construction for plumbing and mechanical equipment as required by the owner, architect, and/or construction manager.
- 2.19 Contractor will install, repair or replace the following: backflow preventers, cleanouts, cleanout tees, connectors, drains (including, but not limited to; floor drains, drains with strainers, gutter drains, rooftop drains, trench drains, sewer control drains), faucets, floor receptors, hydrants, shock absorbers, drinking fountains and support carriers, water closets, traps, pipe support hangers and systems, valves, plumbing fixtures (baths, bidets, drinking fountains, hot water dispensers, eye wash fountains, interceptors, laboratory equipment, lavatories, sinks, urinals, showers, toilets and toilet seats, wash centers and fountains, water closets, water filters), pumps, plumbing appliances (water chillers, water coolers and heaters), and plumbing for fire protection systems, heating and air conditioning systems (HVAC piping).
- 2.20 Contractor will install, repair, and or replace buried or elevated plastic, cast iron, copper [pipe and tubing], corrosion-resistant, glass, stainless steel, and steel piping.
- 2.21 Contractor will supply the following: ABS and PVC Drains, ABS and PVC Roof Drains, ABS Cleanout Fittings, ABS Material for Pipe and Fitting), Acid Waste Systems, Adapters, Air Admittance Valves, Airgap Fittings, Automatic Hot Water Delivery System, and Automatic Water Heater Shut-Off Valves.
- 2.22 Contractor will supply the following: ABS and PVC Drains, ABS and PVC Roof Drains, ABS Cleanout Fittings, ABS Material for Pipe and Fitting), Acid Waste Systems, Adapters, Air Admittance Valves, Airgap Fittings, Automatic Hot Water Delivery System, and Automatic Water Heater Shut-Off Valves.
- 2.23 The contractor will provide the following: Clamps (Stainless Steel), Cleanouts, Closet & Urinal Spuds, Closet Rings and Supports, Collectors, Connector – Gas, Copper Drainage Tube, Copper Fittings, Corrugated Fittings, Couplings, CPVC Hot & Cold Water Fittings, Pipe & Tubing, Crimp

Attachment 1: Specifications for the Work

- Style Brass/Copper Fittings, Crosslinked Polyethylene Tubing, Crosslinked Polyethylene Water Distribution Systems, and Cured-In-Place Thermosetting Resin Conduit Liner.
- 2.24 The contractor will provide the following: Dental Vacuum Pumps, Dielectric Fittings, Diverter Valves, Domestic Thermoplastic Waste Tube & Fittings, Drain Tube & Connectors, Drains & Joints, Drain, Waste and Vent Fittings, Drain, Waste and Vent Internal Cleanout Fittings, and Early Closure Flapper (Retrofit).
- 2.25 The contractor will provide the following: Expansion Couplings, Extruded Polyolefin Pipe Coatings, Faucets, Valves, Fill Valves, Fittings, Fixture Stops, Flapper Valves, Flexible Water Connectors, Floor Sinks, Flush Valves, Flushing Siphons for Water Closet Tanks, Flushometer Tank, Flushometer Valves, Food Waste Disposer, and Fusion-Bonded Pipe Coatings.
- 2.26 The contractor will provide the following: Gas Meter Risers & Transition Fittings, Gas Piping Corrugated Stainless Steel Tubing, Gas Service Risers, Gas Supply Connectors, Grease Trap, Hand-Held Showers & Shower Heads, Heat Exchangers, Hose (Dishwasher Waste), Hot Water Circulation Device, Hubless Cast Iron Soil Pipe and Fittings, Hubless Pipe Couplings & Bushings, and Hydrants (Frostproof).
- 2.27 The contractor will provide the following: Industrial Drains (Stainless Steel), Insulated Protectors (P-Traps, Risers & Supply Stops), Interceptors & Clarifiers, Joint Drain, Waste and Vent Expansion, Piston Driven, Laundry Trays Holding Tanks, Large Diameter Corrugated Polyethylene (PE) Tubing & Fittings, Laundry Trays, Lavatories & Sinks, Leach Line Pipe, and Leaching Chamber.
- 2.28 The contractor will provide the following: Mechanical Couplings for Polyethylene Piping, Metal Pipe & Tubing Branching Tools, Mop Basins, Non-Pressure Water Hose & Tubing, Odor Removing Toilet, Outlet Boxes, Pedestal Lavatory Traps, Pipes, Pipe Wrap Tapes, Pivoting Shampoo Sinks, Plastic Hangers, Clamps, Plumber's Tape, Plastic Plumbing Fixtures (MHRV), Plate Skimmers, Plumbing Fixtures, Polyethylene Cold Water Pipe or Tubing, Polyethylene Gas Pipe (PE), Polyvinylidene Fluoride Drain, Waste and Vent Pipe, Pool Fittings, Porcelain Enameled Fixtures, Porous Filter Protector for Sub-Drain Weep Holes, Potable Water Distribution Manifold, Pre-Pressurized Potable Water Tank, Pressure Couplings & Fittings, Pumps, PVC Cold Water Compression & Gripper Fittings, and PVC Cold Water Pipe & Fittings.
- 2.29 The contractor will provide the following: Rainwater Valves, Remote Industrial Floor Box, Restaurant Fire Suppression System, Retractable Water Hose Reel, Roof Drains, Roof Flashings, Roof/Deck Drains, Safety Suction Valves, Seepage Pit Liners & Covers, Septic Tanks, Service Sinks, Sewage Holding Tanks, Sewer Fittings, Sewer Pipe & Fittings Shampoo Basins, Showers, Sink Tailpiece Drain Coupling, Sinks & Lavatories Smoothwall Polyethylene (PE) Pipe, Solar Water Heater, Solder, Solvent Cement & Primers, Spas, Stainless Steel Pipe, Spigots and Joints, Suction Fittings, Sumps and Sewage Ejector Tanks, and Supply Risers.
- 2.30 The contractor will provide the following: Vacuum Breakers, Vacuum Toilet Systems, Valves, Valves - Backflow Preventer and Relief, Vent Caps, Vitrified Clay Pipe, Fittings, Hubless Pipe Couplings (Unshielded) Bushings & Stoppers, Waste Disposers, Waste Water Trim, Wasteholding Tanks, Water Closets, Water Conditioners, Water Devices, and Water Fill Spouts.
- 2.31 The contractor will provide the following: Test Plugs, Therapy Pool, Thermoplastic Gas Pipe, Tubing and/or Fittings, Tile Flange Kits, Toilets, Trap Primers, Trench Drains, Tub/Shower Valves, Tubing, Tubular Waste Water Trim), and Urinals.
- 2.32 The contractor will provide the following: Water Hammer Arresters, Water Heaters, Water Leak Detection System, Water Pressure Regulator, Water Pumps (Hand Actuated), Water Saver P-Trap/Trap Primer, Water Tanks, Whirlpool Bathtub & Piping Systems, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-Drain, Waste and Vent, and Wrought Copper.
- 2.33 Upon completion, perform all required pressure tests, inspections, and approvals of the completed systems. Make all required adjustments and corrections at no added cost to the owner. Sterilize the water system and provide copies of a certificate of performance.
- 2.34 Provide for the maintenance of the work for one year following final approval by the governing agencies. Maintenance includes all work required in manufacturer's instructions such as inspections, adjustment, repair and replacement of parts as required.
- 2.35 Operating fixtures must perform smoothly. Repair or replace any defective work or equipment. Repair any work that will be undetectable, if defective; redo any repairs that are still defective, as

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directed by the owner, architect, construction manager, or governing regulatory agency.

2.36 Upon completion, clean work area; remove scrap and excess materials from the site.

2.37 After installation, inspect all work for proper installation or damage.

DIVISION 23-HEATING VENTILATION AIR CONDITIONING

Mechanical Piping

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Piping shall comply with ANSI B31.1, where applicable. Piping in pressure systems shall comply with requirements of the ASME Boiler and Pressure Vessel Code, where applicable.
 - 2.1 Steel Pipe:
 - 2.1.1 Pipe: Carbon steel pipe shall comply with ASTM A 53 or A 106. Galvanized pipe shall comply with ASTM A 53. Stainless steel pipe shall comply with ASTM A 312.
 - 2.1.2 Fittings: Malleable iron threaded fittings shall comply with ANSI B16.3. Forged steel threaded and socket weld fittings shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.11. Forged stainless steel threaded and socket weld fittings shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.11. Carbon steel butt welded fittings shall comply with ASTM A 234 and shall be fabricated in compliance with ANSI B16.9. Stainless steel butt welded fittings shall comply with ASTM A 403 and shall be fabricated in compliance with ANSI B16.9.
 - 2.1.3 Flanges: Carbon steel flanges shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.5. Stainless steel flanges shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.5.
 - 2.1.4 Bolting: Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2. Stainless steel bolting shall comply with ASTM A 193, Grade B8, with hex nuts complying with ASTM A 194, Grade 8F, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.
 - 2.2 Copper and Brass Pipe:
 - 2.2.1 Pipe: Seamless copper pipe shall comply with ASTM B 42. Seamless red brass pipe shall comply with ASTM B 43. Copper pipe to be used with brazing or welding shall be oxygen free and shall comply with ASTM B 302 or B 88.
 - 2.2.2 Fittings: Threaded fittings shall comply with ASTM B 249 and shall be fabricated in compliance with ANSI B16.15. Solder fittings shall comply with ASTM B 88 and shall be fabricated in compliance with ANSI B16.18. Butt welding fittings shall comply with ASTM B 302 or B 88 and shall be fabricated in compliance with ANSI B16.9.
 - 2.2.3 Flanges shall comply with ASTM B 61 and shall be fabricated in compliance with ASME B16.24.
 - 2.2.4 Bolting shall comply with ASTM B 36 and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.
 - 2.3 Cast and Ductile Iron Pipe:
 - 2.3.1 Pipe: Bell and spigot pipe shall comply with ASTM A 74 and shall be in compliance with ANSI A112.5.1 and AWWA C106. Bell and spigot pipe is not as readily available as other pipe and shall only be used to repair existing bell and spigot pipe. Push-on type pipe shall comply with ASTM A 377 and shall be in compliance with AWWA C151. Mechanical joint pipe shall comply with ASTM A 377, ANSI and AWWA C111 and C151. Flanged pipe shall comply with ASTM A 377, B16.1, and AWWA C115. Threaded pipe shall comply with ASTM A 377 and shall be threaded at both ends for screwed fittings.
 - 2.3.2 Fittings: Bell and spigot fittings shall comply with ASTM A 74, ANSI A112.5.1, and AWWA C110. Bell and spigot pipe is not as readily available as other pipe and shall only be used to repair existing bell and spigot pipe. Push-on type fittings shall comply with ASTM A 126 or A 536 and AWWA C110. Mechanical joint fittings shall comply with ASTM A 126 or A 536 and AWWA C110 and C111. Flanged fittings shall comply with ASTM A 126 or A 536, ANSI B16.1, and AWWA C110. Threaded

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- fittings shall comply with ASTM A 126 and ANSI B16.4. 2.3.3 Flanges shall comply with ASTM A 126 or A 536, AWWA C115, and ANSI B16.1.
- 2.3.4 Gaskets: Gaskets for cast-iron soil pipe shall comply with ASTM C 564. Gaskets for mechanical joint or push-on type pipe shall comply with AWWA C111.
- 2.3.5 Bolting: Alloy steel bolting shall comply with ASTM A 193, Grade B8, and A 194, Grade 8F. Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.
- 2.4 Polyvinyl Chloride Pipe:
- 2.4.1 Pipe: Pressure rated pipe shall comply with ASTM D 1785. Waste, vent, and drain pipe shall comply with ASTM D 2665. Sewer pipe shall comply with ASTM D 2729.
- 2.4.2 Fittings: Threaded fittings shall comply with ASTM D 2464. Socket solvent weld type fittings for pressure pipe shall comply with ASTM D 2466 or D 2467. Socket solvent weld type fittings for waste and drain pipe shall comply with ASTM D 2665. Socket solvent weld type fittings for sewer pipe shall comply with ASTM D 2729. 2.4.3 Flange Dimensions shall be in compliance with ASME B16.5.
- 2.4.4 Bolting shall be alloy steel bolts and nuts complying with ASTM A 193, Grade B8, and A 194, Grade 8F.
- 2.5 ABS Pipe:
- 2.5.1 Pipe: Waste and drain pipe shall comply with ASTM D 2661. Sewer pipe shall comply with ASTM D 2751. All other ABS pipe shall comply with ASTM D 1527.
- 2.5.2 Fittings: Threaded fittings shall be Schedule 80 ABS and shall be industry standard. Socket solvent weld fittings for waste and drain pipe shall comply with ASTM D 2661. Socket solvent weld fittings for sewer pipe shall comply with ASTM D 2751. Socket solvent weld fittings for all other pipe shall be ABS Schedule 40 complying with ASTM D 2468 or ABS Schedule 80.
- 2.6 Vitrified Clay Pipe:
- 2.6.1 Pipe: Regular vitrified clay pipe shall comply with ASTM C 700. Perforated vitrified clay pipe shall comply with ASTM C 498.
- 2.6.2 Fittings shall be regular vitrified clay complying with ASTM C 700. 2.6.3 Compression Joint Sealing Element shall comply with ASTM C 425 and shall be of rubber, plastic, or metal.
- 2.7 Asbestos cement pipe shall not be repaired but shall be replaced with new piping that does not contain asbestos, as directed by the Authorized Member Representative.
- 2.8 Polyethylene Pipe:
- 2.8.1 Pipe: Polyethylene shall comply with ASTM D 2447. Pipe shall be polyethylene SDRPR and shall comply with ASTM D 3035.
- 2.8.2 Fittings: Butt fusion type fittings shall comply with ASTM D 3261. Socket type heat fusion fittings shall comply with ASTM D 2683. Insert type heat fusion fittings shall comply with ASTM D 2609.
- 2.9 Conduit Systems:
- 2.9.1 Carrier Pipe: Carbon steel pipe shall comply with ASTM A 106. Polyvinyl chloride pipe shall comply with ASTM D 1785. Copper pipe shall comply with ASTM B 42. Fiberglass reinforced plastic pipe shall meet commercial standards.
- 2.9.2 Insulation: For systems 250 degrees or less, polyurethane foam insulation shall comply with commercial standards. For systems over 250 degrees, calcium silicate insulation shall comply with ASTM C 533.
- 2.9.3 Outer Jacket: For systems 250 degrees or less, polyvinyl chloride outer jacket shall comply with ASTM D 1785 or fiberglass reinforced plastic outer jacket shall meet commercial standards. For Systems over 250 degrees, cast-iron outer jacket shall comply with ASTM A 377, or steel conduit outer jacket shall be epoxy-coated, spiral weld, 10 gauge minimum.
- 2.10 Gaskets shall comply with ASME B16.21 and/or the following:
- 2.10.1 Gaskets shall be rubber complying with ASTM C 564.
- 2.10.2 Gaskets for mechanical joint or push-on type cast-iron or ductile iron pipe shall be rubber complying with AWWA C111.
- 2.11 Solvent cement for solvent welding of pipe shall comply with ASTM D 2564, except solvent cement for ABS pipe and fittings shall comply with ASTM D 2235.
- 2.12 Dielectric Unions and Flanges:

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- 2.12.1 Dielectric unions and flanges shall comply with Fed. Spec. WW-U-531 and requirements of ANSI B16.39 and ANSI B16.24.
- 3.0 EXECUTION:
- 3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Authorized Member Representative.
- 3.2 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.
- 3.3 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.
- 3.4 Solvent cement joints shall be made in compliance with ASTM D 2855.
- 3.5 Heat Fusion Joints in polyethylene pipe and fittings shall be made in compliance with ASTM D 2657.
- 3.6 Concrete linings in cast and ductile iron pipe shall be prepared with cement mortar complying with AWWA C104. Pipe leak clamps shall be ductile iron, split sleeve type.
- 3.7 Protective covering for replacement underground steel pipe shall be mechanically applied in a factory or field plant especially equipped for the purpose. Specials, valves, and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand. Joints shall be coated and wrapped by hand. The pipe covering shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a wrapper of coal-tar-saturated asbestos felt, and a wrapper of Kraft paper or a coat of water-resistant whitewash, applied in the order named and complying with the requirements of AWWA C203 in all respects to materials, thicknesses, methods of application, tests, and handling, except that interior lining will not be required. Joints and fittings shall be coated and wrapped in compliance with AWWA C203.
- 3.8 Hydrostatically test pipe systems where required by ANSI B31.1 or ASME Code.
- 3.9 Dielectric unions or flanges shall be provided for connections between ferrous and nonferrous metallic pipe or equipment.
- 3.10 Hubless cast-iron soil pipe shall not be installed under concrete floor slabs or in crawl spaces below kitchen floors.
- 3.11 Plastic pipe shall not be installed under concrete floor slabs, or in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

Valves

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of valves. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Valve pressure/temperature ratings shall equal or exceed the ratings of the valves being replaced. Pressure/temperature ratings shall be in accordance with ANSI B16.5. Valves shall comply with the ASME Boiler and Pressure Vessel Code where applicable.
- 2.1 Gate valves shall comply with MIL-V-12126, MIL-V-18110, MIL-V-13803, MIL-V-12125, MIL-V-58039, and MSS SP-80 as applicable.
- 2.2 Globe valves shall comply with MIL-C-18434 and with MSS-SP-85, MIL-V-24109, MIL-V-17501, MIL-V-24578, and MSS SP-80 as applicable.
- 2.3 Check valves shall comply with MIL-V-6129 and/or MIL-V-10386 and MSS SP-80.
- 2.4 Needle valves shall comply with MIL-V-24586 and/or with applicable MSS specifications.
- 2.5 Ball valves shall comply with MSS SP-72.
- 2.6 Butterfly valves shall comply with Fed. Spec. WW-V-1967 and/or AWWA C504.
- 2.7 Pressure relief Valves shall comply with MIL-V-23255 and MIL-V-55341.
- 2.8 Pressure regulators shall comply with MIL-V-2962, MIL-V-24384, MIL-V-18318, or MIL-V-16733 as applicable.
- 2.9 Flow control valves shall comply with MIL-V-23254.
- 2.10 Backflow preventers shall comply with AWWA C506.
- 2.11 Vacuum breakers shall comply with MIL-V-5461 and MS-87005.

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- 2.12 Solenoid Operated Valves: Coil shall be epoxy encapsulated, manufactured to UL 429, and rated for ac voltage.
- 2.13 Float valves shall comply with Fed. Spec. A-A-246.
- 2.14 Stop and waste valves shall comply with MIL-V-22052.
- 2.15 Plugs and cocks shall comply with MIL-C-1203 and MIL-V-12003.
- 2.16 Diaphragm valves shall comply with applicable MSS specifications.
- 2.17 Calibrated balancing valves shall be calibrated so that flow can be determined when the temperature and pressure differential across the valve is known. Valves shall have an integral pointer that registers the degree of valve opening. Each valve shall be constructed with internal seals to prevent leakage and shall be supplied with preformed insulation. Valves Cv rating shall be as indicated. Valve bodies shall be provided with quick connecting hose fittings for a portable meter to measure the pressure differential. One portable differential meter, suitable for the operating pressure specified, shall be provided. The meter shall be complete with hoses, vent, integral metering connections, and carrying case as recommended by the valve manufacturer.
- 3.0 EXECUTION:
- 3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Authorized Member Representative. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.
- 3.2 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.
- 3.3 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.

Piping Accessories

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping accessories. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Filters: Pressure-temperature rating and filter medium particle size retention rating of the replacement filter shall equal or exceed the ratings of the existing filter. Pressure drop at the required capacity shall not exceed that of the replaced filter. Filters shall be constructed in accordance with ASME Code where applicable.
- 2.2 Strainers shall comply with Fed. Spec. WW-S-2739.
- 2.2.1 Low pressure Y-type strainers shall have Type 304 stainless steel screens. Bodies of threaded or flanged strainers shall be cast iron. Bodies of butt-weld end strainers shall be Schedule 40 cast carbon steel.
- 2.2.2 High pressure Y-type strainers shall comply with ASME Code if applicable. Strainers shall have Type 304 stainless steel screens. Bodies of threaded or flanged strainers shall be cast iron. Bodies of butt-weld end strainers shall be Schedule 80 cast carbon steel.
- 2.3 Traps shall be in accordance with Fed. Spec. WW-T-696, and steam traps shall comply with ASME Code where applicable.
- 2.3.1 Thermostatic traps shall be constructed of cast brass. Thermostatic element valve cone shall be stainless steel.
- 2.3.2 Float and thermostatic traps shall have body and cover constructed of cast iron or semi-steel. Thermostatic element shall have stainless steel valve cone and valve seat. Provide stainless steel or seamless copper float.
- 2.3.3 Inverted bucket traps shall have body and cover constructed of cast iron or semi-steel. Bucket shall be brass or stainless steel, with lever mechanism of heat-treated stainless steel.
- 2.3.4 Thermodynamic traps shall have body and cover constructed of stainless steel. Disc shall be heat-

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- treated stainless steel.
- 2.4 Expansion joints shall comply with standards of the Expansion Joint Manufacturer's Association (EJMA). Replacement expansion joints shall equal or exceed the pressure-temperature ratings of the replaced expansion joint.
 - 2.4.1 Expansion compensators shall have 2 ply phosphor bronze bellows, brass shrouds, and end fittings for copper piping systems, or 2 ply stainless steel bellows, carbon steel shrouds, and end fittings for steel piping systems.
 - 2.4.2 Rubber expansion joints shall be constructed of duck and butyl rubber with full-faced integral flanges, internally reinforced with steel retaining rings.
 - 2.4.3 Slip joints shall comply with MIL-E-17814 and shall be of the type designed for repacking under pressure.
 - 2.4.4 Flexible ball pipe joints shall be designed for 360 degree rotation, with minimum of 30 degree angular flexing movement for sizes 1/4 inch to 6 inches, 15 degrees for sizes 8 inches and larger. Certify carbon steel joints for environmental shock testing in accordance with MIL-S-4456 or MIL-S-901C. Joints shall comply with Section II of ASME Boiler and Pressure Vessel Code and ANSI B31.1 Power Piping for materials and design of pressure-containing parts and bolting.
 - 2.4.5 Expansion joints for grooved piping shall be combination couplings and nipples constructed of cut grooved short pipe nipples and couplings, or slip-type expansion joints constructed of carbon steel pipe and couplings.
 - 2.5 Pipe Supports: Pipe supports shall comply with MSS SP-58 and SP-69. Contact between dissimilar metals shall be prevented in supporting copper tubing. Those portions of pipe supports that contact the tubing shall be copper-plated, rubber- or vinyl-coated, or stainless steel. All pipe supports located in sewage wetwells shall be 18-8 stainless steel.
 - 2.6 Valve boxes shall be of cast iron, extension sleeve type; shall be not less than 5 inches in diameter; shall have a minimum thickness at any point of 3/16 inch; and shall be provided with cast-iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which the valve is used. All parts of valve boxes, bases, and covers shall be coated by dipping in bituminous varnish.
 - 2.7 Flexible Hoses:
 - 2.7.1 Flexible hoses for non-ferrous piping shall be bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.
 - 2.7.2 Flexible hose for ferrous piping shall be stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose.
 - 2.7.3 Rubber flexible hoses shall be rubber and butyl construction with integral full-faced duck and butyl flanges, internally steel wire reinforced, and furnished complete with steel retaining rings.
 - 3.0 EXECUTION:
 - 3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Authorized Member Representative. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.
 - 3.2 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.
 - 3.3 Welding: All welding shall be performed in compliance with ANSI B31.1 and with ASME Code Section IX where applicable.
 - 3.4 Y-type strainers shall be located in supply line ahead of the following equipment if integral strainer is not included in equipment.
 - a. Pumps.
 - b. Steam traps serving steam main drips.
 - c. Temperature control valves.
 - d. Pressure reducing valves.
 - e. Temperature or pressure regulating valves.
 - 3.5 Installation of Steam Traps: Install strainer ahead of trap if not integral with trap.

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- 3.6 Pipe Support Installation: Concrete inserts or L-shaped anchor bolts shall be used to support piping from new cast-in-place concrete. Expansion anchors shall be used to fasten supports to existing concrete and masonry.
- 3.7 Valve boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box.
- 3.8 Flexible hoses shall be installed on equipment side of shutoff valves, horizontally and parallel to equipment shafts wherever possible.

Pumps

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumps. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Worn or damaged pump parts shall be replaced rather than repaired.
 - 2.2 New pump impellers, when required, shall be statically balanced before installation.
 - 2.3 Used impellers shall be checked for balance before reinstallation. Out of balance impellers shall either be balanced or replaced.
 - 2.4 Close coupled pumps, when replaced, shall be replaced complete with motor.
- 3.0 EXECUTION:
 - 3.1 Before any work is started, the pump driver shall be locked out and tagged to prevent any driving power to the pump. The pump suction and discharge piping shall be valved off, locked, and tagged, or pipe line blanks shall be installed.
 - 3.2 Before any work is performed on pumps in acid or other toxic material service, the pump must be vented and drained (flushed, if possible). Acid-proof personal protection shall be worn until pump and parts have been cleaned and neutralized.
 - 3.3 Gaskets shall be replaced whenever a gasketed joint has been disturbed.
 - 3.4 Flexible coupling alignment shall be required if either the pump or motor mounting has been disturbed and shall be to the tolerances specified by the flexible coupling manufacturer.
 - 3.5 Removal and installation of impellers shall be accomplished using pullers, jacks, crane, or hoist. Impact tools are strictly prohibited.
 - 3.6 Turbine pumps removed from casings shall be lifted vertically to prevent damage to the pump or the pump casing.
 - 3.7 New impeller rings, gaskets, and strainers shall be installed before reassembly of turbine pumps.
 - 3.8 Relief valve in discharge line for positive displacement pumps shall be set and tested at 110 percent of design discharge pressure or as recommended by pump manufacturer for service in which pump is used.

Insulation for Above Ground Pipe

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for aboveground pipe. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Insulation shall be in accordance with the following.
 - Service Temperature, F Insulation Material
 - 3,000 Maximum Fiber Blanket, ASTM C 892
 - 1,600 Maximum Calcium silicate, ASTM C 533
 - 1,500 Maximum Expanded perlite, ASTM C 610
 - 1,200 Maximum Preformed mineral fiber, ASTM C 547
 - 800 Maximum Cellular glass, ASTM C 552
 - 225 Maximum Rigid, preformed cellular urethane, ASTM C 591

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- 60 F and below Cellular glass, ASTM C 552 (cold piping) or mineral fiber, Fed. Spec. HH-I-558
- 2.2 Insulation jacket materials shall have fire hazard ratings that do not exceed 75 for flame spread and 150 for fuel contributed and smoke developed, except where otherwise required by the authority having jurisdiction. Test ratings shall be determined in compliance with ASTM E 84 and NFPA 255.
- 2.3 Accessory materials, including insulating cements, adhesives, staples, coatings, tapes, bands, and other accessory materials shall be as recommended for the particular application by the manufacturer of the insulation or jacket.
- 3.0 EXECUTION: Vapor barrier shall be continuous throughout each piping run for cold piping (-30 F to 60 F).

Insulation for Underground Pipe

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for underground pipe. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Insulation for conduit systems shall be calcium silicate complying with ASTM C 533 or polyurethane foam for low temperature systems (250 F and below).
 - 2.2 Insulation jackets for conduit systems shall be cast iron complying with ASTM A 377 or epoxy-coated spiral weld steel conduit for high temperature systems (above 250 F); or shall be polyvinyl chloride complying with ASTM D 1785 or fiberglass reinforced plastic for low temperature systems (250 F and below).
- 3.0 EXECUTION:
 - 3.1 Backfill on pipe system shall be 12 inches minimum.
 - 3.2 Ground surface shall be resodded or otherwise restored to the condition existing prior to the work.

Boiler Firebox Insulation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler firebox insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Block or Board Insulation:
 - 2.1.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 612.
 - 2.1.2 Fiber blanket, ASTM C 892.
 - 2.1.3 Calcium Silicate in accordance with ASTM C 533.
 - 2.1.4 Cellular Glass in accordance with ASTM C 552.
 - 2.1.5 Cellular Polyurethane in accordance with ASTM C 591.
 - 2.1.6 Expanded Perlite in accordance with ASTM C 610.
 - 2.2 Blanket Insulation: Mineral fiber rock, slag, or glass in accordance with ASTM C 553 or ASTM C 592.
 - 2.3 Loose Fill Insulation:
 - 2.3.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 764.
 - 2.3.2 Vermiculite in accordance with ASTM C 516.
 - 2.3.3 Perlite in accordance with ASTM C 549.
 - 2.4 Insulating Cement:
 - 2.4.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 195 or ASTM C 449.
 - 2.4.2 Exfoliated Vermiculite in accordance with ASTM C 196.
 - 2.5 Castable Refractory in accordance with ASTM C 401.
 - 2.6 Spray-Applied Fibrous Insulation in accordance with ASTM C 720 and ASTM C 762.
 - 2.7 Refractory Supports attached to pressure parts of the boiler shall comply with the ASME Boiler and

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Pressure Vessel Code.

3.0 EXECUTION:

3.1 Safety: The boiler shall be removed from service, cooled, drained, and purged prior to conducting internal inspection or repairs. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic, explosive, or suffocating gases.

3.2 Closing up the Boiler: The repair shall not be covered by replaced or reinstalled materials until authorized.

Ductwork Insulation

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork insulation. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Rigid fiberglass ductwork insulation shall conform to Fed. Spec. HH-I-558, Form A. It shall consist of rigid fibrous glass board with foil facing, vapor sealed and attached to ducts with mechanical fasteners. Density shall be 3 lb/ft³.

2.2 Flexible fiberglass ductwork insulation shall conform to Fed. Spec. HH-I-558, Form B. It shall consist of 3/4 lb/ft³ density fibrous glass blanket with reinforced foil and Kraft facing lapped and joints sealed vapor tight.

2.3 Ductwork insulation shall have a flame spread rating not exceeding 75 and a smoke developed rating not exceeding 150 as determined by test procedures in ASTM E 84. Components such as adhesives, mastics, and cements must meet the same individual ratings as the minimum requirements.

2.4 Adhesives shall conform to Mil. Spec. MIL-A-3316.

2.5 Vapor barrier shall conform to ASTM C 1136 Type I for exposed ducts and Type I or Type II for concealed ducts.

3.0 EXECUTION: Insulation shall be installed so that finishes are smooth and all joints are tight and sealed.

Interior Plumbing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of interior plumbing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. Contact the Fire Protection Engineering Branch for requirements of piping material.

2.0 PRODUCTS:

2.1 Drinking Water Dispensers:

2.1.1 Electric water coolers shall comply with ARI 1010 and shall use one of the halogenated hydrocarbons as refrigerant. Top surfaces of the dispenser in contact with water shall be stainless steel or porcelain enameled steel. Piping connections from the shutoff or stop valve and outlet valve arrangement shall be chrome-plated brass, copper tubing, or stainless steel.

2.1.2 Drinking fountains shall comply with Fed. Spec. WW-P-541/6.

2.2 Hot Water Generators and Storage Tanks:

2.2.1 Heating element for the hot water generator shall consist of U-bend coils, a tube sheet, and air element head. The coil shall be seamless tubing inserted into holes in the tube sheet and secured by expanding. The tube sheet shall be copper alloy or other nonferrous metal. Tubing for the heating element shall be light drawn copper tubing complying with ASTM B 75 or copper alloy tubing complying with ASTM B 111, copper alloy No. 706. Element shall be in accordance with Mil. Spec. MIL-H-12322.

2.2.1.1 Copper tubing shall be designed for a working pressure of 150 psig steam and shall withstand an internal hydrostatic pressure of 225 psig for not less than 15 seconds without leaking or any

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- evidence of damage.
- 2.2.1.2 Copper alloy tubing shall be designed for a working pressure of 400 psig with 400 F hot water and shall withstand an internal hydrostatic pressure of 600 psig for not less than 15 seconds without leaking or any evidence of damage.
- 2.2.1.3 The head for the heating element shall be close grained cast iron or fabricated steel for steam service, or cast or fabricated steel for high temperature hot water service. The heads shall be partitioned to separate the steam supply and condensate return. The head shall be equipped with tappings or flanges for the supply, return, air relief, and vacuum breaker connections. The air-relief valve and vacuum breaker connection shall be 1/2 inch pipe size.
- 2.2.2 New storage tanks shall be constructed, tested, and marked in compliance with the ASME Boiler and Pressure Vessel Code, Section VIII. The tank shall be glass-lined steel. Tanks shall be cathodically protected if required by local conditions. Tanks shall be in accordance with Mil. Spec. MIL-T-12295. The thermal efficiency and standby heat loss shall comply with the requirements of ASHRAE 90A.
- 2.2.3 Storage tank repair shall comply with the ASME Boiler and Pressure Vessel Code, Section VIII.
- 2.2.4 Heaters/storage tanks shall be equipped with ASME rated accessories.
- 2.3 Pneumatic Water Supply Systems:
 - 2.3.1 New pneumatic tanks shall be designed for 125 psig working pressure and shall be constructed in compliance with ASME Boiler and Pressure Vessel Code, Section VIII. Tanks shall be equipped with manhole in head, water gauge glass, pressure gauges, water pressure relief valves, and tapped openings for all piping.
 - 2.3.2 Compressor shall be belt-driven by a motor having a maximum speed of 1800 rpm. The motor shall have a manual across-the-line starter and thermal overload protection. Guards complying with OSHA requirements shall be provided for all exposed moving parts.
 - 2.3.3 Control System: Pressure switches shall be of the adjustable type having an operating range of 30 to 90 psig. The switch shall be three position type.
 - 2.3.4 Bladder-Type Pneumatic Tank: An ASME code constructed tank stamped for 125 psig water working pressure shall be provided, unless otherwise indicated. The tank shall be sized as indicated and have a flexible diaphragm made of material conforming to FDA requirements for use with potable water and shall be factory precharged to meet required system pressure.
- 2.4 Gas Fired Water Heaters:
 - 2.4.1 Water heater storage tank shall be steel with a copper or glass lining and shall comply with ANSI Z21.10.1. Equipment shall comply with the approval requirements of AGA Directory of Certified Appliances and Accessories. For elevations above 2,000 feet, the AGA rating shall be reduced at the rate of 4 percent for each 1,000 feet above sea level. Safety pilot valve shall be supplied to automatically shut off the main gas supply to the burner or burners in the event that the pilot flame is extinguished.
 - 2.4.2 Flue gas piping shall be single wall metal pipe constructed of not less than No. 24 B&S gauge sheet copper or No. 20 gauge galvanized sheet steel.
 - 2.4.3 Relief valves shall comply with ANSI Z21.22. Relief valves shall be ASME rated.
 - 2.4.4 Thermostat shall be snap action type actuated by water temperature.
- 2.5 Oil Fired Water Heaters:
 - 2.5.1 Water heater tank shall be glass-lined steel. Tanks of 120-gallon capacity, or less, shall be hydrostatically tested to 300 psig. Tanks shall have vertical flue passages or annular flue passages between the tank and the casing. Tanks shall be cathodically protected if required by local conditions.
 - 2.5.2 Burner shall be mechanical pressure atomizing type.
 - 2.5.3 Controls shall consist of a combustion safeguard (primary control) to shut down the burner in event of ignition failure or flame failure, a limit control to prevent overheating in case of thermostat failure, and a thermostat of the adjustable immersion type to control water temperature.
 - 2.5.4 Relief valve shall comply with ANSI Z21.22. Relief valves shall be ASME rated.
 - 2.5.5 Draft regulator shall be of the automatic, barometric type designed for installation in the chimney or flue connector at the outlet of the water heater. The draft regulator shall meet the requirements of UL 378.

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- 2.5.6 Flue gas piping shall be single wall steel pipe, minimum 28 gauge. Finish shall be zinc coated or oxidized to form blue black color.
- 2.6 Electric Water Heaters:
 - 2.6.1 Water heater tanks shall be glass-lined steel complying with Fed. Spec. W-H-196, with dual heating elements. Tanks shall be cathodically protected if required by local conditions.
 - 2.6.2 Relief valves shall comply with ANSI Z21.22. Relief valves shall be ASME rated.
 - 2.6.3 Thermostats shall be provided in compliance with UL 174.
 - 2.6.4 Wiring shall comply with NFPA 70.
 - 2.6.5 Heating elements shall be medium watt density commercial grade incoloy sheathed flanged mounted elements with prewired terminal leads, and element fusing per the National Electrical Code.
- 2.7 Lavatories:
 - 2.7.1 Lavatories shall be first quality vitreous china or enameled cast iron.
 - 2.7.2 Drains and jam nuts shall be cast wrought copper alloy. Strainer shall be copper alloy or corrosion-resisting steel.
 - 2.7.3 Faucets shall be single, center set, combination, or single control mixing type, complying with Fed. Spec. WW-P-541/4.
 - 2.7.4 Stop valves shall be angle or straight type and constructed of copper alloy, chrome plated.
 - 2.7.5 Traps shall be P-type.
 - 2.7.6 Soap dispensers shall be glass or metal type with a capacity of 12 fluid ounces for liquid soap.
- 2.8 Urinals:
 - 2.8.1 Wall-hung urinals shall have integral trap and extended shield; shall have washout, blowout, or siphon-jet flushing action; and shall be constructed of first quality vitreous china.
 - 2.8.2 Pedestal type urinals shall have integral trap, siphon-jet flushing action, and a bottom outlet for connection to a closet type floor flange. Urinal shall be constructed of first quality vitreous china.
 - 2.8.3 Trough type urinals shall be wall-hung with an integral flushing rim and shall be constructed of first quality vitreous china.
- 2.9 Water Closets:
 - 2.9.1 Elongated bowl water closets shall be of the siphon jet, floor outlet type, for use with a flush valve and constructed of first quality vitreous china. Seats shall be open front, less cover, constructed of molded plastic or wood.
 - 2.9.2 Regular bowl water closets shall be of the siphon jet, floor outlet type, constructed of first quality vitreous china. The tank shall be separate, secured to and supported by the water closet and shall contain a copper, copper alloy, or corrosion-resisting steel float and flush valve with a refill tube, operating lever, and control valve stop and supply pipe. Seats shall be closed front, with cover constructed of molded plastic or wood.
 - 2.9.3 Fittings: Floor flanges, gaskets, bolts, and screws shall be supplied. Flanges may be copper, copper alloy, or cast iron. Gaskets shall be nonstaining wax.
- 2.10 Sinks:
 - 2.10.1 Kitchen sink shall be single or double bowl enameled cast iron, porcelain enameled formed steel, or corrosion-resisting formed steel.
 - 2.10.2 Service sink shall be single bowl, trap standard, floor or wall mounting. Sink shall be constructed of enameled cast iron or vitreous china. Rim guard shall be copper alloy or corrosion-resisting steel.
 - 2.10.3 Faucets shall be a single center set or combination type complying with Fed. Spec. WW-P-541/5. Vacuum breaker shall be provided on faucets where required by codes. Handicapped faucets shall be provided with lever or wrist blades.
 - 2.10.4 Drains shall have a removable metal strainer, jam nut, coupling, and tail piece.
 - 2.10.5 Traps for kitchen sinks shall be P-type chrome plated. Exterior surfaces of traps for service sinks shall be as cast or painted.
- 2.11 Bathtubs shall be enameled cast iron or porcelain enameled formed steel in compliance with Fed. Spec. WW-P-541/3 or shall be fiberglass reinforced plastic. Drains shall be chrome-plated with pop-up or trip lever stopper.
- 2.12 Laundry Tubs:
 - 2.12.1 Laundry Tubs shall be double bowl enameled cast iron or corrosion-resisting formed steel with

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- frame, wall, pedestal, or leg support.
- 2.12.2 Faucet shall be mounted in back of tub and shall be a separate or combination fitting. Combination faucet shall have exposed valve body, union inlet, and swing spout. Finish shall be chrome or nickel plated. Vacuum breakers shall be provided on faucets where required by codes.
- 2.12.3 Drain shall have a removable metal strainer, jam nut, coupling, and tail piece. Drain shall have a suitable rubber type stopper.
- 2.12.4 Trap shall be P-type with cleanout plug and shall be chrome-plated.
- 2.13 Flush Valves: Flush valve shall be a large diaphragm or large piston type exposed style with a side oscillating handle. The flush valve shall have a vacuum breaker; a control stop with or without a cap; a back check in the control stop with or without a cap; a back check in the control stop or anti-siphon within the valve; a flush connection with coupling nuts, gaskets, and spud flanges; and a wall flange or escutcheon. Exposed surfaces of the flush valve shall have a bright chrome-plated finish. The valve shall be capable of operating without chatter or water hammer and shall deliver 2 gallons minimum for urinals and 4 gallons minimum for water closet per flush at any inlet pressure from 10 psi to 50 psi.
- 2.14 Showers shall be wall mounted, column, bath, free standing cabinet, or emergency type complying with Fed. Spec. WW-P-541/7. Shower heads and handles shall be copper alloy or corrosion-resisting steel. Escutcheons shall be corrosion-resisting steel or copper alloy. Control valves shall be copper alloy and have metal integral parts of copper alloy, nickel alloy, or corrosion-resisting steel. Control valves shall be thermostatic mixing; pressure balancing; mechanical, either mixing or single control; or separate hot and cold water valves. Shower heads shall be nonadjustable.
- 2.15 Floor Drains:
- 2.15.1 Cast-iron drains shall comply with ANSI A112.21.1, Figure 3.3. Body shall be cast iron and strainer shall be chrome-plated bronze.
- 2.15.2 Polyethylene drains shall be constructed of polyethylene complying with ASTM D 1248.
- 2.15.3 Gaskets shall be neoprene complying with ASTM C 564 or as recommended by the drain manufacturer.
- 2.16 Wall Faucets: Provide faucets with vacuum breaker, backflow preventer, brass body, 3/4-inch male inlet threads, hexagon shoulder, and 3/4-inch hose connection. Faucet handle shall be securely attached to stem.
- 2.17 Wall Hydrants: Provide hydrants with vacuum breaker, backflow preventer, nickel-brass or nickel-bronze wall plate, and detachable key handle. Hydrant shall be self-draining and have 3/4-inch exposed hose thread on spout.
- 2.18 Lawn Faucets: Provide faucets with either straight or angle brass bodies, and shall be of the compression type. Faucet spout shall have 3/4-inch hose threads, and handle shall be securely attached to stem.
- 2.19 Yard Hydrants: Yard box or post hydrants shall have valve housings located below frost lines. Hydrants shall be bronze with cast-iron box or casing guard. "T" handle key shall be provided.
- 2.20 Backwater Valves: Valves shall be of the flap type, hinged or pivoted, with revolving disks. Hinge pivots, disks, and seats shall be nonferrous metal.
- 3.0 EXECUTION:
- 3.1 Installation of new equipment and repair of existing equipment shall comply with NAPHCC National Standard Plumbing Code. Mounting height of fixtures for use by the physically handicapped shall be in accordance with ANSI A117.1.
- 3.2 Repair of the pneumatic pressure tank shall comply with ASME Boiler and Pressure Vessel Code, Section VIII.
- 3.3 Testing of Repaired Tanks: After repairs have been completed, hot water generator storage tanks and pneumatic pressure tanks shall be tested in compliance with ASME Boiler and Pressure Vessel Code, Section VIII.
- 3.4 Flue Gas Piping: New flue gas piping shall be installed in compliance with NFPA 211. New flue gas vent piping shall be installed in compliance with NFPA 54.
- 3.5 Faucet repair shall be limited to replacement of washers, renewable seats, or broken handles.
- 3.6 Air chambers for prevention of water hammer shall be checked to see if they are waterlogged.

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Steel Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Tank materials shall be as required for the service by AWWA D100 or D103 for water tanks, or by API standards for petroleum product tanks.
 - 2.2 New tanks shall comply with AWWA or API standards as applicable for the service. Storage tanks for flammable liquids shall also comply with UL and NFPA requirements.
 - 2.3 Nozzle flange diameters and drillings shall be in compliance with ANSI B16.5.
 - 2.4 Butt weld nozzles shall be in compliance with ANSI B16.25.
- 3.0 EXECUTION:
 - 3.1 Tank repair and installation work shall comply with applicable requirements of AWWA D100 or D103, or with API standards.
 - 3.2 Welding shall be performed in accordance with AWS D1.1. Pipe welding to nozzles shall be performed in accordance with ASME Boiler and Pressure Vessel Code, Section IX.

Plastic Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Tank material shall be reinforced fiberglass polyester in compliance with AWWA D120 for water tanks, or ASTM C 582 for tanks in chemical service. 2.2 New Tanks shall be horizontal, cylindrical tanks and shall comply with AWWA D120 or ASTM D 3299 as applicable. Chemical resistance tests, when required, shall be performed at the fabrication shop in compliance with ASTM C 581.
 - 2.3 Nozzle flange diameters and drillings shall be in compliance with ANSI B16.5.
- 3.0 EXECUTION: Repair and installation work shall be performed in compliance with recommended procedures and practices of SPII and of PPI, where applicable.

Pool Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pool equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Electric swimming pool heaters shall be UL listed and shall conform to the ASME Boiler and Pressure Vessel Code. The heating elements shall be constructed of copper and shall be pre-wired with the connection at the element terminal sealed against moisture. Controls shall include a differential thermostat and a high temperature limit manual reset switch.
 - 2.2 Gas-Fired Swimming Pool Heaters shall conform to the ASME Code and shall be approved by the American Gas Association. Heat exchangers shall be two-or four-pass design with copper-finned tubes. The burner shall be constructed of stainless steel and shall be provided with all necessary valving to meet ASME Code requirements.
 - 2.3 Diatomite filtration system shall consist of a centrifugal circulating pump, plastic filter elements surrounded by diatomaceous earth coating, a dry chemical feeder for feeding diatomaceous earth, and a modulating level control valve for the filter inlet line.
 - 2.4 Swimming pool chlorinators shall be the gaseous chlorine cylinder-mounted type. Materials for construction of chlorinators shall be in accordance with recommendations of the Chlorine Institute.
 - 2.5 Swimming pool surge tank system shall include a surge tank, a vertical pump, and an electronic float switch. The surge tank shall be in compliance with ASME Code requirements for unfired

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- pressure vessels.
- 2.6 Pool drains shall be constructed of cast iron.
- 3.0 EXECUTION:
- 3.1 Personnel shall not begin repairs on the electric swimming pool heater until power to the heater has been disconnected.
- 3.2 Chlorine gas storage and use shall be in accordance with recommendations of the Chlorine Institute Inc., Chlorine Manual.

Compressed Air Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of compressed air equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 All new compressed air equipment and materials for repair or replacement shall comply with ANSI/ASME B19.3, and ASME Boiler and Pressure Vessel Code, Section VIII.
- 2.2 New reciprocating air compressors shall be of the single or two-stage, heavy-duty, double-acting, water-cooled or air-cooled, "Y" or "L" cylinder type complete with flange-mounted drive motor. The piston, valve, and cylinder construction shall not require lubrication. Teflon piston rings and Teflon or carbon rider rings shall be used. Compressors shall operate at a speed not in excess of 1,800 rpm.
- 2.2.1 Bearings: Main crankshaft bearings shall be anti-friction roller or ball type. Connecting rod bearings shall be sleeve type.
- 2.2.2 Valves: Compressor cylinder valves shall be of the channel, feather, or plate type suitable for service without external lubrication.
- 2.2.3 Lubrication: Force-feed lubrication system shall lubricate the crankshaft, connecting rod, and crosshead bearings.
- 2.2.4 Rod Packing: Piston rod packing shall be Teflon or carbon non-lubricating type.
- 2.2.5 Intake air filter - silencer shall be a pipe-supported dry type capable of removing 95 percent of all particles 10 microns and larger.
- 2.2.6 Intercooler and after cooler shall be a shell-and-tube or plate type.
- 2.2.7 Motor shall be squirrel-cage induction, dripproof, NEMA Class B, with split-sleeve bearings.
- 2.3 New centrifugal and rotary screw compressors shall be of the multi-stage or two-stage type driven by an electric motor through speed-increaser gears.
- 2.3.1 Intake air filter-silencer shall be a full-capacity dry type capable of removing 95 percent of all particles 10 microns and larger.
- 2.3.2 Blowoff silencer shall be a full-capacity blowoff vent type.
- 2.3.3 Bearings: Centrifugal compressor radial bearings shall be of the pivoted shoe type. Axial bearings shall be Kingsbury-type thrust bearings capable of absorbing thrust in either direction. Rotary screw compressor radial bearings shall be anti-friction roller type. Ball thrust bearings shall be provided to carry the axial load.
- 2.3.4 Seals: Centrifugal compressors shall be labyrinth or carbon ring-type air and oil seals. Rotary screw compressors shall be stainless steel sealing rings.
- 2.3.5 Intercoolers and after coolers shall be water-cooled shell and tube type.
- 2.3.6 Vents and Drains: Vents shall be tapped and plugged. Drains shall be complete with drain valves.
- 2.3.7 Lubricating oil system shall be a shaft-driven main oil pump, motor-driven auxiliary oil pump, dual oil coolers, oil reservoir, dual oil filters, pressure switches and gauges, check valves, valves, and interconnecting piping.
- 2.3.8 Check valves shall be 150-pound class, carbon steel.
- 2.4 New control air compressor and dryer shall be air-cooled with a reciprocating compressor and a single receiver constructed in accordance with ASME Code requirements. Motor shall be NEMA Class B design with built-in overload protection. Unit shall include an air gauge, pop safety valve, external check valve, filter, pressure switch, and drain cock. Air dryer shall be refrigerated type

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- designed for continuous operation with hermetically sealed compressor, heat exchanger, ambient air filter, and automatic drain trap. Oil and water filter shall have aluminum housing with pressure rating of 250 psig at 70 F and include manual drain valve and 10 replacement filters.
- 2.5 Aftercoolers shall be of the watercooled, shell-and-tube pipeline type with adequate surface area to limit the discharge to the temperature required. The unit shall include moisture separators, gauge glasses, automatic condensate traps, valves, drain piping, and thermal reliefs on the water side.
 - 2.6 Receivers shall meet ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 requirements and shall include pressure gauge, relief valve, shutoff valve, automatic moisture trap, and drain valve. Receivers shall be designed for 200 psi.
 - 2.7 All rotating parts and equipment shall be true, dynamically balanced at the factory, and shall include vibration isolators.
 - 2.8 Safety guards shall meet OSHA requirements.
 - 2.9 Pressure regulators shall be designed for a maximum inlet pressure of 125 psi and a maximum temperature of 200 degrees F. Regulators shall be single seated, pilot-operated with valve plug, bronze body and trim, and threaded connections. Regulator shall include a pressure gauge.
 - 3.0 EXECUTION:
 - 3.1 Repair and replacement work done on receiver tanks shall be in accordance with ASME Boiler and Pressure Vessel Code and the NBBI. Repair procedures shall provide structural integrity as required by NB-23.
 - 3.2 Welding shall be performed in compliance with AWS D1.1 and ASME Boiler and Pressure Vessel Code, Section IX.
 - 3.3 Repaired pressure parts and replacement pressure parts shall be tested after completion of repair or installation in accordance with the ASME Code.

Fire Tube Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire tube boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.
- 3.0 EXECUTION:
- 3.1 No personnel shall enter the boiler until the boiler has been removed from service, cooled, drained, and purged and the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.
- 3.2 Repair and maintenance work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NB-132 and have been approved by the Authorized Member Representative.
- 3.3 Waterside Repairs: Wash drum internals to remove loose scale and soft deposits prior to making repairs.
- 3.4 Fireside Repairs:
 - 3.4.1 Remove soot and other deposits from furnace tube, fire tubes, and tube sheets.
 - 3.4.2 Cracks at the junction of the furnace tube and tube sheet shall be repaired by welding.
 - 3.4.3 Boiler shell and tube sheet patches shall be designed and installed in compliance with the National Board Inspection Code Chapter VI. All patches shall comply with the requirements for new construction of ASME Boiler and Pressure Vessel Code, Section I or IV.
 - 3.4.4 Damaged fire tubes shall be removed and replaced with new tubes, except for a single leaking fire tube, which may be repaired by plugging at tube sheet at both ends.
 - 3.4.5 Corroded surfaces may be built up by fusion welding in compliance with the NBBI National Board Inspection Code.
 - 3.4.6 Seal welds used for fluid tightness shall be applied in compliance with NB-132.
- 3.5 Closing the Boiler:
 - 3.5.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets,

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and reinstall or close all manholes and handholes.

- 3.5.2 Front and Rear Door: Clean seating surface, replace gaskets, and close front and rear access doors.
- 3.5.3 The repair shall not be covered by replaced or reinstalled materials until authorized.
- 3.6 Inspection and testing of completed boiler repairs shall be in compliance with the ASME Code.

Water Tube Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water tube boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.
- 3.0 EXECUTION:
 - 3.1 No personnel shall enter the steam drum or lower drum until the boiler has been removed from service, cooled, drained, and purged and all steam and water valves, including drain and blowdown valves, have been closed, and locked or tagged. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.
 - 3.2 Repair and maintenance work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of ASME Boiler and Pressure Vessel Code and the NB-132 and have been approved by the Authorized Member Representative.
 - 3.5 Waterside (Internal) Repairs: Wash drum internals to remove loose scale and soft deposits. Turbine the water tubes. Perform chemical cleaning by either circulation or soaking.
 - 3.6 Cracks in drums shall be repaired in compliance with the NBBI National Board Inspection Code.
 - 3.7 Tube seat leaks may be repaired by internal seal welding of the tubes in compliance with NB-132.
 - 3.8 Fireside (External) Repairs:
 - 3.8.1 Clean deposits from fireside surfaces by washing with hot alkaline water, brushing, scraping, or air lancing. Surfaces shall be dried immediately after washing.
 - 3.8.2 Corroded surfaces may be built up by fusion welding in compliance with NB-132, Chapter VI.
 - 3.8.3 Drum shell patches shall be designed and installed in compliance with NB-132.
 - 3.8.4 Minor cracks in tube shall be repaired by replacement of a tube section. Minimum length of replacement tube section shall be 12 inches. Use backing rings when sections are welded into existing tubes. Use the TIG (tungsten-inert-gas) process for the root pass.
 - 3.8.5 For major tube damage, replace entire tube. If only one or two tubes require replacement, the damaged tubes may be removed and the holes plugged if approved by the Authorized Member Representative.
 - 3.8.6 Seal welds used for fluid tightness shall be applied in compliance with NB-132.
 - 3.9 Closing the Boiler:
 - 3.9.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.
 - 3.9.2 The repair shall not be covered by replaced or reinstalled materials until authorized.
 - 3.10 Inspection and testing of completed boiler repairs shall be in compliance with the ASME Code.

High Temperature Water Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high temperature water boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Replacement parts and materials shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.
- 3.0 EXECUTION:
 - 3.1 Personnel shall not enter the boiler until it has been removed from service, cooled, drained, and purged.

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- 3.2 Repair and maintenance work shall be performed in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Authorized Member Representative.
- 3.3 Tubes shall be replaced as specified in NB-23.
- 3.4 Tube joints, headers, and drums shall be repaired as specified in NB-23.
- 3.5 Material and equipment removed for access to the boiler or to make repairs shall be reinstalled following successful completion of performance tests and authorization of the Authorized Member Representative.
- 3.6 Repairs to pressure parts shall be inspected and tested as specified in NB-23. The Contractor shall submit the Inspection Certificate to the Authorized Member Representative.

Cast-iron Boilers and Fireboxes

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of cast-iron boilers and fireboxes, and furnishing and installation of cast-iron boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Replacement parts and materials shall comply with the requirements of the ASME Boiler and Pressure Vessel Code for new construction.
- 2.1 Gas-Fired, Oil-Fired, and Combination Gas/Oil-Fired Boilers: Boilers shall be rated and tested in accordance with ANSI Z21.13. Boilers shall meet the requirements of the following safety codes and standards: UL 726, UL 795, and UL 296. Boilers shall be provided with combustion controls.
- 3.0 EXECUTION:
- 3.1 No personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere has been checked and found to be free of toxic or explosive gases.
- 3.2 Repair and maintenance work shall be performed in accordance with procedures developed by the Contractor, in compliance with requirements of the ASME Boiler and Pressure Vessel Code and NB-132, and approved by the Authorized Member Representative.
- 3.3 Clean Fireside Surfaces: Thoroughly clean flueway and firebox surfaces.
- 3.4 Clean waterside surfaces to remove sludge and sediment.
- 3.4.1 On steam boilers, open blowdown valve and flush water until clear while under steam pressure. On water boilers, open boiler drain cock to remove sludge and sediment that have settled to the bottom. Then refill boiler to correct water level for steam boilers or correct water pressure for water boilers.
- 3.4.2 If boiler is shut down, remove plugs and open drain cock. Wash the inside of the boiler with water to remove sludge and sediment. Fill boiler and drain again. Fill boiler to correct level or pressure.
- 3.5 Replace Damaged Boiler Section: Clean seating surfaces and replace gaskets or sealant before installing boiler sections.
- 3.6 Repair cracks by brazing in compliance with the ASME Boiler and Pressure Vessel Code, Section IV and Section IX.
- 3.7 Closing the Boiler:
- 3.7.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.
- 3.7.2 Other Materials: The repair shall not be covered by replaced or reinstalled materials until authorized.
- 3.8 Inspection and testing of completed boiler repairs shall be in compliance with the ASME Code.

Cleaning of Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers cleaning of boilers. Products and materials used shall be in accordance with the boiler manufacturer's recommendations and/or shall be as directed by the Authorized Member Representative. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the boiler manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

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- 2.0 PRODUCTS:
- 2.1 Equipment required for cleaning, such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizer tank and pump, power brushes, high pressure sprays, and other equipment shall be supplied by the Contractor.
- 2.2 Chemical Cleaning Materials:
 - 2.2.1 Boilout chemicals shall be trisodium phosphate complying with ASTM D 538, caustic soda complying with ASTM D 456, and soda ash complying with ASTM D 458.
 - 2.2.2 Acid Cleaning Chemicals shall be:
 - Hydrochloric Acid complying with Fed. Spec. 0-H-765
 - Ammonium Bifluoride, $\text{N}_2\text{H}_4\text{F}_2$
 - Hydroxycetic Acid, CH_2OHCOOH , Technical Grade
 - Formic Acid, HCOOH , Technical Grade
 - Phosphoric Acid complying with Fed. Spec. 0-0-670
 - Sulfuric Acid complying with Fed. Spec. 0-S-809
 - Sulfamic Acid, HSO_3NH_2
 - 2.2.3 Neutralizing-Passivating Chemicals shall be as follows:
 - Monosodium Phosphate, $\text{H}_2\text{NaO}_4\text{P}$
 - Di-sodium Phosphate, Na_2HPO_4
 - Ammonia, Anhydrous, complying with Fed. Spec. 0-A-445
 - Hydrazine, Anhydrous, H_2NNH_2
 - Sodium Sulfite complying with Mil. Spec. MIL-S-13943
 - Sodium Nitrate complying with Mil. Spec. MIL-S-322
 - 2.2.4 Flushing water shall be demineralized water with a conductivity end point of 50 micro-ohms.
 - 2.2.5 Pressure draining gas shall be commercially pure, 99.5 percent nitrogen.
- 2.3 Mechanical Cleaning Materials and Equipment:
 - 2.3.1 Brushes shall be of the type for use with power units.
 - 2.3.2 Washwater shall be hot alkaline washwater for removing ash deposits.
- 3.0 EXECUTION:
- 3.1 Clean boilers of all scale and deposits.
- 3.2 Inspection: After cleaning, the boiler shall be given a visual inspection for effectiveness of scale removal.
- 3.3 Welding and Burning: No welding or burning shall be allowed during cleaning operations.
- 3.4 Alkaline Boilout:
 - 3.4.1 Boilout chemicals shall be completely dissolved in water before being introduced into the boiler.
 - 3.4.2 Boilout chemicals shall be trisodium phosphate and caustic soda, 1,500 to 2,500 ppm concentration or caustic soda and soda ash, 3,000 ppm concentration.
 - 3.4.3 Boilout pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.
 - 3.4.4 Concentration of chemicals and duration of boilout will be dependent upon the scale analysis. Boilout time may vary from 8 to 24 hours with boiler water solids purged by blowdown at approximately 4-hour intervals.
 - 3.4.5 Flush unit with demineralized water until the effluent is clear of visible solids.
- 3.5 Acid cleaning, using either the circulating or soaking method, shall be done in the following sequence.
 - a. Wash heating surfaces with an acid solvent containing a proper inhibitor. •15560
 - b. Flush unit with clean water.
 - c. Neutralize and passivate the unit.
 - d. Flush the unit with clean water.
- 3.6 Circulating Method:
 - 3.6.1 Acid Application: Acid cleaning time shall vary from a minimum of 4 hours, depending on scale analysis. Time shall be determined by analyzing samples of return solvent for iron concentration and acid strength.
 - 3.6.2 Flushing: After cleaning, flush unit with demineralized water until pH reaches 6.5.

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- 3.6.3 Neutralization: After flushing, neutralize the unit with ammonia and hydrazine for 2 hours at 200 F.
- 3.6.4 Final Flush: Final flush with demineralized water until pH reaches 7.5.
- 3.7 Soaking Method:
 - 3.7.1 Application: Acid cleaning time shall vary from 4 to 8 hours depending on scale analysis. For soft sludges, cleaning time shall be a minimum of 4 hours. Cleaning time shall be 6 hours for thin coatings of hard scale. For heavy deposits, cleaning time shall be a maximum of 8 hours. The time periods noted are actual retention time of the solvent in the unit, including the time of filling and draining. Unit shall be drained under nitrogen pressure.
 - 3.7.2 Flushing: After required cleaning time, flush unit with demineralized water.
 - 3.7.3 Neutralizing: After flushing, the unit shall be neutralized and passivated with a solution of soda ash and boiled out for a period of 4 to 6 hours. The boilout pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.
 - 3.7.4 Final Flush: After boilout, the unit shall be drained and flushed with demineralized water containing sodium nitrate, until the pH reaches 7.5.
- 3.8 Effluent Neutralization: The solvent effluent drained from the unit shall be neutralized with caustic soda or soda ash to a pH of 6.8 to 8.5.

Firebrick Fireboxes for Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire brick fireboxes for boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 P PRODUCTS:
 - 2.1 Replacement parts and materials for pressure parts, or for attachment to pressure parts, shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.
 - 2.2 The Following Refractory Materials shall comply with the requirements of ASTM C 27: fire brick, refractory tile, plastic refractory, castable refractory, and refractory mortar.
- 3.0 EXECUTION:
 - 3.1 Repair and maintenance work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and have been approved by the Authorized Member Representative.
 - 3.2 No personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
 - 3.3 Fire Tube Boilers:
 - 3.3.1 When replacing burner throat tile, maintain correct throat diameter and ensure that throat is centered in the furnace.
 - 3.3.2 Repair burner throat and furnace liner tile cracks with high temperature bonding mortar.
 - 3.3.3 Wash coat burner throat and furnace liner tile with high temperature bonding mortar diluted with water.
 - 3.3.4 Patch cracks, 1/8 inch and larger in width, with high temperature bonding mortar or high temperature plastic refractory.
 - 3.3.5 Patch gap between cast refractory and baffle tile with high temperature plastic refractory.
 - 3.3.6 Patch damaged rear door refractory with cast refractory.
 - 3.4 Watertube Boilers: Repair cracks with ceramic fiber. Apply wash coat to burner throat.
 - 3.5 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.
 - 3.6 Drying Out:
 - 3.6.1 Air Dry: Allow refractory to air dry as long as possible.
 - 3.6.2 Fire Dry: To thoroughly dry refractory by firing, fire boiler intermittently at low rate. •15566

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Firebrick for Insulation of Boiler Fireboxes

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of firebrick for insulation of boiler fireboxes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Replacement parts and materials for attachment to pressure parts of the boiler shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.
 - 2.2 Firebrick, plastic refractory, castable refractory, and refractory mortar shall conform to the requirements of ASTM C 27.
- 3.0 EXECUTION:
 - 3.1 No personnel shall enter the boiler until it has been removed from service, cooled, drained, purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
 - 3.2 Repair and maintenance work shall be performed in accordance with procedures in compliance with requirements of the ASME Boiler and Pressure Vessel Code and NB-132, and approved by the Authorized Member Representative.
 - 3.3 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.
 - 3.4 Drying Out: Allow refractory to dry as long as possible.

Oil-fired and Gas-fired Burners for Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil-fired and gas-fired burners for boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Oil-fired burner pipe, tubing, fittings, flanges, valves, and gaskets shall comply with the requirements of ASME B31.1.
 - 2.2 Gas-fired burner pipe, tubing, fittings, flanges, valves, and gaskets shall comply with the requirements of ANSI Z223.1.
 - 2.3 Burner and pilot system and combustion and safety controls shall comply with the requirements of NFPA 85A, 85B, or 85D; or Mil. Spec. MIL-B-18796.
 - 2.4 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1.
- 3.0 EXECUTION:
 - 3.1 No personnel shall enter the boiler until it has been removed from service, cooled, purged and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
 - 3.2 Before welding, brazing, or cutting, gas piping shall be purged and the atmosphere checked and found to be free of an explosive gas mixture.
 - 3.3 Oil-Fired Burner Repairs: All oil-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, NFPA 85A or 85D, and Mil. Spec. MIL-B-18796. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1.
 - 3.4 Gas-Fired Burner Repairs: All gas-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI Z223.1 and C1, NFPA 85A or 85B, and Mil. Spec. MIL-B-18796. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.2.
 - 3.5 Inspection and Testing:
 - 3.5.1 Leak Test all piping.
 - 3.5.2 Pressure test all piping in compliance with ANSI B31.1 for oil-fired burners or ANSI B31.2 for gas-fired burners.

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Coal-firing Systems for Boilers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coal-firing systems for boilers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Coal-firing system equipment and materials shall comply with the requirements of ANSI B31.1, ASME Boiler and Pressure Vessel Code Section II, and NFPA 85E.
 - 2.2 Burner and pilot system and combustion and safety controls shall comply with the requirements of NFPA 85E.
 - 2.3 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1 and NFPA 70.
- 3.0 EXECUTION:
 - 3.1 No personnel shall enter the boiler until it has been removed from service, cooled, purged, and the atmosphere in the boiler has been checked with a Burrel or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
 - 3.2 Before welding, brazing, or cutting, coal piping shall be purged and the atmosphere checked and found to be free of an explosive coal/air mixture.
 - 3.3 Coal-fired Burner Repairs: All coal-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, ASME Boiler and Pressure Vessel Code, Section II, and NFPA 85E. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1 and ASME Boiler and Pressure Vessel Code, Section IX.
 - 3.5 Testing: Leak test all piping. Pressure test all piping in compliance with ANSI B31.1 and ASME Boiler and Pressure Vessel Code, Section II.

Draft Control Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of draft control equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Structural Steel shall comply with ASTM A 36.
 - 2.2 Steel Pipe shall comply with ASTM A 53.
 - 2.3 Piping Components shall comply with ASTM A 105.
 - 2.4 Flanges, Fittings, and Valves shall comply with ASTM A 181.
 - 2.5 Seamless Copper Tube shall comply with ASTM B 75.
 - 2.6 Insulation shall comply with ASTM C 547.
 - 2.7 Thermal Insulation and Finishing Cement shall comply with ASTM C 449.
 - 2.8 Welding and brazing materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.
- 3.0 EXECUTION:
 - 3.1 Safety: Adequate natural or forced ventilation shall be provided during repair activities conducted in confined spaces. Forced or induced draft fans shall be rendered inoperable before performing internal repairs to the fan casing or adjacent ductwork.
 - 3.2 Repairs shall be accomplished in compliance with NFPA 70.
 - 3.3 Welding and brazing shall be performed in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.
 - 3.4 Drive train components shall be repaired or replaced to transmit power free from vibration at the required torque.

Breeching

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of breeching. Products shall match existing materials and/or shall be as directed by the Authorized Member

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Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Breeching:

2.1.1 Carbon steel shall comply with ASTM A 568.

2.1.2 Galvanized steel shall be carbon steel complying with ASTM A 568, galvanized in compliance with ASTM A 123.

2.1.3 Stainless steel shall comply with ASTM A 167.

2.1.4 High heat insulating refractory shall be an alumina-silica-base castable refractory complying with ASTM C 27.

2.1.5 Acid resistant liner shall be phenolic, rubber, and polyester resin liner.

2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.1.7 Bolts and Nuts: Where breeching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.

2.1.8 Paint for prime coats and finish coats for touchup or refinishing shall be of the high heat-resistant type.

2.2 Masonry:

2.2.1 Mortar and grout for repair of cracks in reinforced concrete shall comply with ASTM C 476. Mortar for use in the repair or replacement of brick lining in high heat breeching shall be ground fire clay complying with ASTM C 27. Chemical-resistant mortar shall be resin mortar complying with ASTM C 395.

2.2.2 Brick for lining of high heat breeching requiring acid resistance shall be refractory brick complying with ASTM C 27. Brick for breeching requiring acid resistance shall be chemical-resistant brick complying with ASTM C 279, type H. 2.2.3 Inspection Doors shall be heavy-duty cast iron or steel, lined on interior with insulating, castable refractory complying with ASTM C 64.

2.2.4 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.

2.3 Refractory Brick:

2.3.1 Brick shall be high heat refractory type complying with ASTM C 27.

2.3.2 Mortar: Fire clay mortar shall be of high heat, ground type complying with ASTM C 27. Chemical-resistant mortar shall be the silica type complying with ASTM C 466.

2.3.3 Refractory shall be of the insulating, castable type complying with ASTM C 27. Chemical-resistant type castable refractory shall be in compliance with ASTM C 401.

2.3.4 Inspection doors shall be heavy-duty cast iron or cast steel, lined on the interior with insulating castable refractory complying with ASTM C 64.

3.0 EXECUTION:

3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Authorized Member Representative.

3.2 Welding: All welding shall be performed in compliance with AWS D1.1.

3.3 Installation of breechings shall be in compliance with NFPA 211.

Stacks

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of stacks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Metal Stacks:

2.1.1 Carbon Steel shall comply with ASTM A 568.

2.1.2 Galvanized steel shall be carbon steel complying with ASTM A 568, galvanized in compliance with ASTM A 123.

2.1.3 Stainless steel shall comply with ASTM A 167.

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- 2.1.4 Insulating refractory shall be alumina-silica base castable refractory complying with ASTM C 27.
- 2.1.5 Acid-resistant liner shall be phenolic, rubber, and polyester resin liner.
- 2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.
- 2.1.7 Insulation Jacket: Canvas jacket shall be 8-ounce standard proprietary canvas jacket. Aluminum jacket shall be 0.016 inch thick, corrugated, embossed, or smooth, complying with ASTM B 209, temper H14, Type 3003 or 5010 with 50-pound polyethylene vapor barrier. Supports for aluminum jacket shall be stainless steel Z-clips and bands 0.016 inch thick by 3/4 inch wide.
- 2.1.8 Bolts and Nuts: Where breeching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.
- 2.1.9 Steel rivets shall comply with ASTM A 502.
- 2.1.10 Steel structural wire rope shall be zinc-coated and shall comply with ASTM A 603. •15577
- 2.1.11 Paint for prime coats and finish coats for touchup or refinishing shall be of the high-heat-resistant type.
- 2.2 Masonry Stacks:
 - 2.2.1 Ceramic glazed clay brick shall comply with ASTM C 126.
 - 2.2.2 Chemical-resistant masonry units shall comply with ASTM C 279.
 - 2.2.3 Castable refractory shall comply with ASTM C 401.
 - 2.2.4 Mortar for fireclay brick shall comply with ASTM C 27. Mortar for chemical-resistant applications shall comply with ASTM C 395. Mortar and grout for reinforced masonry shall comply with ASTM C 476.
- 2.3 Prefabricated stacks shall consist of double-wall vent pipe and fittings. All components shall be UL-listed and shall comply with NFPA 211.
- 3.0 EXECUTION:
 - 3.1 Installation or repair of all stacks shall be in accordance with NFPA 211.
 - 3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Authorized Member Representative.
 - 3.3 Welding: All welding shall be performed in compliance with AWS D1.2.

Boiler Feedwater Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler feedwater equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Specialty components and parts shall be in accordance with applicable requirements of the ASME Boiler and Pressure Vessel Code.
 - 2.2 Welding and brazing materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.
- 3.0 EXECUTION:
 - 3.1 Repairs shall be accomplished with either the entire feedwater system or applicable portions isolated from service and drained.
 - 3.2 All isolation valves shall be secured in the closed position, all drain valves secured in the open position, and pumps rendered inoperative before and during repairs to the deaerators, softeners, and chemical feeders.
 - 3.3 Welding shall be performed in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.
 - 3.4 Electrical work shall comply with the requirements of NFPA 70.
 - 3.5 Drive train components shall be repaired or replaced to transmit power free from vibration at the required torque.
 - 3.6 Repair procedures for receiver vessels shall provide structural integrity as specified in NB-23.

Attachment 1: Specifications for the Work

Gas Meters and Regulators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas meters and regulators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Meters: Meters shall conform to Mil. Spec. MIL-M-18294, Style B, without resettable counter. Meters shall be pipe or pedestal mounted.
 - 2.2 Pressure Regulators: Pressure regulators shall have iron or steel bodies and shall be adjustable for changing the downstream pressure. The regulator shall be adjustable with automatic loading, and shall have automatic pressure relief. The pressure relief shall be diaphragm-operated, spring-loaded type with vent for relief.
 - 2.3 Valves: Valves shall conform to API Spec. 6D, Class 150.
- 3.0 EXECUTION:
 - 3.1 Installation of meters shall conform to ANSI B31.8. Permanent gas meters shall be installed with provisions for isolation and removal for calibration and maintenance.
 - 3.2 Installation of pressure regulators shall be installed with by-pass line and lubricated plug valves installed in the by-pass line and on each side of the regulator between the regulator and by-pass connections.
 - 3.3 Installation of strainer shall be upstream of meter.
 - 3.4 Installation of pressure reducing valve at meter station shall be provided as needed.

Fuel Handling Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fuel handling systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Fuel handling system components shall comply with applicable requirements of API.
 - 2.2 Fuel unloading hose shall be in compliance with applicable requirements of UL 180, 330, 536, and 569 and of ANSI/ASME B31.3.
 - 2.3 Gasoline dispensing pumps shall be in compliance with applicable requirements of UL 79 and 87 and of MIL-P-10406.
 - 2.4 Oil/water separators shall be of the coalescing type, with coalescing media as required for the application. Separators shall be repaired or constructed in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.
- 3.0 EXECUTION:
 - 3.1 Repair and replacement work shall be performed in compliance with applicable requirements of NFPA 30, NFPA 70, and the ASME Code.
 - 3.2 Welding shall be performed in accordance with ANSI B31.3 and ASME Boiler and Pressure Vessel Code, Section IX.
 - 3.3 Flushing: Repaired or replaced systems shall be flushed with the same type of fuel intended for use in the system until the outflowing fuel is free of sediment and emulsion and does not appear cloudy or hazy.

Warm Air Furnaces

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of warm air furnaces. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 New furnace shall comply with the AGA Directory of Certified Appliances and Accessories, NFPA 70, and UL 296, 378, 499, 727, 795, and 900 as applicable.
- 2.2 Filters may be permanent, cleanable type or throw-away type and shall comply with requirements of UL 900. Face velocity of air at maximum flow rate shall not exceed 360 cubic feet per minute for standard velocity filters and 520 feet per minute for high velocity filters.
- 2.3 Flues shall be double-walled and constructed of galvanized steel complying with ASTM A 526.
- 2.4 Controls:
 - 2.4.1 Thermostats shall be low voltage type designed to operate on control circuits not exceeding 30 volts.
 - 2.4.2 Limit control for oil or gas furnaces shall be designed and installed to shut down the burner when the bonnet air temperature reaches 200 F. Differential shall be fixed at not less than 10 F and not greater than 25 F.
 - 2.4.3 Blower control shall prevent operation of blower after burner has fired until the discharge air at bonnet reaches a predetermined temperature. Fan "on" setting shall be adjustable within range of 90 F to 140 F. Differential setting may be fixed between 24 F and 36 F or adjustable between 20 F to 50 F. Blower control shall include manual switch.
- 2.5 Gas Furnaces:
 - 2.5.1 Gas burners shall be of corrosion-resistant steel and shall be designed, adjusted, rated, and certified to fire natural, manufactured, mixed, or propane gas. Burners rated 400,000 Btuh input or less shall be manually or electrically ignited, standing pilot type. Burners rated greater than 400,000 Btuh input shall be electrically ignited, proven pilot type.
 - 2.5.2 Heat exchangers shall be fabricated from steel complying with ASTM A 568.
 - 2.5.3 Gas valves shall be provided with a safety shutoff that will, in the event of flame failure, cause safety shutdown of the burner; an automatic pilot; and except for furnaces firing propane gas, an automatic gas pressure regulator.
 - 2.5.4 Furnace housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424, with baked enamel coating.
- 2.6 Oil Furnaces:
 - 2.6.1 Burners shall be of flange-mounted high pressure atomizing type. Burner ignition shall be by continuous, automatic, cadmium cell control. The burner shall incorporate an oil pump, burner motor, combustion air fan, and burner tube.
 - 2.6.2 Heat exchangers shall be fabricated from cold-rolled steel complying with ASTM A 568 with radiation shield and combustion chamber of stainless steel complying with ASTM A 167.
 - 2.6.3 Furnace housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424 with baked enamel coating.
- 2.7 Electric Furnaces:
 - 2.7.1 Heater elements shall be helically coiled, nickel-chromium wire, individually sequenced with individual Thermal limit controls and fusible links for each element. Entire design shall be UL 499 listed and shall comply with NFPA 70.
 - 2.7.2 Furnace housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424 with baked enamel coating.
- 3.0 EXECUTION:
 - 3.1 New furnace shall be installed in accordance with UL 499, UL 727, or UL 795 as applicable.
 - 3.2 Welding shall be performed in compliance with AWS D1.1.
 - 3.3 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.
 - 3.4 Corroded Heat exchangers shall be removed and replaced.
 - 3.5 Flue: Replace corroded sections of flue in compliance with UL 378.
 - 3.6 Controls: Replace defective controls in compliance with NFPA 70.

Gas Unit Heaters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas unit heaters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product

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manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New unit heater shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; and UL Electrical Construction Materials Directory and UL 795.

2.2 Heat exchangers shall be fabricated from steel complying with ASTM A 569 to form a unitized, multi-section type heat exchanger and combustion chamber for each burner.

2.3 Burners shall be of a corrosion-resistant steel with unitized rows of burners to provide one burner per heat exchanger section and shall have crossover igniter to provide positive ignition of each burner row.

2.4 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity and shall include a flue connection. The housing shall be provided with means for suspension or floor mounting as required.

2.5 Fans shall be the propeller type, fabricated of aluminum or steel, dynamically balanced, and direct motor driven. Fan motors shall be totally enclosed type, and built-in thermal overload protection shall be provided for single phase motors.

2.6 Controls:

2.6.1 Thermal limit control shall be provided to shut off gas supply in the event normal operating temperatures are exceeded.

2.6.2 Fan delay switch shall be provided for continuous fan operation after burner shutdown until heat exchanger temperature is reduced to prevent excessive heat build-up.

2.6.3 Gas valve with safety shutoff and manual main shutoff shall be provided with automatic pilot and shall automatically regulate gas pressure and, in the event of flame failure, shall cause safety shutdown of burner.

2.6.4 Thermostat shall be wall-mounted, heavy-duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

3.0 EXECUTION:

3.1 Welding shall be in compliance with AWS D1.1.

3.2 Blazing shall be in compliance with ASME Boiler and Pressure Vessel Code, Section IX.

3.3 Damage to galvanized coatings shall be repaired by applying galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

Oil Unit Heaters

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil unit heaters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 New unit heaters shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; UL Electrical Construction Materials Directory; and UL 296.

2.2 Heat exchangers shall be of corrosion-resistant steel and shall include a combustion chamber (primary heating surface) and a heat exchanger (secondary heating surface).

2.3 Burners shall be the high pressure or low pressure atomizing type. The burner shall be completely automatic and shall incorporate an oil pump, burner motor, combustion air fan, burner tube, and automatic ignition.

2.4 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity. The housing shall be provided with means of suspension. Housing shall include a flue connection.

2.5 Fan shall be the propeller type fabricated of aluminum or steel.

2.6 Controls:

2.6.1 Thermal limit control shall be provided to shut off oil supply in the event normal operating temperatures are exceeded.

2.6.2 Fan delay switch shall be provided for continuous fan operation after burner shutdown until heater

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exchanger temperature is reduced to prevent excessive heat build-up.

- 2.6.3 Thermostat shall be unit- or wall-mounted and shall be heavy duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.
- 3.0 EXECUTION:
- 3.1 Welding and brazing shall be in compliance with AWS D1.1.
- 3.2 Damage to galvanized coatings shall be repaired by applying galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

Air-cooled Condensing Units

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled condensing units. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: All products shall be rated in accordance with ARI 210 and 270.
- 2.1 Compressor: Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors, spring mounts, and capacity modulation.
- 2.2 Condenser Coils: Provide copper tubes with mechanically bonded aluminum fins.
- 2.3 Fans and Motor: Provide propeller-type with direct drive or belt drive and vertical discharge. Protect fan with heavy-gauge wire guard. Provide motors that are inherently protected, permanently lubricated, and weatherproof. Motors shall be totally enclosed type or dripproof.
- 2.4 Casing: Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy-gauge steel that is zinc coated and finished with enamel.
- 2.5 Controls: Provide safety and operating controls, factory-wired and mounted in an enclosure. Include pressure switches and motor overload devices.
- 3.0 EXECUTION: Follow manufacturer's recommendations.

Condensers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of condensers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Air-Cooled Condensers:
 - 2.1.1 New air-cooled condenser, when required, shall be a factory-fabricated and assembled unit consisting of coils, fans, and electric motor drive. The condenser shall be designed, fitted, and rated in compliance with recommendations and requirements of ARI 460, ASHRAE 20, and UL 207. Sizing of condenser shall be based on a temperature difference between entering outside air and condensing refrigerant not exceeding 30 F. The saturated refrigerant condensing temperature shall not be over 130 F.
 - 2.1.2 Electric motor shall be totally enclosed type located within the enclosure and fully protected from the weather. Motor starter shall be magnetic across the line type with general purpose enclosure. Thermal overload protection shall be the manual reset type.
 - 2.1.3 Housing shall be fabricated from sheet carbon steel complying with ASTM A 569.
 - 2.1.4 Refrigerant piping shall be hard drawn copper, Type L, refrigeration grade complying with ASTM B 75. Valves shall be of brass construction, diaphragm packless or back seating type, specifically designed for refrigeration service.
- 2.2 Water-Cooled Condensers:
 - 2.2.1 New condensers shall be of shell-and-tube construction. The condenser shall be designed, fitted, and rated in compliance with the recommendations and requirements of ARI 450, ASHRAE 22, and UL 207. The condenser shall be constructed in compliance with Section VIII of ASME Boiler and Pressure Vessel Code.

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- 2.2.2 Refrigerant receiver shall comply with Sections II and VIII of the ASME Boiler and Pressure Vessel Code.
- 2.2.3 Condenser materials for repairs shall be in compliance with Section II of the ASME Boiler and Pressure Vessel Code.
- 2.2.4 Condenser tubes shall be fabricated of seamless copper tubing with integral fins, and the tubes shall be individually replaceable and rolled or brazed into the tube sheets of the shell-and-tube unit. The entire bundle shall be removable on shell-and-coil units.
- 3.0 EXECUTION:
- 3.1 Condensers shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.
- 3.2 Condenser tubes shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.
- 3.3 Welding and brazing shall be performed in compliance with AWS D1.1 and Section IX of the ASME Boiler and Pressure Vessel Code.
- 3.4 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

Refrigerant Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigerant equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Performance Ratings: The performance rating of each item of the new refrigerant equipment furnished shall comply with the applicable portions of ARI 450, 460, 495, and 590.
- 2.2 Bearings shall be an exact replacement. Bearing life shall be equal to the bearing to be replaced.
 - 2.2.1 Bearings for reciprocating equipment shall be precision, oil-cooled or babbitted type.
 - 2.2.2 Bearings for centrifugal equipment or rotary screw equipment shall be precision, oil-cooled type.
- 2.3 Mufflers shall be a hot-gas muffler or an exact replacement as indicated. Muffler shall be able to reduce vibration and noise from pulsation.
- 3.0 EXECUTION:
- 3.1 Welding: All welding shall be in compliance with AWS D1.1.
- 3.2 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.
- 3.3 Controls:
 - 3.3.1 Chiller Controls: Replace, adjust, and recalibrate defective parts and assemblies.
 - 3.3.2 Starter Controls: Replace defective contactors and relays as necessary.
 - 3.3.3 Capacity Controls: Adjust guide vane linkages and actuator control in compliance with the manufacturer's specification.
- 3.4 Noncondensables: Check accumulation rate of noncondensables in absorption refrigerant equipment for compliance with manufacturer's instructions.

Refrigeration Specialties

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigeration specialties. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Thermostatic expansion valves shall be rated and tested in accordance with ASHRAE 17 or ARI 750.
- 2.2 Filter driers shall be sealed in-line type or replaceable core type as required. Filter driers shall be tested and rated in accordance with ASHRAE 63 and ARI 710 and shall meet the requirements of UL 207.

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- 2.3 Sight glasses for moisture and liquid indication shall be UL listed.
- 2.4 Refrigerants shall be designated in accordance with ASHRAE 34.
- 3.0 EXECUTION: Installation of all refrigeration equipment shall comply with ASHRAE 15.

Natural Draft Cooling Towers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of natural draft cooling towers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 New cooling towers shall be constructed in compliance with NFPA 214 and Mil. Spec. MIL-C-16278.
 - 2.2 Wood Towers:
 - 2.2.1 Framework shall be repaired with or constructed of redwood complying with CTI STD-103, or Douglas fir complying with CTI STD-114. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.
 - 2.2.2 Louvers shall be repaired with or constructed of redwood, Douglas fir or west coast hemlock. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.
 - 2.2.3 Water basin shall be repaired with or constructed of redwood or Douglas fir. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.
 - 2.3 Metal Towers:
 - 2.3.1 Framework shall be repaired with or constructed of carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123.
 - 2.3.2 Louvers shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
 - 2.3.3 Water basin shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
 - 2.4 Glass Fiber Towers:
 - 2.4.1 Framework shall be repaired with redwood complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.
 - 2.4.2 Louvers shall be of rigid formed plastic complying with Fed. Spec. L-P-535.
 - 2.4.3 Water basin shall be repaired or constructed of redwood or Douglas fir or of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.
- 3.0 EXECUTION:
 - 3.1 Existing cooling tower to be repaired shall be repaired in compliance with NFPA 214.
 - 3.2 Welding and brazing shall be performed in compliance with AWS D1.1.
 - 3.3 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.
 - 3.4 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, and with CTI ATC-105 and ASME PTC 23 for field performance.

Forced Draft and Induced Draft Cooling Towers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of forced draft and induced draft cooling towers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 New cooling towers shall be constructed in compliance with NFPA 214 and Mil. Spec. MIL-C-16278.
 - 2.2 Wood Towers:
 - 2.2.1 Louvers shall be redwood, complying with CTI STD-103 or Douglas fir or hemlock complying with

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- CTI STD-114. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.
- 2.2.2 Fill or contact surface shall be redwood, complying with CTI STD-103, or Douglas fir or hemlock complying with CTI STD-114. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.
- 2.2.3 Drift eliminators shall be redwood, complying with CTI STD-103, Douglas fir or hemlock complying with CTI STD-114, or rigid formed plastic complying with Fed. Spec. L-P-535. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-112.
- 2.2.4 Water distribution basin shall be redwood, complying with CTI STD-103 or Douglas fir complying with CTI STD-114. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.
- 2.2.5 Water collection basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-112.
- 2.2.6 Framework shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123.
- 2.2.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
- 2.3 Metal Towers:
- 2.3.1 Louvers shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
- 2.3.2 Fill or wet deck shall be carbon steel in compliance with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525, rigid formed plastic complying with Fed. Spec. L-P-535, or stainless steel complying with ASTM A 167.
- 2.3.3 Drift eliminators shall be carbon steel, complying with ASTM A 366 and galvanized in compliance with ASTM A 525, rigid plastic complying with Fed. Spec. L-P-535, or stainless steel complying with ASTM A 167.
- 2.3.4 Water distribution basin shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
- 2.3.5 Water collection basin or Pan shall be carbon steel, complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525 or stainless steel complying with ASTM A 167.
- 2.3.6 Framework shall be carbon steel, complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123; or stainless steel complying with ASTM A 167.
- 2.3.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525; or stainless steel complying with ASTM A 167.
- 2.4 Glass Fiber Towers:
- 2.4.1 Louvers shall be formed rigid plastic complying with Fed. Spec. L-P-535.
- 2.4.2 Fill shall be rigid plastic complying with Fed. Spec. L-P-535.
- 2.4.3 Drift eliminators shall be formed rigid plastic complying with Fed. Spec. L-P-535.
- 2.4.4 Water distribution basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-112.
- 2.4.5 Water collection basin shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-112.
- 2.4.6 Framework shall be redwood, complying with CTI STD-103, Douglas fir complying with CTI STD-114, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment complying with CTI WMS-112.
- 2.4.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with

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3.0 EXECUTION:

- 3.1 Existing cooling tower to be repaired shall be repaired in compliance with NFPA 214.
- 3.2 Welding shall be performed in compliance with AWS D1.1.
- 3.3 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.
- 3.4 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, CTI ATC-105, and ASME PTC 23, for field performance.

Coils

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coils. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Pressures:
 - 2.1.1 Water coil design working pressure shall be 200 psig.
 - 2.1.2 Steam coil design working pressure shall be 200 psig steam.
 - 2.1.3 Each replacement water or steam coil shall be hydrostatically tested at 250 psig at the factory.
 - 2.1.4 Each replacement direct expansion coil shall be pneumatically tested at the factory under water at not less than 300 psig. Each coil shall be completely dehydrated and sealed at the factory upon completion of pressure tests.
 - 2.2 Water, Steam and Direct Expansion Coils:
 - 2.2.1 Tubing shall be round, seamless, copper tubing, complying with ASTM B 75.
 - 2.2.2 Fins shall be aluminum or copper.
 - 2.2.3 Coil casing shall be made of galvanized sheet steel complying with ASTM A 526, minimum thickness of 14 gauge.
 - 2.2.4 Water or steam coil headers shall be fabricated from steel pipe complying with ASTM A 53, Grade B; extra heavy seamless copper tubing complying with ASTM B 75; or semisteel complying with ASTM A 126, Class C.
 - 2.2.5 Direct expansion coil headers shall be fabricated from extra heavy seamless copper tubing complying with ASTM B 75.
 - 2.2.6 Each water coil shall be provided with a plugged vent tap and drain tap.
 - 2.2.7 Each steam coil shall be provided with a vacuum breaker.
 - 2.3 Electrical Heating Coils (and Heat Strips):
 - 2.3.1 Resistance wire shall be nickel-chromium wire.
 - 2.3.2 Tubular sheath shall be corrosion-resisting in the surrounding medium and suitable for the temperatures required by the particular application. 2.3.3 Insulating Material shall be densely packed, high purity magnesium oxide.
 - 2.3.4 Insulator supports for directly exposed elements shall be ceramic or porcelain.
 - 2.3.5 Grid and heat strip elements shall have the resistance wire surrounded by the insulation material and enclosed within the tubular sheath. The sheath shall be imbedded and completely sealed within the cast aluminum grid. Electrical terminals shall project through the cast aluminum grid and shall be designed to minimize the entrance of atmospheric moisture into the heating element.
 - 2.3.6 Heat strip element resistance wire shall be uniformly spaced along the length of the sheath.
- 3.0 EXECUTION:
 - 3.1 Fins shall be mechanically bonded or soldered to the tubes. Tubes shall be rolled and bushed, brazed, or welded to headers. Where required, multiple type supports shall be provided to prevent tube sag. The fin tube and header section shall float within the casing to allow free expansion.
 - 3.2 Removing, Saving, Testing, Cleaning, and Recharging Refrigerants:
 - 3.2.1 Refrigerant in a system in which the coil is to be repaired or replaced shall be removed, saved, and reused in recharging the system. When repair or replacement of the coil has been completed, the refrigerant system shall be pressure-tested and recharged with refrigerant.

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- 3.2.2 The repaired coil shall be pressure-tested to 300 psig with dry nitrogen and allowed to stand for 24 hours with no pressure drop after repair or replacement of the coil. Then evacuate the system and/or coil with a vacuum pump capable of pulling 1 mm Hg vacuum absolute. Operate the vacuum pump until a vacuum of 2.5 mm Hg absolute is reached. After evacuation, recharge the system with the refrigerant previously removed. Recharge the refrigerant back into the system through a filter drier with capacity capable of removing foreign materials and moisture in the amount of refrigerant removed. The system shall be replenished with refrigerant to provide a fully charged system.
- 3.2.3 If the system has lost its full charge of refrigerant, a new suction line and liquid line filter drier, sized as recommended by the condenser manufacturer, shall be provided and the system pressure tested, evacuated, and recharged with refrigerant as specified above.
- 3.3 Welding shall be in compliance with AWS D1.1.
- 3.4 Brazing shall be in compliance with ASME Boiler and Pressure Vessel Code, Section IX.
- 3.5 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.
- 3.6 Testing: Hydrostatically test repaired water and steam coils at 1-1/2 times the maximum working pressure.

Steam and Hot Water Unit Heaters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steam and hot water unit heaters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 New unit heaters shall comply with the requirements of AMCA 99 and 210; NFPA 70; and UL Electrical Construction Materials Directory.
 - 2.2 Coils:
 - 2.2.1 Coils shall be constructed of round seamless copper tubing complying with ASTM B 75, mechanically or hydraulically bonded or expanded into fins constructed of copper or of aluminum complying with ASTM B 209. Tube joints shall be made with high temperature brazing alloys complying with ASTM E 56.
 - 2.2.2 Coil headers shall be fabricated from seamless carbon steel pipe complying with ASTM A 53, extra heavy seamless copper tubing complying with ASTM B 75 or B 251, or semi-steel complying with ASTM A 126, Class C.
 - 2.3 Housings shall be fabricated from sheet steel complying with ASTM A 569 of a thickness and of sufficient strength to ensure rigidity. Unit heater housings shall be provided with means of suspension or floor mounting as required.
 - 2.4 Fan and Drive:
 - 2.4.1 Propeller and centrifugal fans shall be fabricated of aluminum or steel.
 - 2.4.2 Centrifugal Fan shaft shall be sized for maximum fan speed.
 - 2.4.3 Fan bearings on belt-driven units shall be self-aligning, permanently lubricated, or the periodic lubricating type with accessible lubricating means. Bearings shall be designed to withstand radial and thrust working loads.
 - 2.5 Controls: Unit heaters shall be furnished with unit-mounted line voltage thermostats to provide ON/OFF fan control.
- 3.0 EXECUTION:
 - 3.1 Welding shall be in compliance with AWS D1.1.
 - 3.2 Brazing shall be in compliance with ASME Boiler and Pressure Vessel Code, Section IX.
 - 3.3 Damage to galvanized coatings shall be repaired by applying galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

Cleaning of Heat Exchangers

- 1.0 DESCRIPTION OF WORK: This specification covers the cleaning of Heat exchangers. Products and

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materials used shall be in accordance with the heat exchanger manufacturer's recommendations and/or shall be as directed by the Authorized Member Representative. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the heat exchanger manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS

2.1 Equipment required for cleaning such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizing tank and pump, power brushes, power cutters, and other related items shall be supplied by the Contractor.

2.2 Chemical Cleaning Materials:

2.2.1 Acid cleaning chemicals shall be hydrochloric acid complying with Fed. Spec. O-H-765, ammonium bifluoride NH₄HF₂, and sulfuric acid complying with Fed. Spec. O-S-809.

2.2.2 Neutralizing chemicals shall be one percent soda ash solution complying with ASTM D 458 and one percent caustic solution complying with ASTM D 456.

2.2.3 Flushing water shall be potable having not more than 1,000 ppm total solids.

2.3 Mechanical Cleaning Materials and Equipment:

2.3.1 Hot water shall be used for high velocity wash.

2.3.2 Powered brushes shall be of the type for use with power units.

2.3.3 Nylon brushes shall be of the type blown with high pressure water.

3.0 EXECUTION:

3.1 General: Clean heat exchangers of all scale and deposits. Straighten and clean fins on finned tubes.

3.2 Inspection: After heat exchanger cleaning operation, tubes will all be given a visual inspection by the Authorized Member Representative for effectiveness of scale removal.

3.3 Welding and Burning: No welding or burning shall be allowed during cleaning operation.

3.4 Acid wash time may vary from four to eight hours depending on scale analysis. Time shall represent actual retention of the solvent in the unit, including filling and draining time.

3.5 Effluent Neutralization: Solvent effluent drained from the unit shall be neutralized with caustic in compliance with ASTM D 456 or soda ash in compliance with ASTM D 458, to a pH of 6.8 to 8.5.

Packaged Heat Pumps

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled packaged heat pumps, including through-wall and roof top type units with supplemental electric heat. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Capacity and performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ARI 240 and 270.

2.2 Casings shall have a corrosion protective coating. Casing shall have 1/2-inch thick minimum thermal insulation, and the compressor compartment shall have acoustical insulation.

2.3 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit. Refrigerant accessories shall include a reversing valve and suction line oil/gas accumulator.

2.4 Evaporator coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at 1.5 times the working pressure.

2.5 Filters shall be 2-inch thick throwaway type.

2.6 Condensers shall have copper tubes and aluminum fins. New condensers shall be leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.

2.7 Auxiliary heating coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.

2.8 Controls shall provide for automatic switchover between cooling and heating cycles.

3.0 EXECUTION:

3.1 Welding shall be performed in accordance with AWS D1.1 and/or ASME Boiler and Pressure Vessel

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Code, Section IX.

- 3.2 Brazing shall be performed in accordance with ASME Boiler and Pressure Vessel Code, Section IX.
- 3.3 Damage to galvanized coatings shall be repaired with paint complying with Mil. Spec. DOD-P-21035.

Humidity Control Equipment

- 1.0 DESCRIPTION OF WORK: This section covers the furnishing and installation of humidifiers and dehumidifiers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Humidifiers shall be pneumatic modulating type.
 - 2.1.1 Steam separator shall be designed to remove water droplets and particles larger than 3 microns when humidifier is operating at full capacity.
 - 2.1.2 Control valve shall be stainless steel plug type with pneumatic operator.
 - 2.1.3 Distribution manifold shall provide uniform dry steam distribution throughout its entire length.
 - 2.1.4 Strainer shall be Y-type.
 - 2.1.5 Steam trap shall be as recommended by the manufacturer of the steam humidifier and shall be preceded by a drip leg.
 - 2.2 Dehumidifiers shall be free-standing self-contained plug-in type units that are UL listed.
 - 2.2.1 Components shall be housed in a portable 22-gauge steel cabinet.
 - 2.2.2 Capacity ratings shall be in accordance with AHAM DH-1. Overflow cutoff control shall be provided.
- 3.0 EXECUTION:
 - 3.1 Steam supply manifold for humidifier shall be installed either perfectly level or extending upward vertically in duct. Discharge holes shall point upstream against airflow.
 - 3.2 Welding shall be performed in accordance with AWS D1.1 and ASME Boiler and Pressure Vessel Code, Section IX, where applicable.

Radiators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of radiators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 New radiators shall comply with AGA Directory of Certified Appliances and Accessories; IBR Testing and Rating Code for Finned Tube (Commercial) Radiation, if applicable; NFPA 70; and UL 499 or UL 795, as applicable.
 - 2.2 Cast-iron radiators:
 - 2.2.1 Core shall be small tube section constructed of cast iron complying with ASTM A 48.
 - 2.2.2 Core sections shall be assembled with malleable iron or polytetrafluoroethylene coated steel push nipples.
 - 2.3 Baseboard-Fintube Radiators:
 - 2.3.1 Nonferrous fintube shall be fabricated of seamless copper tubing, complying with ASTM B 75 and mechanically expanded into aluminum fins.
 - 2.3.2 Ferrous fintube shall be fabricated of steel pressure tubing complying with ASTM A 450 and mechanically expanded into fins of steel sheet complying with ASTM A 568.
 - 2.3.3 Enclosure, dampers and element supports shall be fabricated from carbon steel complying with ASTM A 568.
 - 2.4 Radiant Radiators:
 - 2.4.1 Gas plenum shall be carbon steel with a porcelain enameled finish complying with ASTM A 424 and Fed. Spec. PPP-P-600, or galvanized in compliance with ASTM A 526.
 - 2.4.2 Air mixer shall be carbon steel with a corrosion-resistant finish complying with ASTM A 526 or ASTM A 568.

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- 2.4.3 Venturi shall be carbon steel complying with ASTM A 526 or ASTM A 568 with a corrosion-resistant finish.
- 2.4.4 Enclosure shall be carbon steel complying with ASTM A 526 or ASTM A 568.
- 2.5 Convector Radiators:
 - 2.5.1 Electric heating element shall be constructed of nickel chromium wire enclosed within a metal sheath and electrically insulated in the sheath with a densely compacted refractory material.
 - 2.5.2 Hydronic/steam heating elements shall be constructed of seamless copper tubing complying with ASTM B 75 mechanically expanded into aluminum fins. The tube and fin assembly shall be encased in a frame of steel complying with ASTM A 568. Tube headers shall be steel or brass joined to the tubes by high temperature brazing alloys complying with ASTM E 56.
 - 2.5.3 Enclosure, dampers, element supports, and access doors (when applicable) shall be fabricated from carbon steel complying with ASTM A 568.
- 3.0 EXECUTION:
 - 3.1 Welding shall be performed in accordance with AWS D1.1.
 - 3.2 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint complying with Mil. Spec. DOD-P-21035.

Induction Units

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of induction units. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 New induction units shall include cabinet, primary air plenum with inlet collar, air balancing damper, multi-stage nozzles, coil, drain pan, and discharge stack. Units shall be tested and rated at the factory in accordance with ARI 445.
 - 2.2 Cabinet and primary air plenum shall be constructed of or repaired with 4 gauge galvanized steel with die-cast support frame members. Plenum shall be lined with 3/8-inch thick, 25-pound density insulation, black plastic bonded fiberglass, mat-faced.
 - 2.3 Nozzles shall be provided in vertical strips, precision-molded from heat-resistant thermoplastic material. Nozzles shall be designed for temperature range encountered with pressures up to 3-1/2 inch wg. Nozzle strips shall be mechanically sealed and locked to nozzle frame.
 - 2.4 Dampers shall be multiple hole design and shall extend the full length of the plenum. Adjustment shall be provided by manual push-pull operator located next to the primary air inlet.
 - 2.5 Coils shall be designed for 300 psi working pressure.
- 3.0 EXECUTION:
 - 3.1 Induction units shall be installed level, using shims if required, and anchored to the floor.
 - 3.2 Damage to galvanized coatings shall be repaired in compliance with Mil. Spec. DOD-P-21035.

Air Handling Units

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air handling units. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Built-up air handling units (AHUs) shall consist of casings, fan sections, coils, filter boxes, mixing boxes, dampers, and other equipment as required. All AHUs shall be certified in accordance with ARI 430. Coils shall be certified in accordance with ARI 410. Electric heating coils shall meet the requirements of UL and the National Electric Code. AHUs shall also conform to the requirements of NFPA 90A and all applicable SMACNA standards.
- 3.0 EXECUTION:
 - 3.1 Air handling units shall be installed to conform with NFPA 90A and applicable SMACNA standards.
 - 3.2 Welding shall be performed in compliance with AWS D1.1.

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Centrifugal Fans

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of centrifugal fans. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Fan Performance:
 - 2.1.1 New fans shall comply with AMCA 210, 300, and 301.
 - 2.1.2 Capacity and performance of new or repaired fans shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.
 - 2.2 Fan wheel and Shaft:
 - 2.2.1 Aluminum Fan wheels shall comply with Fed. Spec. QQ-A-596. Fan wheels for wall exhaust fans shall be constructed of aluminum complying with ASTM B 209. Steel for the Fan wheels shall comply with ASTM A 366.
 - 2.2.2 Fan shaft shall be turned, ground, and polished carbon steel alloy.
 - 2.2.3 Fan shaft shall be tubular with swaged ends accurately finished.
 - 2.3 Fan housing:
 - 2.3.1 Fan housing shall be carbon steel sheet complying with ASTM A 569, except wall exhaust Fan housings shall be spun aluminum complying with ASTM B 209.
 - 2.3.2 When the fan discharge of the existing housing to be replaced is changeable, discharge of the new housing shall be easily changed in compliance with AMCA 99.
 - 2.4 Inlet Boxes: Steel for repairs shall be carbon steel sheet complying with ASTM A 569.
 - 2.5 Bearings:
 - 2.5.1 Precision antifriction bearings shall comply with Fed. Spec. FF-B-171.
 - 2.5.2 Sleeve bearings shall be self-aligning sleeve bearings.
 - 2.5.3 Roller bearings shall be self-aligning, high load capacity, grease-lubricated, heavy-duty, pillow block type.
 - 2.5.4 Wall exhaust fan bearings shall be sealed-in lubrication, antifriction type adequate for both radial and thrust loads occurring in the mounting.
 - 2.6 Fan belts shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple belt drives shall be installed in matched sets only.
 - 2.7 Insulation in Fan housing shall be mineral fiber complying with Fed. Spec. HH-I-558, Form B, Type 1. Adhesive shall be fire resistive adhesive complying with Mil. Spec. MIL-A-3316.
- 3.0 EXECUTION:
 - 3.1 Balancing: Centrifugal Fan wheels, repaired or new, shall be balanced statically and dynamically.
 - 3.2 Welding shall be performed in compliance with AWS D1.1.
 - 3.3 Damage to galvanized coatings shall be repaired by application of galvanizing repair point in compliance with Mil. Spec. DOD-P-21035.

Axial Flow Fans

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of axial flow fans. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Capacity and performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. New fans shall comply with AMCA 210, 300, and 301.
 - 2.2 Fan wheel repair material shall be sheet aluminum complying with ASTM B 209. New wheels shall be of airfoil design and shall be statically and dynamically balanced at the factory.
 - 2.3 Fan shafts shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.
 - 2.4 Fan housing shall be 22 gauge, welded carbon steel complying with ASTM A 569.
 - 2.5 Propeller guards, when required, shall be sheet metal complying with ASTM A 366 or hot-dip

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- galvanized were complying with ASTM A 641.
- 2.6 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust loads occurring in the mounting.
- 2.7 Fan belt shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple belt drives shall be installed in matched sets only. Belt guards shall comply with OSHA.
- 2.8 Insulation in Fan housing shall be mineral fiber complying with Fed. Spec. HH-I-545. Adhesive shall be fire resistive adhesive complying with Mil. Spec. MIL-A-3316.
- 3.0 EXECUTION:
- 3.1 Welding shall be performed in compliance with AWS D1.1.
- 3.2 Damage to galvanized coatings shall be repaired by application of galvanizing repair in compliance with Mil. Spec. DOD-P-21035.

Power Roof Ventilators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of power roof ventilators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 PRV Performance:
- 2.1.1 New PVRs shall comply with AMCA 210, 300, and 301.
- 2.1.2 Capacity and performance of new and repaired PRVs shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.
- 2.2 Fan wheel shall be centrifugal, axial flow, or turbine type, non-overloading, constructed of aluminum complying with ASTM B 209.
- 2.3 Fan shaft shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.
- 2.4 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust load occurring in the mounting.
- 2.5 Fan housing shall be spun aluminum complying with ASTM B 209. The housing shall be weatherproof with 360 degrees discharge air pattern.
- 2.6 Fan belt shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple belt drives shall be installed in matched sets only.
- 2.7 Insulation in fan housing shall be mineral fiber complying with Fed. Spec. HH-I-558, Form B, Type 1. Adhesive shall be fire resistive adhesive complying with Mil. Spec. MIL-A-3316.
- 2.8 Roof curb shall be prefabricated, with continuous welded water-tight seams. The curb shall be of the roofed-over, flashing type, with built-in cant strip.
- 2.9 Back draft dampers for installation in the roof curb shall be multiple blade type, constructed of aluminum complying with ASTM B 209.
- 3.0 EXECUTION:
- 3.1 Balancing: Centrifugal Fan wheels, repaired or new, shall be balanced statically and dynamically. Propeller fans shall be statically balanced.
- 3.2 Welding shall be performed in compliance with AWS D1.1.
- 3.3 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint in compliance with Mil. Spec. DOD-P-21035.

Diffusers, Registers, Grilles and Louvers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of diffusers, registers, grilles, and louvers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Supply air ceiling diffusers shall be constructed of aluminum or steel and shall be furnished with

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- volume control dampers. Provide ceiling-mounted diffusers with rubber gasket sponge and ceiling frames for anti-smudging protection.
- 2.2 Supply air slot diffusers for sidewall, sill, or floor mounting shall have 1/2-inch bar spacing with 0 degrees or 15 degrees deflection. Construction shall be extruded aluminum. Furnish with volume control damper.
 - 2.3 Return air registers shall be constructed of aluminum or steel and shall be furnished with opposed blade volume control dampers.
 - 2.4 Return air ceiling registers shall be constructed of aluminum with aluminum or plastic egg crate grille.
 - 2.5 Grilles shall be as specified for registers, without volume control damper.
 - 2.6 Louvers shall be in accordance with SMACNA Duct Construction Standards - Metal and Flexible. Louvers shall be constructed of aluminum or steel and shall be furnished with birdscreens. Louvers shall bear the AMCA Certified Ratings Seal for air performance and water penetrations ratings as described in AMCA 500.
 - 2.7 Inlets and outlets shall be sound rated and certified in accordance with ADC 1062R4 in sound power level, dB referenced to 10 to the minus 12 watt, in octave bands 2 through 8. Performance shall be certified in accordance with ADC 1062R4.
 - 2.8 Inlets and outlets shall follow recommended noise levels as stated in SMACNA Manual for HVAC Systems Duct Design.
 - 3.0 EXECUTION: Diffusers and registers shall be installed in accordance with applicable SMACNA Standards.
 - 3.1 Return air registers/grilles shall be similar to supply air registers/diffusers when applicable.

Air Cleaning Devices

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air cleaning devices. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Throwaway panel filters shall be constructed of glass, paper, or fabric media with a UL listing of Class 2 and shall be 1 or 2 inches thick as required. The filters shall have an initial resistance not greater than 0.30 inch w.g. at a face velocity of 500 fpm.
 - 2.2 Extended surface self-supporting filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media, integral media support, and a rigid galvanized steel frame. Nominal thickness shall be 12 inches. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.
 - 2.2.1 Filters rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.50 inch w.g. at 500 fpm face velocity.
 - 2.2.2 Filters rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.60 inch w.g. at 500 fpm face velocity.
 - 2.2.3 Filters rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.70 inch w.g. at 500 fpm face velocity.
 - 2.3 Extended surface non-supported filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media. Individual bags shall be retained by a galvanized steel frame. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.
 - 2.3.1 Filters rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.35 inch w.g. at 500 fpm face velocity.
 - 2.3.2 Filters rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.45 inch w.g. at 500 fpm face velocity.
 - 2.3.3 Filters rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.55 inch w.g. at 500 fpm face velocity.
 - 2.4 Automatic renewable roll filters shall be constructed of 2-inch thick, viscous-coated, UL-listed Class 1 or Class 2 fibrous media. Filter initial resistance shall be not greater than 0.50 inch w.g. at 500 fpm face velocity. Filter efficiency shall be 80-85 percent when tested in accordance with ASHRAE

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- 2.5 Permanent washable panel filters shall consist of galvanized steel media and frames, 1-inch or 2-inch thickness as required. Filters shall have an initial resistance not greater than 0.10 inch w.g. at 500 fpm face velocity.
 - 2.6 HEPA filters shall be constructed of UL-listed Class 1 glass fiber media sealed in a rigid casing. Filters shall be rated by the DOP Test Method on 0.3 micron particles. Filter initial resistance shall not be greater than 1.0 inch w.g. for the rated airflow. Filters shall be furnished complete with necessary gaskets.
 - 2.6.1 Filter rated for 150 fpm Face Velocity with 95 percent DOP efficiency; 6-inch filter depth.
 - 2.6.2 Filter rated for 250 fpm Face Velocity with 95 percent DOP efficiency; 12-inch filter depth.
 - 2.6.3 Filter rated for 150 fpm Face Velocity with 99.99 percent DOP efficiency; 6-inch filter depth.
 - 2.6.4 Filter rated for 250 fpm Face Velocity with 99.99 percent DOP efficiency; 12-inch filter depth.
 - 2.7 Activated carbon filters shall be constructed of epoxy-coated perforated steel trays containing the activated carbon. Individual trays shall mount in a gasketed side access housing. The unit shall have an initial resistance of 0.35 inch w.g. at 500 fpm face velocity.
 - 2.8 Electronic air cleaners shall consist of an electrostatic agglomerator section and a renewable fibrous glass collector. The unit shall provide a dustspot efficiency of 90 percent at 500 fpm face velocity. Typical operating resistance shall be 0.40 inch w.g.
 - 2.9 Dust collectors shall be the dry centrifugal type complete with integral blower, dust separator, and hopper.
 - 3.0 EXECUTION: Install filters in accordance with applicable sections of NFPA 70, 90A, and 90B.

Tailpipe Exhaust Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tailpipe exhaust equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Capacity and performance shall be based on standard air density (0.075 pound per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.
 - 2.2 Blowers and accessories shall comply with AMCA 210, 300, and 301. Fan impellers shall be constructed of heavy gauge steel and accurately balanced both statically and dynamically when installed in the assembled fan unit. Impeller and housing in the air stream shall be coated with neoprene, epoxy, phenolic resins, or other material suitable to resist the corrosive gases and temperatures encountered. Fans to be mounted on exterior of building shall be provided with weatherproof covers.
 - 2.3 Exhaust duct and fittings for vehicle tailpipe exhaust systems shall be constructed of galvanized sheet steel. Sheets shall conform to Fed. Spec. QQ-S-775, Class D or ASTM A 525. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA Duct Construction Standards - Metal and Flexible.
 - 2.3.1 Tailpipe adapter shall be not less than 20-gauge corrosion-resisting steel. The adapter shall be of the tapered cone type with spring clip or other suitable device for exhaust pipe attachment.
 - 2.3.2 Flexible exhaust tubing shall be 0.012 minimum thickness galvanized sheet steel or heat-resistant, reinforced wire, fiberglass, and neoprene tubing.
 - 2.3.3 Dampers shall be of the circular disk type with quadrant locking device or blast gate type.
 - 2.3.4 A flexible tubing suspension system shall be furnished and installed for repaired tailpipe exhaust systems where no such suspension system exists. The flexible tubing suspension system shall suspend the flexible tubing overhead when not in use, allowing it to be lowered to the operating level, when required. The suspension system installed shall be complete with cable, pulleys, and operating mechanism.
- 3.0 EXECUTION:
 - 3.1 Ductwork joints in galvanized sheet steel ductwork shall be soldered or otherwise sealed. The lock seam in straight sections shall be located on top of the duct. Seams shall be suitable for 10-inch

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water gauge static pressure. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA Duct Construction Standards - Metal and Flexible.

- 3.2 Weather-resistant finishes of items located outdoors shall meet the requirements of ASTM B 117.

Ductwork and Accessories

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork and accessories. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Metal duct and equipment casings, housing, and plenums shall be fabricated in accordance with SMACNA Duct Construction Standards - Metal and Flexible and shall comply with NFPA 90A, 90B, and 91. Metal gauge shall generally be in accordance with SMACNA standards but in no case shall be less than existing duct gauge.
- 2.1.1 Galvanized steel shall comply with ASTM A 527 and with ASTM A 525 for zinc coating.
- 2.1.2 Black steel shall comply with ASTM A 569.
- 2.1.3 Aluminum shall comply with ASTM B 209.
- 2.1.4 Stainless steel shall comply with ASTM A 167.
- 2.2 Fibrous glass duct shall be fabricated in accordance with SMACNA Fibrous Glass Duct Construction Standards.
- 2.3 Flexible duct shall be in accordance with NFPA 90A and SMACNA Duct Construction Standards - Metal and Flexible and shall be UL listed.
- 2.4 Flexible connectors shall be in accordance with NFPA 90A and shall be UL listed.
- 2.5 Sealants shall be in accordance with SMACNA Duct Construction Standards - Metal and Flexible.
- 2.6 Hangers and supports shall be constructed of galvanized steel or other corrosion-resistant material in accordance with SMACNA Duct Construction Standards - Metal and Flexible.
- 2.7 Ductwork accessories shall be in accordance with SMACNA Duct Construction Standards - Metal and Flexible.
- 2.8 Paint for repair of galvanized surfaces shall comply with Mil. Spec. DOD-P-21035.
- 3.0 EXECUTION:
- 3.1 Ductwork: Damaged sections of duct shall be repaired by patching or by replacing complete sections. Work shall comply with the applicable sections of SMACNA Duct Construction Standards - Metal and Flexible, and NFPA 90A, NFPA 90B, or NFPA 91.
- 3.2 Flame Cutting: No cutting by torch or flame shall be done without authorization from the Authorized Member Representative.
- 3.3 Welding shall be performed in compliance with AWS D1.1.
- 3.4 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint.

Control and Fire Dampers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control and fire dampers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 New control dampers may be of parallel or opposed blade design and shall be tested in accordance with the requirements of AMCA 500 for the specific performance characteristics required. Construction shall be in accordance with the requirements of SMACNA construction standards, as well as ASHRAE recommendations pertaining to construction of duct accessories.
- 2.2 New fire dampers may be of single blade, multi-blade, or curtain design and shall be tested in accordance with the requirements of UL 555. Fire dampers shall be UL listed and/or FM approved for their intended use. Fire dampers shall also conform to the requirements of the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.

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3.0 EXECUTION:

- 3.1 Control damper installation and repair work shall be in compliance with applicable portions of details of construction, as shown in ASHRAE and SMACNA standards.
- 3.2 Fire damper installation and repair work for dampers in air conditioning and ventilating duct openings, through walls and floors, shall be in compliance with the requirements of NFPA 90A and the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems. Fire damper installation and repair work for dampers in wall openings without ducts shall be repaired or replaced in compliance with the requirements of NFPA 80, when such openings are not passageways.

Sound Attenuators

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound attenuators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Sound attenuators shall be constructed of galvanized steel with acoustical baffle as required to provide the desired attenuation. Methods for presenting sound attenuation data shall be consistent with the ASHRAE Handbook Series.
- 3.0 EXECUTION: Installation shall comply with the SMACNA duct construction standards.

Control Devices for Mechanical Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control devices for mechanical equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Controls may include sensors, transducers, controllers, controlled devices, and other accessories as required. Typical items include thermostats, humidistats, aquastats, controllers, control valves, dampers, specialized control packages, air supply packages, tubing, control wiring, and panels. Where a complete control system is replaced, all new control components shall be by the same manufacturer.
 - 2.2 Offeror may provide a computer workstation, only when designed to monitor specific data points, equipment or levels throughout the HVAC system. The workstation must meet the following minimum specifications; CPU will be 1ghz Pentium III (or equal) or higher, CD-ROM speed will be 36x, or higher, operating system will be Windows NT 3.51 or Windows 2000 (or equal) or higher, and will be preinstalled by offeror, systems will be Energy Star compliant, AC power adapter will be standard, minimum of 128MB of RAM or higher, 512KB level 2 cache, or better, 10 GB hard drive or better, Parallel port for connection to printer, 15" 1024x768 SVGA video display, or better, mouse or pointing device, full size standard keyboard, parallel Ink jet / Bubble Jet color printer, 300 dpi or better.
 - 2.3 Battery backup and surge suppression unit shall be included. This unit shall protect the connected equipment from electrical spikes, surges, brown outs and related problems. It shall also provide a minimum of 5 minutes battery power to allow for proper shutdown during electrical outages. The unit shall allow for the connection of at least two devices. The unit shall be manufactured by APC, or other well known manufacturers of equal or better quality.
- 3.0 EXECUTION:
 - 3.1 All control components other than those located in finished spaces shall be clearly tagged.
 - 3.2 Control valves shall be mounted horizontally with operator up unless otherwise directed by the Authorized Member Representative.
 - 3.3 Instrument air for pneumatic controls shall be clean, dry, oil-free compressed air.
 - 3.4 It shall be possible to group system alarms by type and category, with categories being subsets of each type.

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- 3.5 The system shall be programmed to dial at least 5 different digital pagers when selected alarms occur. Because the member may have multiple sites (now or in the future), the system shall send a minimum 3-digit code to pagers to identify the site where the alarm exists. The member will define these pager number and codes.
- 3.6 It shall be possible, based on time of day, date and holiday schedules to disable the alarm dial out to pagers.
- 3.7 System software will allow dial in from a remote location at a communications rate of 28.8 kbaud or higher.
- 3.7 The system shall have a user defined remote access password for protection against unauthorized dial-in to the system. This remote access password shall be different from passwords used by individual system operators for onsite access to the system.
- 3.8 System software shall log all incoming alarms, sorted by system site, in chronological order and shall store the last 250 alarms for each system site. The receipt of an alarm shall be announced by a visible screen indication and also by an audible beep. The visible and audible alarm indications shall continue until the alarm is acknowledged by the HVAC monitoring system operator. Alarms shall be stored in separate logs for each site.
- 3.9 Programming on global controllers shall reside in EEPROM or battery backed memory. The battery shall preserve programming for at least 15 days.
- 3.10 It shall be possible to enter or modify programming at all levels of the system, including UCs, while the system is operating by using the HVAC monitoring system to download programming over system communication lines. It shall also be possible to perform these same functions from a remote dial-in site as well.
- 3.11 The system software shall be capable of executing any control sequence that can be flow charted in a time sequential manner.
- 3.12 It shall be possible for the system operator to enter unique heating and cooling occupied set points for each zone.
- 3.13 It shall be possible to install just one outdoor temperature sensor on the system and use the value from that sensor for optimal start for all zones.
- 3.14 To perform an optimal start of a zone the software shall consider the outside temperature and the indoor zone temperature and shall calculate, based on the indoor/outdoor temperature difference and historical minutes/degree information for that particular zone, the amount of time required for a cool down or warm-up from the current zone temperature to the occupied zone temperature set point. The software shall then calculate the Optimal Start Time for the zone by beginning with the occupied time given in the time schedules and subtracting the time required for a cool-down or warm-up. The Optimal Start software shall then actually start the zone at the calculated Optimal Start Time.
- 3.15 All calculations for Optimal Start shall be totally automatic and self-learning and shall require no input from either the offeror or system operator.
- 3.16 For each a/c unit, the system shall produce an alarm if it takes too long for morning warm-up or cool-down. The amount of difference that will create an alarm shall be a global value for each typical a/c system and shall be programmable by the system operator. The purpose of this alarm is to identify a/c units that start unusually early thereby causing central plant equipment to run longer than necessary.
- 3.17 The system shall have a minimum of 10 security levels and 30 passwords. Each password shall consist of a minimum of 4 alphanumeric characters. Each password shall have a system operators name and a security level associated with it.
- 3.18 Passwords shall never be displayed on the monitor unless someone authorized to change passwords has logged onto the system and requested to see the passwords.
- 3.19 It shall be possible to assign one of the 10 security levels to each of the following system functions for the purpose of controlling access to those functions: Acknowledgement of alarms, creation or changing of time schedules, creation or changing of holiday schedules, viewing any field generated display, creation or changing of field generated displays, computer backup functions, assignment of point types, electric demand limiting, ddc software, energy logging, current alarm listing, alarm history, assignment of alarm types/categories to each point, viewing trendlogs, creation or

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changing of trendlogs, computer peripheral configuration, changing system time and date, viewing transmission error summary, viewing or editing passwords or password assignments, viewing operator activity log.

- 3.20 The system shall have an operator activity log that automatically records all system operator activity. It shall time sequentially record all control actions taken at the system keyboard and shall record who took those actions. As a minimum, the system shall store the most recent 200 items of operator activity.
- 3.21 If there is no keyboard activity for a period not greater than 15 minutes then the system shall assume the operator has forgotten to log off. The system shall automatically log off all operators currently logged in at the inactive terminal.
- 3.22 A minimum of 100 different time schedules shall be available for controlling system functions based on time of day and type of day. It shall be possible to assign a nearly unlimited number of points to each time schedule. It shall be possible to assign a unique name of up to 40 characters to each time schedule to identify the purpose of the schedule.
- 3.23 Each time schedule shall have room for a different set of entries for each of eight days, the 7 days of the week and a holiday. It shall be possible to have at least 6 on-off events per day.
- 3.24 There shall be a minimum of 20 holiday schedules. A holiday schedule shall be a list of consecutive dates on which the holiday time schedule is applied.
- 3.25 It shall be possible to assign a nearly unlimited number of points or a/c systems to each holiday schedule.
- 3.26 For each individual digital output, analog output, or set point, it shall be possible to assign one time schedule and one holiday schedule.
- 3.27 It shall be possible for the system operator to create dynamic full screen graphic displays on the system monitor. The system operator shall have complete control over the type and arrangement of information displayed. It shall be possible to display such static information as floor plans, piping and duct arrangements, equipment locations, etc. It shall also be possible to overlay dynamic information such as on/off status of points, temperatures, flow rates, etc on a static display. On any graphic it shall be possible to locate as many target points as desired within the physical space limits of the graphic.
- 3.28 For floor plans, it shall also be possible for the owner to create static portions of graphic displays using AutoCAD and then use the system graphics capability to overlay dynamic data onto the imported AutoCAD displays.
- 3.29 When the system operator initially displays a graphic on the screen the information shown on the graphic shall be current. This information shall be updated at any time by the system operator, by the simple push of a button. Dynamic graphic information shall automatically update at least once every thirty seconds.
- 3.30 It shall be possible to link any one graphic to one or more different graphics through the use of target points. A target point is a physical location on a graphic on which a movable cursor can be located. When the cursor is positioned on a target point it shall be possible to display the graphic assigned to the target point by clicking on the point with a mouse.
- 3.31 There shall also be a dedicated previous function key for the purpose of displaying the graphic that was most recently displayed prior to the currently displayed graphic. This function key will allow a system operator to step backwards in reverse order through a series of graphics that he has previously displayed.
- 3.32 For any output point shown on a graphic, it shall be possible for the system operator to manually override the point to any desired value while simultaneously observing the graphic. Such commands shall include digital commands such as on/off and/or analog commands such as changes in set point values.
- 3.33 As part of the initial system installation the system installer shall include, but not be limited to the following graphic displays; One for each fan coil or air handler or a/c unit, one for the central plant showing a/c system piping and automatic valves, one (or more) for each chiller showing all points of system interface, including open protocol points if applicable, site plan with target points on each building, one (or more if necessary) for each building showing room numbers with target points on each room.

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- 3.34 For wall mounted room temperature sensors it shall be possible for the system operator to program an independent override time in one hour increments up to at least 16 hours for each sensor override button. It shall be possible to program 10 hours override if no override from a sensor override button is authorized.
- 3.35 It shall be possible to assign more than one a/c unit to any one override button.
- 3.36 If equipment assigned to an override button is already on or in the occupied mode, due to either time schedules or a previous push of an override button, the system shall ignore additional user overrides.
- 3.37 If equipment assigned to an override button is off or in the unoccupied mode when the button is pushed then the equipment shall be commanded on or be switched to the occupied mode for the programmed override time period.
- 3.38 The system shall be able to simultaneously sample and store the values of at least 300 input-output points, either digital or analog. It shall be possible to program data sampling intervals over a range from one minute minimum to at least sixty minutes in one minute increments. It shall also be possible to program trend logs to sample only when an analog changes value by a minimum programmable amount, or when a digital point changes state.
- 3.39 The trend log for each input-output point shall store not less than 1500 samples. When a trend log becomes full the most recent samples shall continue to be stored and the oldest samples shall be dropped from the log as required to make room for the most recent samples.
- 3.40 It shall be possible for the owner to do an automatic a/c unit performance test. The test shall have 2 segments; a cooling segment and a heating segment. In the cooling segment, the heat is off and cooling is on 100%. In the heating segment, the cooling is off and the heat is on 100%. This test is intended to be applicable only for the typical a/c unit, not for kitchen makeup, central plant a/c, electrical rooms, or other non-typical systems.
- 3.41 Initiation of a performance test shall automatically enable the central plant, if applicable, and shall cause the plant to operate so that design water temperatures are produced during tests.
- 3.42 The maximum time for each segment shall be separately programmable by the Owner. The time for each segment shall be globally programmable for all a/c units by changing one point on the system display.
- 3.43 For each a/c unit, the system shall record and display the difference between room temperature and supply air temperature at the end of the heating and cooling segments of the most recent test as an indication of performance of the a/c unit.
- 3.44 It shall be possible for the system operator to enter a global alarm differential temperature set point for the heating segment. If the differential temperature attained is not greater than the alarm differential a heating alarm will occur. Likewise, it shall be possible to enter a global alarm differential temperature set point for the cooling segment. If the differential temperature attained is not greater than the alarm differential a cooling alarm will occur. The alarm differential temperature set point for cooling shall be initially programmed at 16°F. Thus if supply air temperature at the end of the cooling segment is not at least 16° below room temperature a cooling alarm will occur. The alarm differential temperature set point for heating shall be initially programmed at 20°F. Thus if supply air temperature at the end of the heating segment is not at least 20° above room temperature a heating alarm will occur.
- 3.45 It shall be possible for the system operator to manually prevent either segment of the full test, either heating or cooling, from occurring by simply operating a point on the system display.
- 3.46 To avoid setting an electrical demand peak, not all a/c units shall be tested at the same time. A/C units shall be placed in logical groups for purposes of this testing. While one group is being tested, other groups shall be prevented from testing. Tests shall be implemented one group at a time on command of the system operator. It shall also be possible to implement the test on one a/c unit at a time.
- 3.47 To avoid setting an electrical demand peak, not all a/c units shall be tested at the same time. A/C units shall be placed in logical groups for purposes of this testing. While one group is being tested, other groups shall be prevented from testing. Tests shall be implemented one group at a time on command of the system operator. It shall also be possible to implement the test on one a/c unit at a time.

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- 3.48 The system shall not perform a test unless the chilled water (CHW) and/or hot water (HW) supply temperature to the building is within design water temperature limits. Design temperatures shall be entered by the system installer and shall be changeable by the system operator. If during a test the CHW supply temperature rises more than two degrees above design, or if HW supply temperature drops more than five degrees below design, the system shall terminate the test and notify the system operator. Results of a test terminated due to inadequate water temperature shall not be recorded.
- 3.49 The system shall not start a heating segment unless the a/c units room temperature is less than 80°F at the start of the segment. The system shall not start a cooling segment unless the a/c units room temperature is greater than 75°F at the start of the segment. This start/no start decision shall be made automatically by the system on a unit by unit basis. If a unit is prevented from performing a segment by these temperature limits it shall have no affect on tests for other a/c units in the group, and the results of the previous test shall continue to be displayed for that a/c unit. If room temperature goes outside these limits after a segment has started the segment shall continue without interruption. These room temperature limits shall be global set points applicable to all a/c units. These set points shall be entered by the system installer and shall be changeable by the system operator.
- 3.50 The system shall monitor fan running hours on all fan coils, air handlers, and outside air fans, plus all central plant equipment such as pumps, cooling tower fans, and chillers. Either it shall be possible for the system operator to program maintenance alarms based upon calendar dates or running hours for all equipment start/stop controlled or status monitored by the system.
- 3.51 The system operator shall be able to create a maintenance work order for each item of controlled or status monitored equipment. To save programming time, it shall be possible to assign the same work order to more than one a/c unit or item of equipment. The work order shall automatically print when a maintenance alarm occurs on a unit to which the work order is assigned.
- 3.52 HVAC system software shall allow operation, programming and configuration of BACnet components along with non-BACnet components.
- 3.53 HVAC system software shall as a minimum support Point-to-Point (PTP) and either Ethernet or ARCnet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device. HVAC system software shall be of BACnet conformance class 6 and support all BACnet services.
- 3.54 Energy management software provided must provide direct digital control and monitoring of a wide range of HVAC equipment such as water chilling units, boiler systems, controlling pumps and cooling towers. Software must have the ability to control equipment from more than one manufacturer. If a software license is necessary to gain access to any equipment, the cost of that license [or password] will be included in any initial quotation to a Mohave member.
- 3.55 All components and systems being proposed may be based on the BACnet or comparable protocols. If the equipment being proposed is based on these protocols, please indicate that in the appropriate specification section and in the pricing information.
- 3.56 Any components being proposed using the BACnet protocol will comply with BACnet standard ANSI/ASHRAE 135-1995.
- 3.57 Any components, products or systems being proposed with the BACnet or comparable protocols will indicate the following information; conformance class supported (Class 1-6), functional groups supported, standard application services supported, standard object types supported; data link layer options, character sets supported, routing capabilities, property range descriptions and any other special information. Please include this information after the applicable performance specification.

Testing and Balancing of HVAC Systems

- 1.0 DESCRIPTION OF WORK: This specification covers testing and balancing of HVAC systems.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
 - 3.1 Test and balance contractor shall be certified by the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC).
 - 3.2 Certified test reports shall be submitted by the Contractor to the Authorized Member

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Representative. Test reports shall comply with the standards, listed below, of the selected test and balance association.

- 3.2.1 NEBB-01, Procedural Standards for Testing - Adjusting - Balancing of Environmental Systems.
- 3.2.2 AABC National Standards for Total System Balance (AABC MN-1).
- 3.3 Test and balance work shall be in accordance with the standards of the selected test and balance association. The work shall also comply with the recommendations of ASHRAE pertaining to instruments, measurements and procedures and with SMACNA-07, HVAC Systems - Testing, Adjusting and Balancing.
- 3.4 Systems shall be tested at near maximum load conditions. Cooling systems shall be tested in summer; heating systems shall be tested in winter.
- 3.5 Equipment settings including dampers, valves, and similar equipment shall be marked to show final positions at the completion of balancing.

DIVISION 26-ELECTRICAL

Wiring Systems Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of wiring systems equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Copper Wire: ASTM B 3, ASTM B 8.
 - 2.2 Aluminum Wire: ASTM B 230, ASTM B 231.
 - 2.3 Busways and Fittings: UL 857, NEMA BU 1.
 - 2.4 Plugs and Receptacles: UL 498, NEMA WD 1 and NEMA WD 6.
 - 2.5 Conduit: ANSI C80.1, C80.3, and C80.5 and NEMA RN 1.
 - 2.6 Enclosures: NEMA ICS 6 and OS 1.
 - 2.7 Specific Purpose Wiring Devices: NEMA WD 1, NEMA WD 6.
 - 2.8 General Electrical: NFPA 70.
 - 2.9 Flexible Metal Conduit: UL 1.
 - 2.10 Surface Metal Raceways and Fittings: UL 5.
 - 2.11 Liquid-Tight Flexible Steel Conduit: UL 360.
- 3.0 EXECUTION:
 - 3.1 Coordination: Contractor shall determine that the wiring system has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the wiring system will not be damaged by the power outage.
 - 3.2 Clearances: Working clearances shall comply with NFPA 70.

Motor Generator Sets

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of motor generator sets. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Batteries: SAE J537 and UL 1236, and IEEE 484 and 485, as applicable.
 - 2.2 Instrument Transformers: ANSI C12.11.
 - 2.3 Motor and Generator: NEMA MG 1 and MG 2.
 - 2.4 Battery Charger: UL 1236.
 - 2.5 Switchgear: NEMA SG 5.
 - 2.6 Electrical Instruments: ANSI C39.1.
- 3.0 EXECUTION:
 - 3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the

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Authorized Member Representative.

- 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.3 Maintenance, Repair, or Replacement Work: The Contractor shall check the generator sets in accordance with the manufacturer's instructions and Mil. Std. MIL-STD-705, MIL-HDBK-705, IEEE-43, IEEE-115, and SSPC-PA-1. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.

Electrical Distribution System Substation Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of electrical distribution system substation equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: The maintenance and repair work shall include, but not be limited to the following major equipment:
 - a. Power Transformers.
 - b. Station Service Transformers.
 - c. Automatic Tap Changing Transformers.
 - d. Switchgear.
 - e. Oil Circuit Breakers.
 - f. Isolating Switches.
 - g. Metering Equipment.
 - h. Relaying Equipment.
 - i. Station Battery System.
 - j. Articulated Secondary Unit Substation.
 - k. Integral Transformer-Load Center.
 - l. Sulfur Hexafluoride (SF6) Circuit Breakers.
- 2.1 Power Distribution Panel: NEMA PB 1, U.L. 67.
- 2.2 Insulating Oil, Electrical (For Transformers, Switches, and Circuit Breakers): ASTM D 923.
- 2.3 Distribution, Power, and Regulating Transformers: ANSI 462 series as applicable.
- 2.4 Instrument Transformers: ANSI C57.13.
- 2.5 Installation and Maintenance of Oil-Immersed Transformers: ANSI/IEEE C57.12.00.
- 2.6 Voltage Air Switches, Bus Supports, and Switch Accessories: ANSI/IEEE C37.30, C37.34.
- 2.7 Low-Voltage AC Power Circuit Breakers: ANSI C37.50.
- 2.8 Electrical Analog Indicating Instruments: ANSI C39.1.
- 2.9 Primary Unit Substation: NEMA 201.
- 2.10 Secondary Unit Substation: NEMA 210.
- 2.11 Molded Case Circuit Breakers: NEMA AB1.
- 2.12 Watthour Meters: ANSI C12.10.
- 2.13 Switchboards, Dead Front Distribution: NEMA PB 2.
- 3.0 EXECUTION:
 - 3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Authorized Member Representative.
 - 3.2 Protection: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
 - 3.3 Workmanship: Work shall be completed in accordance with NFPA 70.
 - 3.4 Interruptions: During interruptions, equipment and standby systems shall be provided to maintain existing electrical service.
 - 3.5 Fences shall be checked for security. Gates and locks shall be checked for proper operation and grounding.
 - 3.6 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest federal and state requirements.

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Transformers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of transformers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Transformer assemblies and components for replacement purposes shall be designed for the same service as existing.
 - 2.2 Transformers covered under this specification are as follows:
 - 2.2.1 Dry Type Transformers.
 - 2.2.2 Instrument Transformers.
 - 2.2.3 Control Transformers.
 - 2.2.4 Grounding Transformers.
 - 2.2.5 Liquid-Filled Transformers.
- 3.0 EXECUTION:
 - 3.1 Safety: Take precautions in compliance with the National Electrical Safety Code (ANSI/IEEE C2); execute work in compliance with NFPA 70.
 - 3.2 Coordination: Coordinate the work schedule with the Authorized Member Representative.
 - 3.3 Repairs: Repair and retighten burnt or broken lugs, windings, loose bolts, nuts, and screws. Repair windings in accordance with NEMA ST 20.
 - 3.4 Testing: Perform electrical insulation tests to verify the integrity of any repairs prior to re-energization of the transformers, unless written permission is obtained from the Authorized Member Representative stating otherwise.
 - 3.5 Oil Handling and Disposal: Handle and dispose of oil and oil contaminated materials in compliance with the latest Environmental Protection Agency requirements.
 - 3.6 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that is not indicated or specified to be corrected under the contract, it shall be promptly reported to the Authorized Member Representative. The Contractor may submit recommendations for correction of the deficiency, safety hazard, or code violation with his report.
 - 3.7 Additional Execution Requirements Specific to Each Type of Transformer:
 - 3.7.1 Dry Type Transformers:
 - 3.7.1.1 General: replacement transformers shall have a winding configuration identical to that of the existing transformer and shall comply with NEMA ST 20 and ANSI C57.12.22.
 - 3.7.1.2 Noise isolation pads shall be checked for excessive wear and replaced if necessary.
 - 3.7.1.3 Dust shall be cleaned from transformer winding and enclosure ventilation louvers.
 - 3.7.2 Instrument Transformers:
 - 3.7.2.1 Current transformers shall be manufactured in compliance with NEMA EI 21.1 and EI 21.2 and shall have an accuracy Class of 0.6 at burden designation of B-0.1 and B-0.2 and an accuracy of 1.2 at B-0.5 as defined in ANSI C57.13 for instrument transformers.
 - 3.7.2.2 Potential transformers shall have an accuracy of 0.3W, 0.3X, 0.3Y, 1.2Z as defined in ANSI C57.13 for instrument transformers.
 - 3.7.2.3 Fuses: Potential transformers shall be protected on the high and low voltage side by fuses.
 - 3.7.2.4 Repair: No attempt to repair current or potential transformers shall be made.
 - 3.7.3 Control Transformers:
 - 3.7.3.1 Core shall be in compliance with UL 506.
 - 3.7.3.2. Fuses: All ungrounded conductors of primary and secondary of potential transformers shall be protected by fuses.
 - 3.7.3.3 Repair: No attempt to repair control transformers shall be made.
 - 3.7.4 Grounding Transformers:
 - 3.7.4.1 Replacement zig-zag grounding transformers shall be three-phase zig-zag autotransformers or six single phase transformers connected zig-zag and shall comply with UL 506.
 - 3.7.4.2 Replacement Wye-delta grounding transformers shall be three-phase transformers or three single

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- phase transformers connected wye-delta and shall be in compliance with ANSI C57.12.00.
- 3.7.4.3 Core shall be in compliance with ANSI C57.12.00.
- 3.7.5 Liquid-Filled Transformers:
- 3.7.5.1 Replacement oil-filled transformers shall have a winding configuration identical to the existing transformer and shall comply with ANSI C57.12.00.
- 3.7.5.2 Gaskets shall match existing type removed.
- 3.7.5.3 Oil added to transformers shall be the same type as existing or shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with NEMA TR P8. Mineral oil shall not be added to high fire point oils such as askarel and silicone.
- 3.7.5.4 Repair leaks by cleaning the leak area and welding or by applying 1/4-inch thick steel plate patch and welding in place. After welding, check the repaired area for leaks, reweld if leaking, reclean, and touch up with paint. Welding shall comply with AWS D1.1.
- 3.7.5.5 Gaskets, vacuum and liquid level gauges found to be defective shall be replaced.
- 3.7.5.6 Ground resistance test readings shall be performed across phase-to-phase windings and phase-to-ground windings. Tabulate results, and submit them to the Authorized Member Representative.
- 3.7.5.7 Dielectric test shall be performed on oil samples taken from top and bottom filter press connections. Record and submit results to the Authorized Member Representative.
- 3.7.5.8 Transformer liquid levels shall be checked for correct level and filled if low. Oil added to transformers shall be same type as existing oil or shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with ANSI/IEEE C57.91 and C57.92. Mineral oil shall not be added to high fire point oils such as askarel and silicone.
- 3.7.5.9 Transformer tap connections and tap changer shall be tightened.
- 3.7.5.10 Pressure of inert gas in cylinders used to maintain positive pressure inside transformer tank shall be checked. Replace cylinder if pressure fails below transformer manufacturer's recommended level for gas cylinder pressure.
- 3.7.6 Outages and Testing of Transformers:
- 3.7.6.1 Service interruptions shall be held to a minimum. De-energization will be accomplished by others.
- 3.7.6.2 Preinstallation Test: Existing transformers that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests. The results of the tests shall be furnished to the Authorized Member Representative.
- 3.7.6.3 Oil Test: Transformers shall have insulating oil tested.
- 3.7.6.4 Insulation Test: Transformers shall have insulation tested.

Electrical Distribution Transformers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution transformers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Poles-Mounted Transformers: ANSI/IEEE C57 series as applicable.
- 2.2 Pad-Mounted Transformers: NEMA/IEEE C57 series as applicable.
- 2.3 Transformer Oil for Oil-Filled Units: ASTM D 923.
- 3.0 EXECUTION:
- 3.1 Outages shall be scheduled and coordinated in advance with the Authorized Member Representative.
- 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.3 Preventive Maintenance, Repair or Replacement Work: The Contractor shall perform all required tests in accordance with applicable codes and standards and the manufacturer's instructions. The Contractor shall perform preventive maintenance work, repair, replacement of any defective part, or furnish new material when required.

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- 3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of in compliance with the latest Environmental Protection Agency requirements. Oil tests shall be in accordance with ASTM standards.
- 3.5 Reports: Upon completion of the work, a report of the results of the tests made shall be furnished to the Authorized Member Representative.

High-voltage Disconnecting Devices

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high-voltage disconnecting devices. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Insulating Oil: ASTM standards applicable to the oil in use.
 - 2.2 General Electrical: ANSI/IEEE C2.
 - 2.3 Power Fuses and Fuse Disconnecting Switches: ANSI C37.46, NEMA SG 2.
 - 2.4 Automatic Circuit Reclosers For AC Systems: ANSI C37.60.
 - 2.5 Automatic Line Sectionalizers For AC Systems: ANSI C37.63, NEMA SG 13, ANSI C37.63.
 - 2.6 Power Switching Equipment: NEMA SG 6.
 - 2.7 Distribution Cutouts and Arrestor Combination Mounting: ANSI C37.36B, ANSI C37.42.
- 3.0 EXECUTION:
 - 3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.
 - 3.2 Protection: Precaution, in compliance with ANSI/IEEE C2, shall be taken to prevent injury to personnel and to avoid damage to equipment and property.
 - 3.3 Oil Handling and Disposal: Oil and oil contaminated materials shall be handled and disposed of to comply with the latest federal and state regulations.

Overhead Electrical Distribution Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of overhead electrical distribution systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Conductors: ANSI C8.35, QQ-W-343; ANSI/IEEE C2, ASTM B 8, B 228, B 229, B 230, B 231, B 232; NEMA WC3, WC5, and WC7.
 - 2.2 Insulators: ANSI C29.1, C29.2, C29.3, C29.4, C29.5, C29.6, C29.7, C29.8, C29.9, and NEMA HV 2.
 - 2.3 Poles: ANSI 05.1; AWP A C4, C25, P1, P8, P9; and CSA A14.
 - 2.4 Crossarms: REA DT-5B, AWP A C25, ANSI C2, ANSI C135.33.
 - 2.5 Hardware: EEI TDJ-1, TD-2, TDJ-3, TD-4, TDJ-5, TDJ-6, TDJ-7, TDJ-9, TDJ-10, TD-11, TD-12, TDJ-17, TDJ-22, and TDJ-23 as applicable.
- 3.0 EXECUTION:
 - 3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.
 - 3.2 Line Clearing: Chemicals used in line clearing operations shall be in compliance with the latest federal and state requirements.
 - 3.3 Safety Precautions: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI/IEEE C2.

Underground Electrical Distribution Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of underground electrical distribution systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative.

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Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

- 2.0 PRODUCTS:
- 2.1 Conductors: ASTM D 4727, ASTM D 1352, ASTM D 1679, ACIE NO. 1-68, ICEA NO. S-19-81, NO. S-66-524, and NO. S-68-516, NEMA WC 7 and NEMA WC 8, and UL 854, as applicable.
- 2.2 Conduits: NEMA TC 2 and NEMA TC 6, UL 6, UL 514B, and UL 543 as applicable.
- 2.3 Tape: U.L.
- 2.4 Insulators: ANSI C29 8 and C29 9.
- 2.5 General Electrical: ANSI C2, NFPA 70.
- 2.6 Testing: IEEE 48.
- 2.7 Concrete: Aggregate, ASTM C 33; Portland cement, ASTM C 150, Type 1; compressive strength 4,000 psi at 28 days.
- 3.0 EXECUTION:
- 3.1 Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.
- 3.2 Tests: All underground lines, splices, and terminations that have undergone maintenance, repair, or are new installation shall be tested before placement in service.
- 3.3 Ductbank: No dips or low points that retain water are permissible. Conduit shall be encased with not less than 3 inches of concrete when not direct-buried.
- 3.4 Manholes and Handholes shall be spaced and installed so as not to exceed the pulling tensions of the cables to be pulled. Maximum pulling tensions shall be as recommended by the cable manufacturer.

Electrical Distribution System Grounding

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system grounding. Products shall match existing materials and/or shall be directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
- 3.1 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved.
- 3.2 Outages: Service interruptions shall be limited in number and duration, and the extent of lines involved shall be held to a minimum.
- 3.3 Protection: Take precautions, in compliance with ANSI C2, to prevent injury to personnel and to avoid damage to equipment and other property.
- 3.4 Workmanship: Installation shall be in compliance with IEEE 80 and 142. Install protective molding, staples and conduit as recommended by these standards.
- 3.5 Trenching: Exercise care when digging trenches for installation or testing of ground equipment. Protect adjacent structures and properly shore excavations.
- 3.6 Grounding shall comply with NFPA 70, ANSI C2, and IEEE 80 and 142. Ground neutral conductors, cable shields, metallic cable sheaths and armor, metallic conduits, pothead bodies, junction boxes, lightning arresters, fence enclosures, and noncurrent-carrying metallic parts of equipment. Ground rods shall be made of copper, or copper-clad steel not less than 1-inch by 8 feet long and, except those installed in manholes, shall be driven into the earth at least 9 feet. Ground connections in earth shall not be backfilled until after inspection by the Authorized Member Representative. Repairs and maintenance of the grounding system shall include resistance measurements and tightening of all bolted connections.

Electrical Distribution System Capacitor Banks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system capacitor banks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance

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with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Material: New capacitors shall comply with NEMA CP 1 and shall not use impregnant containing polychlorinated biphenyls (PCB).

3.0 EXECUTION:

3.1 Outages shall be scheduled and coordinated in advance with the Authorized Member Representative.

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.3 Maintenance and Repair Work: Workmen shall allow the capacitor time to discharge and then short capacitor terminals together and ground before touching any live parts. Capacitors shall be checked in accordance with NEMA CP 1 and NFPA 70. Perform the necessary preventative maintenance, repair, or replacement of any of the components.

3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.

Electrical Distribution System Voltage Regulators

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system voltage regulators. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Material: New regulators shall comply with ANSI C57.15. New oil shall comply with ASTM D 923.

3.0 EXECUTION:

3.1 Outages shall be scheduled and coordinated in advance with the Authorized Member Representative.

3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

3.3 Maintenance and Repair Work: All maintenance and repair work shall be accomplished and in compliance with applicable ANSI C57-series and ASTM standards.

3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.

3.5 Test Reports on field tests made in compliance with ANSI C57.15 shall be submitted to the Authorized Member Representative.

Interior Low-voltage Disconnecting Devices

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of interior low-voltage disconnecting devices. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Switch Box (Enclosed): UL 98.

2.2 Fuse Holders and Fuses: ANSI/UL 512, 198.2, 198B, and ANSI C97.1 as applicable.

2.3 Molded Case Circuit Breakers: NEMA AB 1.

2.4 General Electrical: NFPA 70.

3.0 EXECUTION:

3.1 Coordination: Contractor shall determine that the disconnecting device has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the disconnecting device will not be damaged by the power outage.

3.2 Clearances: Work clearances required by NFPA 70 shall be provided.

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Panelboards and Load Centers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of panelboards and load centers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Panelboards: NEMA PB 1, and PB 1.1.
 - 2.2 Fuses and Fuse Holders: ANSI/UL 512, 198.
 - 2.3 Molded Case Circuit Breakers: NEMA AB 1.
 - 2.4 General Electrical: NFPA 70.
 - 2.5 Enclosures Beyond Repair: Replace with the same size and type in compliance with NEMA ICS. Carbon steel, ASTM A 366; stainless steel, ASTM A 176; galvanized sheet steel, ASTM A 526.
- 3.0 EXECUTION:
 - 3.1 Coordination: Contractor shall determine that equipment served by panelboards and load centers will not be damaged before or after power is cut off and that power to the panelboards and load centers has been disconnected or cut off.
 - 3.2 Clearances: Working clearances required by NFPA 70 shall be provided.
 - 3.3 Tests: All devices and systems that have undergone maintenance, repair, or are new installation shall be tested before placement in service.

Electric Motors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of electric motors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: Parts shall be factory-made. Existing bolts and screws that are rusted, corroded, cross-threaded, or otherwise defective and are removed due to repair work shall be replaced with new bolts and screws.
 - 2.2 Motor assemblies and components for replacement purposes shall be designed for same service as existing. Repaired rotors shall be balanced. Brushes worn to within 20 percent of usable length shall be replaced with same type and size brushes.
 - 2.3 New motor shall be of like kind and of the same size, performance rating, and characteristics as the existing motor to be replaced and shall comply with NEMA MG 1 and UL 1004.
 - 2.4 Products included in these specifications are:
 - 2.4.1 Single Phase Induction Motor.
 - 2.4.2 Universal Motor.
 - 2.4.3 Polyphase Squirrel-Cage Induction Motor.
 - 2.4.4 Polyphase Wound Rotor Induction Motor.
 - 2.4.5 Polyphase Synchronous Motor.
 - 2.4.6 Direct Current Motor.
- 3.0 EXECUTION:
 - 3.1 Compliance: Take precautions in accordance with the National Electrical Safety Code. Workmanship shall be executed in compliance with NFPA 70.
 - 3.2 Scheduling and Coordination: Contractor shall determine that required notices have been given and that equipment served by the motor will not be damaged due to motor shutdown.
 - 3.3 Lubrication, Operation, and Adjustment: Before operational testing, thoroughly clean electric motor of all foreign material, and lubricate all electric motors or parts requiring lubrication with the types of lubricants recommended by the electric motor manufacturer.
 - 3.4 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that is not indicated or specified to be corrected under the contract, it shall be

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promptly reported to the Authorized Member Representative. The Contractor may submit recommendations for correction of such deficiency, safety hazard, or code violation with his report.

3.5 Requirements Specific To Each Motor Type:

3.5.1 Single Phase Induction Motors:

3.5.1.1 Single phase Induction Motors shall comply with ANSI/IEEE 114.

3.5.1.2 Frame sizes shall comply with NEMA MG 13.

3.5.2 Universal Motors:

3.5.2.1 Armature: Core of armatures shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEMA MG 1.

3.5.2.2 Armature assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1.

3.5.2.3 Bearings shall be sleeve bearing or ball bearing type complying with NEMA MG 1.

3.5.2.4 Brushholders shall be in compliance with NEMA MG 1.

3.5.2.5 Brushes shall be in compliance with NEMA CB 1.

3.5.2.6 Shaft shall be in compliance with NEMA MG 1.

3.5.3 Polyphase Squirrel-Cage Induction Motors:

3.5.3.1 Polyphase squirrel-cage induction motors shall comply with NEMA MG 1.

3.5.3.2 Frame size shall comply with NEMA MG 13.

3.5.4 Polyphase Wound Rotor Induction Motors:

3.5.4.1 Polyphase wound rotor induction motor shall comply with NEMA MG 1.

3.5.4.2 Frame size shall comply with NEMA MG 13.

3.5.4.3 Brushes shall be in compliance with NEMA CB 1.

3.5.4.4 Stator shall be rewound with conductors of same gauge and material as the existing stator.

3.5.4.5 Rotor shall be rewound with conductors of same gauge and material as the existing rotor.

3.5.5 Polyphase Synchronous Motors:

3.5.5.1 Polyphase synchronous motor shall comply with NEMA MG 1.

3.5.5.2 Frame size shall comply with NEMA MG 13. •16480

3.5.5.3 Brushes shall comply with NEMA CB 1.

3.5.6 Direct Current Motors:

3.5.6.1 Armature core shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEMA MG 1.

3.5.6.2 Armature assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1.

3.5.6.3 Bearings shall be ball bearing or sleeve bearing type in compliance with NEMA MG 1.

3.5.6.4 Brushholders shall be in compliance with NEMA MG 1.

3.5.6.5 Frame size shall comply with NEMA MG 13.

3.5.6.6 Shaft shall be in compliance with NEMA MG 1.

3.5.6.7 Brushes shall be in compliance with NEMA CB 1.

3.6 Outages and Testing of Electric Motors:

3.6.1 Outages and service interruptions shall be held to a minimum. De-energization will be accomplished by station forces.

3.6.2 Preinstallation Test: Existing motors that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests. Furnish the results of the tests to the Authorized Member Representative.

Recreational Vehicle (RV) Outlets

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of recreational vehicle outlets. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

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- 2.1 30A, 20A Receptacle Pedestal: Midwest No. U041GP4 or approved equal. Each recreational vehicle outlet shall be pedestal mounted with one 30A, 120V receptacle and one 20A, 120V duplex receptacle. Each receptacle shall be protected by a dedicated integrally mounted thermal magnetic circuit breaker. The 20A circuit breaker shall be of the ground fault circuit interrupter (GFCI) type. The unit mounting pedestal shall include loop feed lugs rated for at least 100A, 240 volts, and a wire size of 250 kcmil. Similar lugs shall be provided to accommodate the equipment grounding conductor. The complete assembled unit shall be U.L. listed and shall be NEMA 3R construction. The pedestal cover shall be readily removable and shall provide direct access to the loop feed lugs. Pedestal shall be pad mounted.
- 2.2 50A, 30A, 20A Receptacle Pedestal: Midwest No. U075GP4 or approved equal. Each recreational vehicle outlet will be pedestal mounted with one 50A, 240V receptacle, one 30A, 120V receptacle, and one 20A, 120V duplex receptacle. Each receptacle shall be protected by a dedicated integrally mounted thermal magnetic circuit breaker. The 20A circuit breaker shall be of the ground fault circuit interrupter (GFCI) type. The unit mounting pedestal shall include loop feed lugs rated for at least 100A, 240 volts, and a wire size of 250 kcmil. Similar lugs shall be provided to accommodate the equipment grounding conductor. The complete assembled unit shall be U.L. listed and shall be NEMA 3R construction. The pedestal cover shall be readily removable and shall provide direct access to the loop feed lugs. Pedestal shall be pad mounted.
- 2.2 Concrete Pad: Pad shall be 24-inches square, 6-inches thick. Exposed edges shall be chamfered 1-inch. Reinforcement shall be provided consisting of #4 steel placed 12-inches from each edge. Concrete shall be a minimum of 3000 psi at 28 days. Top of pad shall extend 1-inch above finished grade.
- 3.0 EXECUTION: Contractor shall comply with provisions of the National Electric Code.

Poles for Street and Area Lighting Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for poles for street and area lighting systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Wood Poles: ANSI 05.1 and shall be preservative-treated.
 - 2.2 Steel, Aluminum, and Concrete Poles: ASTM A 500, ASTM B 209, and AASHTO Standards.
 - 2.3 Steel Poles:
 - 2.3.1 Structural Steel: ASTM A 36.
 - 2.3.2 Zinc Coating: ASTM A 123.
 - 2.3.3 Poles shall be chemically cleaned after fabrication and shall be hot-dipped galvanized in compliance with ASTM A 123.
 - 2.4 Aluminum poles shall be of high-strength aluminum having a yield strength of 34,000 psi.
 - 2.5 Concrete Poles: Prestressed steel reinforced, cast type in compliance with ACI 318 and 437. Cement shall comply with ASTM C 150.
 - 2.6 Painting: Materials shall match that of existing or adjacent pole finish.
- 3.0 EXECUTION:
 - 3.1 Safety precautions shall comply with applicable requirements of the National Electrical Safety Code.
 - 3.2 Wood Pole Setting: In normal firm ground, minimum pole setting depths shall be as follows: for pole lengths of 20 feet, 25 feet, 30 feet, and 35 feet the minimum depth shall be 5 feet, 5 feet 6 inches, and 6 feet, respectively. For pole lengths up to 100 feet the minimum depth shall be 10 percent of length for both straight and curved lines, plus 2 feet for straight lines and 10 percent of length•16501 plus 2 feet 6 inches for curves and corners. In rocky or swampy ground, pole setting depths shall be respectively decreased or increased as required by local power company published standards and as approved by the Authorized Member Representative. In swampy ground, a bog shoe may be used.
 - 3.3 Wood Pole Inspections:
 - 3.3.1 Visually inspect standing wood poles for ground-line heart rot, aboveground heart rot, pole top

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- heart rot, shell rot, mechanical damage, eroded foundations, large splits, and lightning damage.
- 3.3.2 Coat surfaces with creosote-based wood preservative coating compound and wrap with impregnated felt bandage in compliance with wood pole preservative materials supplier's instructions.
- 3.4 Wood Pole Decay Maintenance:
- 3.4.1 Ground-line heart rot shall be treated with an approved fumigant.
- 3.4.2 Wood poles with surface decay below grade shall be replaced with new poles.
- 3.5 Concrete Repair: Repair spalling in pole foundations and concrete poles by thoroughly coating with 2,000 psi shear strength epoxy resin, applying 3,000 psi 28-day concrete, and finishing to restore original configuration of the concrete.
- 3.6 Steel Pole Maintenance: Steel poles that are corroded shall be chemically cleaned of rust and scale and painted.

Ballasts and Transformers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaire ballasts and transformers. Products shall match existing materials and/or shall be directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Constant-current transformers shall be of the automatic, moving-coil types designed to maintain the secondary current within 1 percent of rating when operating under normal loading conditions. A protective relay that will automatically disconnect the transformer from the line on open series circuit shall be provided as an integral component of the transformer. Transformers shall be rated 10 kW, 2,400 volts, 60 hertz primary and 6.6 amperes secondary.
- 2.2 Fluorescent ballasts shall be high-power factor type, Class P rated, and CBM certified, rated for single or two-lamp operation. Ballasts shall be lead type for minimum starting temperature of plus 50 F.
- 2.3 High-intensity discharge ballasts shall be high-power factor, single lamp type. Ballasts shall be Type 2, weatherproof for outdoor use.
- 2.4 Lamp Ballasts: ANSI C82.1, C82.4, UL 935, and UL 1029 as applicable.
- 2.5 Series isolation transformers for airfield lighting systems shall be equal to the original transformers in accordance with Air Force Manual (AFM) 14, Part II, Visual Air Navigation Facilities.
- 2.6 Transformers, regulators and reactors shall be in compliance with the requirements of NEMA/IEEE C57.
- 3.0 EXECUTION: Contractor shall comply with provisions of the National Electric Code.
- 3.1 Maintenance and repair of regulators shall include cleaning or replacement of dirty or burned contacts, replacement of worn or broken mechanical parts and electrical insulation, cleaning and tightening connections, replacement of leaking seals and gaskets, replacement of burnt oil, stopping of tank leaks, securing of loose or broken mounts, repair of shorted windings, and testing of regulator against varying loads and for shorts and high resistances.
- 3.2 Temporary wiring modifications shall be made in order that the lighting system shall remain in operating condition, except for the item being repaired or replaced, during normal lighting periods.
- 3.3 Outages: Service interruptions shall be scheduled in advance with the Authorized Member Representative.

Street and Area Lighting Controls

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for street and area lighting controls. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Photo controls shall be of the light-sensitive photo conductor cell type with integral line resistor and

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- relay circuit having a line voltage circuit contact and capacitor and an across-the-line protective lightning arrester. Plug-in locking type shall be in compliance with UL 773.
- 2.2 Replacement relay for control of circuit shall match mounting, voltage, and wattage of existing relay.
 - 2.3 Electronic control units shall be solid-state, transistorized, printed circuit type having no operating moving parts.
 - 3.0 EXECUTION:
 - 3.1 Temporary wiring modifications shall be made in order that the lighting system shall remain in operating condition during normal lighting periods, except for the control unit being repaired or replaced.
 - 3.2 Photo controls, timers and electronic control units shall be inspected for proper operation and repaired or replaced as required.
 - 3.3 Safety: Contractor shall comply with applicable provisions of the National Electric Code.

Luminaires

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaires. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Lamps: ANSI C78 series, C79 series.
 - 2.2 Fixtures: UL 781, 844, 595, 1570, 1571, 1572.
 - 2.3 Lamp Bases and Holders: UL 496, 542, and ANSI C81 series.
 - 2.4 Ballasts: UL 935, 1029, and ANSI C82 series.
 - 2.5 General Electrical: NFPA 70.
 - 2.6 All luminaires shall be designated "IES distribution type" as referred to in the IES Lighting Handbook.
 - 2.6.1 Luminaires shall be adjusted to achieve lighting levels and patterns specific to the application as recommended by the manufacturer. Each luminaire shall bear the UL label.
 - 2.6.2 Only the luminaire being repaired or replaced shall be disconnected from its source of supply during the normal operating hours of the lighting system.
 - 2.6.3 Luminaire heads or housings shall be die-cast aluminum with slip-fitter mounting and provided with 1-1/4 inch through 2-inch slip-fitter fittings. Luminaire heads shall have standard dimensions for interchangeable standard optical assemblies. Heads shall be internally wired and rated at 600 volts.
 - 2.6.4 Enclosed luminaire shall consist of an Alzak-finished aluminum reflector and enclosing refractor mounted on a standard luminaire head.
 - 2.6.5 Open luminaires shall consist of an Alzak-finished aluminum reflector with shielding reflector on house side providing IES Type I distribution, mounted on a standard luminaire head.
 - 2.7 Incandescent Luminaires:
 - 2.7.1 Luminaires shall be enclosed type for filament lamps with IES Type I distribution and shall have a glass refractor providing IES Type I distribution.
 - 2.7.2 Floodlights shall be enclosed type with adjustable support brackets. Enclosed floodlights shall be Class HD having a beam spread of 10 to 18 degrees. Open type floodlights shall have a beam spread of 70 to 100 degrees.
 - 2.8 Fluorescent luminaires shall be the enclosed type.
 - 2.9 High intensity discharge luminaires shall be enclosed type for HID lamps with IES Type I distribution. Enclosed luminaires shall have an enclosing glass refractor providing IES Type I distribution.
- 3.0 EXECUTION:
 - 3.1 Protection: Take precaution in accordance with ANSI C2.
 - 3.2 All service interruptions shall be scheduled in advance with the Authorized Member Representative.
 - 3.3 Workmanship: NFPA 70.

Uninterruptible Power System (UPS)

Attachment 1: Specifications for the Work

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of uninterruptible power systems. Products shall match existing materials or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Batteries: NEMA PE 1 for safety requirements and IEEE 485 for sizing.
 - 2.2 Battery Charger: UL 1236.
 - 2.3 Switchgear: NEMA SG 5.
 - 2.4 Emergency and Standby Power Systems: IEEE 446.
- 3.0 EXECUTION:
 - 3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Authorized Member Representative.
 - 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI/IEEE C2.
 - 3.3 Maintenance, Repair or Replacement Work: The Contractor shall check the UPS in accordance with the manufacturer's instructions and Mil. Std. MIL-STD-202 and IEEE 446. If instructed by the Authorized Member Representative, the Contractor shall check for electromagnetic compatibility in accordance with Mil. Std. MIL-STD-461 and MIL-STD-462. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.

Cathodic Protection of Steel Water Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of cathodic protection of steel water tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Contractor's Qualification: A qualification such as NACE accredited corrosion specialist or a Senior Corrosion Technologist is required to perform or to supervise the inspection of the cathodic protection system. The contractor making the repair and installing new equipment, material, or components shall be under the direct supervision of a NACE accredited corrosion specialist or a Senior Corrosion technologist with a minimum of five years of experience in design and installation of cathodic protection systems for steel water tanks.
 - 2.2 Approval: All repair or replacement material and equipment shall be NACE approved.
- 3.0 EXECUTION:
 - 3.1 Inspection: The inspection of the cathodic protection system shall be made in compliance with applicable NACE standards. The inspection shall include a potential profile of the submerged structures together with visual and electrical tests.
 - 3.1.1 Tank-to-Water Potential Tests: Adjust the rectifier voltage or amperage so as to satisfy design current densities or specified voltage. Document readings, and note any reading below -0.85 volts versus the copper-copper sulfate half-cell or silver-silver chloride half-cell (using conversion chart). Successive potential readings shall be made with the tank full of water and the reference electrode placed at various depths, starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. (A vertical inspection profile shall be taken along the wall between each anode string.) The tank bottom shall also be traversed equidistant from all distributed anodes. Inspect risers by placing reference electrode along the side wall of the riser and measuring at 3-foot intervals as far as possible.
 - 3.1.2 Polarization of the submerged steel surfaces to a tank-to-water potential shall be at least a negative 0.85 volts.
 - 3.1.3 Voltage Measurements Between Tank and Electrode: When inspecting new well-coated tanks, the voltage measured between the tank and reference electrode that is placed at any point along the coated surface shall not exceed negative 1.2 volts.

Attachment 1: Specifications for the Work

- 3.1.4 The rectifier shall be free from any restriction that inhibits free air circulation. Keep air-cooled rectifiers free from dust accumulation, clogged filters or screens, brush, grass, or nests. Fill oil-cooled rectifiers to the proper level, and change the oil when it becomes cloudy. Dispose of oil that is removed as directed by the Authorized Member Representative.
- 3.1.4.1 Output Measurement: Measure and record the current and voltage output. Compare the readings obtained against the previous readings.
- 3.1.4.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are 1664 reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.
- 3.1.4.3 Meter Tests: Check the meters in the rectifier for accuracy by using portable instruments (voltmeter and ammeter) of known accuracy.
- 3.1.5 Visual inspection of the water tank shall be conducted while the Contractor is inspecting the anodes and wiring. At the direction of the Authorized Member Representative, lower the water level to expose as much of the wiring as practical to inspect for deteriorated insulation, faulty connections, etc. Inspect the interior surface for condition of coating and apparent rust or calcareous build up. In systems using permanent anodes, determine if the anode shall last until the next inspection. Record broken, damaged, and missing anodes. Inspect wiring to the anodes. Replace wire that has deteriorated insulation.
- 3.1.6 Reference electrodes and connecting wires shall be inspected by the Contractor to determine whether they are capable of operation until the next annual inspection.
- 3.1.7 Reports: Record and submit all data. Corrosion control records shall follow recommendations found in NACE RP0169.
- 3.2 Maintenance and Repair:
 - 3.2.1 Compliance: The maintenance, repair, and installation of replacement materials shall be in compliance with accepted NACE practices. Install all materials and equipment in compliance with the recommendations of NACE or the manufacturer or to comply with the contract documents. Contractor shall replace all broken, missing, deteriorated, or otherwise unserviceable components determined during inspection.
 - 3.2.2 Workmanship: The maintenance, repair, and installation of repair materials shall be under the supervision of the Contractor's NACE Accredited Corrosion Specialist or Senior Corrosion Technologist. Installation shall be performed by personnel who are specifically trained in this work by the manufacturer and who are engaged full time in the installation and servicing of cathode protection equipment. Electrical work shall be in compliance with the requirements of the National Electrical Code.
 - 3.2.3 Testing Methods: Upon completion of repair, the Contractor shall test, adjust, and place in service the cathodic protection system by the following methods:
 - 3.2.3.1 Testing: Adjust the voltage of the rectifier so as to cause a sufficient current to flow to polarize all parts of the structure to at least -0.85 volts. With a given amount of current flowing, voltage measurement shall be made from the tank to a copper-sulfate reference electrode in contact with the water. Successive potential readings shall be made with a calibrated voltmeter, with the tank full of water and the reference electrode placed at various depths starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. The tank bottom shall also be traversed and readings taken every 3 feet in a single horizontal direction. In making these tests, place the reference electrode midway between two tank anodes and suspend close to, but not touching, the side or bottom of the tank. The distance between the reference electrode and the wall shall not exceed 1 inch for all readings. If any parts of the structure register voltages more negative than minus 1.2 volts, note this in a deficiency checklist.
 - 3.2.3.2 Rectifier Adjustment: Final adjustment of the rectifier output current shall be made so that repeated voltage readings taken as specified above for testing fall between the limits of minus 0.75 to minus 1.2 volts when measured against the reference electrode.
 - 3.2.3.3 Signs: The Contractor shall paint or stencil his name, date of inspection of the system, and due date of next inspection at a place on site designated by the Authorized Member Representative.
 - 3.2.3.4 Reports: After final adjustment, place the cathodic protection system in service, record the

Attachment 1: Specifications for the Work

conditions of the system as left by the Contractor, and submit the report to the Authorized Member Representative.

- 3.3 Operating and Maintenance Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the installation. These technical records shall include such items as: manufacturer's data on installed equipment, operating instructions, lists of repair parts, names and addresses of sources of parts and services, current price lists, repair and maintenance instructions, and construction specifications and shop drawings. When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Authorized Member Representative two complete sets of typewritten or printed instructions covering the maintenance and operation of the installation. The instructions shall cover proper adjustment of the direct current flow, a brief description of cathodic protection principles, a single line operating diagram, anode consideration with reference to local freezing conditions, trouble-shooting checklists, and any other pertinent information concerned with the proper care and maintenance of the installation.

Cathodic Protection System for Underground Utilities

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cathodic protection systems for underground utilities. Products shall match existing materials accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Contractor's Qualification: A qualified person, such as a NACE-accredited Corrosion Specialist or a Senior Corrosion Technologist, is required to perform or supervise the inspection of the cathodic protection system. The contractor making the repair and installing new equipment, material, or components shall be under the direct supervision of a NACE accredited corrosion specialist or a Senior Corrosion technologist with a minimum of five years of experience in design and installation of cathodic protection systems for underground piping systems.
- 2.2 Standard Products: Materials and equipment to be used in the repair or replacement of a cathodic protection system shall be a product of a manufacturer regularly engaged in the manufacture of the product, shall meet the NACE requirements, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.
- 3.0 EXECUTION:
- 3.1 Inspection: A complete inspection of the system shall be made in compliance with NACE RP0169. All findings shall be made in the form of a written report as directed by the Authorized Member Representative.
- 3.1.1 Sacrificial (Galvanic) Anode System: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil (electrolyte) potentials indicate that a neighboring structure is being made more positive, bonding shall be required to avoid damage. Inspect all underground metallic structure within 100 feet of the anode.
- 3.1.2 Impressed Current (Rectifier Ground Bed) System:
- 3.1.2.1 Component Inspection: Make inspection of the individual components to ensure that all parts are operating properly. The inspection shall include, but not be limited to, checking unevenness of the temperature or the stacks, hot or warm joints or contacts, arc burn paths, discolored insulators, watt-hour meter for creep, poor insulation, faulty lightning arresters, fuses, and cleanliness of the rectifier stack.
- 3.1.2.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.
- 3.1.2.3 Interference Tests: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil potentials indicate that a neighboring structure is being made more positive, the Contractor must make recommendations in report to avoid damage. Inspect and test all underground metallic structure

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within 1000 feet of the ground bed and all crossings of the protected structure. Test stations shall be provided at all crossings.

- 3.2 Maintenance and Repair: After the installation of anodes, the Contractor shall inspect the system and reinspect it again 2 to 4 weeks later. In the event that the system, when repaired, will not provide the required protection, as evidenced by the final tests and measurements, the Contractor, together with the Authorized Member Representative, shall determine the cause of the deficiency and the corrective measures necessary. After the necessary corrective measures have been determined, the contract may be modified as required. All repair or replacement material/equipment shall be NACE approved and similar to original materials. Installation shall be in compliance with the recommendations of the manufacturers as approved by the Authorized Member Representative to comply with the contract documents. Replacement materials that are installed shall comply with the applicable portions of NACE RP0169.
 - 3.2.1 Sacrificial (Galvanic) Anode System:
 - 3.2.1.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures found in NACE RP0169.
 - 3.2.1.2 Anode Output Adjustment: If required, install a resistor or resistance wire to prevent the anode from delivering excess current. The resistance wire, if used, shall be a nichrome wire, No. 16 or 22 AWG with type TW insulation.
 - 3.2.1.3 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.
 - 3.2.2 Impressed Current (Rectifier Ground Bed) Systems:
 - 3.2.2.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures in NACE RP0169.
 - 3.2.2.2 Installation: Install anodes similarly to the anodes in the initial installation. Replacement anodes are normally installed in auger-bored holes drilled adjacent to the damaged or deteriorated anode. Install anodes below the center line of the protected structure. Anodes may be emplaced horizontally if obstructions are encountered. Backfill material shall consist of coke breeze compacted in 6-inch layers. Foreign material shall be excluded from the backfill.
 - 3.2.2.3 Electrical Splices and Connections: Negative cable connections shall be thermit-welded in compliance with the weld manufacturer's instruction. Cover the connection with an approved backfill shield placed over the weld connection. The shields shall be sized to cover the exposed metal.
 - 3.2.2.4 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.
 - 3.2.2.5 Interference Testing: Make interference testing on all structures installed under this contract to locate damage being caused by existing or new impressed current cathodic protection systems or other sources of interference. It shall be the Contractor's responsibility to correct all interferences.
- 3.3 Maintenance and Operating Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the installation. These technical records shall include such items as manufacturers' data on installed equipment, operating instructions, lists of repair parts, names and addresses or sources of parts and services, current price lists, repair and maintenance instructions, construction specifications and shop drawings, and as-built drawings of the system.
 - 3.3.1 Consolidation of Records: The Contractor shall consolidate all cathodic protection records including surveys, inspections, operating data, maps, charts, location of leaks (leak maps), and manufacturers' parts manual.
 - 3.3.2 Updating Records: Update existing cathodic protection location maps to show any changes in location or addition of test points or stations, anodes, wiring, etc.
 - 3.3.3 Manuals: When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Authorized Member Representative six copies of operation and maintenance manuals of the cathodic protection system for guidance of using agency personnel. Prepare manual with contents as determined by the Authorized Member Representative.

Attachment 1: Specifications for the Work

Lightning Arresters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of lightning arresters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Arresters shall comply with ANSI/IEEE 28 and ANSI C62.2.
- 3.0 EXECUTION:
 - 3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.
 - 3.2 Workmanship shall be in compliance with ANSI C2.
 - 3.3 Cleaning: Clean work areas and materials of dirt, grime, grease, and debris.
 - 3.4 Expulsion Arresters shall be inspected for depleted fiber material and thin walls. Report deficiencies to the Authorized Member Representative.

Institutional Electric Heating Equipment

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of institutional electric heating equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Controls: NEMA DC 4, UL 20, UL 917, and UL 1020.
 - 2.2 Heaters: UL 499.
 - 2.3 General Electrical: NFPA 70.
 - 2.4 Asbestos Usage: Materials containing asbestos shall not be used if nonasbestos materials are available.
- 3.0 EXECUTION:
 - 3.1 Coordination: Contractor shall determine that heating equipment has been de-energized. Temporary heaters shall be supplied if required to maintain temperature.
 - 3.2 Motor Repair: Electric motors to be repaired shall be done by a shop specializing in the repair of motors.

Electric Unit Heaters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical unit heaters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Heating element shall have nickel-chromium wire packed in high purity magnesium oxide enclosed in a corrosion-resistant sheath. The embedded sheath shall be the manufacturer's standard design.
 - 2.2 Housing shall be fabricated from sheet steel complying with ASTM A 569. The housing shall be provided with means for suspension. Deflector blades shall be constructed of same material as housing and shall be manufacturer's standard design and operation.
 - 2.3 Fan shall be the propeller type fabricated of aluminum or steel.
 - 2.4 Controls:
 - 2.4.1 Thermal overload cutout of the manual reset type shall be provided to disconnect elements in the event normal operating temperatures are exceeded.
 - 2.4.2 Thermostat shall be unit or wall mounted and shall be heavy-duty type with enclosed contacts as specified by the manufacturer, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.

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- 2.5 Asbestos usage: materials containing asbestos shall not be used if nonasbestos materials are available.
- 3.0 EXECUTION:
- 3.1 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved.
- 3.2 Workmanship: Installation work shall be in compliance with the National Electric Code.

DIVISION 27-COMMUNICATIONS

Fiber Optic Cable Transmission System

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fiber optic transmission system. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fiber Optic Cable: EIA 455-25B, EIA 455-30B, EIA 455-33A, EIA 455-41A, EIA 455-46A, EIA 455-47B, EIA 455-51A, EIA 455-53A, EIA 455-61, EIA 455-65, EIA 455-81A, EIA 455-82B, EIA 455-88, EIA 455-91, EIA 455-104A, EIA 455-170, EIA 455-171, and EIA 455-177A, as applicable.
- 2.2 Fiber Optic Receivers: EIA 170, EIA 232E, and EIA 485 as applicable.
- 2.3 Fiber Optic Transmitters: EIA 170, EIA 232E, and EIA 485 as applicable.
- 2.4 Fiber Optic Modems: EIA 232 E and EIA 485 as applicable.
- 2.5 Fiber Optic Connectors: EIA 455-13. Connectors shall be of stainless steel.
- 2.6 Fiber Optic (FO) Repeaters: For simplex circuits, the repeater shall consist of an FO receiver connected to an FO transmitter. For Duplex circuits, the repeater shall consist of a pair of FO receivers that are connected to a pair of FO transmitters.
- 2.3 Fiber Optic Transceivers: EIA 170, EIA 232E, and EIA 485 as applicable.
- 2.8 Enclosures: NEMA 250.
- 3.0 EXECUTION: Contractor shall comply with provisions of the National Electric Code.

Central Monitoring, Control and Instrumentation

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of central monitoring, control, and instrumentation equipment. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Drawings and Data: Drawings and data on existing monitoring control and instrumentation equipment should be requested from the Authorized Member Representative.
- 2.2 Sensing Elements or Transducers: Devices that sense the condition, state, or value of a process variable and produce an output that reflects that condition.
- 2.3 Measurement and Signal Conditioning: Devices that condition and transmit the signal generated by the sensing element and transducers.
- 2.4 Control Devices: Include any device that performs a definite function in control system, such as any switch (limit, pressure, temperature, on-off, etc), valves, solenoid, relays, and solid-state control elements.
- 2.5 Central Monitoring and Control Devices: Include any device that either monitors the signal generated by the transmitters or control devices (indicators, recorders, annunciators, etc.) or provides a final control action from the signal generated by the transmitter such as controllers, computers, etc.
- 2.6 Product Codes and Standards:
- 2.6.1 Safety Requirements for Electrical Measuring and Controlling: ANSI C39.5.
- 2.6.2 Industrial Control Equipment: ANSI/UL 508.

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- 2.6.3 Electrical Analog Indicating Instruments: ANSI C39.1.
- 2.6.4 Instrument Transformers: ANSI C57.13.
- 2.6.5 Industrial Controls and Systems: NEMA ICS.
- 2.6.6 National Electrical Code: NFPA 70.
- 2.6.7 Limit Controls: UL 353.
- 2.6.8 Test Code for Industrial Controls: IEEE 74.
- 2.6.9 Master Test Code for Resistance Measurement: IEEE 118.
- 2.6.10 Master Test Code for Electrical Measurement in Power Circuits: IEEE 120.
- 2.6.11 Dynamic Response Testing of Process Control Instrumentation: ISA S26.
- 3.0 EXECUTION:
- 3.1 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI/IEEE C2.
- 3.2 Power supplies that may be a hazard during the performance of the work shall be locked out.
- 3.3 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.
- 3.4 Report: A final report shall be prepared after the maintenance, repair, or replacement has been accomplished. A list of all equipment worked on, the service performed on each piece of equipment, and calibration data shall be included in the report. The report shall be typed and furnished to the Authorized Member Representative.

DIVISION 28-ELECTRONIC SAFETY & SECURITY

Intrusion Detection System

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plant, labor, equipment and material and installation of intrusion alarm systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Motion Detector: Detectors used in the system shall be passive infrared (ceiling mount) or combination microwave/passive infrared (wall mount) and shall have adjustable sensitivity. Detectors shall have built-in tamper protection and have a visual alarm indicator. Sensitivity shall be 2 to 4 steps within field of view.
- 2.2 Balanced Magnetic Switches: Switch mechanism shall be of the balanced magnetic type that opens and crosses, or opens and grounds the circuit when actuated and have 24-hour tamper protection. To prevent welding of the contacts, each reed-type switch shall be provided with an overcurrent capacity. Switches shall be rated for a minimum lifetime of one million operations. Switches and magnets shall be in enclosures made of nonferrous metal. The switch mechanism shall be internally adjustable so that the operating gap between faces of the switch housing and the magnet container may be adjusted from 1/4 inch to 1 inch to accommodate installation variances. Switch boxes shall be the hub type or shall have threaded bodies. Stainless steel screws shall secure covers of cast-aluminum switch boxes. Covers of magnet housing shall not be readily removable. The balanced magnetic switches for doors shall be Wells Fargo Model SM-3.
- 2.3 Security Alarm Control Panel: The security alarm control panel shall match the base system control panel. Control panel shall have 12 zones and provide an event log. All electronics are contained on a single plug in circuit board utilizing surface mount "SMD" technology. The many programmable features are easily selected or changed from the security terminal remote stations. All programming is stored in a non-volatile EEPROM (Electrically Erasable Programmable Read Only Memory), which maintains its data even when disconnected from power. A "watchdog" circuit monitors the microprocessor and assures the operational integrity of the system. Battery backup shall be provided with control panel.
- 2.4 Electronic Keypad: The electronic keypad for shall allow programming of the control panel.
- 3.0 EXECUTION:

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- 3.1 All work shall be installed as shown on drawings in accordance with the manufacturer's diagrams and recommendations, except where otherwise indicated. The systems shall be totally integrated with the base alarm system. When any of the detectors senses an intruder, an alarm shall be produced in the main control panel located in the building.
- 3.2 **Balanced Magnetic Switch Mounting:** Unless otherwise indicated, magnetic switch components shall be mounted on the inner side of doors with metal brackets and hardware recommended by the switch manufacturer. Brackets shall be neatly designed and finished to match switch and magnetic housings. Switches shall be carefully connected in accordance with manufacturer's instructions to avoid degrading defeat-resistance. The operating portion of the switch shall be mounted on the doorframe with the associated magnet mounted on the door. Two switches shall protect double leaf doors, one on each door. Should a switch mechanism have to be mounted on a door, the electrical connection shall be jumpered within a flexible armored cord constructed from corrosion-resistant metal. Each end of the armored cord shall terminate in a junction box or other suitable enclosure. Armored cord ends shall be mechanically secured to the junction boxes by clamps or bushings. Conductors within the armored cord shall be provided with lug terminals at each end. The jumpered conductors and the armored cord shall display no mechanical strain as the door is moved from fully open to closed. The switch housing shall be protected from unauthorized access by a cover operated, corrosion-resistant tamper device. This device shall initiate an alarm when the cover is opened as much as 1/4 inch from closed position, and be inaccessible until actuated.
- 3.3 **Wiring:** System components shall be securely fastened to their supports independently of the wiring. Runs of conduit, wire and cable shall be straight, neatly arranged, properly supported, and parallel or perpendicular to walls and partitions. All wiring shall be concealed. Power conductors for the devices shall be number 18 AWG and the detection conductors shall be no smaller than number 22 AWG. All devices shall be wired to provide tamper supervision.
- 3.4 Upon completion of the installation and prior to final inspection, the Contractor shall furnish four copies of "as-built" drawings. Drawings shall show equipment configuration, control panel equipment, location of standby power, supply and all connecting wiring. Drawings shall include all wiring color codes and terminal numbers and termination points for all wires. In addition, the Contractor shall furnish four copies of a manual giving complete instructions for the operation, inspection, testing, and maintenance of the system including wiring diagrams.
- 3.5 **Operating Instructions:** Step-by-step procedures required for startup and operation shall be furnished at least 30 days prior to scheduled start of acceptance tests. The instructions shall include the manufacturer's name, equipment and their basic operating features.
- 3.6 **Maintenance Instructions:** A listing of routine maintenance procedures, possible breakdowns, and repairs shall be furnished at least thirty days prior to scheduled start of acceptance test. The instructions shall include simplified diagrams for the system as installed.
- 3.7 **Testing:** After all equipment for this system has been installed and made operational, and at a time directed by the Contracting Office, the Contractor shall conduct tests to demonstrate that the installation and the system operation is in accordance with the plans and specifications. Prior to the demonstration test for the Contracting Officer, the Contractor shall check the entire system, verify device and system satisfactory operation and correct all discrepancies. Testing of the system shall include remote annunciation of alarms. Satisfactory operation of all devices in the system shall be demonstrated during the test. Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing all field tests performed to adjust each detector system, and all field tests performed to provide compliance with the specified performance criteria. Each test report shall indicate the final position or reading of calibrating controls.

Fire Detection and Alarm Systems

- 1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of labor, equipment and material and installation of fire detection and alarm systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 **PRODUCTS:**

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- 2.1 Materials and equipment shall be new standard products of the manufacturer's latest design, and suitable to perform the function intended. Components of two or more models will not be combined to form a single control unit. Where two or more pieces of equipment must perform the same functions, the same manufacturer shall produce this equipment. The name of the manufacturer shall appear on all major components. Fire alarm zones shall be laid out by device type such as: attic heat detectors, pull stations, ceiling mounted heat detectors, flow switches, tampers, and duct detectors. Zones shall not be laid out geographically such as by sections of the facility with all devices in that section mixed in a single zone. There shall only be one central fire alarm panel located in any facility. Heat detectors shall be removed from facilities when a fire sprinkler system is installed.
- 2.2 All materials and equipment shall conform to the requirements of the UL, or the FMS for fire-alarm systems of the type indicated. The Contractor shall submit proof that the items furnished under this specification conform to these requirements. The UL label or seal, or listing in the U Fire Protection Equipment Directory will be accepted as evidence that the items conform to UL requirements. The FMS label or seal, or listing in the Factory Mutual Approval Guide will be accepted as sufficient evidence that the items conform to the FMS requirements.
- 2.3 Contractor shall include a complete set of shop drawings to include all material and equipment proposed for installation. Shop drawings shall show the complete conduit and wiring layout for the equipment, including AWG size and type wire, number of conductors and connections to the equipment items. The drawings shall be point to point from panel to each J-box to each device and show wire color and wire number. Numbers will be installed on wires using crimp-on tags placed 5 to 6 inches from Wires end.
- 3.0 EXECUTION:
- 3.1 Installation and wiring: System components shall be securely fastened to their supports independently of the wiring. The control unit shall be installed in a room directly accessible from the building exterior. Runs of conduit, tubing, wire and cable shall be straight, neatly arranged, properly supported, and parallel or perpendicular to walls and partitions. Installation of wiring shall conform to NFPA 70. All wiring shall be installed in conduit. The sum of the cross-sectional areas of individual conductors shall not exceed 40 percent of the interior cross-sectional area of the conduit. Wiring for fire alarm zones shall be color-coded by zone with two colors remaining consistent throughout the zone. No two zones using the same colors shall transit the same junction box. This does not negate the requirements for numbering wires. Numbers will originate at the control panel and be used throughout the circuit at all junctions and terminal devices. Wiring for audible visual circuits shall be color-coded red for positive and black for negative. All junction boxes and their covers will be painted red. Existing wiring in facilities being renovated shall not be reused.
- 3.2 Audible and visual alarm devices: Audible and Visual devices shall be furnished to indicate an alarm throughout the building. Type devices are specified below. The top of the devices shall be mounted in accordance with NFPA 72 para. 4-3. All devices shall be supervised and operate on low voltage D.C. furnished by the control panel. All audible devices shall meet U 464 requirements.
- 3.3 Signal Devices: Strobe horns shall be used for non-coded signals. Bells will be used where horns conflict with other devices. Chimes with strobe lights will be used in low noise areas such as hospitals and childcare facilities. The same type of device shall be consistent throughout a facility. Devices shall not be mixed.
- 3.4 Visual Alarm Indicator: Visual indicators shall have a high impact plastic translucent lens with "FIRE" printed in red letters on at least two sides and shall be positioned to be readable from any angle. The flashing of multiple visual indicators shall be synchronized. This indicator will normally be integral with the horn except where only a visual indicator is required such as latrines.
- 3.5 Manual fire-alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into alarm initiating circuits. Stations shall be installed on semi-flush mounted outlet boxes. Stations shall be double action type. Stations shall be located within 5 feet of the exits and on all floors. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels or glass rods for operation are not acceptable. The use of a common screwdriver shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for

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the voltage and current upon which they shall operate. Stations shall have a separate screw terminal or lead for each conductor unless a nut plate is provided to accommodate both conductors in a loop. The loop shall not be continuous at the connection. Surface mounted boxes shall be painted the same color as the fire alarm manual stations.

- 3.6 Fire detecting equipment shall conform to NFPA 72 and shall be of the following types, as indicated on the drawings and as approved by the Contracting Officer. Detector circuit design shall be suitable for the types and numbers of detectors, as approved, and shall limit detector circuit current not to exceed ratings of the detectors and associated relays. Per NFPA 72 para. 2-3.6.1.3, detectors shall not be installed until after the construction cleanup of all trades is complete and final. Furthermore, during renovation projects, existing detectors shall be removed and reinstalled or covered during construction.
- 3.7 Photoelectric Type Smoke Detectors: Ceiling smoke detectors, which operate on the light scattering or the light obstruction principle, shall be furnished. Smoke detectors shall not be mounted in the direct path of airflow from ceiling or wall-mounted diffusers.
- 3.8 Duct-Mounted Smoke Detectors: Duct-mounted photoelectric smoke detectors shall be furnished and installed in accordance with NFPA 72 para. 2-10.5 and NFPA 90A. A remote key/reset/test switch shall be furnished for duct detectors that are at a location that is not easily accessible for testing the installed duct detector. The detector housing shall be equipped with a transparent viewing port which shall permit viewing of detector head Alarm/Power-On indicator -at viewing angles up to 80 degrees off normal and inspection of cleanliness conditions inside the detector head mounting chamber. The detector shall be the plug-in type in which the detector base contains terminals for making all wiring connections. The detector indicator shall blink intermittently during standby conditions and shall glow red during alarm conditions. All LED's to indicate the operating and alarm condition and test and reset buttons or test part shall be visible, and accessible, with the unit installed and the cover in place. Detector operating voltage will be supplied from the DC circuits of the fire alarm panel.
- 3.9 Air Handler Units (AHU) with a capacity below 2000CFM shall not have duct smoke detectors installed. The AHU will be shutdown by the fire alarm control panel (FACP). AHU's with a capacity between 2000 - 15,000 CFM shall have one duct detector installed in the supply air duct. AHU's with a capacity greater than 15,000 CFM will have two duct detectors installed, one in the supply air duct and one in the return air duct. Duct smoke detectors will shut down their respective AHU's upon alarm.
- 3.10 Fixed-Temperature Heat Detectors: Only Fixed temperature heat detectors shall be installed unless another type is specifically required to meet code requirements. The UL 521 test rating shall be 135 degrees F. or as shown. Heat detectors installed in attics and mechanical rooms shall be rated at 194 degrees F only. Heat detectors installed in exterior applications such as open storage units shall be all weather detectors, 302AW194.
- 3.11 Control unit (Fire alarm panel) shall be installed as part of the system in each protected building and shall be approved for use with the fire detecting equipment, manual fire-alarm stations, and alarm-sounding devices. The unit shall operate with 24 volts DC derived from its internal AC rectifier/power supply. The control unit circuits shall be exclusively solid state. The control unit shall be housed in a substantial steel cabinet with lock and key. The cabinet shall be painted inside and out. The control unit shall include light emitting diodes (LED's)(Lamps or neon tubes not acceptable) to visually indicate the system condition, e.g., alarm and trouble by zone, system trouble conditions, primary and backup power supply status, etc. A single switch will be provided to test all LED'S. The control unit shall include switches and devices to test all control unit functions. This includes a system test switch, zone disable, system reset, auxiliary disconnect and audible trouble silence switch, etc. The silence switch shall be provided with an audible resound feature. The unit shall supervise all alarm initiating circuits and all alarm sounding circuit. The components shall be modular with plug-in capability. Wires will not require removal to service a module. A separate supervisory module will be provided for tamper and supervisory circuits. All zones will be identified by rigid, engraved plastic ID tags attached to the face of the control unit or the internal face providing they are visible through a transparent window. Paper, etching or embossing tape is not acceptable. It shall also provide regulated and unregulated DC power for smoke detectors,

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which do not operate on zone voltage. With a zone disabled the control unit shall repeat the alarm sequence when a second, third, etc., alarm is initiated in other zones. All LED's shall be plainly visible when the door on the control unit is closed. The control unit shall operate separate audible and visual signals when a ground fault is detected in any supervised circuit or device. It shall sound a distinct audible alarm and flash the visual alarm indicators throughout the building when any manual or automatic device on the system is activated. The fire alarm panel shall be equipped with at least two alarm relays and one trouble relay as integral components of the panel. Add on relays are not acceptable. One alarm relay and the trouble relay dry contacts shall be used solely to activate a radio transceiver. The second alarm relay shall accomplish all auxiliary control, interlock and shutdown functions, as indicated herein and as shown on the drawings. Only low voltage (24) will be brought into the panel for auxiliary functions. The use of plug-on units and special devices not supplied by the manufacturer in conjunction with this feature is unacceptable. The control unit shall meet the requirements of UL 864 and shall be listed for NFPA 72. A remote annunciator will not be required.

- 3.12 Addressable Control Units: Addressable control units shall be fully field programmable from the internal keyboard. This shall include the addition of points, modification of points, and deletions. All system software required to perform uploads/downloads by base maintenance personnel shall be supplied.
- 3.13 Primary Power Supply: Primary power supply for the control unit shall be on a dedicated 15-amp branch circuit protected by surge protection devices. The service disconnect shall be accessible only to authorized personnel, installed adjacent to the control unit and clearly marked FIRE ALARM. At locations where the circuit breaker is out of sight of the fire alarm control panel, a disconnect switch shall be installed adjacent to the control panel. The conductors feeding the control panel shall be #14 AWG. Stake-on terminal lugs are not acceptable for wire terminations. Id tag will be rigid plastic.
- 3.14 Standby Power Supply: Standby power to insure operation of the fire alarm system in the event of primary power failure shall be provided by no more than two each maintenance free storage batteries. Power supply shall be provided with an automatic battery charger capable of a high/low charge rate. Battery shall have the capacity to operate the fire system for 24 hours and then be capable of sounding all alarms for five minutes in the event of total failure of the primary power supply. The charging circuit for the battery shall be supervised to indicate a low battery condition and be rated to recharge fully discharged batteries in 24 hours.
- 3.15 After all equipment for this system has been installed and made operational, the contractor shall conduct tests to demonstrate that the installation and the system operation is in accordance with the plans and specifications. Testing of the system shall include remote annunciation of alarms and trouble conditions to the fire department. The contractor will also certify in writing that the work accomplished meets all contractual requirements.

DIVISION 31-EARTHWORK & DIVISION 32-EXTERIOR IMPROVEMENTS**Standard Penetration Tests**

- 1.0 DESCRIPTION OF WORK: This specification covers core drilling and borings for subsurface investigation of soils.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
 - 3.1 Auger Borings: ASTM D 1452.
 - 3.2 Soil Samples: ASTM D 1586, ASTM D 1587.
 - 3.3 Rock Cores: ASTM D 2113, Size BX and NX.
 - 3.4 Bearing Capacity: ASTM D 1194.
 - 3.5 Soils Classification: ASTM D 2487, D 2488.
 - 3.6 Boring Logs: Boring report shall include, but not be limited to, a boring location plan locating and numbering boring and boring logs. Log of borings shall have boring number; date of start and

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finish of boring; rig type, job number and name; sample number, depth, and type; depth of strata changes, soil description and classification, surface elevation, depth of boring, and depth of water table.

Concrete Core Drilling

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of equipment and labor for core drilling of existing concrete. Procedures shall be in accordance with the equipment manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: (Section not used)
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Equipment shall be of shot-drill or diamond-drill type and shall be acceptable to the Authorized Member Representative. Shot drilling shall be used on horizontal surfaces only.
 - 3.1.2 Location and Size of Cores shall be as directed by the Authorized Member Representative.
 - 3.2 Core Drilling:
 - 3.2.1 Drilling shall be performed in a neat manner providing a smooth, clean hole perpendicular to the surface.
 - 3.2.2 Equipment shall be rigidly affixed to the surface to prevent drifting or misalignment of the hole.
 - 3.2.3 Work shall be planned and executed so that dust and rubble are held to a minimum.
 - 3.2.4 Surrounding surfaces, material and equipment shall be protected from damage from dust, water and flying debris.
 - 3.3 Test Samples:
 - 3.3.1 Where cores from drilling are to be used for testing of existing concrete, the resulting core shall meet the requirements of ASTM C 42.
 - 3.3.2 Test cores shall be taken at locations as directed by the Authorized Member Representative.

Clearing and Grubbing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for clearing and grubbing.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
 - 3.1 Clearing: Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.
 - 3.2 Grubbing: Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.
 - 3.3 Tree removal shall include the felling of trees and the removal of stumps and roots.
 - 3.4 Disposal of Materials: All felled timber, logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be in compliance with all federal, state, and local regulations, including environmental regulations.

Site Grading

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for site grading.
- 2.0 PRODUCTS: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor. The source of borrow material shall be the Contractor's responsibility. Satisfactory material shall be approved by the Authorized Member Representative.
- 3.0 EXECUTION:

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- 3.1 Topsoil shall be removed without contamination with subsoil and stockpiled convenient to areas for later application or at locations designated. Topsoil shall be removed to full depth and shall be stored separate from other excavated materials and piled free of roots, stones, and other undesirable materials.
- 3.2 Excavation: After all stripping has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades designated. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be disposed of in areas approved for surplus material storage.
- 3.3 Preparation of Ground Surface for Fill: All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsatisfactory material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped, or broken up as directed, in such manner that the fill material will bond with the existing surface.
- 3.4 Fills and Embankments: The completed fill shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case. Fill shall be satisfactory material and shall be reasonably free from roots, other organic material, trash, and stones having a maximum diameter greater than 6 inches. No frozen material will be permitted in the fill. Stones having a dimension greater than 4 inches shall not be permitted in the upper 6 inches of fill or embankment.
- 3.5 Finished Excavation, Fills, and Embankments: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes.
- 3.6 Placing Topsoil: On areas to receive topsoil, the compacted sub grade soil shall be scarified to a 2-inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry.

Rock Removal

- 1.0 DESCRIPTION OF WORK: This specification covers removal of rock. Operating procedures shall be in accordance with the equipment manufacturer's recommendations. Demolition and removal of material shall be as required to support the work.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Review the site for existing features, such as buildings or utilities that will require protection or other coordination of the work.
 - 3.1.2 Clear the area and excavate as required to provide access to the rock to be removed.
 - 3.1.3 Provide bracing, shoring, etc., as required to safely execute the work.
 - 3.1.4 Provide dewatering as required.
 - 3.2 Installation:
 - 3.2.1 Remove rock to the lines required or designated. Blasting must be approved by the Authorized Member Representative.
 - 3.2.2 Haul Excavated Materials to the designated area.

Finish Grading for Structures and Slabs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for finish grading for structures and slabs.
- 2.0 PRODUCTS: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor. The source of approved borrow material shall be the Contractor's responsibility. Satisfactory materials shall consist of cohesionless materials classified by ASTM D 2487 as CL, GW, GP, GM, GC, SP, SC, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are

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nonplastic.

3.0 EXECUTION:

- 3.1 Topsoil shall be removed without contamination with subsoil and stockpiled convenient to areas for later application or at locations specified.
- 3.2 Excavation shall be performed to the required lines and grades. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be disposed of in areas approved for surplus material storage.
- 3.3 Fills and Embankments: The completed fill shall meet the requirements of the particular case. Fill shall be satisfactory material. No frozen material will be permitted in the fill. Stones having a dimension greater than 4 inches shall not be permitted in the upper 6 inches of fill or embankment.
- 3.4 Compaction Requirements: Satisfactory material shall be placed in horizontal layers not exceeding 8 inches in loose depth and compacted to 95 percent maximum density in conformity with ASTM D 1556.

Site Excavation and Fill

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of material for site excavation and fill.
- 2.0 PRODUCTS: Satisfactory materials shall consist of cohesionless materials classified by ASTM D 2487 as CL, GC, GW, GP, GM, SP, SC, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
- 3.0 EXECUTION:
- 3.1 Excavation: The Contractor shall perform excavation of every type of material encountered within the limits of the project, to the required lines, grades, and elevations. Satisfactory excavated materials shall be placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials. Additionally required material for fill or embankments shall be excavated from approved borrow areas.
- 3.2 Ditches, Gutters, and Channel Changes: Excavation of ditches, gutters, and channel changes shall be to the required cross sections, grades, and elevations. Backfill shall be thoroughly compacted satisfactory material.
- 3.3 Selection of Borrow Material: Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from approved sources.
- 3.4 Backfill: Backfill adjacent to any and all types of structures shall be placed and compacted in such a manner as to prevent wedging action or eccentric loading upon or against any structure.
- 3.5 Embankment: Earth embankments shall be constructed from satisfactory materials free of organic or frozen material in the embankment and rocks with any dimension greater than 4 inches in the upper 8-inch layer. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth.
- 3.6 Compaction Requirements: Satisfactory material shall be compacted to 90 percent maximum density in conformity with ASTM D 1556.

Excavation, Trenching and Backfilling for Utilities Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for excavation, trenching, and backfilling for utilities systems.
- 2.0 PRODUCTS:
- 2.1 Satisfactory Materials: Satisfactory materials shall consist of any cohesionless materials classified by ASTM D 2487 as CL, GC, GM, GW, GP, SC, SP, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
- 2.2 Select Granular Material: Select granular material shall consist of well-graded sand gravel, crushed gravel, or crushed slag composed of hard, tough, and durable particles.
- 3.0 EXECUTION:
- 3.1 Excavation: During excavation, material satisfactory for backfilling shall be stockpiled at a sufficient distance from the banks of the trench to prevent slides or cave-ins. Excavated material not required

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or not satisfactory for backfill shall be removed from the site. Trenches shall be dewatered as required.

- 3.1.1 Trench Excavation: Trench walls below and above the top of the pipe shall be sloped or made vertical, depending on the type of pipe used and the soil conditions. Trench width below the top of the pipe shall not exceed 24 inches plus pipe outside diameter (OD) for pipes of less than 24-inch inside diameter and shall not exceed 36 inches plus pipe OD for larger sizes. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater shall be removed to avoid point bearing. Vertical trench walls more than 5 feet high shall be shored. Trench walls that are cut back shall be excavated to at least the angle of repose of the soil.
- 3.1.2 Removal of Unyielding Material: Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with select materials and compacted.
- 3.1.3 Removal of Unstable Material: Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material placed in layers not to exceed a loose thickness at 6 inches and compacted.
- 3.1.4 Excavation for Appurtenances: Excavation for manholes, catch basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations.
- 3.2 Backfilling: Backfill material shall be placed in layers of 8 inches loose thickness unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils under roadways, airfields, etc. Water flooding or jetting will not be permitted.
- 3.2.1 Sidewalks, Turfed or Seeded Areas, and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Water flooding or jetting methods of compaction will be permitted for granular noncohesive backfill material. Water jetting will not be allowed to penetrate the initial backfill.
- 3.2.2 Trench Backfill: Trenches shall be backfilled to the grade required. The trench shall be backfilled to 2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during any required pressure tests unless approved by the Authorized Member Representative.
- 3.2.3 Displacement of Sewers: After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected to determine whether significant displacement has occurred. If the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed.
- 3.3 Special Requirements: Special requirements for both excavation and backfill relating to the specific utilities are as follows:
 - 3.3.1 Gas Distribution: Trenches shall be excavated to a depth that will provide not less than 18 inches of cover in rock excavation and not less than 24 inches of cover in other excavation.
 - 3.3.2 Water Lines: Trenches shall be excavated to a depth that will provide a minimum cover required for frost protection, or from the indicated finished grade, whichever is lower, to the top of the pipe. For fire protection yard mains or piping, the depth of cover shall comply with NFPA No. 24.
 - 3.3.3 Heat Distribution System: Trenches shall be excavated to a depth that will provide a minimum cover required for frost protection. Initial backfill material shall be free of stones larger than 1/4 inch in any dimension.
 - 3.3.4 Electrical Distribution System: Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise required.

Structural Excavation and Backfill

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for structural excavation.

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- 2.0 PRODUCTS: (Section not used.)
- 2.1 Satisfactory Materials: Satisfactory materials shall consist of any cohesionless materials classified by ASTM D 2487 as CL, GC, GM, GW, GP, SC, SP, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
- 2.2 Select Granular Material: Select granular material shall consist of well-graded sand, gravel, crushed gravel, or crushed slag composed of hard, tough, and durable particles.
- 3.0 EXECUTION:
- 3.1 General: The excavation shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure. Unsatisfactory material shall be removed, and satisfactory material shall be placed and compacted.
- 3.2 Drainage: Excavation shall be performed so that the area of the site and the area immediately surrounding the site and affecting operations at the site will be continually and effectively drained.
- 3.3 Utility and Drain Trenches: Trenches for underground utilities systems and drain lines within 5 feet of the building or structure shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed.
- 3.4 Borrow: Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained from approved sources.
- 3.5 Excavated Materials: Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed.
- 3.6 Final Grade of Surfaces of Support Concrete: Excavation to final grade shall not be made until just before concrete is to be placed. For pile foundations, the excavation shall be stopped at an elevation 6 to 12 inches above the bottom of the footing before driving piles. Rock shall be worked down to a satisfactory bed or sidewall.
- 3.7 Filling and Sub grade Preparation: Satisfactory materials free from roots, debris, or stones larger than 3 inches shall be used in bringing fills to the lines and grades indicated and for replacing unsatisfactory materials.
- 3.8 Backfilling: Backfilling shall not begin until construction below finish grade has been approved; underground utilities systems have been inspected, tested, and approved; forms have been removed; and the excavation has been cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Backfill shall not be placed in wet or frozen areas. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

Pipe Sleeves for Utility Lines

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pipe sleeves for utility lines. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Jack-Boring Operation: AREA-01.
- 2.2 Sleeve Materials:
 - 2.2.1 Concrete Pipe: ASTM C 76.
 - 2.2.2 Steel Pipe: ASTM A 53.
 - 2.2.3 Corrugated Steel Pipe: ASTM A 760.
 - 2.2.4 Ductile Iron Pipe: ASTM A 716.
- 3.0 EXECUTION:
- 3.1 Roads and Airfields: At primary access road crossings and at airfield runways and taxiways where aircraft move under their own power, utility lines shall be encased in sleeves of rigid conduit for the length installed under such facilities. Sleeves shall extend a minimum of 5 feet beyond the toe of the slope on each side of the embankment.

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- 3.2 Structures: Where utility lines are required to be installed within 3 feet of existing buildings or structural foundations, the lines shall be encased in sleeves of rigid conduit.
- 3.3 Clearance: A minimum clearance of at least 2 inches between the inner diameter of the sleeve and the maximum outside diameter of the sleeved pipe, including the joints, shall be provided.
- 3.4 Sand Bedding: Sand bedding shall be provided for the carrier pipe through the sleeve.

Field Tests

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for soils compaction testing.
- 2.0 PRODUCTS:
 - 2.1 Cohesionless and Cohesive Materials: Cohesionless materials include materials classified in ASTM D 2487 as CL, GM, GC, GW, GP, SC, SM, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH.
 - 2.2 Degree of Compaction: Degree of compaction required as expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, Method D, abbreviated below as maximum density.
- 3.0 EXECUTION:
 - 3.1 Compaction Requirements: Each layer shall be compacted to not less than the percentage of maximum density specified below:
Percent CE 55 Maximum Density

	Cohesive Material	Cohesionless Material

Fill, Embankment, and Backfill		
Under proposed structures, building slabs, steps, and paved areas	90	95
Under sidewalks and grassed areas	85	90
Sub grade		
Under building slabs, steps, and paved areas, top 12 inches	90	95
Under sidewalks, top 6 inches	85	90

- 3.2 Test Procedure: Field in-place density shall be determined in accordance with ASTM D 1556.

Soil Stabilization: Crushed Rock Sub Grade

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and the preparation and production of a stabilized sub grade by adding granular material and/or fines to the native sub grade material.
- 2.0 PRODUCT: The crushed rock sub grade shall be a composite mixture of coarse aggregate and fine aggregate. Coarse aggregate shall consist of hard, durable particles or fragments of stone, gravel, or slag, or a combination of these. Materials that break up when alternately frozen and thawed, or when alternately wetted and dried are not suitable for stabilized material. Fine aggregate shall consist of natural or crushed sand. The composite mixture of coarse and fine aggregates should be free from vegetable matter and lumps or balls of clay. Aggregate used shall meet the following gradation limits or shall meet the gradation requirements of the applicable State Highway Department wherein the work is performed as approved by the Authorized Member Representative:
 - Coarse Aggregate
 - Retained on 1-1/2 inch sieve 0 percent
 - Retained on 3/4-inch sieve 0 - 15 percent
 - Retained on No. 4 sieve, minimum 10 percent
 - Retained on No. 8 sieve 25 - 70 percent
 - Fine Aggregate
 - Retained on No. 40 sieve 50 - 90 percent
 - Retained on No. 200 sieve 85 - 95 percent
- 3.0 EXECUTION: Scarify the sub grade to the depth required. Add granular material to the native material that will bring the composite mixture into compliance with sub grade material

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requirements. Add water and compact sub grade to required density.

Soil Stabilization: Hydrated Lime

- 1.0 DESCRIPTION OF WORK: This specification covers furnishing of materials and the preparation and production of a stabilized sub grade by the addition of hydrated lime to the native material.
- 2.0 PRODUCTS: Hydrated lime material requirements shall be as follows:
 - 2.1 Available Lime Index as Calcium Hydroxide: 90 percent minimum.
 - 2.2 Residue Retained on No. 30 Sieve: 1 percent maximum.
 - 2.3 Residue Retained on No. 200 Sieve: 20 percent maximum.
- 3.0 EXECUTION:
 - 3.1 Preparation: Scarify the sub grade to the depth required and pulverize the material until it is substantially free of lumps greater than 3 inches in diameter.
 - 3.2 Installation: Lime shall be applied to the pulverized material as a slurry unless otherwise directed. Water shall be added as needed to provide a moisture content of not less than 20 percent. Surface-applied lime slurry shall be plowed and/or disced into the soil as necessary. The resulting mixture shall be aged for not less than 48 hours before compaction.

Soil Stabilization: Vibroflotation

- 1.0 DESCRIPTION OF WORK: This specification covers the densification of sandy subsurfaces by the method of vibroflotation.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION: The vibroflotation process shall be applied only to areas of clean, granular soils, with not over 20 percent silt or 10 percent clay. Vibrators shall be water-jetted into the soil mass to the depth required. The vibrator shall be withdrawn in 1 foot increments as the saturated soil compacts laterally and at a rate of approximately 1 ft/min to a minimum relative density of 70 percent. As the surface crater forms, sand or crushed rock shall be added and compacted to the appropriate line and grade. The horizontal distance between successive treatments shall not exceed 5 feet, or as directed.

Soil Sterilization

- 1.0 DESCRIPTION OF WORK: This specification covers soil sterilization. Products shall be as directed. Installation procedures shall be in accordance with the product manufacturer's recommendations.
- 2.0 PRODUCTS:
 - 2.1 Weed Eradication and Soil Fumigation: Products approved by the Environmental Protection Agency.
 - 2.2 Liquid and Dry Herbicides:
 - 2.2.1 Bare Ground Herbicides: Bromacil powder mixture or an ammonium sulfamate spray.
 - 2.2.2 Wetting Agents: As required.
 - 2.3 Equipment: Equipment shall be appropriate to the application and approved before use by the Authorized Member Representative.
- 3.0 EXECUTION:
 - 3.1 Soil: After the sub grade has been prepared, all areas to be surfaced shall be treated with a weed eradicator and soil fumigant only in the designated areas.
 - 3.2 Wetting Agents: Wetting Agents may be used as an additive to improve the performance of weed and brush herbicides.

Sediment Control

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and the installation of sediment control by means of a silt fence to control the drifting of silt, sand, dust, or earth.
- 2.0 PRODUCTS:
 - 2.1 Silt Fence shall be composed of 100 percent spunbonded nylon with polyester netting and shall have the following minimum properties:
 - Weight 4.2 oz/yd ASTM D 3776 2
 - Thickness 10 mils ASTM D 1777
 - Grab Tensile 130 lbs. ASTM D 1682

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Elongation to Break 25% +/- 3% ASTM D 1682

Mullen Burst 210 lbs.

Water Flow Rate 470 gpm/ft²

Equip. Opn. Size 70 - 100

Cord 1/8 in. Nylon Braid

Strength Retention Ultraviolet Protection Fabric Width Supplied in Widths to Meet Local, State, D.O.T., and/or Federal Requirements

- 2.2 Fence Posts shall be steel T-posts or cured oak posts, spaced approximately 8 feet apart. Selection of the type of post used, as well as the distance between posts, shall be determined by the manufacturer of the fabric and approved by the Authorized Member Representative.

3.0 EXECUTION:

- 3.1 Installation: Installation procedures shall be as recommended by the manufacturer.

- 3.2 Reuse: Silt fence shall be of such quality that it may be removed and reused at other sites.

Gabions

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gabions. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

- 2.1 Wire Cages shall be made of hexagonal twist mesh (3 1/2 inches x 4 1/2 inches) with heavily galvanized steel wire. Wire for wire cages shall be a minimum of 0.118 inch in diameter and shall be in conformance with ASTM A 510 and A 641.

- 2.2 Lacing Wire shall meet the same specifications as the wire used in the mesh, except that its diameter shall be a minimum of 0.0866 inch.

- 2.3 Fill Material shall consist of hard, durable, clean stone, 4 to 8 inches in size, or as approved.

3.0 EXECUTION:

- 3.1 Preparation: Before gabions are placed, the earth on which the gabions are to be placed shall be graded to be relatively smooth.

3.2 Installation:

- 3.2.1 Baskets shall be delivered in a collapsed form. Erect and lace together with lacing wire.

- 3.2.2 Install Fill Rock in mesh baskets with appropriate equipment. Manually adjust stone during the filling operation to prevent undue voids.

- 3.2.3 Hand Place Exposed Faces using selected stone to prevent gabions from bulging. Level the last lift of stone with the top of the gabion to properly close the lid to provide an even surface for the next course.

Riprap

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of riprap. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

- 2.1 Riprap: Stone used for dumped riprap shall be hard, durable, angular in shape, resistant to weathering and to water action, and free from overburden, spoil, shale, and organic material. Neither width nor thickness of a single stone should be less than one third its length. Rounded stone, boulders, shale, and stone with shale seams will not be acceptable. The minimum density of the riprap material shall be 162 pounds per cubic foot. Each load of riprap shall be reasonably well graded. Sand and rock dust exceeding 5 percent by weight of each load shall not be permitted.

- 2.2 Riprap Bedding: The riprap bedding blanket shall consist of well-graded gravel, crushed rock, sand, or a combination thereof with a maximum size of 6 inches. All material comprising the riprap bedding blanket shall be composed of tough, durable particles, reasonably free from thin, flat, and elongated pieces, and shall contain no organic matter nor soft, friable particles in excess quantities.

3.0 EXECUTION:

- 3.1 Preparation: Prepare earth slopes by grading and compacting.

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3.2 Installation:

- 3.2.1 Riprap Bedding Blanket Layers shall be placed on the prepared slope or area to develop the full thickness. Each layer shall be placed in one operation, using methods that will not cause segregation of particle sizes within the bedding. The surface of the finished layer should be reasonably even and free from mounds or windrows.
- 3.2.2 Stone for riprap shall be placed on the prepared slope or area in a manner that will produce a reasonably well-graded mass of stone with the minimum practicable percentage of voids. Riprap shall be placed to its full course in one operation and in such a manner as to avoid displacing the underlying material. The larger stones shall be well distributed and the entire mass of stone shall be well-graded. The result shall be a compact, uniform riprap layer.

Soil: Cement Surfacing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of soil-cement surfacing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Soil: Use SP and SM soils as classified in ASTM D 2487. The soil aggregate shall contain not more than 55 percent material by dry weight passing the No. 4 sieve and not more than 25 percent material passing the No. 200 sieve. Clay lumps shall be removed.
 - 2.2 Cement: ASTM C 150, Type I.
 - 2.3 Curing Compound: ASTM C 309.
- 3.0 EXECUTION:
 - 3.1 Place the plant-mixed soil-cement in uniform lifts and compact to the agreed-upon density as determined by ASTM D 558. The optimum moisture content shall be maintained.
 - 3.2 Finish soil-cement surface to the required lines, grades, and cross sections after compaction.
 - 3.3 Construction Joints: If required, construction joints may be horizontal or vertical.
 - 3.4 Curing: Temporary curing of surfaces to receive subsequent bonded lifts or coatings shall be by water fogging. Final curing shall be by application of a membrane maintained intact for 7 days.

Portland Cement Concrete Overlays

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Portland cement concrete overlays on previously paved areas. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Coarse Aggregate:
 - 2.1.1 Composition: Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, a combination thereof, or crushed blast-furnace slag.
 - 2.1.2 Particle Shape: Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by ASTM D 3398.
 - 2.1.3 Gradation: The maximum size of coarse aggregate shall be the lesser of 1/4 of the pavement thickness or 2 inches nominal size. Gradation limits are specified in ASTM C 136.
 - 2.1.4 Deleterious Substances: The amount of deleterious substances in the coarse aggregate shall not exceed the limits, defined in ASTM C 117 and C 123.
 - 2.2 Fine Aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand and shall be composed of clean, hard, durable particles. Particles of the fine aggregate shall be generally spherical or cubical in shape. Gradation limits are specified in ASTM C 136.
 - 2.3 Portland cement shall be Type I in compliance with ASTM C 150.
 - 2.4 Air-Entraining Admixture shall be in compliance with ASTM C 260. Concrete mixtures shall have air

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- content by volume of concrete of 4 to 7 percent based on measurements made immediately after discharge from the mixer.
- 2.5 Concrete mixture shall have a nominal slump of 2 inches with a maximum of 3 inches and a 28-day flexural strength of not less than 650 psi.
 - 2.6 Joint and Crack Sealing Materials: Joint filler, joint sealant, and crack sealant shall comply with the following:
 - 2.6.1 Expansion joint fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard in compliance with the physical requirements of ASTM D 1752.
 - 2.6.2 Type I sealant shall comply with applicable standards and/or specifications, except that sealant may be furnished as a ready-mixed liquid.
 - 2.6.3 Type II sealant shall comply with applicable standards and/or specifications.
 - 2.6.4 Type V sealant shall comply with CE CRD-C-527 and may be either a single or multiple component material.
 - 2.7 Epoxy-Resin Materials: Materials used in Epoxy-resin grout, mortar, and concrete shall comply with the following:
 - 2.7.1 Epoxy-resin grout shall be a two-compound material formulated to comply with Applicable standards and/or.
 - 2.7.2 Epoxy-resin concrete shall be composed of epoxy-resin binder and uniformly graded aggregate in compliance with ASTM C 144. The maximum size of aggregate shall be 3/8 or 1/2 inch.
 - 2.8 Dowels shall be plain steel bars complying with ASTM A 499.
 - 3.0 EXECUTION:
 - 3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc. to meet the required grade. Bonding course shall be applied to the area prepared to receive overlay and shall be of Epoxy-resin grout and Portland cement mortar.
 - 3.2 Concrete Placement: Concrete shall be placed within 45 minutes from the time all ingredients are charged into the mixing drum.
 - 3.2.1 Weather Limitations: The temperature of the concrete placed during warm weather shall not exceed 85 degrees F. Special protection measures, approved by the Authorized Member Representative, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. Calcium chloride shall not be used.
 - 3.3 Vibration: In the final phases of placing, surface vibrating equipment shall be used, and the duration of vibration shall not exceed 20 seconds.
 - 3.4 Joints shall be saw cut and in alignment with underlying existing joints.
 - 3.5 Finishing:
 - 3.5.1 Transverse Finishing: Immediately after placement, concrete shall be accurately struck off and screeded to such elevation that when consolidated and finished, the surface of the pavement will be free from porous places and will be at the required grade. The finishing machine shall make at least two trips over each area of pavement to compact the concrete and produce a surface of uniform texture, true to grade.
 - 3.5.2 Longitudinal Floating: After completion of the transverse finishing, the longitudinal mechanical float shall be operated to smooth and finish the pavement to grade.
 - 3.5.3 Hand finishing shall be with an approved strike and tamping template and a longitudinal float.
 - 3.5.4 Straightedge Finishing: After the longitudinal floating is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled wood floats and straightedges. The final finish shall be made with the straightedges, which shall be used to float the entire pavement surface.
 - 3.5.5 Burlap Drag Finishing: When most of the water glaze or sheen has disappeared and before the concrete becomes nonplastic, drag the surface of the pavement in the direction of the concrete placement with a multiple ply burlap drag.
 - 3.5.6 Edging: After other finishing has been completed, the edges of slabs along the forms and at the joints shall be carefully finished with an edging tool to form a smooth rounded surface of the required radius.
 - 3.6 Concrete Curing and Protection:

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- 3.6.1 Concrete curing methods shall consist of mat method, impervious sheeting method, or liquid membrane curing method.
- 3.6.2 Concrete Protection: Protect repaired areas against damage prior to final acceptance. Traffic shall be excluded from repaired areas.

Steel Reinforced Portland Cement Concrete Overlays

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel reinforced Portland cement concrete overlays on previously paved areas. Products shall match existing materials and/or shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1.1 Composition: Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, a combination thereof, or crushed blast-furnace slag.
 - 2.1.2 Particle Shape: Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by ASTM D 3398.
 - 2.1.3 Gradation: The maximum size of coarse aggregate shall be the lesser of one-fourth of the pavement thickness or a nominal size of 2 inches. Gradation limits are specified in ASTM C 136.
 - 2.1.4 Deleterious Substances: The amount of deleterious substances in the coarse aggregate shall not exceed the limits defined in ASTM C 117 and C 123.
- 2.2 Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand and shall be composed of clean, hard, durable particles. Particles of the fine aggregate shall be generally spherical or cubical in shape. Gradation limits are specified in ASTM C 136.
- 2.3 Portland cement shall be Type I in compliance with ASTM C 150.
- 2.4 Air-entraining admixtures shall be in compliance with ASTM C 260. Concrete mixtures shall have air content by volume of concrete of 4 to 7 percent based on measurements made immediately after discharge from the mixer.
- 2.5 Concrete mixture shall have a nominal slump of 2 inches with a maximum of 3 inches and a 28-day flexural strength of not less than 650 psi.
- 2.6 Joint and Crack Sealing Materials: Joint filler, joint sealant, and crack sealant shall comply with the following:
 - 2.6.1 Expansion joint fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard in compliance with the physical requirements of ASTM D 1752.
 - 2.6.2 Type I sealant shall comply with Applicable standards and/or specifications, except that sealant may be furnished as a ready-mixed liquid.
 - 2.6.3 Type II sealant shall comply with Applicable standards and/or specifications.
 - 2.6.4 Type V sealant shall comply with CE CRD-C-527 and may be either a single or multiple component material.
- 2.7 Epoxy-Resin Materials: Materials used in Epoxy-resin grout, mortar, and concrete shall comply with the following:
 - 2.7.1 Epoxy-resin grout shall be a two-compound material formulated to comply with Applicable standards and/or.
 - 2.7.2 Epoxy-resin concrete shall be composed of epoxy-resin binder and uniformly graded aggregate in compliance with ASTM C 144. The maximum size of aggregate shall be 3/8 inch or 1/2 inch.
- 2.8 Steel Reinforcement: All reinforcement shall be free from loose flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce bond. Bar mats shall comply with ASTM A 184. Welded steel wire fabric shall comply with ASTM A 185. Tie bars shall be deformed bars in compliance with ASTM A 615, A 616, or A 617. Dowels shall be plain steel bars complying with ASTM A 499.
- 3.0 EXECUTION:
 - 3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. Bonding course shall be applied to the area prepared to receive overlay and shall be of Epoxy-resin grout and Portland cement mortar.

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- 3.2 Reinforcement steel shall be installed by the strike-off method wherein the concrete is deposited on the sub grade and struck to the indicated elevation of the steel. The reinforcement shall be laid upon the prestruck surface.
- 3.3 Concrete Placement: Concrete shall be placed within 45 minutes from the time all ingredients are charged into the mixing drum.
 - 3.3.1 Weather Limitations: The temperature of the concrete placed during warm weather shall not exceed 85 degrees F. Special protection measures, approved by the Authorized Member Representative, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. Calcium chloride shall not be used.
- 3.4 Vibration: In the final phases of placing, surface vibrating equipment shall be used, and the duration of vibration shall not exceed 20 seconds.
- 3.5 Joints shall be saw cut and in alignment with underlying existing joints.
- 3.6 Finishing:
 - 3.6.1 Transverse Finishing: Immediately after placement, the concrete shall be accurately struck off and screeded to such elevation that when consolidated and finished, the surface of the pavement will be free from porous places and will be at the required grade. The finishing machine shall make at least two trips over each area of pavement to compact the concrete and produce a surface of uniform texture, true to grade.
 - 3.6.2 Longitudinal Floating: After completion of the transverse finishing, the longitudinal mechanical float shall be operated to smooth and finish the pavement to grade.
 - 3.6.3 Hand finishing shall be done with an approved strike and tamping template and a longitudinal float.
 - 3.6.4 Straightedge Finishing: After the longitudinal floating is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of longhandled wood floats and straightedges. The final finish shall be made with the straightedges, which shall be used to float the entire pavement surface.
 - 3.6.5 Burlap Drag Finishing: When most of the water glaze or sheen has disappeared and before the concrete becomes nonplastic, the surface of the pavement shall be dragged in the direction of the concrete placement with a multiple ply burlap drag.
 - 3.6.6 Edging: After other finishing has been completed, the edges of slabs along the forms and at the joints, where indicated or directed, shall be carefully finished with an edging tool to form a smooth rounded surface of the required radius.
- 3.7 Concrete Curing and Protection:
 - 3.7.1 Concrete curing methods shall consist of mat method, impervious sheeting method, or liquid membrane curing method.
 - 3.7.2 Concrete Protection: Repaired areas shall be protected against damage prior to final acceptance. Traffic shall be excluded from repaired areas.

Fibrous Reinforced Portland Cement Concrete Overlays

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fibrous reinforced Portland cement concrete overlays on previously paved areas. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Coarse Aggregate:
 - 2.1.1 Composition: Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, a combination thereof, or crushed blast-furnace slag.
 - 2.1.2 Particle Shape: Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by ASTM D 3398.
 - 2.1.3 Gradation: The maximum size of coarse aggregate shall be the lesser of one-fourth of the pavement thickness or 2-inch nominal size. Gradation limits are specified in ASTM C 136.
 - 2.1.4 Deleterious Substances: The amount of deleterious substances in the coarse aggregate shall not exceed the limits defined in ASTM C 117 and C 123.

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- 2.2 Fine Aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand and shall be composed of clean, hard, durable particles. Particles of the fine aggregate shall be generally spherical or cubical in shape. Gradation limits are specified in ASTM C 136.
- 2.3 Portland cement shall be Type I in compliance with ASTM C 150.
- 2.4 Air-Entraining Admixture shall be in compliance with ASTM C 260. Concrete mixtures shall have air content by volume of concrete of 4 to 7 percent based on measurements made immediately after discharge from the mixer.
- 2.5 Concrete mixture shall have a nominal slump of 2 inches with a maximum of 3 inches and a 28-day flexural strength of not less than 650 psi.
- 2.6 Joint and Crack Sealing Materials: Joint filler, joint sealant, and crack sealant shall comply with the following:
 - 2.6.1 Expansion joint fillers shall comply with ASTM D 1751 or D 1752 and shall be resin impregnated fiberboard in compliance with the physical requirements of ASTM D 1752.
 - 2.6.2 Type I sealant shall comply with Applicable standards and/or specifications, except that sealant may be furnished as a ready-mixed liquid.
 - 2.6.3 Type II sealant shall comply with Applicable standards and/or specifications.
 - 2.6.4 Type V sealant shall comply with CE CRD-C-527 and may be either a single or multiple component material.
- 2.7 Epoxy-Resin Materials: Materials used in Epoxy-resin grout, mortar, and concrete shall comply with the following:
 - 2.7.1 Epoxy-resin grout shall be a two-compound material formulated to comply with Applicable standards and/or.
 - 2.7.2 Epoxy-resin concrete shall be composed of epoxy-resin binder and uniformly graded aggregate in compliance with ASTM C 144. The maximum size of aggregate shall be 3/8 inch or 1/2 inch.
- 2.8 Steel Fibers: The fibers shall be made from low carbon steel. The following sizes of steel are acceptable: 0.010-inch x 0.022-inch flat steel fiber, 0.010-inch x 0.50-inch round steel fiber, 0.016-inch x 1.0-inch round steel fiber, and 0.016-inch x 0.75-inch round steel fiber with 0.010-inch x 0.020-inch flat section along the length of the fiber and 2.5-inch x 0.025-inch round steel fibers.
- 3.0 EXECUTION:
 - 3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. Bonding course shall be applied to the area prepared to receive overlay and shall be of Epoxy-resin grout and Portland cement mortar.
 - 3.2 Batching: Fibers and aggregate shall be blended prior to charging the mixer. The introduction of cement, water, and additives shall be matched with the rate of flow of the fiber-aggregate mixture to assure uniform mix.
 - 3.3 Concrete Placement: Concrete shall be placed within 45 minutes from the time all ingredients are charged into the mixing drum.
 - 3.3.1 Weather Limitations: The temperature of the concrete placed during warm weather shall not exceed 85 degrees F. Special protection measures, approved by the Authorized Member Representative, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. Calcium chloride shall not be used.
 - 3.4 Vibration: In the final phases of placing, surface vibrating equipment shall be used and the duration of vibration shall not exceed 20 seconds.
 - 3.5 Joints shall be saw cut and in alignment with underlying existing joints.
 - 3.6 Finishing:
 - 3.6.1 Transverse Finishing: Immediately after placement, the concrete shall be accurately struck off and screeded to such an elevation that, when consolidated and finished, the surface of the pavement will be free from porous places and will be at the required grade. The finishing machine shall make at least two trips over each area of pavement to compact the concrete and produce a surface of uniform texture, true to grade.
 - 3.6.2 Longitudinal Floating: After completion of the transverse finishing, the longitudinal mechanical float shall be operated to smooth and finish the pavement to grade.

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- 3.6.3 Hand finishing shall be done with an approved strike and tamping template and a longitudinal float.
- 3.6.4 Straightedge Finishing: After the longitudinal floating is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled wood floats and straightedges. The final finish shall be made with the straightedges, which shall be used to float the entire pavement surface.
- 3.6.5 Broom Finishing: Burlap drag finishing will not be allowed as this brings the steel fibers to the surface. Finishing shall be accomplished using a stiff broom.
- 3.6.6 Edging: After other finishing has been completed, the edges of slabs along the forms and at the joints, where indicated or directed, shall be carefully finished with an edging tool to form a smooth rounded surface of the required radius.
- 3.7 Concrete Curing and Protection:
 - 3.7.1 Concrete curing methods shall consist of mat method, impervious sheeting method, or liquid membrane curing method.
 - 3.7.2 Concrete Protection: Repaired areas shall be protected against damage prior to final acceptance. Traffic shall be excluded from repaired areas.

Asphaltic Concrete Overlays

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphaltic concrete overlays. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Asphalt Cement: The asphalt cement shall comply with ASTM D 946 penetration grade 85-100 requirements and shall show a negative spot test when tested in compliance with AASHTO T 102.
 - 2.2 Mineral Aggregates: Shall comply with ASTM D 3515 for 3/4-inch maximum aggregate mix.
 - 2.3 Test Properties: The bituminous mixture shall meet the following requirements when tested in compliance with applicable standards and/or regulations.

Stability minimum, lb	500
Flow maximum, 1/100-in. units	20
Voids total mix, %	3-5
Voids filled with bitumen, %	75-85
- 3.0 EXECUTION:
 - 3.1 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. An asphalt tack coat shall be applied to all contact surfaces in advance of the asphalt concrete overlay placement. The asphalt tack shall be placed at an asphalt residue coverage rate of 0.05 gal/sq yd.
 - 3.2 Installation:
 - 3.2.1 Joints: Longitudinal joints of the overlay shall be offset at least 1 foot from existing joints. Transverse joints shall be offset at least 2 feet from existing transverse joints.
 - 3.2.2 All asphalt concrete mixture and pavement that are contaminated, damaged, or defective shall be removed and replaced by the Contractor. Skin patching of rolled pavement will not be permitted.
 - 3.2.3 Compaction of Mixture: The asphalt concrete mixture shall be rolled until a density of not less than 95 percent and not more than 100 percent of laboratory compacted specimen is obtained.
 - 3.2.4 Surface Smoothness: After final rolling, the pavement surface shall not vary in excess of 1/8 inch from a 10-foot straightedge laid on the surface.

Crushed Stone Paving

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of crushed stone paving. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:

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- 2.1 Aggregates: Aggregates shall consist of natural gravel, crushed stone or slag, crushed gravel, angular sand, or other approved materials. Aggregates shall be durable, sound, and free from foreign material, including objectionable coatings, lumps and balls of clay, and organic matter.
- 2.1.1 Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles (length to width greater than 3 to 1) shall not exceed 30 percent.
- 2.1.2 Crushed gravel shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum site gradation sieve specified.
- 2.1.3 Crushed stone shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces for each range of sizes.
- 2.1.4 Slag shall be an air-cooled blast-furnace product having a dry weight of not less than 65 pcf.
- 2.2 Binder material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.
- 2.3 Gradation requirements specified in the following table shall apply to the completed aggregate surface. The table shows permissible gradings for granular material used in aggregate surface roads and airfields. Sieves shall conform to ASTM E 11. Aggregate used shall meet the following gradation limits or shall meet the gradation requirements of the applicable State Highway Department wherein the work is performed as approved by the Authorized Member Representative:
Gradation for Aggregate Surface Courses

Sieve Designation	No. 1	No. 2	No. 3	No. 4
25.0 mm 1 in.	100	100	100	100
9.5 mm 3/8 in.	50-85	60-100	--	--
4.7 mm No. 4	35-65	50-85	55-100	70-100
2.0 mm No. 10	25-50	40-70	40-100	55-100
0.425 mm No. 40	15-30	24-45	20-50	30-70
0.075 mm No. 200	8-15	8-15	8-15	8-15

- 2.4 Liquid Limit and Plasticity Index: The portion of the completed aggregate surface course passing the No. 40 sieve shall have a maximum liquid limit of 35 and a plasticity index of 4 to 9.
- 3.0 EXECUTION:
- 3.1 Preparation: The previously constructed layer or base shall be cleaned of loose and foreign matter. Adequate drainage shall be provided. Ruts or soft spots shall be corrected. For cohesionless underlying materials, the surface shall be stabilized with aggregate prior to placement of the stabilized-aggregate course.
- 3.2 Installation:
- 3.2.1 Mixing and Placing: Materials shall be mixed in such a manner as to obtain a uniform stabilized-aggregate material and a uniform optimum water content for compaction. Mixing and placing procedures shall produce true grades, minimize segregation and degradation, optimize water content, and ensure a satisfactory base course.
- 3.2.2 Compaction: Each layer of stabilized-aggregate paving shall be compacted. Water content shall be maintained at optimum. Areas inaccessible to the rollers shall be compacted with mechanical tampers and shall be shaped and finished by hand methods.
- 3.2.3 Layer Thickness: No layer shall be in excess of 8 inches nor less than 3 inches in compacted thickness.
- 3.2.4 Proof Rolling: Materials in paving or underlying materials that produce unsatisfactory results by rolling shall be removed and replaced with satisfactory materials and recompacted.
- 3.2.5 Edges of Paving: Approved materials shall be placed along edges of stabilized-aggregate paving course in such quantities as will compact to thickness of the course being constructed, allowing at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of the paving course.
- 3.2.6 Finishing: Finished surface shall be of uniform grade and texture.

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- 3.2.7 Thickness Control: Compacted thickness of the stabilized paving course shall be within 1/2 inch of the thickness required.

Portland Cement Concrete Sidewalks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Portland cement concrete (PCC) sidewalks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Ready-Mixed Concrete: Ready-mixed concrete shall comply with ASTM C 94, Alternate No. 2. The concrete shall have a slump of not more than three inches. The concrete shall attain a minimum compressive strength of 2,500 psi at seven days.
 - 2.2 Aggregates: ASTM C 33.
 - 2.3 Reinforcement Steel: Wire mesh reinforcement shall comply with ASTM A 184.
 - 2.4 Expansion joint fillers: Expansion joint fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard complying with ASTM D 1752.
 - 2.5 Joint Sealers: CE CRD-C-527.
- 3.0 EXECUTION:
 - 3.1 Reinforcement Steel: Fasten reinforcement steel accurately and securely in place with suitable supports and ties before the concrete is placed.
 - 3.2 Concrete Conveying: Convey concrete to construction areas by methods that will prevent segregation.
 - 3.3 Concrete Placing: Moisten the sub grade just before the concrete is placed. Place concrete in one layer of such thickness that when compacted and finished the sidewalk will be of the required thickness.
 - 3.4 Edge and Joint Finishing: Carefully finish all slab edges, including those at formed joints, with an edger having a radius of 1/8 inch.
 - 3.5 Contraction Joints: Divide the concrete surface into rectangular areas by means of contraction joints spaced at not more than five feet on center.
 - 3.6 Expansion Joints: Form expansion joints about structures and features that project through or into the sidewalk pavement. Fill expansion joints with joint filler of the type, thickness, and width to match existing or as directed by the Authorized Member Representative. Place the joint filler with the top edge 1/4 inch below the surface. Remove concrete over the joint filler.
 - 3.7 Joint Sealing: At the end of the curing period, carefully clean and seal expansion joints.
 - 3.8 Portland cement Concrete Curing: Cure new concrete by protection against loss of moisture and rapid temperature changes for a period of not less than 7 days.
 - 3.9 Backfilling: After curing, remove debris adjoining the sidewalk, backfill, grade, and compact to conform to the surrounding area.

Asphaltic Concrete Sidewalks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphalt concrete sidewalks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Asphaltic Concrete:
 - 2.1.1 Hot-Mixed, Hot-Laid Bituminous Paving Mixtures: ASTM D 3515.
 - 2.1.2 Plant-Mixed, Stockpiled Asphalt Cold Mixes: Asphalt Institute Manual MS-14.
 - 2.2 Bituminous Prime: ASTM D 2027, Grades MC-30 or MC-70; ASTM D 2028, Grade RC-70; or ASTM D 2026, Grade SC-70.
 - 2.3 Base Course: ASTM D 2940.
 - 2.4 Bituminous Tack Coat: ASTM D 977, Grades RS-1, MS-1 or SS-1h; ASTM D 2027, Grade MC-30;

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- ASTM D 2028, Grade RC-70; ASTM D 2026, Grade SC-70; or ASTM D 2397, Grades CRS-1 or CSS-1.
- 2.5 Seal Coat: ASTM D 2027, Grade MC-250 or MC-800; or D 2028, Grade RC-250 or RC-800.
- 2.6 Slurry Coat Mixture shall be comprised of 70 percent sand or fine aggregate, 10 percent water, and 20 percent liquid or emulsified asphalt.
- 2.6.1 Fine Aggregate: ASTM D 1073, Grade 2.
- 2.6.2 Emulsified Asphalt: ASTM D 977, Grades SS-1 or SS-1h.
- 3.0 EXECUTION:
- 3.1 Application Temperatures: Application temperatures for all asphalt materials shall comply with provisions of the Asphalt Institute publications and the applicable ASTMs.
- 3.2 Sub grade: Construct the sub grade or walkway replacement true to grade and compact as required.
- 3.3 Base Course:
- 3.3.1 Placing: Spread the base course material evenly upon the prepared sub grade, in a layer of such depth that when compacted the layer will be uniform and of the thickness required.
- 3.3.2 Compaction: Immediately following the spreading of the material, compact the base course with equipment to a density as required.
- 3.4 Surface Course:
- 3.4.1 Placing: Apply prime coat, and allow it to cure. The placing of the mixture shall be continuous. Paint all contact surfaces of previously constructed sidewalk with a tack coat of rapid-setting liquid asphalt just before the fresh mixture is placed.
- 3.4.2 Forms: Set forms with the upper edge true to line and hold grade rigidly in place by stakes placed on the outside of the forms and set flush with the top edge of the forms.
- 3.4.3 Compaction: Immediately following the placement of the asphalt concrete mixture, compact the surface course with equipment to a density as required.
- 3.4.4 Backfilling: After removing the forms and debris, backfill the exposed or excavated area adjoining the sidewalk with granular material, grade, and compact to conform to the surrounding area.
- 3.5 Patching:
- 3.5.1 For Repair Operations Involving Raveling, Heaving, Spalling, and Alligatoring: Cut asphalt concrete paving back to solid material, making cut area rectangular with vertical sides. Remove deteriorated pavement including base material if required. Replace base course, compact, and tack coat the base material and the vertical surfaces of cut area. Fill area with new asphalt concrete and compact level with existing walkway. Dust patched area with sand or mineral dust.
- 3.5.2 Pothole Repair: Cut rectangular hole around pothole back to solid pavement leaving straight, vertical edges. Remove loose material and water to firm base. Fill holes and compact to within 3 inches of the surface in layers not exceeding 6 inches with either base material or asphalt mixture. Apply tack coat to base material and vertical edges. On the surface layer, fill with asphalt mixture and mound to such height that when compacted the mix will be level with surrounding walkway surface. Dust patched area with sand or mineral dust.
- 3.5.3 Low Spot or Depression Repair: Determine limits of depression with straightedge, and mark outline with crayon. Apply tack coat, 0.05 to 0.15 gallon per square yard, to the cleaned area, and allow to cure. Spread area with asphalt concrete mix and feather edge by raking and manipulation of the material. Roll and compact area to surrounding walkway level. Recheck with straightedge. Apply a sand seal to the patched area to prevent entrance of water.
- 3.5.4 Polished Aggregate Repair: Clean and dry area thoroughly. Apply tack coat at a rate of 0.05 to 0.15 gallon per square yard; overlay area with new asphalt concrete mix to a minimum 1-1/2 inch thickness and feather to adjoining walkway surfaces. Roll with pneumatic or steel rollers.
- 3.5.5 Damaged Edging Repair: Remove damaged or deteriorated edging materials and replace.
- 3.5.6 Prime Coat: Prime new base course with MC-70 liquid asphalt at a rate of 0.20 to 0.30 gallon per square yard. Take care to apply no more asphalt than will penetrate into the base course during curing. Blot excess prime with sand before the surfacing material is applied.
- 3.5.7 Tack Coat: Surfaces and cut edges of existing asphalt concrete shall be given a tack coat of MC-70 liquid asphalt at a rate of 0.05 to 0.15 gallon per square yard. After application of the tack coat, allow time for the material to cure before surfacing and patching material is placed.
- 3.5.8 Seal Coat Spray Application: Walkway surfaces that are to be sealed shall receive a liquid asphalt

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coat applied at a rate of 0.15 to 0.20 gallon per square yard, along with a fine aggregate at a rate of 15 to 20 pounds per square yard.

- 3.6 Crack Repair: Fill cracks with liquid asphalt, sand asphalt emulsion water mixture, or slurry seal. After thorough cleaning, work the mixture into cracks by broom or squeegee. Cracks 1/8 to 1/2 inch width shall be slurry sealed and filled with liquid asphalt. Dust repaired cracks with fine aggregate or mineral dust to prevent cracking. Final thickness of the slurry seal shall be 1/8 inch minimum.

Miscellaneous Sidewalks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gravel, masonry, and wood sidewalks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Aggregate shall comply with the following:
 - 2.1.1 Surface Course Aggregates shall be well-graded, crushed stone, 3/4- to 1-1/4 inch size, consisting of clean, sound, durable particles.
 - 2.1.2 Masonry Grout Aggregate: ASTM C 404, Size 2.
 - 2.2 Base Course: Base course material shall be a granular, dense-graded, high-quality compactable material.
 - 2.3 Ready-Mixed Concrete: Ready-mixed concrete shall comply with ASTM C 94. The concrete shall attain a minimum compressive strength of 2,500 psi at 28 days.
 - 2.4 Portland cement Concrete: Cement shall comply with ASTM C 150.
 - 2.5 Joint Filler: Masonry joint filler shall be Portland cement concrete mix with cement complying with ASTM C 150.
 - 2.6 Masonry Units: Color and texture shall match the existing as nearly as is practicable.
 - 2.7 Wood and Preservatives: Footboards and supports shall be 1-1/2 inch thick Number 1 dense Douglas fir or yellow pine lumber, pressure-treated with chromate copper arsenate (CCA) preservative complying with AWP A P5. Retention shall be a minimum of 0.25 pounds per cubic foot.
- 3.0 EXECUTION:
 - 3.1 Base Course Repair: Remove material in soft spots to such depth required to provide a firm foundation for surface materials and fill with granular material of a quality that will compact when moistened. Roll or tamp this material to obtain the proper density.
 - 3.2 Surface Repair:
 - 3.2.1 Aggregate Walkways: Spread the surface material evenly on the base course in a layer of such depth that when compacted, the layer will be uniform with a minimum thickness of 4 inches.
 - 3.2.2 Joint Filling: Completely remove and clean the joint of all loose joint material, dirt, clay, or other foreign matter. Fill the joint flush with concrete to provide a uniform surface.
 - 3.2.3 Wood Walkways: Secure wood members with galvanized nails, screws, bolts, or other approved fasteners to ensure tight joints.
 - 3.2.4 Masonry Walkways: New or salvaged masonry units will be placed on a 3/4-inch mortar setting bed with mortar joints matching the existing walkway. Place the setting bed on a fresh 3-inch thick Portland cement concrete slab.

Precast Sidewalks and Pavers

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast sidewalks and pavers. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Precast Concrete Patio Blocks: Natural or colored, 2 inches thick.

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- 2.2 Exposed Aggregate or Granite: ASTM C 615 and National Building Granite Quarries Association, Inc.
- 2.2.1 Exposed Limestone: Limestone (Oolitic), ASTM C 568, Category II.
- 2.2.2 Exposed White Tumblestone Aggregate: As directed.
- 2.3 Stone Pavers:
 - 2.3.1 Bluestone Flagging Paver: Irregular cut, 1 inch thick.
 - 2.3.2 White Marble, Crushed Stone: ASTM C 503 and Marble Institute of America (MIA), 3 inches thick.
 - 2.3.3 Bluestone, Crushed Stone: 3 inches thick.
 - 2.3.4 Natural Cleft Slate: ASTM C 629, 3/4-inch irregular cut, 1/2-inch random rectangular cut, or 1/4-inch random rectangular butted joints.
- 2.4 Granite Blocks: Blocks shall be 3 to 5 inches thick and comply with requirements of ASTM C 615 and National Building Granite Quarries Association, Inc. Sizes shall be 3- 1/2 inches square; 4 to 12 inches by 3 to 5 inches; and 6 to 15 inches by 3 to 6 inches.
- 2.5 Mortar and Grout:
 - 2.5.1 Portland cement: ASTM C 150 and the staining requirements of ASTM C 91.
 - 2.5.2 Masonry Cement: ASTM C 91, non-staining.
 - 2.5.3 Hydrated Lime: ASTM C 207, Type S.
 - 2.5.4 Sand: ASTM C 144.
 - 2.5.4.1 White Pointing Mortar: Natural white sand or ground white stone.
 - 2.5.4.2 Colored Pointing Mortar: Marble, granite, or sound stone.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Clean stone or concrete block with clear water.
 - 3.1.2 Ferrous Metal: Apply a heavy coat of bituminous paint on metal surfaces in contact with block.
 - 3.2 Installation:
 - 3.2.1 Expansion Joints: Install continuous strips of preformed joint filler.
 - 3.2.2 Clean subbase and saturate with clean water.
 - 3.2.3 Slush Coat: Apply 1/16-inch thick slush coat of cement grout over concrete subbase about 15 minutes prior to placing setting bed.
 - 3.2.4 Setting Bed: Mix one 94-pound bag of cement to 3 cu ft of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of stone. Spread and screed to a uniform thickness.
 - 3.2.5 Set stone or concrete block before initial set of cement bed occurs. Wet stone or block thoroughly before setting. Apply a thin layer of neat cement paste 1/32-inch to 1/16-inch thick to setting bed, or bottom of stone or block.
 - 3.2.6 Grout joints as soon as possible after initial set of setting bed and tool slightly concave. Use grout mix of one bag Portland cement to 2 cu ft sand. Cure grout by maintaining in a moist condition for 7 days. Do not permit traffic on surface during setting of units or for at least 24 hours after final grouting of joints.

Concrete Curbs and Gutters

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete curbs and gutters. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Concrete Curing Materials:
 - 2.1.1 Burlap: AASHTO M 182 having a weight of 14 ounces or more per square yard when dry.
 - 2.1.2 Impervious Sheeting: ASTM C 171.
 - 2.1.3 Liquid Membrane Curing Compound: ASTM C 309. Compound shall be free of paraffin or petroleum.
 - 2.2 Joint Materials:
 - 2.2.1 Expansion joint fillers: ASTM D 1751 or ASTM D 1752.
 - 2.2.2 Joint Sealers: CE CRD-C-527 or applicable standards and/or specifications.

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- 2.3 Concrete: Concrete shall have a minimum compressive strength of 3,000 psi. The maximum size of aggregate shall be 1-1/2 inches. Concrete shall have a slump of not more than 3 inches and an air content by volume of concrete of 3 to 6 percent.
- 2.4 Forms: Curb and gutter forms shall be of wood or steel. The outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter and shall be securely fastened to and supported by the outside form. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits, or other defects. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4-inch plywood. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self-aligning. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers.
- 3.0 EXECUTION:
 - 3.1 Preparation: The sub grade shall be constructed to grade and cross section. The sub grade shall be of materials equal in bearing quality to the sub grade under the adjacent pavement and shall be compacted. The sub grade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed. The sub grade shall be in a moist condition when concrete is placed.
 - 3.2 Installation:
 - 3.2.1 Form Setting: Forms for curbs shall be carefully set to alignment and grade and to conform to the dimensions of the curb. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms.
 - 3.2.2 Concrete Placement and Finishing: Concrete shall be placed in layers not to exceed 6 inches. Concrete shall be thoroughly consolidated. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch, and the surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with longitudinal strokes. Immediately after removing the front curb form, the face of the curb shall be rubbed. The surface shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float. Expansion joints and contraction joints shall be constructed at right angles to the line of curb and gutter. Contraction joints shall be constructed by means of 1/8-inch thick separators, of a section conforming to the cross section of the curb and gutter. Contraction joints shall match joints in abutting Portland cement concrete pavement. At other pavements, construction joints shall be placed at not less than 5 feet nor greater than 15 feet apart. Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb at the end of all returns. Expansion joints shall match expansion joints of abutting Portland cement concrete pavement. At other pavements, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 45 feet. Exposed concrete surfaces shall be cured for not less than 7 days.
 - 3.2.3 Backfilling: After curing, debris shall be removed, and the area adjoining the concrete shall be backfilled, graded, and compacted.
 - 3.2.4 Sealing Joints: Expansion joints and the top 1-inch depth of contraction joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Excess material on exposed surfaces of the concrete shall be removed immediately and exposed concrete surfaces cleaned.

Portland Cement Concrete

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of Portland cement concrete (PCC) pavements. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Ready-Mixed Concrete shall comply with ASTM C 94, Alternative No. 2. The concrete shall have a

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slump of not more than three inches. The concrete shall attain a minimum compressive strength of 2,500 psi at seven days.

- 2.2 Aggregates shall comply with ASTM C 33.
- 2.3 Air Entraining Admixtures shall comply with ASTM C 260.
- 2.4 Concrete Curing Materials shall comply with one of the following:
 - 2.4.1 Burlap: AASHTO M182.
 - 2.4.2 White, Opaque Polyethylene-Coated Burlap: ASTM C 171.
 - 2.4.3 White, Opaque Polyethylene Sheeting: ASTM C 171.
 - 2.4.4 White Waterproof Paper: ASTM C 171.
 - 2.4.5 Liquid Membrane Curing Compound: ASTM C 309.
- 3.0 EXECUTION: (Not used.)

Bridge Deck Asphalt Concrete Wearing Surfaces

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of bridge deck asphalt concrete wearing surfaces. Products shall match those existing and/or as shall be directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. The standard specification for highway construction for the state in which the project is located shall be considered the standard for material, equipment, details, and construction methods as supplemented hereafter.

- 2.0 PRODUCTS:

- 2.1 Aggregate:

- 2.1.1 Coarse Aggregate for Bituminous Mixtures: ASTM D 692.
 - 2.1.2 Fine Aggregate for Bituminous Mixtures: ASTM D 1073.
 - 2.1.3 Mineral Filler for Bituminous Mixtures: ASTM D 242.

- 2.2 Bituminous Materials:

- 2.2.1 Asphalt Cement: ASTM D 946, penetration grade 85-100.
 - 2.2.2 Anionic Emulsified Asphalt: ASTM D 977, SS-1 or SS-1h.
 - 2.2.3 Rapid Curing Type Liquid Asphalt: ASTM D 2028, RC-70 and RC-250.
 - 2.2.4 Medium Curing Type Liquid Asphalt: ASTM D 2027, MC-30, MC-70, and MC 800.
 - 2.2.5 Coal-Tar Pitch: Specific gravity shall be 1.20 to 1.27 at 77 degrees.
 - 2.2.6 Coal-Tar Pitch Emulsion: ASTM D 3320.
 - 2.2.7 Fiberglass Fabric: ASTM D 1668, Type II or III.

- 2.3 Asphalt Mixture:

- 2.3.1 Asphalt Seal Coat: RC-70 or MC-70 with following aggregate:

Sieve Size	Percent Passing (Wt.)
1/2-in.	100
3/8-in.	94-100
No. 4	15-45
No. 16	0-4

- 2.3.2 Asphalt Slurry Seal: SS-1 or SS-1h with following aggregate:

Sieve Size	Percent Passing (Wt.)
No. 8	100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Mix shall contain not less than 15 percent asphalt emulsion nor more than 10 percent water by weight.

- 2.3.3 Asphalt Patch Mix: RC 250 or MC 800 with the following aggregate.

Sieve	Percent

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Size	Passing (Wt.)
3/4-in.	100
1/2-in.	85-100
No. 4	65-80
No. 8	50-65
No. 16	37-52
No. 30	25-40
No. 50	18-30
No. 100	10-20
No. 200	3-10

Liquid asphalt shall not be less than 5 percent by weight.

- 2.3.4 Coal-Tar Emulsion Slurry: The slurry shall not have more than 10 percent water or 5 pounds of aggregate per gallon of coal-tar emulsion. Aggregate shall have the following gradation:

Sieve	Percent
Size	Passing (Wt.)
No. 10	100
No. 16	30-65
No. 30	0-5

- 2.3.5 Asphalt-Sand Seal Protection Mix: Asphalt cement penetration shall be grade 85-100 with the following aggregate.

Sieve	Percent
Size	Passing (Wt.)
3/8-in.	100
No. 4	97-100
No. 10	80-95
No. 40	50-70
No. 80	25-40
No. 200	8-10

3.0 EXECUTION:

3.1 Preparation:

- 3.1.1 Traffic Control: When traffic is maintained on bridge under repair or is directed over a temporary run-around, furnish, erect, and maintain all barricades, flags, torches, lights, guardrails, temporary pavement markings, and traffic control signs required for the protection of the public and for the direction of traffic. Number, type, color, size, and placement of all traffic control devices and the use of a flagman shall comply with USDOT FHA MUTCD "Traffic Controls for Highway Construction and Maintenance Operations." All traffic control devices in advance of the construction limits shall also be the responsibility of the Contractor.

3.1.2 Removal of Damaged or Deteriorated Materials:

- 3.1.2.1 Cleaning for Crack Filling and Slurry Seals: The area shall be swept with stiff bristle brooms and blown clean. Cracks shall be cleaned to the maximum depth possible and made free from any dirt, stones, or other foreign matter.

- 3.1.2.2 Removal of Deteriorated Material for Patching: Areas to be patched shall extend a minimum of 1 foot into sound surfacing around the perimeter. Saw cut to minimum 3/4 inch deep along all edges of areas delineated to be patched. Remove loose and unsound material completely to the support structure.

- 3.1.2.3 Preparation for Waterproofing Structural Deck: Remove existing asphalt wearing course and membrane completely to the support structure. Surface shall be smooth and free from projections that might damage the waterproofing membrane.

3.2 Maintenance and Repair Methods:

- 3.2.1 Filling and Sealing Cracks: Fill the cracks to within 1/8 inch of the surface with asphalt emulsion slurry. Allow the slurry to cure completely before sealing. Seal cracks with liquid asphalt RC-70. The surface of the sealant shall be sprinkled with dry sand to prevent tracking.

- 3.2.2 Seal Coating: Spray asphalt emulsion seal coat uniformly over the repair area at the rate of 0.15 to 0.25 gallon per square yard after all cracks in the repair area are filled. Immediately following the

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application of the asphalt emulsion, spread seal coat aggregate uniformly over the treated surface at the rate of 15 to 25 pounds per square yard. Compact by rolling the entire surface. Upon the completion of the work, no loose aggregate shall be allowed to remain on the surface. Allow the sealed area to cure thoroughly before opening to traffic.

- 3.2.3 Slurry Seal Coating: Where cracks exceed 1 inch in depth or 1/2 inch in width, or both, they shall be filled with the slurry mixture and allowed to cure before placing the slurry seal. Place slurry mixture evenly over area to be sealed. Final thickness of the slurry seal shall be between 1/16 inch and 1/8 inch. Where two applications of the slurry seal are required, allow the initial application to cure before placing the succeeding application.
- 3.2.4 Patching Asphalt Concrete Surface:
 - 3.2.4.1 Prime Coat: Prime the entire area of patch, including vertical faces, with liquid asphalt RC-70.
 - 3.2.4.2 Placing and Compacting Asphalt Patch Mix: Place sufficient material in the patch area to ensure that the patch surface will not be below that of the adjacent material after compaction. Where the thickness of the finished compacted patch is greater than 3 inches, spread and compact the mixture in 2 or more layers.
- 3.2.5 Waterproofing Structural Deck: The waterproofing membrane system shall consist of a penetrating primer, a built-up coal-tar pitch emulsion membrane with 2 plies of coated glass fabric, and a 1/2-inch asphalt-sand seal protection layer.

Crack Sealing of Asphalt Concrete Pavements

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for crack sealing of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Liquid Asphalt shall comply with ASTM D 2027, Grade MC-250.
 - 2.2 Emulsified Asphalt shall comply with ASTM D 977, Grade MS-2.
 - 2.3 Sealing Compound shall comply with applicable standards and/or specifications.
 - 2.4 Fine Aggregate shall be natural sand or crusher dust and have a maximum size of not more than 1/8 inch and be free of clay or organic matter.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 All Cracks to be sealed shall be cleaned of dirt and debris.
 - 3.1.2 Crack Cleaning Equipment shall consist of a portable air compressor with hose and nozzles for directing air directly into cracks and stiff bristle brooms.
 - 3.1.3 Heating Equipment for Liquid Asphalt shall be mobile and shall be equipped with an agitating device for stirring material during heating, a thermometer, regulating equipment for heat control, and a gravity-type draw-off valve.
 - 3.1.4 Heating Equipment for Sealing Compound: Unless otherwise required by the manufacturer's recommendations, the equipment shall be mobile and shall consist of double-boiler, agitator-type kettles with oil medium in the outer space for heat transfer. The applicator unit shall be so designed that the sealant will circulate through the delivery hose and return to the inner kettle when not sealing cracks.
 - 3.1.5 Application Equipment shall have a spout or nozzle of such size that the sealing material will be placed in the cracks without entrapping air in cracks or spreading material on adjacent pavement surface.
 - 3.2 Installation:
 - 3.2.1 Sealing Compound: All cracks 1/8 inch wide and wider shall be sealed. The application temperature for sealing compound shall comply with applicable standards and/or specifications. Cracks 1/2 inch wide and wider shall be filled with a slurry of fine sand and an emulsified asphalt or liquid asphalt. After the slurry has cured, cracks shall be sealed with liquid asphalt or emulsified asphalt and lightly sanded.
 - 3.2.2 Liquid and Emulsified Asphalt Sealer: The temperature shall be varied so that it flows freely into

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cracks and completely fills cracks without entrapping air. Cracks shall be free of moisture before filling and shall be filled slightly above the pavement surface. When excess sealer has been removed, the sealer shall be covered with fine sand.

- 3.2.3 Traffic Control: Traffic will not be permitted over sealed cracks until the sealer has cooled so that it is not picked up by vehicle tires. The Contractor will be responsible for all barricades and flagmen necessary to control traffic.

Patching of Asphalt Concrete Pavements

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for patching of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Asphaltic Concrete:
- 2.1.1 Hot-Mixed, Hot-Mixed Asphaltic Concrete and Emulsified Asphalt shall comply with requirements of ASTM D 3515.
- 2.1.2 Plant-Mixed, Stockpiled Asphalt Cold Mixes shall comply with the requirements of Asphalt Institute Specification PM-2.
- 2.2 Bituminous Prime: Bituminous prime shall comply with ASTM D 2027.
- 2.3 Base Course: Base course material shall comply with local highway department specification for dense-graded, high-quality material.
- 2.4 Bituminous Tack Coat: Bituminous tack coat shall comply with ASTM D 2027.
- 3.0 EXECUTION:
- 3.1 Preparation of Areas for Patching:
- 3.1.1 Pot Holes: Trim the perimeter of each hole to a vertical face and back to well-compacted material. Remove material to a depth that provides a uniform well-compacted bottom surface. Remove all loose material resulting from trimming or otherwise existing in the hole. Areas to be repaired are to be dry before repair is started.
- 3.1.2 Alligator-Cracked and Rutted Areas: The pavement shall be sawed or cut with pavement breakers to a smooth vertical face 1 foot outside of the alligator-cracked areas. Unsatisfactory material shall be removed in a manner not to disturb the sides of the excavated area.
- 3.1.3 Slippage Areas: Saw a rectangular area around the slippage area that overlaps into the well-bonded material by at least 1 foot. The depth of the saw cut shall be equal to the thickness of the layer of material that is slipping. The surface where slipping is occurring shall be broomed clean and all loose material removed.
- 3.2 Installation:
- 3.2.1 Application Temperatures: Application temperatures for all asphalt material shall comply with provisions of the Asphalt Institute Publications and the applicable ASTM.
- 3.2.2 Base Course: Place base course material in layers not exceeding a compacted thickness of 6 inches. After placing, compact each layer by mechanical compactors to a density of not less than the density of the corresponding layer of the adjacent pavement structure.
- 3.2.3 Prime Coat: Prime base course with MC-70 liquid asphalt at a rate of 0.20 to 0.30 gallon per sq. yd. Bolt excess prime with sand before the surfacing material is applied.
- 3.2.4 Tack Coat: Give the edges of existing asphaltic concrete or surfaces of Portland cement concrete and asphaltic concrete a tack coat of MC-70 liquid asphalt at a rate of 0.05 to 0.15 gallon per sq. yd. Allow the material to cure before placing the surfacing material.
- 3.2.5 Hot-Mixed Asphaltic Concrete: Place the material in layers not exceeding 2-1/2 inches in thickness and compact to a density equal to the density of the adjacent asphaltic concrete.
- 3.2.6 Stockpiled Cold Mixes: The compacted thickness of each layer of material shall not exceed 2 inches. Before compaction, the material shall be allowed to aerate, if necessary, until the proper amount of cohesion has developed to obtain adequate compaction. When more than one layer is used, each layer shall be thoroughly cured before the succeeding layer is placed.

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Spray Applications, Seal Coats and Surface Treatments

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the spray applications, seal coats, and surface treatments of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Bituminous Material: Bituminous material shall be liquid asphalt complying with ASTM D 2028, Grade RC-250, or tar complying with ASTM D 490, Grade RT-6.
 - 2.2 Aggregate: Aggregates shall consist of crushed stone, crushed gravel, or crushed slag. The moisture content of the aggregate shall be such that the aggregate will be readily coated with the bituminous material. Aggregate gradations shall be in compliance with ASTM C 136.
 - 2.3 Construction Equipment:
 - 2.3.1 Bituminous distributor shall be designed and equipped to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates from 0.05 to 2.0 gal/sq yd with a pressure range of from 25 to 75 lb/sq in. and with an allowable variation from any specified rate not exceeding 5 percent.
 - 2.3.2 Single pass surface treatment machine shall be capable of distributing the bituminous material and aggregates uniformly in controlled amounts in a single pass operation over the surface to be sealed.
 - 2.3.3 Heating equipment for storage tanks shall consist of steam coils, hot oil coils, or electrical coils. If steam or hot oil coils are used, the coils must be so designed and maintained that the bituminous material cannot become contaminated.
 - 2.3.4 Power rollers shall be the self-propelled tandem and three-wheel type rollers, weighing not less than 5 tons and shall be suitable for rolling bituminous pavements.
 - 2.3.5 Self-propelled pneumatic-tired rollers shall have a total compacting width of not less than 60 inches. The gross weight shall be adjustable within the ranges of 200 to 350 lb/in. of compacting width.
 - 2.3.6 Spreading Equipment: Aggregate spreading equipment shall be adjustable and capable of spreading aggregate at controlled amounts per square yard.
 - 2.3.7 Drags: Broom drags shall consist of brooms mounted on a frame, designed to spread fine aggregate uniformly over the surface of a bituminous pavement. Towing equipment shall have pneumatic tires.
 - 2.3.8 Brooms and blowers shall be of the power type and shall be suitable for cleaning surfaces of bituminous pavements.
- 3.0 EXECUTION:
 - 3.1 Preparation of Surface:
 - 3.1.1 Immediately before application of the spray, all loose material, dirt, clay, or other objectionable material are to be removed from the surface with a power broom or blower supplemented with hand brooms. Correct all deficient areas such as pot holes, depressions, and excessive cracking.
 - 3.1.2 Application of Bituminous Material: Immediately following the preparation of the surface, apply the bituminous material uniformly over the entire surface to be treated. All spots missed by the distributor shall be properly treated with bituminous material.
 - 3.1.3 Application Temperature: Application temperatures for all materials shall comply with provisions of the Asphalt Institute Publications and the applicable ASTMs.
 - 3.2 Installation:
 - 3.2.1 Spreading Aggregate: Application of seal aggregate shall immediately follow the application of bituminous material, and in no case shall the time to application exceed 15 minutes.
 - 3.2.2 Brooming and Rolling: Begin the rolling operations immediately following the application of cover aggregate. Rolling shall be accomplished with pneumatic-tired rollers; steel-wheeled rollers shall be used in a supplementary capacity only. All surplus aggregate shall be swept off the surface and removed not less than 24 hours or more than four days after rolling is completed.

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Slurry Seals

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for slurry seals for asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Project materials, design, material proportions, mix composition, and mix property requirements shall comply with current state slurry seal specifications.
- 3.0 EXECUTION:
 - 3.1 Preparation of Surface:
 - 3.1.1 Cleaning: Clean the existing surface prior to application of a tack coat or slurry seal mixture.
 - 3.1.2 Repair: Repair all unsatisfactory or defective areas prior to application of a tack coat or slurry seal mixture.
 - 3.1.3 Tack Coat: Apply a tack coat, with a bituminous distributor at the rate of 0.05 gal per sq yd., after the surface is repaired and cleaned. The tack coat shall consist of one part emulsion and three parts water and shall be the same type and grade emulsion as used in the slurry seal mixture. The tack shall be cured before application of the slurry seal mixture.
 - 3.2 Installation:
 - 3.2.1 Preparation and Application of Slurry Seal: Mix and apply the slurry seal mixture with a self-propelled continuous flow unit calibrated to accurately deliver and thoroughly mix the required proportion of aggregate, emulsion, water, and mineral filler. Total mixing time shall not exceed four minutes, and no violent mixing shall be permitted. A water fog spray shall immediately precede application of the slurry seal mixture. The slurry seal mixture shall show no signs of segregation during mixing or placing. The slurry seal mixture shall be free of uncoated or oversized aggregate, lumps, or premature breaking of the emulsion when placed. The average thickness of the cured slurry seal, when measured over the pavement surface, shall be 1/4 inch. The slurry seal minimum thickness shall not be less than 1/8 inch.
 - 3.2.2 Drags: The drag shall be of a burlap material and shall be cleaned or replaced to prevent accumulations of slurry seal mix.
 - 3.2.3 Rolling: Roll the slurry seal mix a minimum of five coverages with a pneumatic roller.
 - 3.2.4 Curing: Protect the slurry seal mix from traffic until cured.
 - 3.2.5 Correcting Deficient Areas: Any slurry seal that becomes contaminated, segregated, defective, or damaged before final acceptance by the Authorized Member Representative shall be removed and replaced by the Contractor.
 - 3.3 Weather Limits: Air and pavement temperatures shall be 60 F and rising prior to the application of the slurry seal mixture.

Asphalt Curbs

- 1.0 DESCRIPTION OF WORK: This specification covers construction of asphaltic concrete curbs in conformity with the lines, grades, and dimensions shown on the plans or established by the Authorized Member Representative. The standard specification for highway construction for the state in which the project is located shall be considered the standard for material, equipment, details, and construction methods as supplemented hereafter.
- 2.0 PRODUCTS:
 - 2.1 Asphalt Cement: ASTM D 946, penetration grade 60-70 or 85-100.
 - 2.2 Coarse Aggregate: ASTM D 692.
 - 2.3 Fine Aggregate: ASTM D 1073.
 - 2.4 Mineral Filler: ASTM D 242.
 - 2.5 Composition of Mixture: The asphaltic concrete mixture shall consist of aggregates, filler if needed, and asphalt cement combined in such proportions that the composition by weight of the finished mixture shall be within the limits specified by the state in which the project is located.
- 3.0 EXECUTION: The curb shall be placed in position on a primed surface by means of an approved automatic curb machine which shapes and compacts the mixture to the designated cross section. The placement temperature of the mixture shall be approximately 260 F. Any required joints shall

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be carefully made in such manner as to ensure a continuous bond between the old and new sections of the curb. The newly laid curb shall be protected from traffic by barricades or other suitable methods until the heat of the asphalt mixture has dissipated. Immediately after the asphalt curb has hardened, it shall be backfilled where required with suitable material.

Cold Milling of Bituminous Pavements

- 1.0 DESCRIPTION OF WORK: This specification covers the removal of the existing bituminous surface by cold milling to the depths and limits shown on the drawings or as established by the Authorized Member Representative. It also includes the loading and stockpiling, if required, of the milled material.
- 2.0 PRODUCTS: (Section not used).
- 3.0 EXECUTION:
 - 3.1 Equipment, Tools, and Machines:
 - 3.1.1 Cold-Milling Machine: The cold-milling machine shall be a self-propelled machine capable of milling the pavement to a specified depth and smoothness. The milling machine shall have effective means of controlling transverse slope and controlling dust produced during the pavement milling operation. The milling machine shall not cause damage to any part of the pavement structure that is not to be removed.
 - 3.1.2 Cleaning Equipment: All cleaning equipment shall be suitable for removing and cleaning loose material from the pavement surface.
 - 3.2 Grade: The finished mill surfaces shall conform to the lines, grades, and cross sections indicated. Finished surfaces at a juncture with other pavements shall coincide with the finished surfaces of the abutting pavements.
 - 3.3 Preparation of Surface: The pavement surface shall be cleaned of excessive dirt, clay, or other foreign material immediately prior to milling the pavement.
 - 3.4 Milling Operation: Sufficient passes shall be made so that the designated area is milled to the grades and cross sections indicated. Any items, such as manholes, valve boxes, and utility lines, damaged or any pavement that is torn, gouged, broken, or undercut shall be repaired or replaced as directed by the Authorized Member Representative.

Bituminous Rejuvenation

- 1.0 DESCRIPTION OF WORK: This specification covers the rejuvenation of existing bituminous airfield pavements, roads, streets, parking areas, and other general applications by the use of a chemical rejuvenator.
- 2.0 PRODUCTS:
 - 2.1 Rejuvenator: The asphalt rejuvenating agent shall be composed of a petroleum resin-oil base uniformly emulsified with water and shall conform to the following physical and chemical requirements:

Property Test Method Requirement	

Viscosity, S.F. at 77 F, sec.	ASTM D 244 15-40
Residue, % (1)	ASTM D 244 (Mod.) 60-65(min.)
Sieve Test, %	ASTM D 244 (Mod.) 0.10 (max.)
Viscosity @ 140 F, centistokes (2)	ASTM D 2170 80-500
Flash Point, Cleveland Open Cup (COC), of (3)	ASTM D 92 350 (min.)
- 3.0 EXECUTION:
 - 3.1 Bituminous Storage Tanks shall be capable of heating the bituminous material under effective and positive control at all times to the required temperature.
 - 3.2 Bituminous Distributor shall be designed and equipped to spray the bituminous material in a uniform double to triple lap at the temperature recommended by the manufacturer, at variable widths, and at readily determined and controlled rates from 0.04 to 0.2 gallons per square yard, plus or minus 5 percent.
 - 3.3 Brooms and blowers shall be of the power type.
 - 3.4 Preparation of Surface: Immediately before applying the rejuvenator, all loose material, dirt, clay, or

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other objectionable material shall be removed from the surface to be treated.

- 3.5 Application of Rejuvenator: The rejuvenator shall be uniformly applied over the surface at the approved rate with an allowable variation of plus or minus 20 percent. Materials shall be applied at the temperature recommended by the manufacturer.
- 3.6 Excess Rejuvenator Material: Approved mineral aggregate shall be provided by the Contractor and shall be spread in sufficient quantity to effectively blot up any excess rejuvenator material remaining on the treated pavement surface after 24 hours.
- 3.7 Insufficient Rejuvenator Material: When it is determined by the Authorized Member Representative that the actual application rate of the rejuvenator is more than 20 percent below the approved application rate, subsequent application(s) shall be made within 24 hours to ensure adequate penetration into the pavement surface.

Cold Mix Recycling

- 1.0 DESCRIPTION OF WORK: This specification covers the cold mix recycling of existing paving and the addition of new materials, as required, or as directed by the Authorized Member Representative.
- 2.0 PRODUCTS:
 - 2.1 Aggregates:
 - 2.1.1 General: Aggregates shall consist of material obtained from milling, or removing and crushing the existing in situ material, and/or new aggregate material as needed.
 - 2.1.2 Aggregate Quality and Gradation: Aggregate for bituminous mixture shall be of such size that the material can be spread with a paver to the desired thickness and compacted to meet the specified smoothness, grade, and density requirements. New aggregates shall be approved and be equal to or better than the reclaimed aggregate in quality. Maximum size of new aggregate shall not exceed one-half of the layer thickness and in no case shall the maximum aggregate size exceed 1 inch.
 - 2.2 Bituminous Materials: Bituminous materials, if required, shall be an emulsified asphalt conforming to ASTM D 977 or ASTM D 2397, grade as required.
 - 2.3 Job-Mix Formula: The Job-Mix Formula (JMF) for the recycled mixture will be furnished by the Contractor to the Authorized Member Representative. The formula will indicate a definite percentage of water and asphalt to be added to the mixture. The JMF will be allowed an asphalt content tolerance of 0.3 percent. The asphalt content may be adjusted by the Authorized Member Representative to improve paving mixture, without adjustment in contract unit price. When asphalt is added, the optimum asphalt content will be selected to provide the following properties when samples are compacted at 250 F with 75 blows of standard Marshall hammer on each side of the specimen. Property Requirement

Stability minimum, pounds	1,800
Flow maximum, 1/100-inch units	16
Voids in total mix, percent	3-5
Voids filled with bitumen, percent	70-80

The water content will be selected to provide maximum density when samples are prepared at the optimum asphalt content and compacted with 75 blows of Marshall hammer at ambient temperature. When no asphalt binder is added to the mixture, the water content will be selected by the Authorized Member Representative to provide maximum density.

- 3.0 EXECUTION:
 - 3.1 Preparation of Bituminous Mixtures: The required amount of bituminous material for each batch, or calibrated amount of continuous mixing, shall be introduced into the mixer. Aggregates, asphalt emulsion, and water shall be mixed for 35 seconds or longer, as necessary, to thoroughly coat all particles with bituminous material. When longer mixing time is necessary, additional mixing times all be determined by the Authorized Member Representative.
 - 3.2 Conditioning of Existing Surface: Ruts or soft yielding spots that appear in the existing pavement areas and deviations of surface from requirements specified shall be corrected. An asphalt tack coat shall be applied to all contact surfaces in advance of the recycled overlayment. The asphalt tack shall be placed at an asphalt residue coverage rate of 0.05 gal/sq. yd.
 - 3.3 Placing:

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- 3.3.1 Layer Thickness and Curing: Each layer of compacted mixture shall be no more than 2-1/2 inches in thickness; each layer of bituminous mixture shall be allowed to cure for at least 5 days before placing a succeeding layer.
- 3.3.2 Compaction of Mixture: Bituminous mixtures shall be rolled until all roller marks are eliminated and a density of at least 86 percent of the theoretical maximum density has been obtained when tested in accordance with ASTM D 2041. When bituminous material is not added to the cold recycled mixture, the material shall be compacted to 100 percent of density determined by ASTM D 2041, compaction effort designation CE-55.
- 3.3.3 Joints: Longitudinal joints shall be offset at least 1 foot from existing joints. Transverse joints shall be offset at least 2 feet from existing transverse joints.
- 3.3.4 Surface Smoothness: After final rolling, the pavement surface shall not vary in excess of 1/8 inch from a straightedge laid on the surface.

Central Plant Hot Mix Recycling

- 1.0 DESCRIPTION OF WORK: This specification covers the central plant hot-mix recycling of existing asphalt concrete intermediate and wearing courses for airfields, heliports, and heavy-duty pavements. The specification also includes the addition of new materials, as required or as directed by the Authorized Member Representative.
- 2.0 PRODUCTS:
 - 2.1 Aggregates:
 - 2.1.1 General: Aggregates shall consist of material obtained from milling, or removing and crushing the existing in-situ material, and/or new aggregate material as needed.
 - 2.1.2 Aggregate Quality and Gradation: Aggregate for the bituminous mixture shall be such size that the material can be spread with a paver to the desired thickness and compacted to meet the specified smoothness, grade, and density requirements. New aggregates shall be approved and shall be equal to or better than the reclaimed aggregate in quality. Maximum size of new aggregate shall not exceed one-half of the layer thickness, and in no case shall the maximum aggregate size exceed one inch. Aggregate gradations shall be as prescribed by local usage, with the approval of the Authorized Member Representative. In order to meet pollution requirements and ensure the recycled mixture is satisfactory, the amount of reclaimed asphalt pavement shall not exceed 60 percent for drum mixers or 50 percent for batch plants.
 - 2.2 Mineral Filler shall conform to ASTM D 242.
 - 2.3 Bituminous Materials:
 - 2.3.1 New Asphalt Cement: The appropriate types and grades of bituminous materials for the anticipated use and climactic environment shall be used. Requirements of ASTM D 946 shall be used to specify penetration-graded asphalt cement, or ASTM D 3381 for viscosity-graded asphalt cement.
 - 2.3.2 Recycled Asphalt Cement: The penetration of asphalt cement recovered from the recycled mixture shall be in accordance with ASTM D 1856 and shall have a penetration between 50 and 70 percent of that specified for the particular region for new asphalt cement, measured in accordance with ASTM D 5.
 - 2.4 Job-Mix Formula (JMF): The JMF for the recycled mixture will be furnished by the Contractor to the Authorized Member Representative. The formula will indicate the percentage of reclaimed asphalt pavement, the percentage of bitumen, and the temperature of the completed mixture when discharged from the mixer. The requirements for stability, flow, and voids are shown in the following tables for nonabsorptive and absorptive mixtures, respectively.

Nonabsorptive-Aggregate Mixture

	Wearing Property Course	Intermediate Course
Stability minimum, lbs	1,800	1,800
Flow maximum, 1/100-inch units	16	16
Voids total mix, percent	3-5	5-7
Voids filled with bitumen, percent	70-80	50-70

Absorptive-Aggregate Mixture

Wearing	Intermediate

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	Property Course	Course
Stability minimum, lbs.	1,800	1,800
Flow maximum, 1/100-inch units	16	16
Voids total mix, percent	2-4	4-6
Voids filled with bitumen, percent	75-80	55-75

When the water-absorption value of the entire blend of aggregate does not exceed 2.5 percent, the aggregate is designated as nonabsorptive. When the water-absorption value exceeds 2.5 percent as determined by ASTM C 127 and ASTM C 128, the aggregate is designated as absorptive.

3.0 EXECUTION:

3.1 Preparation of Bituminous Mixtures: Aggregates, reclaimed asphalt pavement, mineral filler, bitumen, and recycling agent shall be conveyed into the mixer in proportionate quantities required to meet the JMF. Particles larger than 2 inches shall be removed from the reclaimed asphalt pavement prior to being added to the mixer. Mixing time shall be as required to obtain a uniform coating of the aggregate with the bituminous material. Temperature of bitumen at time of mixing will be specified by the Authorized Member Representative. Temperature of aggregate and mineral filler in the mixer shall not exceed 325 F when bitumen is added. **3.2 Surface Preparation of Underlying Course:** Prior to placing of intermediate or wearing course, the underlying course shall be cleaned of all foreign or objectionable matter. The surface of previously constructed base course shall be sprayed with a prime coat at an asphalt residue coverage rate of 0.25 gal/sq. yd. Contact surfaces of previously constructed pavement, curbs, manholes, and other structures shall be sprayed with a thin tack coat at an asphalt residue coverage rate of 0.05 gal/sq. yd.

3.3 Placing:

3.3.1 Layer Thickness and Curing: A required uncompacted thickness of intermediate course, 7 inches or less, may be spread and compacted in one layer. Where the required thickness of base is more than 7 inches, the mixture shall be spread and compacted in two or more layers. Each layer of compacted mixture for the surface course shall be no more than 2-1/2 inches in thickness. Each layer of bituminous mixture shall be allowed to cure for at least 5 days before placing a succeeding layer.

3.3.2 Compaction of Mixture: Rolling shall begin as soon after placing as the mixture will bear roller without undue displacement. After the Contractor is assured of meeting crown, grade, and smoothness requirements, rolling shall be continued until a mat density of 98 to 100.0 percent and a joint density of 96.5 to 100.0 percent of density is obtained. Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers.

3.3.3 Joints: Longitudinal joints shall be offset at least 1 foot from existing joints. Transverse joints shall be offset at least 2 feet from existing transverse joints.

3.3.4 Surface Smoothness: After final rolling, the pavement surface shall not vary in excess of 1/8 inch from a straightedge laid on the surface.

Pavement Markings

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and replacement of pavement markings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General: Paint and reflective media shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacturer, manufacturer's name, formulation number, and directions, all of which shall be plainly legible at time of use. The paint shall be homogeneous and easily stirred to smooth consistency. Paint that is older than one year shall not be used.

2.2 Paint:

2.2.1 Paint for Roads and Streets shall comply with applicable standards and regulations, and shall be acceptable to the Authorized Member Representative.

2.2.2 Paint for Airfields shall comply with applicable standards and regulations, and shall be acceptable to

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- the Authorized Member Representative.
- 2.3 Reflective Media for Roads and Streets shall comply with applicable standards and regulations, and shall be acceptable to the Authorized Member Representative.
 - 2.4 Thermoplastic Materials shall comply with AASHTO M 249.
 - 2.5 Raised Pavement Markers shall comply with the Federal Highway Administration Manual on Uniform Traffic Control Devices:
 - 2.5.1 Reflective Pavement Markers: Reflective pavement markers shall be of the prismatic reflector type, consisting of a high impact plastic shell filled with a mixture of inert thermosetting compound and filler material.
 - 2.5.2 Non-reflectorized Pavement Markers: Nonreflective pavement markers shall consist of a heat fired, white, vitreous, ceramic base and a heat-fired, opaque, glazed surface to produce the properties in these specifications.
 - 2.6 Adhesive for Installation of Raised Pavement Markers shall comply with AASHTO M 237.
 - 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Safety and Protection: Contractor shall assure the least possible obstruction to traffic.
 - 3.1.2 Removal of Existing Pavement Marking: Remove paint, plastic markings, and raised markers by sandblasting, infrared heat, high pressure water, and water or scraping. Heat may be used to augment scraping; however, the underlying pavement shall not be burned.
 - 3.2 Installation:
 - 3.2.1 Thermoplastic Applicator: Utilize extrusion or spray application equipment for applying thermoplastic material to the pavement. The equipment shall provide for varying widths of traffic markings.
 - 3.2.2 Bead Dispensers: Attach bead dispensers to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line.
 - 3.2.3 Tolerances in Dimensions and in Alignment: The length of the painted segment for skip stripe and the gap between segments may each vary plus or minus one foot, except that over-tolerance and under-tolerance lengths shall approximately compensate.
 - 3.2.4 Protection: Adequate warning signs, flagmen, and necessary precautions for the protection of the wet paint and the safety of the public shall be provided. Cones, rubber "Z" guards or similar protective devices shall be placed along the newly painted stripe to prevent traffic from crossing the wet paint.
 - 3.2.5 Corrective Measures: Stripes that fail to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred or damaged by traffic or from other causes, shall be corrected. Drip and spattered paint shall be removed.

Water Lines

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water lines. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Piping for water service lines shall be galvanized steel, polyvinyl chloride (PVC) plastic, polyethylene, polybutylene, or copper tubing. Piping for water distribution and supply lines shall be ductile iron, polyvinyl chloride (PVC) plastic, filament-wound reinforced or centrifugally cast reinforced thermosetting resin, thermosetting reinforced plastic mortar pressure pipe, or reinforced concrete.
 - 2.1 Copper Tubing: ASTM B 88, Type K, annealed, with compression pattern flared joints.
 - 2.2 Ductile Iron Pipe: AWWA C151, 150 psi working pressure. Pipe shall be cement-mortar lined in accordance with AWWA C104. Joints shall conform to AWWA C111. Flanges shall conform to AWWA C115.
 - 2.3 Polyvinyl Chloride (PVC) Plastic Pipe: All pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B, designated as PVC 1120 in ASTM D 1785.
 - 2.3.1 Pipe Less Than 4 Inches in Diameter:
 - 2.3.1.1 Screw Joint: ASTM D 1785, Schedule 80, with joints meeting requirements of 150 psi working

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- pressure, 200 psi hydrostatic test pressure.
- 2.3.1.2 Elastomeric Gasket Joint: ASTM D 1785, Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure.
 - 2.3.1.3 Solvent Cement Joint: ASTM D 1785 or D 2241, with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.
 - 2.3.2 Pipe, 4-Inch through 12-Inch Diameter: Pipe, couplings, and fittings shall conform to the requirements of AWWA C900, Class 150, CIOD pipe dimensions, elastomeric gasket joint.
 - 2.4 Reinforced and Prestressed Concrete Pipe: Steel cylinder reinforced concrete pipe shall conform to AWWA C300, C301, or C303 and shall be designed to withstand a working pressure of not less than 150 psi, with bell and spigot steel joints and gaskets.
 - 2.5 Steel Pipe 3 Inches and Larger, not Galvanized: AWWA C200 with dimensional requirements as given in ANSI B36.10M for pipe 6 inches in diameter and larger, and ASTM A 53 for smaller sizes. Joints shall be mechanical, bell and spigot, or flanged. Pipe shall be coated with coal-tar primer followed by a hot coat of coal-tar enamel, a wrapper of asbestos felt impregnated with coal-tar, and a wrapper of Kraft paper or a coat of water-resistant white wash.
 - 2.6 Galvanized Steel Pipe, Less than 3 Inches: ASTM A 53, standard weight, screwed joints.
 - 2.7 Polyethylene Plastic (PE) Pipe Less than 3 Inches in Diameter: Pipe, tubing, and heat fusion fittings shall conform to AWWA C901.
 - 2.8 Polybutylene Plastic (PB) Pipe Less than 3 Inches in Diameter: Pipe, tubing, and fusion fittings shall conform to AWWA C902.
 - 2.9 Filament Wound Reinforced Thermosetting Resin Pipe (RTRP-I) for Lines 3 Inches and Larger: ASTM D 2996, normal working pressure of 150 psi at 73 F.
 - 2.10 Centrifugally Cast Reinforced Thermosetting Resin Pipe (RTRP-II) for Lines 3 Inches or Larger: ASTM D 2997.
 - 2.11 Reinforced Plastic Mortar Pressure (RPMP) Pipe for Lines 3 Inches or Larger: ASTM D 3517, bell and spigot type joints with elastomeric or mechanical gaskets.
 - 2.12 Filament Wound and Centrifugally Cast Reinforced Thermosetting Resin Pipe and Reinforced Plastic Mortar Pressure Pipe: Pipe shall have a quick burst strength equal to or greater than four times the normal working pressure of the pipe. The quick burst strength test shall conform to the requirements of ASTM D 1599. Joints shall be bell and spigot type with elastomeric gaskets.
 - 2.13 Valves:
 - 2.13.1 Check Valves shall be designed for a minimum working pressure of 150 psi. Valves 2 inches and smaller shall be all bronze with screwed fittings and shall conform to MSS SP-80, Class 150, Types 3 and 4. Valves larger than 2 inches shall be iron body, bronze-mounted with flanged ends, and non-slam type. Flanges shall be the 125-pound type conforming to ANSI B16.1.
 - 2.13.2 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150. Valves 3 inches and larger shall be iron body, bronze-mounted, and shall conform to AWWA C500.
 - 2.13.3 Rubber-seated butterfly valves shall conform to the performance requirements of AWWA C504.
 - 2.13.4 Indicator post for valves shall conform to the requirements of NFPA No. 24.
 - 2.14 Fire Hydrants: AWWA C502 or C503.
 - 2.15 Fire Hydrant Hose Houses: NFPA No. 24.
 - 2.16 Disinfection Materials: Liquid chlorine conforming to AWWA B301 or calcium or sodium hypochlorite conforming to AWWA B300.
 - 3.0 EXECUTION:
 - 3.1 Installation:
 - 3.1.1 Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.
 - 3.1.2 Copper tubing shall not be installed in the same trench with ferrous piping materials.
 - 3.1.3 Roads and Airfields: Pipe sleeve shall be rigid conduit and shall have a minimum clearance of at least 2 inches between the inner wall of the sleeve and the maximum outside diameter of the sleeved pipe and joints shall be provided.
 - 3.1.4 Structures: Where water pipe is required to be installed within three feet of existing structures, the water pipe shall be sleeved as required for roads, railroads, and airfields.

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- 3.2 Joint Deflection:
 - 3.2.1 Ductile Iron Pipe: The maximum allowable deflection will be as given in AWWA C600.
 - 3.2.2 Flexible Plastic Pipe: Maximum offset in alignment between adjacent pipe joints shall not exceed 5 degrees.
 - 3.2.3 Reinforced Concrete Pipe: Maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, will be 5 degrees.
 - 3.2.4 Steel Pipe: For pipe with bell and spigot rubber gasket joints, maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets will be 5 degrees.
- 3.3 Placing and Laying:
 - 3.3.1 The following codes shall govern pipe installations: RTRP, ASTM D 3839; PE and PB, ASTM D 2774; PVC, AWWA M23.
 - 3.3.2 Pipe passing through walls of valve pits and structures shall be provided with cast-iron wall sleeves.
- 3.4 Service Lines: Service lines 2 inches and smaller shall be connected to the main by a directly tapped corporation stop or by a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Service lines 1-1/2 inches and smaller shall have a service stop. Service lines 2 inches or larger shall have a gate valve.
- 3.5 Setting of Fire Hydrants: Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Not less than 7 cubic feet of free draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.
- 3.6 Thrust Blocks: Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on waterlines 6 inches in diameter or larger, and fire hydrants shall be provided with thrust blocking or metal tie rods and clamps or lugs.
- 3.7 Hydrostatic Tests: The pipeline shall be subjected to both a pressure test and a leakage test.
 - 3.7.1 Pressure Test: After the pipe has been installed and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water in a manner to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour.
 - 3.7.2 Leakage Test: A standard one-hour leakage test shall be performed subsequent to or concurrently with the pressure test and shall meet an allowable leakage rate

Water Reservoirs and Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of elevated water tanks, ground level water tanks, and standpipes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Standpipe, elevated steel water tank, or storage reservoir shall be in accordance with the applicable requirements of AWWA D100 and AWWA D102, except as modified herein.
- 2.1 Bolts, Anchor Bolts, and Rods for Welded Steel Tanks: ASTM A 307; galvanizing shall conform to ASTM A 153.
- 2.2 Reinforcing Steel: ASTM A 615, ASTM A 616, or ASTM A 617.
- 2.3 Plates: ASTM A 36.
- 2.4 Tubular Shapes: ASTM A 500, Grade B, for cold-formed; ASTM A 501 for hot-formed.
- 2.5 Design Loads: The following loads shall be considered in the design of tank structures and foundations:
 - a. Dead Loads: The unit weights for steel shall be 490 pcf and 144 pcf for concrete.
 - b. Live Load: Live load shall be the weight of all liquid when the tank is filled to just overflowing.
 - c. Wind Load and Snow Load: The elevated tank shall be designed according to ANSI A58.1 for a wind speed of 100 mph and for a snow load of 25 psf.
- 3.0 EXECUTION:
 - 3.1 Foundations for the standpipe, reservoir, tank columns and riser, and for the valve chamber shall be constructed of concrete, reinforced where necessary, and designed in accordance with Section

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12 of AWWA D100 except as shown or specified herein. Footings shall be designed in accordance with ACI 318 and constructed in conformance with the applicable requirements of SECTION: CONCRETE. The foundation for the reservoir shall be composed of a concrete ring at base of reservoir with bed of gravel under bottom of reservoir. After concrete ring walls are constructed, the gravel fill shall be placed to thickness shown on plans. Well-graded gravel or crushed stone, not exceeding 2 inches in size with no more than 5 percent passing the No. 200 sieve, shall be placed and thoroughly tamped or rolled at a moisture content that will yield a maximum density for the type of compaction equipment used. The material shall have a crowned surface of 1 inch vertical to 10 feet horizontal as a minimum to allow for the settlement and to ensure that tank bottom will be approximately level.

- 3.2 Anchors: A sufficient number of anchors, designed to prevent overturning of the standpipe, reservoir, or elevated storage tank, when empty, shall be installed. The anchors shall be not less than 1-1/4 inches in diameter and shall be set deep enough to resist the computed uplift. The anchors shall be bent 90 degrees for anchorage in the concrete, or they shall be provided with anchor plates, which may be made of scrap plates or structural steel channels. The anchor bolts shall be attached to the cylinder or anchor plates by means of properly designed lugs made of structural steel shapes or bent plates. Factor of safety on overturning under design wind load shall be 1.33 minimum. An inverted truncated pyramid of earth with 2 on 1 side slopes above top of footing may be used in determining overturning stability.
- 3.3 Test of Valves and Piping: After the tank has been erected and the valves and piping installed and before field painting is begun, the valves and piping shall be subjected for 1 hour to a hydrostatic pressure test of 1.33 times the anticipated static pressure at the points of reading when the system is put into operation.
- 3.4 Disinfection: Comply with requirements of AWWA C652.

Chilled Water Lines

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of chilled water lines. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Piping and Fitting for Chilled Water Lines:
 - 2.1.1 Pipes to 4 Inches: Steel, welded, Schedule 40, ASTM A 53.
 - 2.1.2 Pipes 6 to 16 Inches: Steel, seamless or ERW, standard weight, ASTM A 53.
 - 2.1.3 Fittings to 1-1/2 Inches: MI, 150-pound, ASTM A 197, screwed ends ANSI B16.3.
 - 2.1.4 Fittings 2 to 16 Inches: Steel, seamless, standard weight, ASTM A 234, butt weld ends, ANSI B16.9.
 - 2.1.5 Unions to 2 Inches: MI, 150-pound, ASTM A 197, screwed ends, brass-to-iron seats.
 - 2.1.6 Unions 2-1/2 to 16 Inches: Flanged.
 - 2.1.7 Flanges 16 Inches and Under: Steel, ASTM A 105 or A 181, 150-pound, slip-on or welding neck type, ANSI B16.5.
 - 2.1.8 Gaskets-Water Service: Red rubber sheet, 1/16 inch thick, ring or full face as required, ASTM D 2000.
 - 2.1.9 Gaskets-Air Service: Compressed asbestos, 1/16 inch thick, ring or full-faced as required, ASTM F 104.
 - 2.2 Shutoff Valves for Chilled Water Lines:
 - 2.2.1 Gate Valves: MSS SP-80. Size 1/4 to 2 inches shall be screwed ends with bronze body. Size 2-1/2 to 16 inches shall be flanged ends with cast-iron body.
 - 2.2.2 Butterfly Valves: AWWA C504. Size 3 to 16 inches, wafer-flanged ends with cast-iron body.
 - 2.3 Control Valves for Chilled Water Lines:
 - 2.3.1 Globe Valves: MSS SP-80. Size 1/4 to 2 inches shall be screwed ends with bronze body. Size 2-1/2 to 10 inches shall be flanged ends with cast-iron body.
 - 2.3.2 Angle Valve: MSS SP-80. Size 1/4 to 2 inches shall be screwed ends with brass body. Size 2-1/2 to

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- 14 inches shall be flanged ends with cast-iron body.
- 2.3.3 Butterfly Valve: AWWA C504. Size 3 to 16 inches shall be wafer-flanged with cast-iron body.
- 2.4 Check Valves for Chilled Water Lines: Fed. Spec. WW-V-51. Swing valves shall be size 1/4 to 2 inches, screwed ends with bronze body or size 2-1/2 to 16 inches, flanged ends with bronze body.
- 2.5 Preinsulated Pipe Materials:
- 2.5.1 Foam Insulation: ASTM C 1029. Factory-applied polyurethane foam insulation shall completely fill the annular space between carrier pipe and jacket.
- 2.5.2 Jacketing Material: Material shall be extruded white polyvinylchloride, conforming to ASTM D 1784.
- 2.5.3 Joints shall be insulated with polyurethane foam, jacketed with PVC sleeves, and sealed with heat-shrinkable tape.
- 2.5.4 Fittings shall be insulated with polyurethane foam and jacketed with PVC fittings.
- 3.0 EXECUTION:
- 3.1 Preparation: The trench bottom shall be stabilized by over excavating 6 inches and replaced by fine graded earth or sand. After pipe is assembled in place and prior to testing, a partial backfill shall be accomplished by tamping fine graded earth or sand around the pipe in 6-inch layers to a minimum of 6 inches above the jacket, leaving joints exposed for visual inspection during hydrostatic testing.
- 3.2 Testing: The joints of the chilled water lines shall be exposed for visual inspection during hydrostatic testing. After testing is complete, joints shall be covered in a similar manner and backfill operation shall proceed.

Well Repair

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water wells. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Repair and replacement parts shall be clean, free of rust and scale, and of proper size and design for the specific well repair to be made.
- 3.0 EXECUTION:
- 3.1 Cement grout may be hand mixed at the site.
- 3.2 Level and re-sod area after heavy equipment has been used or if chemicals have been spilled.
- 3.3 Abandoned wells shall be sealed in accordance with AWWA A100.
- 3.4 Disinfect well, after repair, in accordance with AWWA A100.

Water Wells

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for drilled and gravel packed water wells. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the American Water Works Association (AWWA) standards and the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Casings:
- 2.1.1 Carbon Steel: ASTM A 53 and ASTM A 139.
- 2.1.2 Stainless Steel: ASTM A 409.
- 2.1.3 Plastic: ASTM F 480.
- 2.2 Screens: Stainless Steel ASTM A 304.
- 2.3 Gravel Packs: AWWA A100, Sections 6.3, 6.4, and 6.5.
- 2.4 Sealing Grout: AWWA A100, Sections 7.2 and 7.3.
- 3.0 EXECUTION:
- 3.1 General: Construction shall be in accordance with the latest edition of AWWA A100 in its entirety including appendices. The standard shall not only cover 8-inch drilled wells and gravel packed wells but the criteria shall also be applied to 4-inch to 6-inch diameter wells.
- 3.2 Drilling: The method of drilling shall be approved by the Authorized Member Representative.

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- 3.3 Drilling Samples: Samples of formations shall be retained by the Contractor during drilling with full access by the Authorized Member Representative. Additional samples shall be taken as directed by the Authorized Member Representative. Drilling samples shall be delivered to the Member at the completion of the well installation as directed.
- 3.4 Reports: Geophysical logging and drillers log report shall be required as directed by the Authorized Member Representative.
- 3.5 Casing Size: Casing diameter and wall thickness shall be as determined by Tables 2 and 3 of AWWA A100 but in no case shall the wall thickness be less than 1/4 inch (or Schedule 40 for 4-inch pipe).
- 3.6 Screen Size: The screen diameter, length, and grid openings shall be as required by the aquifer but in no case shall the entrance velocity exceed 1.5 fps. Screen construction shall be approved by the Authorized Member Representative.
- 3.7 Constant Flow Rate: The Authorized Member Representative will determine the constant flow rate test level based on information from the step-drawdown tests considering the recommendation of the Contractor.

Gas Distribution Lines

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of gas distribution lines. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Piping for Gas Distribution Lines: Piping shall be steel, Schedule 40, ASTM A 53 or polyethylene, ASTM D 1248 and ASTM D 2513. Pipe designations shall be PE 2306 and PE 3306, designated for gas distribution.
 - 2.2 Fittings for Steel Pipe:
 - 2.2.1 Threaded: Fed. Spec. WW-P-521, Type I, black.
 - 2.2.2 Welded: Butt-welded fittings shall conform to ANSI B16.9. Socket welded fittings shall conform to ANSI B16.11.
 - 2.2.3 Flanged: ANSI B16.5.
 - 2.2.4 Pipe Threads: ASME B1.20.1.
 - 2.3 Valves: Valves shall conform to Mil. Spec. MIL-V-12003, type I, 175 psig. In plastic lines, valves shall be so designed as to protect against excessive torsional or shearing loads.
 - 2.4 Protective Covering for Underground Steel Pipe: A coat of coal-tar primer, a coat of coal-tar enamel, a wrapper of coal-tar saturated felt, and a wrapper of Kraft paper or a coat of water-resistant whitewash shall be applied in accordance with the requirements of AWWA C203.
- 3.0 EXECUTION:
 - 3.1 Gas Lines: Plastic pipe shall not be installed above ground, in distribution systems that exceed 50 psig, or where operating temperatures of the materials will be below -20 F or above 100 F.
 - 3.2 Installation of gas lines shall be in conformance with ANSI B31.8 and, where applicable, IAPMO IS-10.
 - 3.3 Gas mains shall have a minimum cover of 24 inches, and service lines shall have a minimum cover of 18 inches.
 - 3.4 A single conductor No. 14 AWG Wire with type TW insulation shall be installed with plastic pipe to facilitate pipe locating.
 - 3.5 Tests: The distribution system of gas mains and gas service lines shall prove gas-tight by air test under a pressure of 75 psig or not less than 1-1/2 times the operating pressure, whichever is greater.
 - 3.5.1 Test of Gas Mains: The test shall continue for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. The initial test readings shall not be made for at least one hour after the pipe has been subjected to the full test pressure. The testing instruments shall be approved and subject to inspection at all times during the test.
 - 3.5.2 Test of Service Lines: Service lines shall be tested in accordance with ANSI B31.8.

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Foundation Drainage Systems

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of foundation drainage systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Clay Pipe: ASTM C 700.
 - 2.2 Perforated Clay Pipe: ASTM C 700.
 - 2.3 Concrete Pipe: ASTM C 14.
 - 2.4 Perforated Concrete Pipe: ASTM C 14 with perforations conforming to ASTM C 444.
 - 2.5 Porous Concrete Pipe: ASTM C 654.
 - 2.6 Clay Drain Tile: ASTM C 4.
 - 2.7 Perforated Clay Drain Tile: ASTM C 498.
 - 2.8 Concrete Drain Tile: ASTM C 412.
 - 2.9 Cast-Iron Soil Pipe: ASTM A 74.
 - 2.10 Perforated Corrugated Steel Pipe: ASTM A 760.
 - 2.11 Perforated Corrugated Aluminum Alloy Pipe: Fed. Spec. WW-P-402.
 - 2.12 Perforated Bituminized-Fiber Pipe: ASTM D 2311 or D 2417.
 - 2.13 Perforated Corrugated Polyethylene Drainage Tubing: Soil Conservation Service, Engineering Standard 606.
 - 2.14 Acrylonitrile-Butadiene-Styrene (ABS) Pipe: ASTM D 2751, with a maximum SDR of 35.
 - 2.15 Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, with maximum SDR of 35, and with flexible elastomeric seal joint.
 - 2.16 Fittings: Fittings shall be of compatible materials for pipe.
 - 2.17 Cleanouts: Cleanout pipe and fittings and piping through walls and footings shall be cast-iron soil pipe. Each cleanout shall have a brass ferrule and cast-brass, screw- jointed plug with socket or raised head for wrench.
 - 2.18 Cover and Wrapping Materials for Open Joints in Drain Tile: Tar paper, roofing paper, reinforced building paper, glass fiber fabric, or other similar type material. Wrapping material shall be 18 x 14 mesh, 0.01-inch diameter nonferrous wire cloth.
- 3.0 EXECUTION:
 - 3.1 Trenches shall be kept dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Wye fittings shall be used at intersections.
 - 3.2 Bedding: Graded bedding, minimum 6 inches in depth, shall be placed in the bottom of trench for its full width and length. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.
 - 3.3 Pipe Laying: Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Perforated pipe shall be laid with perforations facing down.
 - 3.4 Joints:
 - 3.4.1 Perforated and porous types of drain pipes shall be laid with closed joints.
 - 3.4.2 Non-perforated and plain-end drain tile shall be laid with 1/8-inch to 1/4-inch open joints. Open joints shall be covered or wrapped.
 - 3.4.3 Joints of concrete or clay sewer pipe shall be caulked with oakum and filled solid with cement mortar.
 - 3.4.4 Joints of cast-iron pipe or connections between cast-iron and porous concrete pipes shall be caulked with oakum gasket and filled with lead.
 - 3.4.5 Perforated bituminized-fiber pipe joints in which pipe ends and couplings are tapered shall have a tight-driven fit. Approved split-collar couplings may be used with square-end pipe.
 - 3.4.6 Plain-end perforated clay drain tile joints shall be made with spring-wire clips, coated with a rust preventive that will maintain a taut but elastic joint between sections when laid.
 - 3.4.7 Acrylonitrile-Butadiene-Styrene (ABS) Pipe shall be jointed using solvent cement or elastomeric joints.

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- 3.4.8 Polyvinyl Chloride (PVC) Pipe Joints shall be in accordance with ASTM D 3212.
- 3.5 Outlet Lines: The outlet end of drain lines connecting with an open gutter or outfall shall be covered with a removable wire basket of copper or bronze wire cloth.
- 3.6 Backfilling: After joints and connections have been inspected and approved, pervious backfill material shall be placed on each side of the pipe or tile and 12 inches above the top of the pipe as shown for the full width of the trench. A protective covering shall be placed over the pervious backfill for the full width of the trench before regular backfill is placed.
- 3.7 Cleanouts in unpaved areas shall be set in 12-inch by 12-inch by 4-inch concrete blocks.

Underslab Drainage

- 2.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of underslab drainage. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Concrete pipe shall conform to ASTM C 14.
- 2.2 Clay pipe shall conform to ASTM C 700.
- 2.3 Perforated clay pipe shall conform to ASTM C 700. Clips for plain-end pipe shall be constructed of not smaller than No. 9 hard-drawn or oil-tempered steel wire conforming to ASTM A 227 or A 229, and shall be coated with an approved rust preventive coating.
- 2.4 Perforated concrete pipe shall conform to ASTM C 444 and to ASTM C 14.
- 2.5 Perforated bituminized fiber pipe and couplings shall conform to ASTM D 2418.
- 2.6 Perforated corrugated steel pipe shall conform to ASTM A 760.
- 2.7 Perforated corrugated steel pipe, fully bituminous-coated shall conform to Fed. Spec. WW-P-405.
- 2.8 Drain Tile: Clay drain tile shall conform to ASTM C 4. Concrete drain tile shall conform to ASTM C 412.
- 2.9 Porous concrete pipe shall conform to ASTM C 654.
- 2.10 Galvanized bituminous-coated, semicircular steel pipe shall conform to ASTM A 444. Bituminous coating shall be in accordance with Fed. Spec. WW-P-405.
- 2.11 Perforated corrugated aluminum alloy pipe shall conform to Fed. Spec. WW-P-402.
- 2.12 Perforated corrugated aluminum alloy pipe, fully bituminous-coated shall conform to Fed. Spec. WW-P-402.
- 2.13 Precoated corrugated steel pipe shall conform to Fed. Spec. WW-P-405.
- 2.14 Acrylonitrile-Butadiene-Styrene (ABS) Piping shall conform to ASTM D 2751.
- 2.15 Polyvinyl Chloride (PVC) Pipe and Fittings shall conform to ASTM D 3034, Type PSM, with flexible elastomeric seal joint.
- 2.16 Filter fabric shall be a pervious sheet of polyester, nylon, or polypropylene filaments woven or otherwise formed into a uniform pattern with distinct and measurable openings. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.
- 2.17 Drainage Structures: Concrete shall have a minimum strength of 3,000 psi and an air content of 3 to 6 percent. Concrete cover over reinforcing shall be in conformance with ACI 318. Expansion joint filler material shall conform to ASTM D 1751 or D 1752. Mortar shall be composed by volume of one part Portland cement and two parts sand.
- 2.18 Precast reinforced concrete manhole risers and tops shall conform to ASTM C 478.
- 2.19 Precast concrete segmental blocks shall conform to ASTM C 139.
- 2.20 Precast concrete manhole bases shall conform to ASTM C 478.
- 2.21 Brick shall conform to ASTM C 62 or ASTM C 55.
- 2.22 Prefabricated corrugated metal: steel manholes and risers shall be fabricated of galvanized and bituminous coated corrugated metal.
- 2.23 Frames and covers or gratings shall be cast gray iron, ASTM A 48, Class 35B or ductile iron, ASTM A 536, Grade 65-45-12.
- 2.24 Ladders or ladder rungs shall be fabricated of cast iron, wrought iron, or galvanized steel.
- 2.25 Subdrain filter and bedding material shall be washed sand, sand and gravel, crushed stone,

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crushed stone screenings, or slag composed of hard, tough, durable particles free from adherent coatings.

3.0 EXECUTION:

3.1 Manholes shall be installed complete with frames, ladders, and covers or gratings.

3.2 Filter Fabric: One layer of filter fabric shall be wrapped around open joints and perforated or slotted collector pipes. Trenches to be lined with filter fabric shall be graded to obtain smooth side and bottom surfaces so that the fabric will not bridge cavities in the soil or be damaged by projecting rock.

3.3 Pipe laying: The laying of pipe shall proceed upgrade beginning at the lower end of the pipeline. Pipe shall not be laid in water. Pipe shall be bedded to the established grade line. Perforations shall be centered on the bottom of the pipe.

3.4 Jointing:

3.4.1 Nonperforated Concrete and Clay Pipe: Pipe shall be laid with 1/8- to 1/4-inch openings between ends of pipe.

3.4.2 Perforated Concrete and Clay Pipe: Pipe shall be laid with closed joints. Plain-end perforated clay pipe sections shall be fastened together with spring wire clips furnished by the pipe manufacturer.

3.4.3 Perforated Bituminized-Fiber Pipe: Pipe shall be installed with either a tapered coupling or a split-collar coupling.

3.4.4 Perforated Corrugated Metal Pipe, or Unpaved Bituminous-Coated, Perforated Corrugated Metal Pipe: The sections of pipe shall be securely fastened together with standard connecting bands furnished by the manufacturer of the pipe.

3.4.5 Drain Tile: Drain tile shall be laid with open joints of approximately 1/8-inch width but not over 1/4-inch width.

3.4.6 Porous Concrete Pipe: Pipe shall be installed with mortar joints.

3.4.7 Bituminous-Coated or Uncoated Semicircular Steel Pipe: Coupling bands shall consist of uncorrugated top and bottom sections bolted together with four bolts.

3.4.8 Bituminous-Coated or Uncoated Corrugated Aluminum Pipe: Use standard connecting bands furnished by the pipe manufacturer.

3.4.9 Acrylonitrile-Butadiene-Styrene (ABS): Solvent cement or elastomeric joints for ABS pipe shall be in accordance with ASTM D 2751.

3.4.10 Polyvinyl Chloride (PVC) Pipe: Joints shall be in accordance with the requirements of ASTM D 3212.

3.5 Backfilling: Filter material shall be placed around and over the pipe. The remainder of the trench shall be filled with overlying backfill material.

Storm Drains

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of storm drains. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Reinforced Concrete Pipe: ASTM C 76 or AASHTO M 170.

2.2 Reinforced Concrete Arch Culvert and Storm Drainpipe: ASTM C 506.

2.3 Reinforced Concrete Elliptical Culvert and Storm Drainpipe: ASTM C 507.

2.4 Nonreinforced Concrete Pipe: ASTM C 14 or AASHTO M 86, Class 1, Class 2, Class 3.

2.5 Reinforced Concrete Box Sections: ACI 346.

2.6 Clay Pipe: AASHTO M 65 or ASTM C 700.

2.7 Corrugated Steel Pipe, Pipe Arch, and Couplings: Pipe and couplings shall conform to ASTM A 760.

2.8 Structural-Plate Steel Pipe, Pipe Arches, and Arches: Plate and bolted assembly shall conform to Fed. Spec. WW-P-405.

2.9 Corrugated Aluminum Alloy Pipe, Pipe Arch, and Underdrains: Pipe shall conform to Fed. Spec. WW-P-402.

2.10 Structural-Plate Aluminum Pipe, Pipe Arches, and Arches: Plate and bolted assembly shall conform to Fed. Spec. WW-P-402.

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- 2.11 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings: ASTM D 2751.
- 2.12 Reinforced Plastic Mortar (RPMP) Sewer Pipe: ASTM D 2992.
- 2.13 Precast Reinforced Concrete Manholes: ASTM C 478 or AASHTO M 199.
- 2.14 Reinforced Plastic Mortar (RPM) Manholes: ASTM D 3840.
- 2.15 Corrugated Polyethylene (PE) Plastic Manholes: ASTM D 3753.
- 2.16 Glass Fiber-Reinforced Polyester Manholes: ASTM D 3841.
- 2.17 Prefabricated Corrugated Metal Inlets and Manholes: Manholes and inlets shall be complete with frames and covers, or frames and gratings.
- 2.18 Manhole ladders or steps shall be fabricated of steel or heavy-duty aluminum, minimum 16 inches in width with 3/4-inch diameter or square rungs on 12-inch centers. Steel ladders and inserts shall be galvanized after fabrication.
- 2.19 Precast concrete segmental blocks shall conform to ASTM C 139, and shall be not more than 8 inches thick nor less than 8 inches long.
- 2.20 Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II, or ASTM C 32, Grade MS. Brick structures shall be plastered with 1/2-inch of mortar over the entire outside surface of the walls.
- 2.21 Walls and headwalls shall be reinforced concrete, plain concrete, or steel sheeting as indicated.
- 2.22 Flared End Sections shall be a standard design with pipe manufacturer and manufactured of the same material as specified for the pipe.
- 2.23 Concrete for Structures: ACI 318.
- 2.24 Mortar shall be composed of Portland cement, Portland blast-furnace slag, Portland-pozzolan, or masonry cement, as available.
- 3.0 EXECUTION:
- 3.1 Excavation:
 - 3.1.1 Trenches: Except where banks are cut back on a stable slope, excavation for trenches shall be sheeted, braced, and shored as necessary for proper laying of pipe. Care shall be taken not to over excavate. Remove stones as necessary to avoid point bearing.
 - 3.1.2 Storm Sewers: The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.
 - 3.1.3 Appurtenances: Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks.
- 3.2 Backfilling:
 - 3.2.1 Trenches: Backfill trenches to finish grade with satisfactory materials. Replace pavement, base course, and compact sub grade disturbed by trenching operations in an acceptable manner with materials equal to the adjacent compacted sub grade, base course, and pavement for a minimum distance of 12 inches on each side of the trench and conform to the requirements hereinafter specified.
 - 3.2.2 Lower Portion of Trench: Deposit backfill material in 6-inch maximum thickness layers and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24 inches over lines, unless otherwise noted. The backfill material in this portion of the trench shall be free from stones larger than 3 inches in any dimension and hard clods and conglomerates larger than 6 inches in any dimension.
 - 3.2.3 Remainder of Trench: Except for special materials for pavements and railroads, backfill the remainder of the trench with material that is free of stones larger than 6 inches or 1/2 the layer thickness, whichever is smaller, in any dimension. Deposit backfill material in layers not exceeding the thickness specified.
- 3.3 Installation:
 - 3.3.1 General: Under no circumstances shall pipe be laid in water. No pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.
 - 3.3.2 Plastic Pipe and Manholes: Install plastic pipe and manholes in compliance with ASTM D 2321,

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ASTM D 3753, and ASTM D 3839.

- 3.3.3 Concrete and Clay Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of the flow.
- 3.3.4 Circular Concrete Pipe with Elliptical Reinforcing: Placement shall be such that reference lines designating top of pipes will not be more than 5 degrees from the vertical plane through the longitudinal axis of the pipe.
- 3.3.5 Corrugated Metal Pipe and Pipe Arch: Laying shall be with the separate sections joined firmly together with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Suitable markings or properly placed lifting lugs shall be provided to ensure placement of factory elongated pipe in a vertical plane.
- 3.3.6 Structural-Plate Steel Pipe, Pipe Arches, and Arches: Tighten bolts on each section progressively and uniformly, starting at one end of the structure after all plates are in place. Repeat the operation to ensure that all bolts are tightened to meet the torque requirement of 200 foot-pounds, plus or minus 50 foot-pounds.
- 3.3.7 Structural-Plate Aluminum Pipe, Pipe Arches, and Arches: Tighten bolts on each plate progressively and uniformly, starting at one end of the structure after all plates are in place. Repeat the operation to ensure that all bolts are torqued to a minimum of 100 foot-pounds on aluminum alloy bolts and a minimum of 150 foot-pounds on galvanized steel bolts.
- 3.3.8 Manhole Ladders: Install manhole ladders when the manhole depth exceeds 12 feet. Anchor ladders adequately to the wall by means of steel inserts spaced not more than 6 feet apart vertically. Provide at least 6-1/2 inches of space between wall and inside of rungs.

Force Drains and Inverted Siphons

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of force mains and inverted siphons. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Piping for force mains shall be ductile iron, steel, polyvinyl chloride (PVC) plastic, filament-wound reinforced or centrifugally cast reinforced thermosetting resin, thermo-setting reinforced plastic mortar pressure pipe, or reinforced concrete.
- 2.1 Ductile Iron Pipe: AWWA C151, 150 psi working pressure. Pipe shall be cement mortar-lined in accordance with AWWA C104. Joints shall conform to AWWA C111. Flanges shall conform to AWWA C115.
- 2.2 Polyvinyl chloride (PVC) Plastic Pipe: All pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B, designated as PVC 1120 in ASTM D 1785.
- 2.3 Reinforced and Prestressed Concrete Pipe: Steel cylinder reinforced concrete pipe shall conform to AWWA C300, C301, or C303 and shall be designed to withstand a working pressure of not less than 150 psi, with bell and spigot steel joints and gaskets.
- 2.4 Steel Pipe 3 Inches and Larger, not Galvanized: AWWA C200 with dimensional requirements as given in ANSI B36.10 for pipe 6 inches in diameter and larger, and ASTM A 53 for smaller sizes. Joints shall be mechanical, bell and spigot, or flanged.
- 2.5 Filament Wound Reinforced Thermosetting Resin Pipe (RTRP-I) for Lines 3 Inches and Larger: Pipe shall conform to ASTM D 2996. The pipe shall be suitable for a normal working pressure of 150 psi at 73 F.
- 2.6 Centrifugally Cast Reinforced Thermosetting Resin Pipe (RTRP-II) for Lines 3 Inches or Larger: Pipe shall conform to ASTM D 2997.
- 2.7 Reinforced Plastic Mortar Pressure (RPMP) Pipe for Lines 3 Inches or Larger: Pipe shall conform to ASTM D 3517. Joints shall be bell and spigot type with elastomeric or mechanical gaskets.
- 2.8 Valves:
 - 2.8.1 Check Valves shall be designed for a minimum working pressure of 150 psi. Valves larger than 2 inches shall be iron body, bronze-mounted, shall have flanged ends, and shall be the non-slam type. Flanges shall be the 125-pound type conforming to ANSI B16.1.
 - 2.8.2 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valves smaller than 3

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- inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150. Valves 3 inches and larger shall be iron body, bronze-mounted, and shall conform to AWWA C500.
- 2.8.3 Rubber-Seated Butterfly Valves shall conform to the performance requirements of AWWA C504.
- 2.8.4 Plug Valves: Cast-iron valves shall comply with MSS SP-78. Steel plug valves shall comply with API Spec. 6D.
- 2.8.5 Pinch Valves shall be double-acting, jam-proof type with unobstructed streamlined flows and built-in operator. The valve shall have flanged ends. Flanges shall be of the 125-pound type complying with ANSI B16.1.
- 2.8.6 Air Release Valves shall be attached by means of threaded pipe connections.
- 2.8.6.1 Manual Air Release Valves shall consist of a 3-inch gate valve and 3-inch ductile iron pipe and fittings.
- 2.8.6.2 Automatic Air Release Valves shall be of the compound lever type capable of withstanding operating pressures of 150 psi.
- 2.9 Valve Boxes shall be cast iron or concrete. Only concrete boxes will be acceptable in roadways or in areas subject to heavy loads.
- 2.10 Valve Vaults: Precast concrete units conforming to ASTM C 478.
- 3.0 EXECUTION:
- 3.1 Utility Separation: Pressure sewer pipe and water pipe shall be separated by at least 10 feet horizontally.
- 3.2 Placing and Laying:
- 3.2.1 RTRP Pipe shall be installed in accordance with ASTM D 3839. PVC shall be installed in accordance with AWWA M23.
- 3.2.2 Pipe Passing Through Walls of valve pits and structures shall be provided with cast-iron wall sleeves.
- 3.3 Thrust Blocks: Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on waterlines 6 inches in diameter or larger, and fire hydrants shall be provided with thrust blocking or metal tie rods and clamps or lugs.
- 3.4 Hydrostatic Tests: The pipeline shall be subjected to both a pressure test and a leakage test.
- 3.4.1 Pressure Test: After the pipe has been installed and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water in a manner to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour.
- 3.4.2 Leakage Test: A standard one-hour leakage test shall be performed subsequent to or concurrently with the pressure test and shall meet an allowable leakage rate according to the following formula:
$$L = \frac{NDP}{K}$$
where L equals the allowable leakage in gallons per hour, N is the number of field joints in the length of pipeline tested, D is the nominal diameter of the pipe in inches, P is the square root of the average test pressure in psig, and K is equal to 7,400.

Sand Drains

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sand drains. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Galvanized Perforated Corrugated Metal Pipe: AASHTO M36.
- 2.2 Perforated Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1784.
- 2.3 Aggregate shall be sand, gravel, crushed rock, or chat that is clean, sound, and of a good quality. Gradation shall conform to the following table:
- | | |
|--------------------------------|---------|
| Retained on the 1-inch sieve | 0% |
| Retained on the 3/8-inch sieve | 0-15% |
| Retained on the No. 8 sieve | 40-60% |
| Retained on the No. 30 sieve | 70-95% |
| Retained on the No. 100 sieve | 98-100% |
- 3.0 EXECUTION:

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- 3.1 Pipe Bedding: Aggregate shall be placed in uniform layers on level excavation.
- 3.2 Perforated Pipe shall be laid with securely aligned joints to lines and grades, which will allow proper drainage.
- 3.3 Perforated Pipe shall be embedded with a minimum coverage of two feet of aggregate or as directed.

Wastewater Collection

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of wastewater collection systems. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Bituminized Fiber Pipe and Fittings: ASTM D 1861, except that wye branches and tees may be vitrified clay, concrete, or cast iron.
 - 2.2 Cast-Iron Soil Pipe and Fittings: ASTM A 74, Class SV or XH. Acid-resistant lines shall be Class XH and contain not less than 12 percent silicon.
 - 2.2.1 Rubber Gaskets for Compression Joints: ASTM C 564.
 - 2.2.2 Caulked Joints: Joint packing material shall be twisted jute or oakum, tarred type. Lead shall comply with Fed. Spec. QQ-C-40.
 - 2.3 Clay Pipe and Fittings: Clay Pipe and Fittings shall conform to ASTM C 700. Compression Joints shall conform to ASTM C 425.
 - 2.4 Concrete Pipe: 24 inches in diameter or less, nonreinforced, ASTM C 14, Class 1; greater than 24 inches in diameter, reinforced, ASTM C 76.
 - 2.4.1 Joints less than 36 inches in diameter shall be bell and spigot type; pipe 36 inches or greater in diameter shall be bell and spigot type, tongue and groove type, or modified tongue and groove type. Joints and gaskets shall conform to ASTM C 443.
 - 2.4.2 Portland cement for Concrete Pipe and Fittings: ASTM C 150, Type IIA or V.
 - 2.5 Plastic Pipe: Plastic pipe shall not be used for sewers larger than 15 inches in diameter.
 - 2.5.1 Acrylonitrile-Butadiene-Styrene (ABS) Composite Piping: ASTM D 2680, Type SC or Type OR, size 8 inches through 15 inches in diameter.
 - 2.5.2 Acrylonitrile-Butadiene-Styrene (ABS) Pipe and Fittings: ASTM D 2751, solvent weld or bell and spigot O-ring joint, size 12 inches or less in diameter.
 - 2.5.3 Polyvinyl Chloride (PVC) Pipe and Fittings: ASTM D 3034, Type PSM with a maximum SDR of 35, size 15 inches or less in diameter, with flexible elastomeric seal joint, elastomeric gasket joint in accordance with ASTM D 3212.
 - 2.5.4 Branch Connections: Branch connections shall be made by use of regular fittings or solvent cemented saddles. Saddles for acrylonitrile-butadiene-styrene (ABS) composite pipe shall comply with Figure 2 of ASTM D 2680, saddles for acrylonitrile-butadiene-styrene (ABS) pipe shall comply with Table 3 of ASTM D 2751, and saddles for polyvinyl chloride (PVC) pipe shall comply with Table 4 of ASTM D 3034.
 - 2.6 Clay Pipe: Standard strength pipe shall conform to AASHTO M 65. Extra strength pipe shall conform to AASHTO M 65 or ASTM C 700. Compression fittings shall comply with ASTM C 425.
 - 2.7 Reinforced Plastic Mortar Pipe: ASTM D 3262. Fittings shall be in accordance with ASTM D 3840. Joints shall be bell and spigot type utilizing an elastomeric gasket.
 - 2.8 Brick for Manholes: ASTM C 62, Grade SW, or ASTM C 32, Grade MS.
 - 2.9 Cement Mortar: ASTM C 270, Type M. Use Type IIA cement.
 - 2.10 Concrete Blocks for Manholes: ASTM C 139.
 - 2.11 Portland cement: ASTM C 150, Type IIA or V.
 - 2.12 Concrete: ASTM C 94, compressive strength of 4,000 psi.
 - 2.13 Precast Reinforced Concrete Manhole Sections: ASTM C 478.
- 3.0 EXECUTION:
 - 3.1 Adjacent Facilities: Unless otherwise dimensioned, the sewer shall not be closer horizontally than ten feet to a water-supply main or service line, except that where the bottom of the water pipe will

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be at least twelve inches above the top of the sewer pipe, the horizontal spacing may be a minimum of six feet. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of ten feet on each side of the crossing shall be fully encased in 4 inches of concrete or shall be acceptable pressure pipe with no joint closer horizontally than three feet to the crossing.

- 3.1.1 Roads, Railroads, and Airfields: Sewer pipe shall be suitably encased in a sleeve of rigid conduit under primary access road crossings, railroad crossings, and at airfield runways and taxiways where aircraft are moved under their own power.
- 3.1.2 Structures: Where sewer pipe is required to be installed within three feet of an existing building or structural foundation, the sewer pipe shall be sleeved.
- 3.2 Pipe Laying: Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of the flow.
- 3.3 Leakage Tests: Lines shall be tested for leakage by either infiltration tests or exfiltration tests, as appropriate. Leakage shall not exceed 0.2 gallons per inch diameter per 100 feet of pipeline per hour.
- 3.4 Test for Deflection: When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline upon completion of all work, including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads.
- 3.5 Building Connections shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building.

Erosion Control

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mesh or netting for erosion control. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Jute Mesh: Fed. Spec. CCC-C-467.
 - 2.2 Plastic Mesh: Manufacturer's recommendation.
 - 2.3 Plastic Netting: Manufacturer's recommendation.
 - 2.4 Polypropylene Mesh: Manufacturer's recommendation.
- 3.0 EXECUTION:
 - 3.1 Preparation: Grade, compact, fertilize, and seed the area to be protected.
 - 3.2 Installation: Apply blankets either horizontally or vertically to the slope. In ditches, apply blanket in direction of water flow. Lap and anchor blankets according to the manufacturer's instructions.

Sewer Line Manholes

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewer line manholes. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 General: All materials shall be clean, free of defects, corrosion, and damage. All items shall be of proper type, size, design, and characteristics for the use intended. Unless otherwise specified, all items shall be factory made.
 - 2.2 Manhole Brick: Bricks used in the repair of manholes shall comply with ASTM C 32, Grade MS.
 - 2.3 Concrete used in the repair of manholes shall comply with ASTM C 94 with compressive strength of 3,000 psi.
 - 2.4 Portland cement shall comply with ASTM C 150, Type 5.
 - 2.5 Concrete Blocks for manhole repair shall comply with ASTM C 139, of the size required to match prevailing conditions.
 - 2.6 Cement Mortar shall comply with ASTM C 270, Type M.
 - 2.7 Precast Concrete Sections for manhole repair shall comply with ASTM C 478, utilizing Portland cement.
 - 2.8 Manhole Steps shall be of cast iron construction in compliance with ASTM A 48, Class 20-B or ASTM

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- A 536, with a minimum tensile strength of 35,000 psi.
- 2.9 Grout shall be of Portland cement, metallic or nonmetallic, nonshrink or expansive type, complying with ASTM C 476 or ASTM C 658.
 - 2.10 Epoxy Mortar shall be utilized to fill all deteriorated joints of brick manholes.
 - 2.11 Castings shall be gray iron, complying with ASTM A 48, Class 20B, or ductile iron, complying with ASTM A 536.
 - 2.12 Frames and Covers shall be for light-duty traffic, with 24-inch entrance diameter, anchored to the manhole structure.
 - 2.12.1 Waterproof Frame and Cover shall be gasket sealed with bolts for lid and shall comply with "Frames and Covers," above. Bolts and nuts shall be steel.
 - 2.12.2 Replacement Covers shall be solid, flat top, of the proper design and load rating, and fit the existing frame without need for adapters or additional hardware.
 - 2.12.3 Cover Height Adjustment Devices shall be expandable to fit the frame rim size and adjustable vertically to match the required finished grade elevation.
 - 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Cleaning Existing Surfaces: Prior to applying grout, scrape surfaces of all loose material, dry of excess water, and clean of organics, slimes, or dust.
 - 3.1.2 Manhole Crack Preparation: Drill holes in cracks at the extreme ends and at 6- to 9-inch intervals with a masonry bit.
 - 3.2 Installation:
 - 3.2.1 Grouting, Interior of Manhole: Grout and seal interior wall of manhole by hand application, giving a trowel finish.
 - 3.2.2 Grouting, Exterior of Manhole: If pressure grouting from ground surface, insert applicator directly above area to be grouted and inject grout until grout enters manhole through crack. If pressure grouting from inside manhole, insert grout applicator at each drilled hole along the crack and repeatedly pump until grout emerges through the crack and annular space between hole and applicator.
 - 3.2.3 Curing of Grout: Cure Portland cement grout in a damp atmosphere by closing all entrances to the manhole.

Sewer Line Grouting

- 1.0 DESCRIPTION OF WORK: This specification covers sewer line grouting. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Grout shall be applicable to sewer conditions and as required to seal the pipe from leaks. Type of grout used shall be compatible with the soil and moisture conditions and shall provide watertight seals under all internal and external conditions to which the sewer shall be subjected.
 - 2.2 Chemical Grout shall be acrylamide gel or polyurethane foam.
 - 2.2.1 Acrylamide Gel shall be an aqueous solution of acrylamide and N,N' methylenebisacrylamide powders, with the proper catalyst, such as B-dimethylaminopropionitrile and ammonium persulfate, mixed in the proper proportions and concentrations to achieve the desired results, depending on the field conditions.
 - 2.2.2 Polyurethane Foam Grout shall be an aqueous solution of liquid urethane polymer, with a water-soluble amine accelerator.
 - 2.3 Epoxy Mortar Grout shall comply with ANSI A118.3.
 - 2.4 Portland cement Grout shall comply with ASTM C 476.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Alternate Sewage Discharge shall be provided to a downstream manhole.
 - 3.1.2 Preparatory Cleaning: Prior to beginning of grouting work, sewers to be repaired shall be cleaned of all debris, sediments, and tuberculation.
 - 3.2 Installation:

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- 3.2.1 Grouting shall take place at all joints determined to require repair and at cracks and crevices where infiltration or exfiltration is occurring or has a possibility of occurring.
- 3.2.2 Grouting of Lateral Connections and Manhole External Drops shall consist of pumping grout to fill the entire length of the lateral pipe and manhole drops until the grout exfiltrates through the various leaks. Allowing for proper grout setting time, ream the grouted pipe of excess grout in its entirety. Remove all excess grout without being discharged in the main sewer and dispose of properly.
- 3.2.3 Manual Grout Application: Grout large sewers allowing the physical entrance of personnel utilizing probe-type applications and injecting the grout material directly in the leaks or through holes drilled at the leaks. Grouting shall continue until all leaks are stopped.
- 3.2.4 Testing of Grouted Sewers:
 - 3.2.4.1 Air Testing of each individual joint and crevice shall be conducted upon setting of the in-place grout. The test shall be for not less than 30 seconds at each location, at pressures greater than or equal to the hydrostatic head caused by the maximum expected groundwater elevation. Record pressures at each location at five second intervals with an accuracy of 0.05 psi. Repair locations having pressure drops due to air leaks using grout or another approved method, until all leaks are stopped. Retest location after repairs are made.
 - 3.2.4.2 Hydrostatic Testing:
 - 3.2.4.2.1 Upon completion of grouting a section of sewer, the line shall be hydrostatically tested for leaks. Repair leaks using grout or another approved method, until all leaks are stopped. Retest line section after repairs are made.
 - 3.2.4.2.2 Infiltration and Exfiltration Leakage into or out of the sewer shall not exceed the equivalent of 100 gallons per day, per inch of diameter, per mile of sewer from any section between successive manholes. The infiltration test may be used when the ground water is at least 2 feet higher than the pipe crown. Measure leakage with a weir. The exfiltration test shall consist of plugging successive upstream manholes and service connections and filling of line from the upstream manhole with water to a depth of 2 feet or more above the pipe crown or the ground water, whichever is higher.
 - 3.2.4.3 Pneumatic Testing: Upon completion of grouting a section of sewers, the line shall be pneumatically tested for leaks in compliance with ASTM C 828. Repair leaks using grout or another approved method, until all leaks are stopped. Retest line section after repairs are made.
- 3.2.5 Performance of Grouted Sewers: Grouted sewer lines shall have no more than 100 gallons per inch diameter per mile of sewer per day, infiltration or exfiltration, upon completion of the work. Regrout sections of sewers experiencing more than the allowable leakage or otherwise repair by approved methods.

Sewer Line Cleaning

- 1.0 DESCRIPTION OF WORK: This specification covers sewer line cleaning. Cleaning procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: All materials shall be clean, free of defects, corrosion, and damage. All items shall be of proper type, size, design, and characteristics for the use intended. Unless otherwise specified, all items shall be factory-made.
 - 2.1 Portable Cleaning Equipment: Equipment used in the cleaning of sewer lines shall be as required to complete the work for the size, length, and conditions of the sewer. Portable and mobile equipment shall comply with Water Pollution Control Federation Manual of Practice No. 7.
 - 2.2 Chemicals shall be of the strength required to perform the work. The chemicals shall not be damaging to pipe materials, manholes, pumping equipment, nor treatment process and shall not be contaminated by foreign substances.
- 3.0 EXECUTION:
 - 3.1 Preparation:
 - 3.1.1 Protection required to prevent damage to adjacent materials, equipment, fixtures, and finishes shall be provided. Necessary protective clothing and accessories for personnel working with chemicals shall be provided.

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- 3.1.2 Ventilation of Sewers: Contractor shall provide proper ventilation for personnel working in the sewer.
- 3.1.3 Alternate Sewage Discharge: Contractor shall provide an alternate routing of sewage discharge to a downstream manhole.
- 3.1.4 Traffic: Contractor shall provide all traffic signs required to safely direct traffic at and around work areas.
- 3.2 Installation:
 - 3.2.1 Direction of Work: Sewer line cleaning work, with the exception of hydraulic scouring, shall proceed in the downstream direction. Cleaning by hydraulic scouring shall proceed in the upstream direction.
 - 3.2.2 Testing: Upon completion of cleaning operation, test sewer lines for proper operation and observe for a period of 24 hours. Clean out all stoppages and the retest the line for proper operation.

Septic Tanks and Grease Traps

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of septic tanks and grease traps. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Concrete Repair Material shall be epoxy type grout in compliance with Applicable standards and/or.
- 3.0 EXECUTION:
 - 3.1 Septic Tanks and Grease Traps shall be drained and cleaned.
 - 3.2 Adequate Ventilation shall be provided and precautions against the presence of explosive vapors shall be taken if it is necessary to enter the septic tank.
 - 3.3 Soil Absorption System: Remove and dispose of vegetation roots impeding the flow of water in the soil absorption system properly. Restore all noticeable irregularities in the ground surface, caused by removal, by filling with soil that matches surrounding soil.
 - 3.4 Filling Abandoned Septic Tanks and Grease Traps: Clean and fill abandoned septic tanks and grease traps with compacted soil.

Siphon Tank and Siphons

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment plant dosing siphon tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Tank Repair Material shall be epoxy type grout complying with Applicable standards and/or.
 - 2.2 Concrete Coatings:
 - 2.2.1 Outside and Above Grade shall be epoxy type in compliance with Mil. Spec. MIL-P-24441.
 - 2.2.2 Inside and Below Grade shall be Coal-tar epoxy type in compliance with SSPC-PAINT 16.
 - 2.3 Steel Repair Material shall be steel plate or epoxy cement and fiberglass cloth.
 - 2.4 Corroded or Defective Siphons: Replace those parts corroded or defective with new parts compatible with the unit, as recommended by the manufacturer.
 - 2.5 Steel Coatings:
 - 2.5.1 Red-Lead Base Coat shall comply with Fed. Spec. TT-P-86, Type I.
 - 2.5.2 Aluminum Paint shall comply with Fed. Spec. TT-P-38.
- 3.0 EXECUTION:
 - 3.1 Corroded or Broken Pipe and Fittings: Replace as required.
 - 3.2 Minor Leaks: Repair minor leaks in the tank using material and surface preparation and application methods recommended by the material manufacturer.
 - 3.3 Spalled Areas: Repair as required.
 - 3.4 Cleaning and Coating:

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- 3.4.1 Interior Concrete Surfaces of the tank shall be cleaned with high pressure water or steam to remove all dirt and residue, allowed to dry, and brush sandblasted in compliance with SSPC-SP 7.
- 3.4.2 The exterior concrete surfaces of the tank shall be cleaned by means of brush sandblasting in compliance with SSPC-SP 7. The surfaces shall be blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint shall be applied.
- 3.4.3 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of an epoxy filler. The surfacing material shall be allowed to cure overnight, and then two coats of Coal-tar epoxy complying with SSPC-PAINT 16 shall be applied.
- 3.4.4 Submerged ferrous metal surfaces that are exposed to the sewage shall be sandblasted in compliance with SSPC-SP 10 and coated with two coats of coal-tar epoxy.
- 3.4.5 Ferrous metal surfaces that are not submerged shall be cleaned by means of sandblasting in compliance with SSPC-SP 6. Surfaces inaccessible to sandblasting shall be power tool cleaned in compliance with SSPC-SP 3. Surfaces shall be coated with one coat of red-lead base paint. After the base paint has dried sufficiently, two coats of Aluminum finish paint shall be applied.

Grease Interceptors

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grease interceptors. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Semi-Automatic Grease Draw-Off: Unit shall be on-floor type, cast iron, porcelain, or painted inside and out, with internal air relief, grease draw-off piping, and valve with flow control fitting. Draw-off piping and nozzle may be interchanged in field to make unit a right- or left-handed installation. Unit shall also have double wall trap with removable baffles and gasketed cover with low pressure chamber. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.
 - 2.2 Manual Grease Draw-Off: Unit shall be on-floor type, partially recessed or flush-with-floor type, cast iron, porcelain, or painted inside and out, with internal air relief and flow control fitting. Unit shall have double wall trap, removable baffles, gasketed cover bearing plumbing, and drainage seal of approval. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.
 - 2.3 Manual Grease Draw-Off, Coated Steel Type: Unit shall be high volume on floor or partially recessed, with internal air relief, double wall trap, removable baffles, gasketed non-skid cover, and flow control fitting. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.
- 3.0 EXECUTION: The unit shall be placed in the influent line of the waste water disposal and treatment system.

Imhoff Tanks

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of sewage treatment plant Imhoff tanks. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Coatings:
 - 2.1.1 Epoxy-Filler Compound for concrete surfaces shall comply with Applicable standards and/or.
 - 2.1.2 Coal-tar epoxy shall comply with SSPC-PAINT 16.
 - 2.1.3 Epoxy paint shall comply with Mil. Spec. MIL-P-24441.
 - 2.1.4 Red-lead base paint shall comply with Fed. Spec. TT-P-86, Type I.
 - 2.1.5 Aluminum finish paint shall comply with Fed. Spec. TT-P-38.
 - 2.2 Steel Tank Repair Material for minor leaks shall be a two-component epoxy sealing compound. For

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- badly corroded areas, a steel plate of the same composition and thickness as the original tank shall be used.
- 2.3 Pipe and Fittings for replacement shall be equivalent to the existing pipe and fittings.
 - 3.0 EXECUTION:
 - 3.1 Preparation: Drain the contents of the tank and dispose of the sludge and sewage.
 - 3.2 Leak Repair:
 - 3.2.1 Concrete Tanks: Repair concrete tank leaks by cleaning and chipping or sandblasting the area of the leak and applying two-component epoxy concrete sealant.
 - 3.2.2 Steel Tanks: Repair steel tank leaks by cleaning, scraping, chipping, or sandblasting the area of the leak and applying epoxy steel sealant. Repair badly corroded areas of steel tanks by cutting out the corroded area and welding a section of new steel plate in place. Welding shall be in compliance with AWS D1.1.
 - 3.3 Pipe and Fittings: Replace pipe and fittings as required.
 - 3.4 Cleaning and Coatings:
 - 3.4.1 Interior Concrete Surfaces of the tank shall be cleaned with high pressure water or steam to remove dirt and residue, allowed to dry, and brush sandblasted.
 - 3.4.2 Holes and voids in the concrete surfaces left from the blast cleaning shall be filled by means of troweling and squeeze application of epoxy filler. Two coats of Coal-tar epoxy shall be applied to the surface after the epoxy has cured.
 - 3.4.3 Submerged ferrous metal surfaces such as piping and equipment that are exposed to the sewage shall be sandblasted and coated with two coats of coal-tar epoxy.
 - 3.4.4 Exterior Concrete Surfaces of the tank shall be cleaned by means of brush sandblast. The surfaces shall be blown down with air to remove the blasting residue and dust, and two coats of epoxy-polyamide paint shall be applied.
 - 3.4.5 Ferrous metal surfaces that are not submerged shall be cleaned by means of sandblasting. Coat surfaces with one coat of red-lead base paint. After the base paint has dried sufficiently, apply two coats of Aluminum finish paint.

Sewer Line Pipe Lining

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sewer line pipe lining. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Lining Material:
 - 2.1.1 Polyethylene Pipe: Extruded, flexible industrial grade, high density (Type 3 or 4) in 40 foot lengths, complying with ASTM D 2239 and D 2447.
 - 2.1.1.1 Diameter: Outside diameter shall be as large as possible while allowing for ease of pulling into the existing sewers. Pipe dimensions shall comply with ASTM D 2447 and D 2837.
 - 2.1.1.2 Liner Thickness and Class shall be suitable for the use intended. The tolerance on the pipe wall thickness shall be as noted in Table 2 of ASTM D 2447.
 - 2.1.1.3 Gravity Sanitary, Gravity Storm, and Gravity Industrial Sewers shall be Schedule 40.
 - 2.1.1.4 Gravity Thermal Discharge Sewers shall be Schedule 80.
 - 2.1.1.5 Low Pressure Sewers shall be Schedule 40, complying with ASTM D 2239.
 - 2.1.1.6 High Pressure Sewers shall be Schedule 80, complying with ASTM D 2239 and D 2837.
 - 2.1.1.7 Chemical Resistance: Pipe liner shall be resistant to chemical attack, erosion, and corrosion.
 - 2.1.1.8 Fittings shall be fabricated from polyethylene pipe. The polyethylene fittings shall have the same pressure rating as the pipe and shall comply with ASTM D 3261.
 - 2.1.2 Cement-Mortar Lining:
 - 2.1.2.1 Portland cement shall comply with ASTM C 150, Type 1.
 - 2.1.2.2 Pozzolan Cement shall comply with ASTM C 618 and shall not comprise more than 20 percent of total cement amount, by weight.
 - 2.1.2.3 Sand shall be well graded, clean, free from organic and extraneous matter. One hundred percent

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- shall pass the 16-mesh size screen.
- 2.1.2.4 Lining Thickness: Cement lining shall be not less than 1/8 inch for pipe sizes 4 to 14 inches, not less than 3/16 inch for pipe sized 16 inches and larger, and not less than 1/4 inch for steel pipe 16 inches and larger.
- 2.1.3 Reinforced Mortar Pipe Slip-Lining:
 - 2.1.3.1 Gravity Sewers: Slip-lining shall be of glass fiber reinforced polyester mortar pipe, complying with ASTM D 3262.
 - 2.1.3.2 Pressure Sewers (Force Mains): Slip-lining shall be of glass fiber reinforced polyester mortar pipe complying with ASTM D 2517.
 - 2.1.3.3 Diameter: Outside diameter shall be as large as possible while allowing for ease of pulling into existing sewers, as recommended by the manufacturer.
 - 2.1.3.4 Chemical Resistance: Pipe liner shall be resistant to chemical attack, erosion, and corrosion.
 - 2.1.3.5 Fittings: Fittings shall be manufactured of the same materials as is the glass fiber reinforced polyester mortar pipe.
- 2.1.4 Epoxy-Mortar Lining:
 - 2.1.4.1 Epoxy Compound shall comply with ASTM D 1763.
 - 2.1.4.2 Admixtures shall be well graded with one hundred percent passing the 16-mesh size screen. All admixtures shall improve the workability, density, and strength of the mortar.
 - 2.1.4.3 Lining Thickness: For pipe sizes 4 to 14 inches, epoxy mortar lining thickness shall be not less than 1/8 inch. For pipe sizes 16 inches and larger, epoxy mortar lining shall be not less than 3/16 inch.
- 2.2 Joint:
 - 2.2.1 Slip-Lining:
 - 2.2.1.1 Polyethylene Pipe Butt Joints: Pipe lengths, fittings, and flanged connections to be joined by thermal butt fusion shall be of the same type, grade, and class of polyethylene compound and supplied by pipe supplier.
 - 2.2.1.2 Flanged Joints shall consist of a polyethylene flange, thermally butt fused to the ends of the pipe. The companion flange shall be steel or cast iron and nylon-coated.
 - 2.2.1.3 Lateral Service Connections: Sidewall connections shall be made with polyethylene pipe sections of the same material, grade, and class as the liner material and shall have the same pressure ratings. Lateral connections shall be watertight.
 - 2.2.2 Reinforced Mortar Lining:
 - 2.2.2.1 Bell and spigot joints shall be the inverted type.
 - 2.2.2.2 Manhole Joints and Connections shall be oakum ring and grout as required.
- 3.0 EXECUTION:
 - 3.1 Slip-Lining, Polyethylene Pipe:
 - 3.1.1 Insertion of Liner: Liner shall be laid at a constant line and grade as the existing pipe, without undulations or damage. Where the existing pipe is not at constant grade, the liner shall follow as true a constant grade as possible.
 - 3.1.2 Grouting: At manholes, annular space shall be packed with oakum and expansion grout or nonshrink grout as required. At existing line, after liner has been inserted, grout wherever existing pipe has failed structurally.
 - 3.1.3 Concrete Encasement: Crown of liner shall be encased in concrete a minimum thickness of 6 inches for the entire length of the excavated trench and out at least 6 inches each side of the bottom half of the original pipe remaining down to firm soil. Wherever existing concrete encasement has been removed, the liner shall be encased in the same manner as the original pipe.
 - 3.1.4 Thrust Blocks: Concrete thrust blocks shall be provided as required.
 - 3.2 Cement Mortar and Epoxy Mortar Lining:
 - 3.2.1 Cement Mortar Mixing: One part cement to one and one-half parts of sand by volume.
 - 3.2.2 Application of Lining: The lining shall be applied to produce a smooth, uniform thickness throughout the interior of the pipe line.
 - 3.2.3 Curing of the Cement Mortar Lining: Immediately upon completion of the lining of a length of pipe between access openings or at the end of a day's run, the section of pipe shall be closed at each end, the access openings covered to prevent the circulation of air, and the atmosphere kept moist.

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- 3.2.4 Reconnection of Pipes After Lining: Close and make watertight all openings in the sewer lines.
- 3.2.5 Pressure Test and Leaks: Hydrostatic and leakage test shall be conducted on all pipe that is cleaned and lined.
- 3.3 Reinforced Mortar Pipe Lining:
 - 3.3.1 Joining of Pipe Ends: Liner sections containing bell and spigot joints shall be joined using an O-ring.
 - 3.3.2 Grouting Work shall be accomplished following the same techniques as described in paragraph Slip-Lining, Polyethylene Pipe.
- 3.4 Cement Mortar Lining:
 - 3.4.1 Epoxy Mortar Lining: Excessive mortar shall be removed from the manhole walls and bottom. Manhole bottom shall receive special care in making all transitions smooth.
 - 3.4.2 Work at Service Connections: Plugs or caps shall be placed at the access point of the service connection to the sewer and shall be removed once the mortar has set. The completed lining shall not be damaged.
- 3.5 Reinforced Mortar Pipe Lining: Joining of fiberglass reinforced polyester mortar pipe shall be carried out in the trench, with the first section of liner already inserted.
- 3.6 Lateral Connections: Service to connections shall be provided for and continued after installation of the lining.
- 3.7 Testing: Upon completion of lining operation, the sewer line shall be tested for proper operation and shall be observed for a period of 24 hours. All deficiencies shall be corrected.
- 3.8 Pavement Restoration: All disturbed pavement shall be restored to its original condition and shall match existing adjacent.
- 3.9 Inspection: Large diameter sewers shall be inspected from inside to ensure that all lateral connections and joints are in proper order. Sewers that have been cement-lined may be inspected for a smooth finish, while plugs and caps are being removed.

Sewage Treatment Lagoons

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of sewage treatment lagoons. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Concrete Block shall comply with ASTM C 129.
 - 2.2 Concrete Grout shall comply with Applicable standards and/or.
 - 2.3 Riprap Stone shall comply with AREA-01.
 - 2.4 Concrete Repair Material shall comply with Applicable standards and/or.
 - 2.5 Sand shall comply with ASTM C 33.
 - 2.6 Portland cement shall comply with ASTM C 150, Type V.
 - 2.7 Rubble shall consist of broken concrete or broken stone.
- 3.0 EXECUTION:
 - 3.1 Algae Removal shall be by mechanical or manual methods and shall include, but not be limited to, skimming, pumping through a screen, raking, or draining and cleaning the lagoon.
 - 3.2 Slope and Dike Reconstruction shall be made to re-establish the original design configuration and grades. Place riprap, where required, so that its angle of repose is not exceeded.
 - 3.3 Liner Reconstruction and Repair shall be made with materials compatible with the existing liner and compatible with the wastewater and sludge to be contained therein.
 - 3.4 Repairs to Elastomeric Membrane Liners shall be made with like material and shall overlap all cuts, tears, fractures or other defects a minimum of 4 inches. Cut repair pieces square or rectangular. The method of bonding the new material to existing material shall be similar to the original joint banding method, except when the original joints have failed. In this case, the material supplier shall demonstrate that an alternate jointing system shall be satisfactory to the Authorized Member Representative. Replace earth or sand cover removed during repair or replacement of plastic liner to the same thickness as the original installation.
 - 3.5 Repairs to Non-Elastomeric Membrane Liners shall be made by cutting out defective areas back to

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sound liner material and replacing with similar material. Joints shall be watertight.

Fences and Gates

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fences and gates. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Ground Rods, Down Conductors, and Connectors:
 - 2.1.1 Ground Rods: Galvanized steel rods, 3/4 inch in diameter by 10 feet in length.
 - 2.1.2 Down Conductors: No. 8 copper wire or equivalent.
 - 2.1.3 Connectors: Pressure type bolted or compression type.
 - 2.2 Foundations shall be concrete with a minimum 28-day strength of 3,000 psi, and shall extend from 3 feet 6 inches below finished grade to 2 inches above finished grade. Tops of foundations shall slope away from posts. Extend gate post foundations to the underside of the bottom hinge. Foundations for line posts shall be 10 inches in diameter. Foundations for terminal and gate posts shall be the diameter of the post plus 8 inches but not less than 12 inches.
- 3.0 EXECUTION:
 - 3.1 Existing Fence Connections: Wherever new fencing joins an existing fence, either at a corner or at the intersection of straight line fences, a corner post with brace post shall be set at the junction and braced. If the connection is made elsewhere than the corner of the fencing, the last span of the existing fence shall contain a brace span.
 - 3.2 Security Fence: Wherever existing fencing fabric is embedded in concrete or earth, or attached to an earth-embedded galvanized steel sheet, repairs shall be made as follows:
 - 3.2.1 Earth Embedment: Install new fabric or galvanized steel sheet to depth of existing. Attach steel sheet securely to adjacent existing sheeting and new and existing fencing fabric. Thoroughly backfill and compact soil in repair area.
 - 3.2.2 Concrete Embedment: Install fence fabric to the depth of existing fabric. Place concrete to match existing configuration. Clean all exposed fencing of concrete that is a result of new construction.
 - 3.3 Gate Installation: Install, plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Install and adjust hardware for smooth operation and lubricate where necessary.
 - 3.4 Grounding: Ground on each side of every gate where crossed by high-tension-line crossings, at 1,000 to 1,500 foot intervals along fence in isolated areas, and at 500 to 750 foot intervals when in close proximity (100 feet or less) to public roads, highways, and buildings. Down conductors shall run full height of fence wherever wood posts are used and shall be securely fastened to each strand of wire to provide electrical continuity.
 - 3.5 Field Painting: At the completion of repair work, touch up all surfaces damaged by construction operations. Galvanized surfaces shall be painted with zinc-oxide paint. Wood, steel, vinyl coated, aluminized, and other fencing materials shall be touched up following the manufacturer's recommendations or to match existing finish.
 - 3.6 Final Grading: The final ground surface shall be graded to remove irregularities and maintain the clearance between the bottom of the fence and the ground surface.
 - 3.7 Seeding and Sodding: Seed or sod all lawn areas disturbed by repair and maintenance operations with a plant variety of the same species as that in adjacent areas. Areas where grass does not take hold shall be reseeded or resodded as directed by the Authorized Member Representative.

Steel Chain Link Fencing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of steel chain-link fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

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2.0 PRODUCTS:

- 2.1 Galvanized Fabric shall comply with Fed. Spec. RR-F-191/1, Type I, of 9 gauge wire and 2-inch mesh.
- 2.2 Framework: Posts, top rails, and braces shall be galvanized steel pipe in compliance with Fed. Spec. RR-F-191/3, Class 1.
- 2.3 Gates shall comply with Fed. Spec. RR-F-191/2 and shall be of the same type, size, and shape as the existing. Provide a keeper to automatically engage and hold the gate leaf open until manually released, a center plunger rod, a center stop, vertical lift framework, and sliding track.
- 2.4 Electric Operator for gates shall include a totally enclosed motor, starter, gear reduction, clutch, limit switch, and housing. Operator shall be controlled by an electric lock. Slide gate operators shall be equipped with magnetic brake, manual disconnect, and chain drive. Swing gate operators shall be equipped with a crank arm.
- 2.5 Accessories:
 - 2.5.1 Barbed Wire shall comply with Fed. Spec. RR-F-191/4 and shall be two strands of 12-1/2 gauge galvanized steel wire, twisted, with four point barbs spaced five inches apart.
 - 2.5.2 Post Caps: Pressed steel or malleable iron, galvanized, and of the configuration required.
 - 2.5.3 Extension Arms for barbed wire shall extend outward at a 45 degree angle and shall have provision for attaching three strands of barbed wire with the top strand approximately one foot above the fence fabric.
 - 2.5.4 Stretcher Bars: Minimum 3/16-inch by 3/4-inch steel bars, galvanized in compliance with ASTM A 123.
 - 2.5.5 Stretcher Bar Bands: Heavy pressed steel bands, galvanized in compliance with ASTM A 123.
 - 2.5.6 Tension Wire: Spring coil or crimped wire of minimum seven gauge galvanized steel with minimum tensile strength of 80,000 pounds per square inch and coating as specified for the fabric.
 - 2.5.7 Fasteners: Steel wire with an ASTM A 641, Class 1 galvanized coating.
 - 2.5.8 Slat Inserts: California Redwood treated with a stain preservative to maintain appearance.
 - 2.5.9 Boulevard Clamps: Stamped 13 gauge mild steel, galvanized, in compliance with ASTM A 641, Class 1. Clamps for vinyl coated fence shall have the vinyl coating applied over the zinc coating.
- 3.0 EXECUTION:
 - 3.1 Posts: Set plumb, in straight alignment with other posts, evenly spaced and rigidly set. Set posts to a depth of 3 inches above the bottom of the concrete foundation.
 - 3.2 Rails:
 - 3.2.1 Top Rail: Install continuous through post caps, securely fastening to end, corner, pull, and gate posts with rail end.
 - 3.2.2 Intermediate and bottom rails: Attach to line posts with boulevard clamps and to terminal posts with rail ends.
 - 3.3 Truss Bracing: Securely fasten to end, corner, pull, and gate posts 12 inches below cap and extend to the adjacent line post. Braces shall be trussed from the line post to the bottom of the terminal post with round rods and turnbuckles.
 - 3.4 Fabric:
 - 3.4.1 Repair (Cutting and Patching) of Fabric: Cut out the damaged fabric, position new fabric to line up with existing mesh, and securely fasten to existing fabric.
 - 3.4.2 Replacement of Fabric: Stretch to proper tension and securely fasten to terminal posts using stretcher bars.
 - 3.4.3 Restretching Existing Fabric: Stretch existing fabric indicated to be restretched to proper tension and refasten to posts and rails.
 - 3.5 Barbed Wire: Stretch and secure to extension arms with heavy wire pins.
 - 3.6 Gate Hinges: Install to prevent twisting or turning under action of the gate and to swing through 180 degrees from closed to open position.

Steel Rod and Bar Fencing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel rod and bar fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product

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manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pickets shall be of height and style required to match existing, solid mild steel bar, galvanized in compliance with ASTM A 123.

2.2 Framework: Posts and rails shall be of length and style to match existing, solid mild steel, galvanized in compliance with ASTM A 123.

2.3 Gates:

2.3.1 Frame: Galvanized steel, all welded construction.

2.3.2 Truss Rods: Galvanized steel as required for stability, minimum 3/16 inch in diameter.

2.3.3 Hardware: Gate latches, hinges, gate track, trolley, rollers, plunger rod, and locks as required.

2.4 Accessories:

2.4.1 Brackets: Malleable iron or pressed steel of the sizes and configurations required to adequately support attached members, minimum 3/16 inch thick.

2.4.2 Trim: Flat caps for all posts and pickets where required. Caps shall be galvanized cast iron or zinc die castings of thickness standard to the manufacturer.

2.4.3 Sleeves: Where required, sleeves shall be minimum 16-gauge steel tubing of the required configuration to receive post. Sleeves shall be galvanized in compliance with ASTM A 123.

3.0 EXECUTION:

3.1 Pickets: Fasten pickets to rails with clip angles and bolts and nuts.

3.2 Posts: Set posts in sleeves or footings as required to match existing conditions.

3.3 Brackets: Brackets for wall mounting and change of grade shall be securely fastened to wall and/or posts with appropriate fasteners.

3.4 Alignment: Finished fencing shall be in proper alignment with all posts plumb.

3.5 Welding: Comply with AWS D1.1.

3.6 Repair: Items shall be straightened, welded, sufficiently bolted, or otherwise strengthened as required.

Wrought Iron Rod and Bar Fencing

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wrought iron rod and bar fencing including ornamental malleable iron fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Pickets shall be 3/8-inch square wrought iron rods of the required length and configuration.

2.2 Gates: Hardware shall be compatible with existing hardware in appearance and function.

2.3 Accessories:

2.3.1 Brackets: Brackets for fastening fencing to walls, floor, posts, and other attachments shall be wrought iron.

2.3.2 Trim: Provide iron trim items as required.

2.3.3 Bolts and Nuts shall be ASTM A 307 and galvanized in compliance with ASTM A 153.

3.0 EXECUTION:

3.1 Pickets shall be welded to rails. Welding shall comply with AWS standards and shall seal the joint against moisture.

3.2 Rails shall be securely fastened to posts with angle brackets.

3.3 Posts shall be set in sleeves or footings to match existing conditions. Posts set in sleeves shall have the annular space between the sleeve and post filled with lead or sulfur.

3.4 Brackets for wall mounting and change of grade shall be securely fastened to wall and/or posts with appropriate fasteners.

3.5 Gates:

3.5.1 Frame: Iron rod and bar rails and pickets shall be welded with full welds into sections in a pattern matching existing fencing. Rail-and-picket sections shall be fastened to posts with angle brackets, bolts, and nuts.

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3.5.2 Bracing: Iron rod or bar braces shall be welded in place when required to strengthen the gate.

Precast Concrete and Masonry Fencing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of precast concrete and masonry fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Fence Materials:
 - 2.1.1 Pre-Cast Concrete: Match existing fencing units in all dimensions, patterns, colors, and textures. Units shall comply with ASTM C 145 Grade N, Type 1 for solid units and ASTM C 90 Grade N, Type 1 for hollow units, and ACI 318 as applicable.
 - 2.1.2 Brick: Exposed brick masonry shall comply with ASTM C 216, Grade SW. Brick for below grade shall comply with ASTM C 62, Grade SW. Brick shall be selected for appearance to match existing brick in dimension, color, and texture.
 - 2.1.3 Mortar:
 - 2.1.3.1 Mortar shall comply with ASTM C 270, Type S and shall be 1 part Portland cement (ASTM C 150), 1/2 part lime (ASTM C 207), and 4-1/2 parts sand (ASTM C 144). Sand for joints 1/4 inch or less shall pass a No. 16 sieve. Sand containing any substance that will stain the masonry shall not be used. Waterproofing admixtures shall be approved by the Authorized Member Representative.
 - 2.1.3.2 Colored Mortar shall be a factory-formulated mixture of masonry cement complying with ASTM C 91 and mortar color.
 - 2.1.4 Masonry Grout: Coarse grout for masonry lintels and for filling cells in masonry units shall consist of 1 part Portland cement, 1/10 part lime, and 1-1/2 parts sand. Fine grout for bedding and grouting steel and for all other applications shall consist of 1 part Portland cement, 1/10 part lime, and 2-1/2 parts sand. Use waterproofing admixture in all grout used in exterior walls.
 - 2.2 Posts:
 - 2.2.1 Line Posts: Line posts shall be of the same materials and configuration as existing posts with reinforcing as required.
 - 2.2.2 Terminal and Corner Posts: Match existing terminal and corner posts in configuration and adequately reinforce.
 - 2.2.3 Gate Posts: Gate posts shall have all attachments for gates firmly embedded and shall be of sufficient strength to withstand stresses applied by the gate.
 - 2.3 Rails: Rails shall be of the same materials and configuration as existing rails with all accessories for firmly attaching to posts.
 - 2.4 Gates:
 - 2.4.1 Frame: Constructed of 2 x 4 wood members with attached pickets. Configuration of gate shall match that of existing gates.
 - 2.4.2 Gate Bracing shall consist of a single 2 x 4 running diagonally across the gate to opposite corners of the frame. High end of brace shall be at hinge edge of gate.
 - 2.4.3 Hardware: Hinges, latches, and other hardware shall be hot-dipped galvanized steel in compliance with ASTM A 153 and of configurations to match existing hardware.
 - 2.4.4 Padlock: Padlocks shall comply with ASTM F 883.
 - 2.5 Accessories:
 - 2.5.1 Special Shapes: Special shapes, including copings and post caps, shall be as required to match existing units to be replaced.
 - 2.5.2 Reinforcement: Masonry reinforcement, anchors, and ties shall comply with the following requirements:
 - 2.5.2.1 Reinforcement Bars shall comply with ASTM A 615, Grade 40.
 - 2.5.2.2 Joint reinforcement shall be prefabricated from zinc-coated cold drawn steel wire in compliance with ASTM A 641. Provide prefabricated pieces for corners and intersections of walls. Reinforcement shall be truss type, approximately two inches narrower than the nominal thickness of wall.

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- 2.5.2.3 Wire-Mesh Ties shall be 16-gauge or larger zinc-coated steel wire woven into 1/2-inch mesh and cut in strips one inch narrower than the width of walls in which they are used. Zinc-coating shall comply with ASTM A 641.
- 2.5.2.4 Wire Brick Ties shall be fabricated from 3/16-inch diameter zinc-coated steel wire complying with ASTM A 641.
- 2.5.3 Attached Items: Light fixtures and miscellaneous items attached to the fencing shall be provided with appropriate means for securely fastening to fence components.
- 2.5.4 Bolts and Nuts shall be ASTM A 307 and galvanized in compliance with ASTM A 153.
- 2.6 Foundations:
 - 2.6.1 Material: Where foundation work is required for maintenance and repair, the new foundation shall match the existing foundation in materials and design.
 - 2.6.2 Depth: Foundations shall extend below frost line or to the depth of existing foundations, whichever is greater.
- 3.0 EXECUTION:
 - 3.1 General:
 - 3.1.1 All Scaffolding and Falsework shall be ample strength and well secured. Masonry work exceeding 10 feet in height shall be properly braced and supported until masonry is self-supporting.
 - 3.1.2 Where Fresh Masonry Joins Partially or Totally Set Masonry, clean the exposed surface of the set masonry to obtain the best possible bond with the new work. Remove all loose masonry units and mortar.
 - 3.2 Mixing Mortar and Grout:
 - 3.2.1 Mix in a Mechanical Batch Mixer for a minimum of 5 minutes after all materials have been added.
 - 3.2.2 Mix Grout in compliance with ASTM C 476. Grout shall have a consistency at time of placement to yield a slump of 10 to 11 inches as determined by ASTM C 143.
 - 3.3 Reinforcement:
 - 3.3.1 Install Horizontal Continuous Joint reinforcement in all unit masonry fences. Reinforcement shall start not more than 8 inches above the masonry supporting surface and end within the top full mortar joint, or to match existing conditions and shall be spaced at maximum 16-inch centers vertically.
 - 3.3.2 Joint reinforcement shall be placed approximately 1/2 inch from masonry faces.
 - 3.3.3 At intersections, bond each course with wire mesh ties or prefabricated Joint reinforcement spaced not to exceed 16 inches vertically.
 - 3.3.4 Install Vertical Reinforcement bars of the size indicated on the drawings in the hollow cores of masonry units as required. Fill all cells containing reinforcement for the full height of the reinforcement with grout.
 - 3.4 Precast Concrete:
 - 3.4.1 Bond shall be laid to match existing pattern. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Webs shall also be bedded in all courses of posts, in starting course on footings and solid foundation walls and around cells that are to be reinforced or filled with grout.
 - 3.4.2 All Exposed Mortar Joints shall be tooled with a round jointer to produce smooth, dense, concave joints, except as otherwise required to match existing mortar joints.
 - 3.5 Brick:
 - 3.5.1 Bond shall be laid out to maintain joints to uniform thickness throughout.
 - 3.5.2 Brick shall be laid with completely filled mortar joints to match existing. Mortar beds shall be spread smooth. The ends of brick shall be buttered with sufficient mortar to fill the end joint.
 - 3.5.3 All Exposed Mortar Joints shall be tooled with a round jointer to produce smooth, dense, concave joints.
 - 3.6 Pointing and Cleaning: Upon completion, all new joints shall be carefully pointed, filling all holes. Cut out defective joints and repoint them with mortar. Keep all exposed masonry clean and free of mortar as the work progresses. Clean masonry surfaces using fiber brushes and trisodium phosphate solution; acid shall not be used for any masonry cleaning. Rinse surfaces with clean water immediately after cleaning.

Attachment 1: Specifications for the Work

Permanent Wood Fencing

- 1.0 DESCRIPTION OF WORK: The specification covers the furnishing and installation of materials for repair and maintenance of permanent wood fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Pickets:
 - 2.1.1 Size: Wood for pickets shall match the existing fencing in material, configuration, dimensions, texture, and finishes.
 - 2.1.2 Attachment: Hot-dipped galvanized nails complying with Fed. Spec. FF-N-105 shall be used to fasten pickets to rails.
 - 2.2 Framework:
 - 2.2.1 Line Posts: 4 x 4 of required length to match existing post height and extend into the ground as required to assure rigid installation.
 - 2.2.2 Terminal and Corner Posts: 4 x 4 of required length.
 - 2.2.3 Gate Posts: 4 x 6 and of the length required for firm embedment to resist gate action.
 - 2.2.4 Top Rail: 2 x 4 of length required to span between posts.
 - 2.2.5 Where Bracing is Required, it shall match top and bottom rails in dimension and finish.
 - 2.2.6 Metal Posts and Rails: Solid mild steel galvanized in compliance with ASTM A 123 of the length and style required to match existing.
 - 2.3 Gates:
 - 2.3.1 Frame: 2 x 4 members with attached pickets. Configuration of gate shall match that of existing gates.
 - 2.3.2 Bracing: Single 2 x 4 running diagonally across the gate to opposite corners of the frame.
 - 2.3.3 Hardware: Hinges, latches, and other hardware shall be hot-dipped galvanized and of configurations to match existing hardware. Bolts and nuts shall comply with ASTM A 307 and galvanized in compliance with ASTM A 153.
 - 2.4 Finish: All wood fence members shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with Fed. Spec. TT-W-00571. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment. Paint to match existing after treatment and installation.
- 3.0 EXECUTION:
 - 3.1 Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground. Posts of fencing that are higher than four feet and exposed to strong winds and posts at all gates shall be of heavy construction and shall be embedded in concrete.
 - 3.2 Rails: Install at the height and in the manner required to match existing fencing, and secure to post with fasteners similar to existing.
 - 3.3 Pickets: Space, attach, and position to match existing pattern and attachment methods.
 - 3.4 Accessories: Install to match existing conditions.

Temporary Fencing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of temporary fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Pickets:
 - 2.1.1 Size: Wood pickets shall be 3/8 inch thick, 1-1/2 inches wide, and 48 inches high.
 - 2.1.2 Coating: Red oil paint or stain.
 - 2.1.3 Spacing: Approximately two inches apart.
 - 2.1.4 Attachment: Bind together with three double strands of wire.

Attachment 1: Specifications for the Work

2.2 Framework:

- 2.2.1 Materials: Wire shall be 13 gauge galvanized steel, complying with ASTM A 641.
- 2.2.2 Types: The framework shall consist of three parallel double strands of wire twisted between pickets to hold them securely in place.
- 2.2.3 Wire Connectors: Wire for attaching fabric to metal posts shall be nine gauge.
- 2.2.4 Staples and Nails shall comply with Fed. Spec. FF-N-105. Staples and nails shall be zinc-coated and of sufficient length for purpose required.

2.3 Gates:

- 2.3.1 Frame: Frames shall consist of two parallel horizontal wooden members with pickets attached at two-inch spacing.
- 2.3.2 Bracing: Two wooden members placed diagonally on the gate between the frame boards.
- 2.3.3 Hardware shall include two strap hinges, latching device, and stop bar, all of zinc-coated steel, in compliance with ASTM A 153.

2.4 Supports:

- 2.4.1 Steel: Line posts and uprights shall be drive type, T sections, and provided with suitable anchor plate. The sections shall be hot-rolled steel complying with ASTM A 702, galvanized in compliance with ASTM A 123. The T sections shall have the following minimum sizes:

Post Length (Feet)	Post Weight (Pounds)
5	7.32
5 1/2	7.99
6	8.65
6 1/2	9.32
7	9.98
7 1/2	10.64
8	11.31
9	12.64
10	13.97

- 2.4.2 Wood: Posts shall be cut from cedar, Douglas fir, pine, or other approved species of timber. Posts shall be peeled, treated, dressed, and cured. All wood posts and braces shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with Fed. Spec. TT-W-00571. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment.
- 2.4.3 Braces: Steel braces shall have same configuration as line posts and uprights without the anchor plate. Wood braces shall be treated No. 2 or better grade, Douglas fir or southern yellow pine. Braces shall meet all of the requirements for wood posts.
- 2.4.4 Location: Posts shall be evenly spaced to adequately support the fence framework.

3.0 EXECUTION:

- 3.1 Wood Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground.
- 3.2 Steel Posts: Hold in a vertical position and drive to the required depths by an approved post driver. Post tops shall not be damaged during driving.
- 3.3 Corner, Brace, Or End Panels: Construct corner, brace, or end panels at the beginning and terminal ends, at gate openings, at all intersections, and at all corners or changes in horizontal alignment of fences, in existing fence on both sides of junction with new fence (except when junction is at a corner already braced), and on both sides of cattle guards.
- 3.4 Pull Posts shall be constructed when the distance of unbraced fencing exceeds 640 feet. Pull posts shall be spaced equidistant in the fence at intervals of 640 feet or less.
- 3.5 Framework Installation: Stretch to proper tension and securely fasten to posts. Top and bottom wires of fabric shall be tied or stapled to each post. Tie or staple every other wire to alternating posts. Every wire shall be tied or stapled to corner, pull, end, and gate posts. Wire for tied fabric shall be nine gauge.
- 3.6 Picket Replacement: Where required, new pickets shall be securely fastened into the existing wire

Attachment 1: Specifications for the Work

framework using 13 gauge galvanized wire.

- 3.7 Restretching Existing Fabric: Fabric designated to be restretched shall be restretched to proper tension and refastened to posts. Excess fabric extending beyond the post shall be removed.

Farm-Type Wire Fencing

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and replacement of farm-type wire fencing. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fabric shall be galvanized steel wire complying with ASTM A 116.
- 2.2 Framework:
- 2.2.1 Steel:
- 2.2.1.1 Posts shall comply with ASTM A 702, T-section, zinc-coated.
- 2.2.1.2 Stays shall be 9-1/2 gauge twisted wire, galvanized in compliance with ASTM A 641, Class 3.
- 2.2.2 Wood: Posts shall be cut from cedar, Douglas fir, pine, or other approved species of timber. Posts shall be peeled, treated, dressed, and cured and shall contain no unsound knots. All posts shall match existing post dimensions. All wood posts and braces shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with Fed. Spec. TT-W-00571. Wood cut or sawed after treatment shall have the cut surfaces well-coated with the preservative used in the treatment.
- 2.3 Braces: Steel braces shall have the same configuration as line posts and uprights without the anchor plate. Braces shall meet all of the requirements for wood posts.
- 2.4 Connectors:
- 2.4.1 Wire for Attaching Fabric to Posts shall be 12-1/2 gauge or coarser, galvanized in compliance with ASTM A 641, Class 3.
- 2.4.2 Staples and Nails shall comply with Fed. Spec. FF-N-105. Staples and nails shall be zinc-coated and of sufficient length for purpose required.
- 2.5 Gates:
- 2.5.1 Tubular Steel:
- 2.5.1.1 Frame shall be a minimum of 1-3/8 inch outside diameter tubular steel, braced with a sturdy center bar and diagonal adjustable brace wire to prevent sagging. Gates shall be fitted with hinges. All material shall be hot-dipped zinc-coated.
- 2.5.1.2 Fabric for Gates shall be as specified for the fence and shall be securely tied to the framework at top, bottom, and sides with 9-gauge wire.
- 2.5.2 Angle Iron:
- 2.5.2.1 Frame shall be fabricated of angle iron with cross ties and stays of light angle iron. Frame shall be zinc-coated in compliance with ASTM A 120 or A 153.
- 2.5.2.2 Fabric for Gates shall be as specified for the fence and shall be securely tied to the framework at top, bottom, and sides with 9-gauge wire.
- 2.5.3 Wood: Provide a 3/8-inch minimum diameter galvanized steel truss rod and turnbuckle.
- 2.6 Barbed Wire:
- 2.6.1 Barbed Wire shall comply with ASTM A 121 and shall be made from 2 strands of 12-1/2 gauge galvanized steel wire, twisted, with four-point barbs spaced five inches apart. Wire shall have Class 2 zinc coating.
- 2.7 Hardware:
- 2.7.1 Gate Hardware shall include the following:
- 2.7.1.1 Bottom Hinge shall be designed to carry the weight of the gate.
- 2.7.1.2 The Upper Hinge shall be adjustable.
- 2.7.1.3 Lock with Chain shall be 1-3/4 inch size complying with ASTM F 883.
- 2.7.1.4 Keeper shall automatically engage and hold the gate leaf open until manually released.
- 2.7.1.5 Center Plunger Rod.
- 2.7.1.6 Center Stop.

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- 2.7.1.7 Vertical Lift.
- 2.7.1.8 Sliding Track.
- 2.7.2 Lightning Arresters, Insulators and Insulator Clamps, Fasteners, Signs, and Other Accessories shall be provided and installed as required.
- 3.0 EXECUTION:
- 3.1 Wood Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground. Refasten all braces, gates, hardware, fabric, and other accessories.
- 3.2 Steel Posts: Steel posts shall be held in a vertical position and driven to the required depths by an approved post driver. Tops of posts shall not be damaged by driving operation.
- 3.3 Corner, Brace, or End Panels: Corner, brace, or end panels shall be constructed at the beginning and terminal ends, at gate openings, at all intersections, at all corners or changes in horizontal alignment of fences, in existing fence on both sides of junction with new fence, (except when junction is at a corner already braced), and on both sides of cattle guards.
- 3.4 Pull Posts shall be constructed when the distance of unbraced fencing exceeds 640 feet. Pull posts shall be spaced equidistant in the fence at intervals of 640 feet or less.
- 3.5 Wire Installation: Barbed and/or woven wire fabric shall be stretched to proper tension and securely fastened to posts. Top and bottom wires of fabric shall be tied or stapled to each post. Tie or staple every other wire to alternating posts. Every wire shall be tied to corner, pull, end, and gate posts. Wire for tying woven wire fabric and barbed wire shall be 9-gauge.
- 3.6 Restretching Existing Fabric: Fabric indicated to be restretched shall be restretched to proper tension and refastened to posts. Excess fabric extending beyond the post shall be removed.
- 3.7 Alignment: Finished fencing shall be plumb and in proper alignment with posts, and all wire work shall be taut.

Electrical Traffic Control Signals

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical traffic control signals. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General: Replacement equipment items shall be regularly manufactured products.
- 2.2 Concrete Poles: Cement ASTM C 150; aggregate ASTM C 33; minimum compressive strength 6,000 psi when tested in compliance with AASHTO T22. Tensioning steel shall comply with ASTM A 603. Strands shall not be tensioned above 70 percent of the rated ultimate strength. Epoxy compound for sealing hollow cores shall comply with ASTM D 1763.
- 2.3 Galvanized Conduit Nipples: UL 514B.
- 2.4 Ground Wire: Cast-in-concrete pole, No. 6 stranded bare wire, ASTM A 603.
- 2.5 Wood Poles: ANSI 05.1, waterborne preservative-treated in compliance with AWPAC C3, Retention Zone 1.
- 2.6 Structural Steel: ASTM A 36.
- 2.7 Steel Pipe: ASTM A 53.
- 2.8 Steel Bars: ASTM A 576.
- 2.9 Wire Strand: ASTM A 475.
- 2.10 Zinc Coatings: Members, ASTM A 123; fasteners, ASTM A 153.
- 2.11 Mast Arms for Supporting Traffic Signals: ASTM A 36; aluminum alloy 3003, or alloy alcad 3004 complying with ASTM B 209.
- 2.12 Concrete for Pull Boxes: ASTM C 94, 3,000 psi.
- 2.13 Cast-Iron Covers: ASTM A 48.
- 2.14 Signal Lens: Manufactured in compliance with Article 5 and 6, ITE Technical Report Number 1.
- 2.15 Loop Wire for Vehicle Detectors: No. 14 AWG or No. 12 AWG, stranded copper wire, type TTHN, THWN, or THW, ASTM B3.
- 2.16 Grout: One part cement complying with ASTM C 150 and two parts sand complying with ASTM C

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- 33.
- 2.17 Conduit: Polyvinyl chloride, UL 651, Schedule 40 or galvanized rigid metal, ASTM B3.
- 2.18 Ground Wire: Soft drawn copper, bare, stranded, ANSI C7.1.
- 2.19 Electrical Work: NFPA No. 70.
- 3.0 EXECUTION:
- 3.1 Scheduling and Coordination: The Contractor shall ensure that required notices have been given and that power interruptions have been scheduled and approved.
- 3.2 Traffic: Provide temporary traffic signs at and around work area. Signs and locations shall be as approved by the Authorized Member Representative.
- 3.3 Vehicle Detector Assemblies, Loop Type: Saw out existing loops to be replaced to their full depth. Install and seal loop wire. Splice and solder loop wire and lead-in cable and wrap a minimum of two wraps with silicone tape and heavy-duty electrical tape. Install sealant in compliance with the manufacturer's recommendations. Excavate and remove existing lead-in cable to be replaced, and install new lead-in cable in place and connect to cabinet ground.

Traffic Signs

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of traffic signs. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Sign Foundations:
 - 2.1.1 Replacement Foundation Footing Concrete shall be a mixture of cement complying with ASTM C 150 and aggregate complying with ASTM C 33. Compressive strength shall be 2,800 psi at 28 days.
 - 2.1.2 Sulfur Mortar shall comply with ASTM C 287.
 - 2.1.3 Reinforcing Steel shall comply with ASTM A 615.
- 2.2 Sign Supports shall be of the "break-away" type. Supports shall be strong enough to resist applicable wind forces without damage, but shall be designed to experience a brittle rupture type failure or a "quick separation" type joint.
 - 2.2.1 Sign Support, Aluminum:
 - 2.2.1.1 Replacement Castings shall be Alloy A356.0-T6 in compliance with ASTM B 108.
 - 2.2.1.2 Replacement Structural Members shall comply with ASTM B 308.
 - 2.2.1.3 Replacement Bars, Rods, Shapes, and Tubes shall comply with ASTM B 221, alloy 6061-T6.
 - 2.2.1.4 Replacement Bolts, Nuts, and Screws shall match items being replaced and shall be alloy 2024-T4 with anodic coating complying with ASTM B 580, or 6061-T6 in compliance with ASTM B 211. Bolt heads shall be hexagon. Bolt threads shall be Class 2, 2A, or 2B in compliance with ANSI B18.2.1. Nuts shall be hexagon shaped in compliance with ANSI B18.2.2.
 - 2.2.1.5 Replacement washers shall be furnished from sheet metal complying with ASTM B 209, alloy alclad 2024-T3 or T4.
 - 2.2.2 Sign Support, Steel:
 - 2.2.2.1 Replacement Structural Members shall comply with ASTM A 36.
 - 2.2.2.2 Replacement Bars shall comply with ASTM A 108.
 - 2.2.2.3 Replacement Pipe shall comply with ASTM A 53 standard weight.
 - 2.2.2.4 Replacement Fasteners shall comply with ASTM A 307 and ASTM A 325.
 - 2.2.2.5 Replacement Anchor Bolts for anchoring base plates to concrete bases and nuts and washers shall be galvanized in compliance with ASTM A 153.
 - 2.2.3 Sign Support, Wood:
 - 2.2.3.1 Replacement Wood Sign Post shall be of the species listed in AASHTO M168, dressed four sides and having a pyramidal top cut before being treated.
 - 2.2.3.2 Replacement Sign Post shall be pressure treated with creosote or creosote-tar solution complying with AWPB LP-55.
- 2.3 Sign Face:
 - 2.3.1 Replacement Plywood Sign Face shall be grade HDOAB G-1 EXTERIOR, in compliance with DOC PS 1. Material shall be cut to size in compliance with ANSI D6.1E.

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- 2.3.2 Replacement Galvanizing Steel Sign Face shall comply with USDOT FHA MUTCD.
- 2.4 Reflective Sheeting shall be enclosed lens unless otherwise directed by the Authorized Member Representative.
 - 2.4.1 Enclosed Lens Reflective Sheeting shall comply with Fed. Spec. L-S-300.
 - 2.4.2 Reflective Sheeting shall comply with FP-79 minimum reflective intensity. Measurements shall comply with Fed. Spec. L-S-300.
 - 2.4.3 Color shall be matched visually and within the limits shown on the Color Tolerance Charts issued by the Federal Highway Administration. The diffuse day color of the reflective sheeting shall be determined in compliance with ASTM E 97.
 - 2.4.4 Film:
 - 2.4.4.1 General: Reflective sheeting shall be sufficiently flexible to be easily cut to shape and permit application over, and conformance to, moderate shallow embossing characteristic of certain sign borders and symbols.
 - 2.4.4.2 Surface: Sheeting surface shall be smooth and flat, shall facilitate cleaning and wet performance, and shall exhibit 85 degrees glossmeter rating of not less than 40, as specified in ASTM D 523. The sheeting surface shall withstand cleaning with gasoline, VM&P Naphtha, mineral spirits, turpentine, methanol, and xylol.
- 2.5 Demountable Sign Face Materials:
 - 2.5.1 Acrylic Plastic Reflectors: Replacement demountable sign letters, digits, arrows, borders, and alphabet accessories shall be reflectorized and shall consist of acrylic plastic reflectors supported by embossed aluminum frames. They shall comply with the Standard Alphabet for Highway Signs, of the Federal Highway Administration, Series E.
 - 2.5.2 Design and Fabrication: The letters shall be modified as necessary to accommodate the required reflectors. All items except border strips shall be fabricated from 0.040-inch minimum sheet aluminum. Border strips shall be of 0.032-inch minimum sheet aluminum. Mounting holes shall be provided within the frames to permit the use of screws, rivets or other acceptable fasteners. The size and spacing of the reflector holes shall provide maximum night legibility and visibility of the finished cutout figure.
 - 2.5.3 General Requirements: The reflectors shall be of acrylic plastic meeting the requirements of Fed. Spec. L-P-380, Type I, Class 3. The reflectors shall be yellow or colorless. The lens shall consist of a smooth front surface, free from projections or indentations other than for identification, and a rear surface bearing a prismatic configuration that will effect total internal reflection of light.
 - 2.5.4 Reflective Sheeting:
 - 2.5.4.1 Demountable Sign Letters, Digits, Arrows, Borders, and Alphabet Accessories, when so specified, shall be reflectorized with reflective sheeting supported by flat aluminum backing and shall comply with the Standard Alphabet Highway Signs of the Federal Highway Administration.
 - 2.5.4.2 Design and Fabrication: Letter design shall be Series E, modified for legibility. All items except border strips shall be fabricated from 0.040-inch sheet aluminum, 6061-T6 alloy, with mounting holes to permit use of screws, rivets, or other acceptable fasteners.
- 2.6 Highway Delineators, Enclosed Lens Type: Replacement reflectors shall be of acrylic plastic and a minimum of 3 inches in diameter. They shall be mounted in a heavy-duty housing with a back plate. The reflector shall consist of a clear and transparent plastic lens, which shall be colorless, and a plastic back of the same material, fused to the lens under heat and pressure around the entire perimeter to form a homogeneous unit, permanently sealed against dust, water, and water vapor. The acrylic plastic shall comply with Fed. Spec. L-P-380, Type I, Class 3.
- 2.7 Highway Delineators, High Intensity Type:
 - 2.7.1 Replacement Reflectorized Delineators shall consist of a reflective sheeting compound of glass spheres, embedded in a weatherproof, synthetic, noncellulose material. The overall size of the plastic reflectors shall be 4 inches by 5 inches, with a reflective area of at least 17.5 square inches.
 - 2.7.2 Delineators shall be silver-white when viewed with reflected light.
- 2.8 Highway Delineators Including Posts and Attachments:
 - 2.8.1 Reflective Sheeting: Replacement reflective sheeting for delineators shall match delineators being replaced.
 - 2.8.2 Delineator Posts and Accessories shall be of steel or aluminum. They shall have the necessary holes

Attachment 1: Specifications for the Work

- for attachment of the delineator housing. The assembly shall be furnished with the necessary bolts, nuts, and washers for attaching to the posts.
- 2.8.3 Insulating Materials: Neoprene, for separation of aluminum and steel parts, shall contain at least 60 percent, by volume, of pure neoprene. Other material may be used, subject to the approval of the Authorized Member Representative as to pliability and ability to withstand wear caused by stretching or distortion.
- 2.8.4 Reflector Units for guardrail installation shall match existing reflector being replaced in size and color.
- 2.8.5 Highway Delineators shall be supplemented with directional guidance signs as directed by the Authorized Member Representative. Signs shall be the chevron alignment type and shall comply with ANSI D6.1E, Type W 1-8.
- 2.9 Painting Panels for Nonreflectorized Background:
- 2.9.1 Replacement Metal Panels for sign categories not required to be reflectorized shall have a nonreflectorized background composed of one spray coat of primer and two finish coats of baked enamel.
- 2.9.2 Finish Coats shall be baked alkyd resin enamels meeting Fed. Spec. TT-E-529, Class B, of a composition that affects the finished background surface. When thoroughly dry, the colors shall match those described in the current Highway Blue Color Tolerance Chart, PR Color No. 3, or in Highway Green Color Tolerance Chart, PR Color No. 4, of the Federal Highway Administration.
- 2.9.3 Wood Signs shall have two coats of oil paint complying with Fed. Spec. TT-P-52. Message paint shall be a single coat of oil paint. All colors shall comply with ANSI D6.1E.
- 2.10 Sign Wash Detergent shall comply with ASTM D 3399.
- 3.0 EXECUTION:
- 3.1 Footings for Signs, Posts, and Supports:
- 3.1.1 Backfill Material shall be at or near optimum moisture and neither dry nor saturated. It shall be tamped thoroughly in place.
- 3.1.2 Concrete Footings may be cast in place or precast. Hand mixing of concrete will be permitted where the quantity does not exceed one-half cubic yard.
- 3.2 Erection of Signs and Sign Supports: Sign posts shall be erected vertically. Posts erected in sleeves shall be anchored with sulphur mortar. Mortar shall comply with ASTM C 287. Sign faces shall be positioned to be generally perpendicular to the line-of-sight for the observer. Reflectorized signs shall be inspected at night. If specular reflection is apparent on any sign, its position shall be adjusted by the Contractor to eliminate the condition.
- 3.3 Delineators and Hazard Markers: Delineator posts shall be driven to a depth of 30 inches.
- 3.4 Removal of Existing Signs and Posts:
- 3.4.1 Damaged, Obsolete, or Change of Purpose Signs and Posts shall be removed and delivered to a storage area designated by the Authorized Member Representative. Post hole shall be backfilled, tamped, and made level with the adjacent surface. Disturbed paving, sidewalks, and grassed areas shall be replaced with matching material of same quality and quantity as existing.
- 3.4.2 Signs and Posts to be Replaced shall be removed and replaced by new signs and posts in identical locations. Backfill around post shall be thoroughly compacted to hold posts securely in a vertical position.

Playing Fields

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of playing fields. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fills required to bring the sub grade of playing surfaces up to required elevation shall be placed in horizontal layers of not more than 8 inches in loose thickness. The top layer of all fills and excavated areas under the playing surfaces shall be compacted to 95 percent CE 55 maximum density. Each lower layer shall be compacted to at least 90 percent of MIL-STD-621, Method 100,

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- CE 55 maximum density.
- 2.2 Sand-Clay Playing Surfaces shall consist of a stone foundation course, a clay foundation course, a wearing course and, where equipped, a drainage filter course, constructed on the prepared sub grade.
 - 2.2.1 Stone Foundation Course: A layer at least 3 inches thick of 3/4- to 1-1/2 inch crushed stone shall be spread over the sub grade or over the drainage filter course constructed thereon and shall be given preliminary compaction by rolling, followed by a filler consisting of 1/4- to 1/2-inch crushed stone to fill voids in the underlying stone. The stone foundation course shall be compacted to a minimum of 90 percent of CE 55 maximum density.
 - 2.2.2 Clay Foundation Course: Selected inorganic fat clay (CH) shall be evenly spread on the stone foundation course to produce a compacted layer not less than 3 inches thick. The clay layer shall be compacted to a minimum of 90 percent of CE 55 maximum density.
 - 2.2.3 Wearing Course: The approved inorganic clay-silt mixture of approximately 50 percent each of clay and silt shall be screened through a 1/4-inch mesh screen. The wearing course shall be mixed in proportions of 1 part sand to 2 parts clay-silt by volume. The wearing course shall be compacted to at least 90 percent of CE 55 maximum density and shall range from 1 to 1-1/2 inches in thickness.
 - 2.2.4 Drainage Filter Course: The drainage filter course shall consist of a well-graded aggregate course encased in a geotextile material and laid in such a manner to allow water to freely drain from the playing surfaces. The geotextile material shall be a woven or non-woven filter material with a minimum permeability of 0.02 cm/sec. The material shall be resistant to mildew, ratting, insects, rodents, and chemicals normally encountered in a subsurface drainage system.
 - 2.3 Bituminous Concrete Playing Surfaces shall consist of a base course, prime coat, bituminous leveling course, tack coat, surface course, color coating and, where required, a drainage filter course, all constructed on a prepared sub grade. The stabilized-aggregate base course shall be compacted at optimum moisture to at least 95 percent CE 55 maximum density. Marshall stability shall not be less than 500 pounds and the flow shall not be greater than 20/100 inch. The bituminous mixture shall be compacted until the voids in the total mix are reduced to less than 4.0 percent by volume.
 - 2.3.1 Thickness of Courses: Base course shall be 4 inches thick after compaction. Leveling course shall be 1-1/2 inches thick after compaction unless directed otherwise. Surface course shall be 1 inch thick after compaction.
 - 2.3.2 Color Coating and Marking Paint: After curing of the bituminous surface course, the entire playing surface shall be covered with a color coat as required.
 - 2.4 Portland cement Concrete Playing Surfaces:
 - 2.4.1 Aggregate: The nominal aggregate size shall be 1-1/2 inches to No. 4 sieve size and shall conform to ASTM C 33.
 - 2.4.2 Portland cement: The cement shall conform to ASTM C 150, Type IA or IIA; or ASTM C 595, Type IP-A.
 - 2.4.3 Thickness: Horizontal Portland cement concrete playing surfaces shall consist of concrete slabs 4 inches thick.
 - 2.5 Maintenance of Sand-Clay Surfaces: Prior to final acceptance, the Contractor shall make one application of 3/4 pound of calcium chloride per square yard to the sand-clay surface of the entire playing area.
 - 2.6 Portable Outdoor Bleachers:
 - 2.6.1 Bleachers shall be designed to support a uniformly distributed live load of 100 pounds per square foot of gross horizontal projection and a horizontal wind load of 30 lbs/sq ft of gross vertical projection. All seat and foot plank members shall be designed to support not less than 120 pounds per linear foot.
 - 2.6.2 Wood Seating and Walk Boards shall be preservative-treated and painted.
 - 2.7 Steel Basketball Poles: Minimum diameter 3-1/2 inches; galvanized pipe.
 - 2.8 Running Track: Gravel and cinders over stone base; compaction to 90 percent of CE 55 maximum density. One hundred percent by weight of the gravel and cinders shall pass the 3/4-inch screen, and 90 percent of the gravel and cinders shall be retained on the No. 4 screen.
 - 3.0 EXECUTION: (Section not used).

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Recreational Facilities

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous/recreational facilities. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Materials shall be resistant to corrosion and degradation by ultraviolet rays. Hardware and fittings shall be at least as corrosion-resistant as the materials fastened.
 - 2.1.1 Steel Plates, Pipe, Tubing, Sheets, Wire Ropes, Chains, and Miscellaneous Shapes shall be stainless steel or galvanized steel, even if painted or coated with vinyl or other protective finish. All open pipe and tube ends shall have rain caps.
 - 2.1.2 Wood shall be all-heart cedar, cypress, or redwood or shall be treated with a non-toxic preservative. Wood shall not be used where it will be in direct contact with the ground, unless approved by the Authorized Member Representative.
 - 2.1.3 Fiberglass shall be smooth fiberglass-reinforced polyester with gelcoat coating and shall meet the following minimum physical properties: 22,000 psi flexural strength, 15,000 psi tensile strength, and 20,000 psi compressive strength.
 - 2.1.4 Aluminum shall be anodized.
 - 2.1.5 Foundations shall be 3,000 psi compressive strength concrete, reinforced as required. Provide embedded anchorage items as required.
 - 2.2 Playground Equipment, shall include, but not be limited to, see-saws, slides, swings, whirlers, and monkey bars, shall be prefabricated and designed to withstand the anticipated structural loads.
 - 2.2.1 Exposed Surfaces shall be smooth (except where required to be nonslip) seamless, and nonsplintering.
 - 2.2.2 Steps, Platforms, and Other Flat Surfaces Subject to Foot Traffic shall be non-slip, but not abrasive and shall be formed to exclude or drain away water.
 - 2.2.3 Fastening shall be flush, concealed, or otherwise formed or located to prevent injury to children playing on the equipment.
 - 2.2.4 Slides shall have stainless steel sliding surfaces.
 - 2.3 Bike Racks shall be mounted, and sections (if rack is sectional) shall be attached with tamper-proof fasteners.
 - 2.4 Fiberglass Shelters shall be reinforced with steel, aluminum, or wood framework as required. Shelter roof shall be sloped to drain. Fiberglass edges shall be returned so that they are not exposed. Shelters shall be prefabricated and designed to withstand the anticipated live, dead, and wind loads.
 - 2.5 Fire Rings shall be Iron Mountain Forge Model Number 120-X or approved equal.
 - 2.6 Pedestal Grills shall be Iron Mountain Forge Model Number 220-X or approved equal.
 - 2.7 6' Long, Galvanized Frame, Aluminum Top and Seat Picnic Table shall be Iron Mountain Forge Model Number 238-6GA or approved equal.
 - 2.8 6' Long, Galvanized Frame, Vinyl Clad Top and Seat Picnic Table shall be Iron Mountain Forge Model Number 238-6GV or approved equal.
- 3.0 EXECUTION: Recreational facilities shall be installed plumb, aligned, and securely anchored to the ground. Adjust equipment with moving parts until operation is smooth and easy.

Topsoil

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of topsoil. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Topsoil shall be the existing surface soil stripped and stockpiled on the site.
 - 2.2 pH Adjusters:

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- 2.2.1 Agricultural Limestone shall have a minimum calcium carbonate equivalent of 90 percent.
- 2.2.2 Other Liming Materials shall have a minimum calcium carbonate equivalent of 80 percent.
- 2.2.3 Aluminum Sulfate shall be commercial grade.
- 2.3 Soil Conditioners and Amendments:
 - 2.3.1 Peat shall be a natural product conforming to ASTM D 2607.
 - 2.3.2 Sand shall be clean and free of toxic materials.
 - 2.3.3 Vermiculite shall be horticultural grade and free of any toxic materials.
 - 2.3.4 Rotted Manure shall be unleached stable or cattle manure containing no chemicals or ingredients harmful to plants.
 - 2.3.5 Rotted Sawdust shall be free of chips, stones, sticks, soil, and toxic substances.
 - 2.3.6 Gypsum shall be 90 percent pure and free of any toxic materials.
- 2.4 Fertilizer shall be commercial grade, free flowing, uniform in composition and shall conform to applicable State and Federal regulations. Granular fertilizer shall conform to Fed. Spec. O-F-241, Type I, Level B.
- 2.5 Soil Fumigant shall be 97 percent methyl bromide and 3 percent chloropicrin.
- 2.6 Mulch shall be straw, hay, or fiber mulch applied simultaneously with grass seed and fertilizer.
 - 2.6.1 Straw shall be stalks from oats, wheat, rye, barley, or rice that are free from noxious weeds, mold, or other objectionable material.
 - 2.6.2 Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, free from noxious weeds, mold, or other objectionable material.
 - 2.6.3 Wood Cellulose Fiber for use with hydraulic application of grass seed and fertilizer shall consist of specially prepared wood cellulose fiber or a combination of wood cellulose and recycled newsprint fibers.
- 2.7 Asphalt Adhesive for application with straw or hay mulch shall be cutback asphalt conforming to ASTM D 2028, or emulsified asphalt conforming to ASTM D 977.
- 2.8 Herbicide and Pesticide use must comply with all applicable State and Federal laws.
- 3.0 EXECUTION:
 - 3.1 Placing Topsoil: Topsoil shall be distributed uniformly and spread evenly to an average thickness of 3 inches, with a minimum thickness of 2 inches. Soil compacted by construction equipment or soil on compacted cut slopes of grades shall be pulverized to a minimum depth of 2 inches by disking or plowing before applying topsoil.
 - 3.2 Application of Soil Conditioners: All fertilizers, pH adjusters, and soil conditioners shall be incorporated into the soil to a depth of at least 4 inches.
 - 3.3 Application of Soil Amendments: Soil amendments shall be spread uniformly over the soil and thoroughly incorporated into the existing soil to a depth of 8 inches.
 - 3.4 Mulch shall be spread uniformly in a continuous blanket, using 1-1/2 tons per acre.

Sodding and Seeding

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of seed and sod. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Seed shall be the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Weed seed shall not exceed 1 percent by weight of the total mixture.
 - 2.2 Sod shall be nursery grown, field sod, certified sod, or approved sod as classified in the ASPA Guideline Specifications to Turfgrass Sodding.
 - 2.3 Sprigs shall be healthy living stems, stolons, or rhizomes and attached roots of grass without adhering soil. Sprigs shall include two to three nodes, shall be 4 to 6 inches long, and shall be obtained from approved sources where the sod is heavy and dense. Harvesting and planting operations shall be coordinated to prevent exposure of sprigs to the sun for more than 30 minutes

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- before covering and moistening.
- 2.4 Water shall not contain elements toxic to plant life.
- 3.0 EXECUTION:
- 3.1 Preparation: Except on slopes steeper than 2 horizontal to 1 vertical, the soil shall be tilled to a depth of at least 4 inches. On slopes between 2 horizontal to 1 vertical and 1 horizontal to 1 vertical tillage, depths shall be 2 inches. On slopes steeper than 1 horizontal to 1 vertical, no tillage will be permitted.
- 3.2 Application:
- 3.2.1 Planting Seasons and Conditions: Planting shall not be done when the ground is frozen, snow covered, or in an unsatisfactory condition for planting.
- 3.2.2 Seed shall be broadcast uniformly. The seed shall be covered to an average depth of 1/4 inch. •02933
- 3.2.3 Immediately After Seeding, the entire area shall be firmed with a roller and the soil moistened to a depth of 6 to 8 inches.
- 3.2.4 Sodding shall be accomplished in accordance with the ASPA Guideline Specifications to Turfgrass Sodding.
- 3.2.5 When Spot Sodding, the sod shall be cut into plugs 2 inches square or 2 inches in diameter. The individual pieces of sod shall be placed on 12-inch centers and pressed firmly into the soil by foot pressure or by tamping.
- 3.2.6 After Sod Pieces Have Been Placed in Position, the sodded area shall be rolled or tamped so that air pockets are eliminated.
- 3.2.7 Water Shall Be Applied to the sodded areas at a rate sufficient to ensure thorough wetting of the soil to a depth of at least 4 inches.
- 3.2.8 Sprigging: Sprigs shall be planted in such quantity as to provide a minimum of 25 viable sprigs or 108 linear inches of viable sprigs per square yard of areas.
- 3.2.8.1 Immediately After Sprigging Operations Have Been Completed, the planted area shall be firmed with a cultipacker or a roller.
- 3.2.8.2 Water Shall Be Applied at the time of sprigging operations wetting the soil to a depth of 4 inches.
- 3.2.9 Protection of Turfed Areas: Immediately after seeding, sodding, or sprigging, the area shall be protected against traffic or other use by erecting barricades, as required, and approved signs shall be placed at appropriate intervals until final acceptance.

Landscape Irrigation System

- 1.0 DESCRIPTION OF WORK: This specification covers the complete irrigation system including: pipe, tubing, fitting, bubbler and emitter heads, control units, and all appurtenances necessary for an operating system. The system shall be Contractor designed, and installed with Authorized Member Representative approval.
- 2.0 PRODUCTS:
- 2.1 Piping and Fittings:
- 2.1.1 Copper Tubing: ASTM B 88, Type K; solder joint fittings, ASME B16.22 and B16.18 using 95-5 tin antimony solder.
- 2.1.2 PVC Pipe: ASTM D 1785, PVC 1120, Schedule 40 or 80, or ASTM D 2241, PVC 1120 SDR 21, Class 200; threaded or socket type, solvent cemented.
- 2.1.3 Polyethylene Pipe: ASTM D 2239, PE3406, SDR 15; insert fittings shall be used with stainless steel clamps.
- 2.1.4 Tubing for use with drip emitters shall be either polyethylene or polybutylene and shall have a minimum working pressure of 100 psi at 37 C.
- 2.2 Risers for Pop-up Bubbler Heads shall be of the double-swing joint type.
- 2.3 Application Devices shall be as specified herein.
- 2.3.1 Pop-up spray heads shall conform to Fed Spec WW-H-001220, Type II, class as required for the spray pattern needed.
- 2.3.2 Shrubbery sprinkler heads shall be brass nozzle type with adjustable conical spray coverage for permanent aboveground mounting or riser or pop-ups, height compatible with ground cover.
- 2.3.3 Bubbler heads shall be of the umbrella type in which the flow is evenly distributed around the

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- perimeter of a flat plate on top of the bubbler. The bubbler shall be so adjustable as to provide half or full circle patterns and operating range of 20 psi to 90 psi. The flow rate shall be adjustable for gallonage and pressure by an easily accessible regulating screw.
- 2.3.4 Drip emitters shall be made of rigid, black, ultraviolet-resistant plastic. Each emitter head shall consist of at least two distinct pieces and be designed for easy and complete disassembly for cleaning. The emitters shall be capable of clog-free operation using water filtered through a 30-mesh screen. Emitters shall be multi-headed and shall be spaced to vary with soil conditions and wetted irrigation area.
- 2.4 Valves:
- 2.4.1 Gate valves less than 3 inches shall conform to MSS SP-80, Type 1, Class 150, with threaded or soldered ends.
- 2.4.2 Gate valves 3 inches and larger shall conform to AWWA C509, with flanged ends.
- 2.4.3 Pressure Reducing Valves: One valve shall be installed with each solenoid control valve. The valves shall be hydraulically operated, pilot operated, globe or angle type, and may be actuated either by diaphragm or piston. Valve bodies shall be bronze and shall conform to MSS SP-80, Type 1, Class 150. Valve stem shall be stainless steel. Valve discs and diaphragms shall be synthetic rubber. Valve seats shall be bronze. Pilot controls shall be bronze with stainless steel working parts.
- 2.4.4 Solenoid control valves shall be heavy-duty, all brass construction suitable for 150 psi working pressure and shall be a globe-type diaphragm valve of normally closed design.
- 2.4.5 Manual drain valves less than 2-1/2 inches shall be MSS SP-80, Type 3, Class 150, with soldered or threaded ends. Manual drain valves 2-1/2 inches and larger shall be MSS SP-85, Type II, Class 250, with threaded or flanged ends.
- 2.4.6 Automatic drain valves shall be brass or plastic, spring-loaded ball drip type, 150 pounds, and threaded ends, designed to close at 6 foot pressure head with positive seal at 3 psi pressure or greater, and be open to drain at less than 3 psi pressure.
- 2.4.7 Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCHR-01. Backflow preventers with intermediate atmospheric vent shall be in accordance with ASSE 1012. Reduced pressure principle backflow preventers shall be in accordance with ASSE 1013.
- 2.5 Accessories:
- 2.5.1 Valve keys for manually operated valves shall be 1/2 inch diameter by 3 feet long, tee handles and keyed to fit valves.
- 2.5.2 Valve Boxes: Boxes shall be reinforced concrete pipe with cast-iron cover. Plastic valve boxes and covers, 9 in. inside diameter and self-draining, may be used as an option when approved by the Authorized Member Representative and in accordance with ASTM D 638. The word "IRRIGATION" shall be cast on cover.
- 3.0 EXECUTION:
- 3.1 Placing and Laying: Pipe shall not be laid in water or when trench conditions are otherwise unsuitable for the work. Water shall be kept out of the trench until the material in the joints has hardened or until caulking or jointing is completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no substance will enter the pipes or fittings. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as shown or as directed.
- 3.2 Testing:
- 3.2.1 Hydrostatic Tests: After all new piping and risers are in place and prior to the installation of heads, each control valve shall be opened separately and the system shall be thoroughly flushed. After flushing, risers shall be capped and the entire system shall be subjected to a hydrostatic pressure test for a period of four hours. No testing shall be done until the last joint has had at least 12 hours to set. Leaking joints, cracked or defective pipe or valves shall be cut out and replaced and the complete test repeated until satisfactory results are obtained as approved by the Authorized Member Representative.
- 3.2.2 Operational Test: After the hydrostatic test, heads shall be installed and the system completed and tested to demonstrate functional efficiency. The entire system shall be operated on a normal basis

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for at least one month. Deficiencies such as clogging of emitters shall be corrected by the Contractor.

Plantings

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plantings. Products shall match existing materials and/or shall be as directed by the Authorized Member Representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
 - 2.1 Plants:
 - 2.1.1 Plants shall be nursery grown or plantation grown stock conforming to ANSI Z60.1 and shall bear botanical names listed in the publication for Standardized Plant Names.
 - 2.1.2 Planting Stock shall be well-branched and well-formed, sound, vigorous, healthy, and free from disease, sun-scald, windburn, abrasion, and harmful insects or insect eggs and shall have healthy, normal, and unbroken root systems.
 - 2.1.3 Balled and Burlapped Plants and balled and potted plants shall have ball sizes and ratios conforming to ANSI Z60.1.
 - 2.1.4 Bare-Root Plants shall be dug with the root system substantially intact but with the earth carefully removed.
 - 2.1.5 Container Grown Plants shall have sufficient root growth to hold the earth intact when removed from containers but shall not be root bound.
 - 2.2 Inert Membranes:
 - 2.2.1 Polyethylene shall conform to ASTM D 2103 and shall be 4 mils thick and black in color.
 - 2.2.2 Roofing Felt shall conform to ASTM D 250, Type II.
 - 2.2.3 Fiberglass Mat shall be of lime borosilicate glass fibers with an average fiber diameter of 8 to 12 microns and 2- to 4-inch strands of fiber bonded with phenol formaldehyde resin. The mat shall be 100 percent textile glass fiber.
 - 2.3 Granular Fill for Plant Pit and Bed Drainage: Granular fill for filling over excavations and for bedding of pipes shall consist of uniformly graded sand, stone, gravel, or stone screenings free from an excess of soft or unsound particles or other objectionable matter.
 - 2.4 Mulch shall be free from deleterious materials and shall be stored so as to prevent inclusion of foreign materials.
 - 2.5 Trunk Wrapping Material: Tree wrap shall be two thicknesses of crinkled paper cemented together with a layer of bituminous material.
 - 2.6 Guying and Staking Material: Stakes for tree support and ground stakes shall be treated with preservative and sized for their usage. Accessories for guying and staking shall include wire and cable, turnbuckles, eyebolts, and deadmen as the project requires.
 - 2.7 Edging Material for plantings shall be composed of wood, metal, or plastic, as the project requires.
 - 2.8 Antidessicant shall be an emulsion that will provide a film over plant surfaces permeable enough to permit transpiration and will not damage the plant.
 - 2.9 Herbicides and Pesticides used must comply with all applicable state and federal laws and be registered with the U.S. Environmental Protection Agency.
- 3.0 EXECUTION:
 - 3.1 Clearing and Grading: Clearing shall consist of the satisfactory removal and disposal of brush, snags, and rubbish occurring within the area designated.
 - 3.2 Protection of Existing Vegetation: If lawns have been established prior to planting operations, the surrounding turf shall be covered before excavations are made in a manner that will protect turf areas. Existing trees, shrubbery, and beds that are to be preserved shall be barricaded in a manner that will effectively protect them during planting operations.
 - 3.3 Turf Removal: Where planting beds occur in existing turf areas, the turf shall be removed to a depth that will ensure the removal of the entire root system.
 - 3.4 Plant Pits shall be dug to produce vertical sides and flat, uncompacted bottoms.
 - 3.5 Planting Seasons and Conditions: Planting shall be done when the ground is not frozen, snow covered, or in an otherwise unsuitable condition for planting.

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- 3.6 Setting Plants: Balled and burlapped and container-grown plants shall be handled and moved only by the ball or container. Plants shall be set plumb and held in position until sufficient soil has been firmly placed around roots or ball.
- 3.7 Fertilization: After establishment of finished grade around plants, all pit and bed areas shall be topdressed with fertilizer at rates recommended by the manufacturer. Fertilizer shall be applied to existing trees at rates recommended by the manufacturer.
- 3.8 Watering: All watering shall be done in a manner that will provide uniform coverage but will not cause erosion or damage to the finished surface. Sufficient water shall be applied to penetrate the planting bed to a depth of 4 inches.
- 3.9 Wrapping: The trunks of deciduous trees shall be wrapped immediately after planting.
- 3.10 Staking and Guying: Plants 4 to 6 feet tall shall be single staked. Plants over 6 feet tall shall be double staked. Hose chafing guards shall be used where wire would contact the plant.
- 3.11 Pruning: New plant material shall be pruned as required. Trimmings shall be removed from the site. Cuts 1/2 inch in diameter and larger shall be painted with tree wound dressing.
- 3.12 Maintenance During Installation: Maintenance operations shall begin immediately after each plant is planted and shall continue as required until final acceptance.

DIVISION 33-UTILITIES

Site Utility Distribution Piping

- 1.0 DESCRIPTION OF WORK: This specification covers site utility distribution piping, and/or materials as directed by the Authorized Member Representative.
- 2.0 PRODUCTS:
 - 2.1 Polyvinyl Chloride (PVC) Plastic Piping:
 - 2.1.1 Pipe and Fittings: Pipe, AWWA C900, shall be plain end or gasket bell end, Pressure Class 150 (DR 18) with cast-iron-pipe-equivalent OD. Molecular Oriented (MO) PVC pipe, AWWA C900, shall be plain end or gasket bell end, Pressure Class 150 with cast-iron-pipe-equivalent OD. Fittings shall be gray iron or ductile iron, AWWA C110/A21.10 or AWWA C153/A21.53, and have cement-mortar lining, AWWA C104/A21.4, standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe specified in this paragraph. Pipe color is to be blue or white.
 - 2.1.2 Joints and Jointing Material: Joints for pipe shall be push-on joints, ASTM D 3139. Joints between pipe and metal fittings, valves, and other accessories shall be compression-type joints/mechanical joints, ASTM D 3139 and AWWA A21.11. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe, ASTM F 477. Gaskets for compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, AWWA A21.11, for mechanical joints. Mechanically coupled joints using a sleeve-type mechanical coupling, as specified in paragraph entitled "Sleeve-Type Mechanical Couplings," may be used as an optional jointing method in lieu of push-on joints on plain-end PVC plastic pipe, subject to the limitations specified for mechanically coupled joints using a sleeve-type mechanical coupling and to the use of internal stiffeners as specified for compression-type joints in ASTM D 3139. 2.
 - 2.1.3 High Density Polyethylene (HDPE) Plastic Pipe ASTM F-714-Pipe Std.; ASTM D3261 – Fittings Std.; AWWA C-901; 3" – 8" SDR 11.0, 160 psi. HDPE inside diameter shall equal or exceed PVC inside diameter.
 - 2.1.4 Valves, Hydrants, and Other Water Main Accessories: Gate Valves on Buried Piping: AWWA C500, AWWA C509, or UL 262. Unless otherwise specified, valves conforming to: (1) AWWA C500 shall be nonrising stem type with double-disc gates and mechanical-joint ends, (2) AWWA C509 shall be nonrising stem type with mechanical-joint ends, and (3) UL 262 shall be inside-screw type with operating nut, double-disc or split-wedge type gate, designed for a hydraulic working pressure of 150 psi, and shall have mechanical-joint ends. Materials for UL 262 valves shall conform to the reference standards specified in AWWA C500. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have O-ring stem seals. Stuffing boxes shall be bolted and

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constructed so as to permit easy removal of parts for repair. In lieu of mechanical-joint ends and push-on joint ends, valves may have special ends for connection to sleeve-type mechanical coupling. Valve ends and gaskets for connection to sleeve-type mechanical coupling shall conform to the applicable requirements specified for the coupling. Provide 6 inch size valves with gearing, AWWA C500. Valves shall be of one manufacturer.

- 2.1.5 Fire Hydrants: Hydrant: AWWA C502, UL 246, dry barrel type, inside dimension of 7 inches (175 mm) minimum, with minimum 5 inches (125 mm) diameter valve seat opening; minimum net water area of barrel not less than 190 percent of valve opening; 6 inch (150 mm) bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets. Hydrant outlets shall have 0.90 discharge coefficients.
- 2.1.6 Hydrant Extensions: Fabricate in multiples of 6 inches (150 mm) with rod and coupling to increase barrel length.
- 2.1.7 Hose and Streamer Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle. Install a Storz connection in place of the 4-1/2" steamer connection.
- 2.1.8 Finish: Primer and two coats of enamel in color to be selected by base.
- 2.1.9 Casing (under roadways): Casing under all paved roads shall meet, at a minimum, the following: a. Wall Thickness: (Steel Casing) All casings shall be 0.188", ASTM A139, Grade B. b. Steel casing shall be coated inside and out with approved primer plus one coat of asphaltum paint on outside. c. All casing as a minimum shall extend 3 feet beyond the edge of roadway surfaces.
- 2.1.10 Casing/Pipe Spacers: The Contractor shall provide casing spacers for all piping routed through steel casing. The spacers shall be stainless steel construction with UHMW polymer runners and shall be in two (2) halves. The nuts and bolts used shall be stainless steel. A total of no less than two (2) spacers per joint of pipe shall also be used plus one (1) near the openings (ends) of the casing. The Contractor shall provide casing end seals on all casings. The end seals shall wrap around the casing and carrier pipes after installation to provide a barrier to backfill debris and seepage. Stainless steel bands shall be used to secure the end seals.
- 2.2 Water Service Line Materials: Plastic Piping - Plastic pipe and fittings shall bear the seal of the National Sanitation Foundation for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer. Polyvinyl Chloride (PVC) Plastic Piping: ASTM D 1785, Schedule 40; or ASTM D 2241, with SDR as necessary to provide 150 psi minimum pressure rating. Fittings, ASTM D 2466. Pipe and fittings shall be of the same PVC plastic material and shall be one of the following pipe/fitting combinations, as marked on the pipe and fitting, respectively: [PVC 1120/PVC I; PVC 1220/PVC 12;] PVC 2120/PVC II; PVC 2116/PVC II. Solvent cement for jointing, ASTM D 2564.
- 2.2.1 Insulating Joints - Joints between pipe of dissimilar metals shall have a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact between adjacent sections of piping.
- 2.2.2 Corporation Stops - Ground key type; bronze, ASTM B 61 or ASTM B 62; and suitable for the working pressure of the system. Ends shall be suitable for solder-joint or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops, AWWA C800; coupling nut for connection to flared copper tubing, ASME/ANSI B16.26.
- 2.2.3 Curb Boxes - Provide a curb box for each curb or service stop. Curb boxes shall be of cast iron of a size suitable for the stop on which it is to be used. Provide a round head. Cast the word "WATER" on the lid. Each box shall have a heavy coat of bituminous paint.
- 3.0 EXECUTION:
- 3.1 Location Of Water Lines: Terminate the work covered by this section at a point approximately 5 feet from the building, unless otherwise indicated. Do not lay water lines in the same trench with gas lines or electric wiring. 1. Water Piping Installation Parallel With Sewer Piping a. Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.
- 3.2 Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that: (1) The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping. (2) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-

Attachment 1: Specifications for the Work

approved water pipe and pressure tested in place without leakage prior to backfilling. (3) The sewer manhole shall be of watertight construction and tested in place.

3.3 Installation of Water Piping Crossing Sewer Piping:

3.3.1 Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.

3.3.2 Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction: (1) Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling. (2) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.

3.3.3 Pipe Laying And Jointing: Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 2 1/2 feet. Install access fittings to permit disinfection of water system.

3.3.4 Connections To Existing Water Lines: Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Scheduling of any outage requires a minimum of one week prior notice for the user of the facility. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.

3.3.5 Special Requirements For Installation Of Water Mains

3.3.6 Installation of PVC Plastic Water Main Pipe and Associated Fittings: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Make compression-type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

3.3.7 Pipe Anchorage: Provide concrete thrust blocks. Thrust blocks shall be in accordance with the requirements of AWWA C605 for reaction or thrust blocking and plugging of dead ends, except that

Attachment 1: Specifications for the Work

size and positioning of thrust blocks shall be as indicated. Use concrete, ASTM C 94, having a minimum compressive strength of 4,000 psi at 28 days. 3. Install a # 10 gage copper trace wire with buried PVC pipe to facilitate location with an electronic detector. Install wire 8 to 12 inches above pipeline and terminate 3 to 4 inches above grade. Do not wrap wire around pipe. The magnetic detectable conductor must have a brightly colored plastic covering with the "Water Service" imprinted in large letters.

- 3.3.8 Installation of Valves: Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.
- 3.3.9 Installation of Hydrants: Install hydrants in accordance with AWWA C600 for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Install hydrants with the 4 1/2 inch connections facing the adjacent paved surface. If there are two paved adjacent surfaces, contact the Contracting Officer for further instructions.
- 3.3.10 Disinfection - Disinfect new water piping and existing water piping in accordance with AWWA C651 and as required by State permit. Bacteriological samples shall be taken on two consecutive days at the connection to the existing system, the end point of the new addition, on each new line branching off main, and every 1,200 feet on straight runs of pipe.



7/25/2023

Modification of Contract (Contract Extension) (Page 1 of 3)

Robert Carr
Pueblo Mechanical and Controls, LLC.
6771 E. Outlook Drive
Tucson, AZ 85756

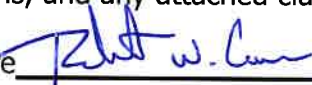
RE: Contract # 19F-PMAC2-0904 modification of contract through an extension of contract is made by, and between, Pueblo Mechanical and Controls, LLC. and Mohave Educational Services Cooperative (Mohave).

In accordance with its terms and conditions, Mohave requests to extend contract 19F-PMAC2-0904 for a period of one (1) year, beginning 9/4/2023. The extension shall be under the same terms and conditions contained therein.

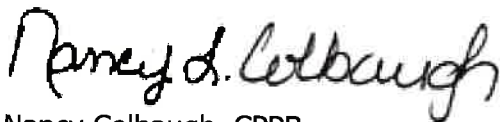
Provide your agreement to extend by completing the appropriate information below and on the following pages. If the contract is extended, Pueblo Mechanical and Controls, LLC. agrees to provide products or prices as per 19F-0808.

By signing this Modification of Contract, you hereby certify to the best of your knowledge and belief that your firm complies with Byrd Anti-Lobbying Amendment 31 U.S. Code § 1352, 2 CFR § 200.450 and Federal Acquisition Regulation 52.203-11

We agree to **modify** and **extend** the contract as specified above, abiding by the current terms and conditions, and any attached clarifications.

Signature  Title OSM
Typed/Printed Name ROBERT W. CARR Date 8/8/2023

Upon your signed, executed Modification of Contract through a Contract Extension, you shall be bound to sell the materials and/or services offered to and accepted by Mohave in accordance with the solicitation, including all terms, conditions, specifications, amendments and any accepted written exceptions.



Nancy Colbaugh, CPPB
Contracts Manager
Mohave Educational Services Cooperative, Inc.
625 East Beale Street | Kingman, AZ 86401
Phone 928-718-3228 | Fax 928-718-3232

If all pages of this notice are not received at Mohave's Kingman office on, or before, 9/4/2023, orders shall be held without processing. Email or fax completed extension to contracts@mesc.org or 928-718-3232.

To terminate the contract effective 9/4/2023, email or fax a notice of your request to cancel the contract to contracts@mesc.org or 928-718-3232. You agree to complete any authorized work or orders received prior to that date. Renewals not received within 14 days following 9/4/2023 may result in cancellation of the contract. However, any authorized orders received prior to this date, shall be completed under this contracts terms and conditions.

Modification of Contract (Contract Extension)

(Page 2 of 3)

Requested Pricing Modifications

We list your contract as utilizing Coefficient applied to UPB, Trade Service (TRA-SER) pricing and some fixed price for professional services.. Please confirm the following regarding pricing under your contract:

☒ Our contract utilized firm-fixed pricing. We agree to hold the current prices until the next contract renewal date of 9/4/2024.

☐ Our contract utilized percentage off MSRP/Retail pricing. The current price lists/catalogs are still applicable.

☐ We are requesting a price modification. A price list/catalog will be submitted by _____. (Insert Date)

Remember that your firm cannot quote any new products contained in pricing submitted with your contract extension until it has been reviewed and a Contract Modification through a pricing update/product addition has been issued. Current contract pricing will remain in effect until this process is complete.

Please verify that the following information is correct and accurate:

POs Attn: Order Desk
Pueblo Mechanical and Controls, LLC.
6771 E. Outlook Drive
Tucson, AZ 85756

Remit to: Pueblo Mechanical and Controls, LLC.
Accounts Receivable
6771 E. Outlook Drive
Tucson, AZ 85756

Member Contact: Robert Carr
Contract Administrator: Robert Carr
Phone Number: 800-840-9170
Fax Number: 888-473-4374

Vendor Logo

Currently, we have the following logo on file for use on our website in our product/vendor finder:



If you wish to revise or update the logo we have on file, keep the following requirements in mind:

- *What file types are acceptable?* Vector point files are highly recommended (such as .ai or .eps files). If you don't have access to a vector point file, a large hi-resolution (approximately 150-300 dpi) JPEG, TIFF, BITMAP, GIF or PNG file will work. Having a file with a high dpi will help keep images looking sharp if we need to resize the logo.
- *What file size is recommended?* There is no limitation to the logo file size.

Modification of Contract (Contract Extension)

(Page 3 of 3)

Vendor Benefits Description

Currently, we have the following information on our website detailing the benefits of your contract for our members to view:

Pueblo Mechanical and Controls, LLC. is a recognized JOC expert, specializing in full spectrum energy efficient heating, cooling, ventilation, and air conditioning [HVAC] installation and service. Since 2001, having completed over 3,800 projects and thousands of service calls for educational institutions, cities, counties, and various federal and private organizations, state-wide. Procuring our services is simple, secure, and above all, cost effective!

Mohave makes utilizing its approved and trustworthy vendors convenient and statute compliant with guidelines and procedures in place that protect you, the customer. Service is friendly and lightning fast! Inquire about our affordable service contracts and enjoy continued technical and hands-on support for systems of all types and ages.

We proudly service a host of governmental agencies with guaranteed work; we will not rest until the project is done right and worthy of the Mohave membership we serve.

If you wish to revise or update the vendors benefits information we have on file, keep the following requirements in mind:

- The description should be 150-200 words that explain the benefits that your company can provide to our members through your Mohave contract.
- The description should give a brief overview for members who may be accessing information about your contract from our product vendor finder on Mohave's website.
- Please note that Mohave reserves the right to revise or modify the information provided either for content or length.

Email or fax request for information revisions or additional information to contracts@mesc.org or 928-718-3232. If you have any questions, contact your Contract Specialist either via email at michaelc@mesc.org or phone 928-718-3222.



The Due Diligence Tutorial may be downloaded using the following link:

Click here to view and download the Due Diligence Tutorial for Mohave Contracts.

Pricing for this contract may be found at the following link:

Click here to go to the Mohave Pricing

For further assistance contact the Contract Specialist for this contract:

Michael Carter Specialist, CPPB

Phone: 928-718-3221

Email: **michael@mesc.org**

Price Proposal – Primary Vendor Information
(Place in a clearly marked, separate sealed envelope)

IF YOUR FIRM WAS SHORTLISTED FOR DIVISION 22 PLUMBING, DIVISION 23 HEATING, VENTILATION AND AIR CONDITIONING OR DIVISION 26 ELECTRICAL, PROVIDE CO-EFFICIENTS AND PRICING INFORMATION FOR BOTH DIVISIONS OR INDICATE IF THE CO-EFFICIENTS WILL BE IDENTICAL FOR BOTH DIVISIONS.

Price Proposal shall be submitted in a clearly marked, separate sealed envelope. Offeror shall provide a price proposal to include the following information:

- 1. Name and Date of the Unit Price Book (UPB):**
- 2. Coefficient(s) to be applied to pre-priced items (items listed in the UPB) for work performed during:**
 - Normal business hours (Monday - Friday 7 a.m. - 5 p.m.)
 - Other hours (after hours, weekends, and holidays)
 - Note adjustments to the coefficient(s), if applicable, for work performed in different regions of the state.
- 3. Coefficient(s) to be applied to non pre-priced items (items not listed in the UPB) for work performed during:**
 - Normal business hours (Monday - Friday 7 a.m. - 5 p.m.)
 - Other hours (after hours, weekends, and holidays)
 - Note adjustments to the coefficient(s), if applicable, for work performed in different regions of the state.

Notes: Provide a brief explanation of the rationale for your coefficients. The rationale should indicate how you determined the cost of doing the work and the various elements that made up your coefficients. See Specification 1.2.13, Pricing, for additional information.

- 4. Open Book Pricing Workbook:**

NOTE: *The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.*

If offeror is including the Open Book Pricing methodology in their price proposal, the Open Book Price workbook shall be completed as follows:

- Provide complete information in the worksheet titled, "*Price Summary*" in the electronic Open Book Price workbook titled, "*19F-0808 Open Book Price Summary.xlsx*" includes yellow highlighted cells for *General and Administrative Cost (G&A)* and *Profit*. Place the percentage value your firm will use to calculate overhead and profit for the Direct Project Costs and General Conditions.
- The worksheet titled, "*General Conditions*" in the electronic Open Book Price workbook titled, "*19F-0808 Open Book Price Summary.xlsx*", includes general conditions, services, or costs not identified or included in the subcontractor quotations.
- Provide the labor and/or service unit price for the yellow highlighted cells in the section titled, *Admin Fee Items: Unit Price*. Additionally, include the unit of measure (e.g. per hour, per day, per week) as applicable in the *Unit Of Measure* column.
- Provide additional costs as applicable for yellow highlighted cells in the section titled, *Non-Admin Fee Items*. Non-Admin Fee items include costs that are "passed-through" to member at cost to the contract vendor. *Mohave shall not collect administration fees on the above non-admin fee items.*
- Add line items to the Admin and/or Non-Admin Fee schedules as necessary.
- **Only services/costs identified in this price schedule will be allowed under an awarded contract.**
- This workbook will serve as your quoting template for all open book projects under an awarded contract.

Price Proposal – Primary Vendor Information
(Place in a clearly marked, separate sealed envelope)

5. Trade Service Price Guides for items and services not included in the UPB:

- The pricing methodology to determine the Mohave price shall be:
 - Discount off list (specify discount).
 - Discount off Column Two (specify discount) when List Price is unavailable.

6. Professional Services (Provide the applicable hourly rate for each service offered. No coefficient will be applied to these rates.)

- Design Services
- Engineering Services
- Other Professional Services (specify service and rate)

7. Maintenance Services and Extended Warranties (Provide the cost for all maintenance services and extended warranties that are available after the warranty period. No coefficient will be applied to these prices.)

8. Other Charges (Provide any additional costs, or incidental charges. Such charges may include the items listed below. No coefficient will be applied to these charges.)

- 100% Performance and Payment Bonds
- Meals and incidental expenses (M&IE), transportation and lodging
- Mobilization (Indicate when mobilization charges would apply.)

NOTE: Mobilization may only be used with projects priced using Trade Service and labor. Mobilization charges shall not be allowed with UPB or Open Book Pricing methodologies.

- Other

9. Will you offer members a quick pay discount if payment is made within 10 or 20 days? Yes ___ No X

- If Yes, what is the discount for 10 days? _____ 20 days? _____

Travel Description

If travel rates are applicable, describe how they are calculated, and when they are necessary, (e.g. 50 miles from origin). Include information regarding what the travel rates cover. (See **Pricing: Reimbursement for Transportation, Mileage, Lodging, Meals and Incidental Expenses** in the Special Terms and Conditions.)

Travel rates are applicable when work sites exceed 50-mile radius from our current Tucson and Phoenix office locations. In some

cases overnight lodging will not be required if it is more cost effective to travel to the work site daily versus overnight stays.

Meals & Incidentals are only applicable for work involving overnight accommodations.

Bond Methodology Description

Provide detailed information explaining the methodology to be used when bonds are applied to projects. Describe in detail the method your surety company requires you to use (e.g., bonds are applied before sales tax is applied, bonds are applied after sales tax is applied). Mohave will use this information to verify that your firm is consistently charging bonds in the same manner under an awarded contract.

The use of bonds is based on current state legislation and owners' requirements. Projects under \$100,000 do not require bonding

Unless specifically requested by the owner, all proposals will include this language. Bonding cost is calculated based on the total

price obligation.

UNIT PRICE BOOK [UPB]
TRA-SER
OPEN BOOK
PRICE PROPOSAL SUMMARY

2. Coefficients - Pre-Priced Primary UPB Coefficients [RS Means CostWorks]:

APPLIES TO ALL DIVISIONS

Normal Business Hours [M-F 7am – 5pm]:	.85
Other Hours [Weekends, holidays, etc.]:	.95
Adjustments to the coefficient(s), if applicable for work performed in different regions of the state:	N/A - None

Professional Services

Design Services [Mechanical/Electrical]:	\$116.00/hr.
Engineering Services:	\$120.00/hr.
Principal Engineering Services:	\$142.00/hr.

Other Professional Services

Drafting [CAD] Design:	\$92.00/hr.
Architect:	\$142.00/hr.
Principal Architect:	\$160.00/hr.

Maintenance and Other Services [based on hourly labor rates]:

Duty Position	Normal Hours	After Hours / Emergency Hours	Holidays
HVAC Chiller Tech [Wetside Applications]	\$104.00/hr.	\$142.00/hr.	\$176.00/hr.
HVAC Unitary Tech [Dryside Applications]	\$99.00/hr.	\$136.00/hr.	\$168.00/hr.
Pipefitter / Steamfitter	\$94.00/hr.	\$129.00/hr.	\$159.00/hr.
Sheet Metal Installation	\$74.00/hr.	\$101.00/hr.	\$125.00/hr.
Plumber	\$98.00/hr.	\$134.00/hr.	\$166.00h/hr.
Water Treatment	\$101.00/hr.	N/A	N/A
HVAC Building Automation Tech – Controls/Programing	\$98.00/hr.	\$134.00/hr.	\$166.00/hr.
Project Manager / Quality Control	\$96.00/hr.	\$131.00/hr.	\$163.00/hr.
Electrical [by PMAC]	\$87.00/hr.	\$119.00/hr.	\$147.00/hr.
General Labor	\$50.00/hr.	\$68.00/hr.	\$85.00/hr.

Note: Labor rates above are all inclusive, no other factors or mark-ups are applied

**Note: Normal hours are 7:00 am – 5:00 pm Monday – Friday [Excluding holidays]
Other Charges**

3. Coefficients - Custom or Special Non-Prepriced Items Not Found in UPB or TRA-SER [Pricing based on three quotes when available; single source or customer mandated items due to specific specifications are available if they comply with contract requirements]

Normal Business Hours [M-F 7am – 5pm]: **1.20**
 Other Hours [Weekends, holidays, etc.]: **1.20**
 Adjustments to the coefficient(s), if applicable
 for work performed in different regions of the state: **N/A - None**

NOTE: The use of the non-prepriced pricing option will only take place when the equipment/supplies are not listed in primary or secondary costing and include a statement clearly indicating that pricing is not available via other pricing methodologies

Explanation Notes: Established coefficients represent the minimum realistic cost estimate to capture direct/indirect costs, overhead, and a sustainable profit. The coefficients represent project cost averages based on project spanning 15 years of UPB utilization.

4. Open Book Pricing Workbook/Summary:

Name of Pricing Source: **19F-0808 Open Book Price Summary Excel Spreadsheet – Jul 19**

General & Administrative Cost (G&A) **10%**

Profit **5%**

General Conditions **Derived from Open Book pricing spreadsheet General Conditions Tab**

Duty Position [Direct Company Labor]	Normal Hours	After Hours / Emergency Hours	Holidays
Project General Manager	\$94.00/hr.	\$129.00/hr.	\$159.00/hr.
Project Manager	\$83.00/hr.	\$114.00/hr.	\$141.00/hr.
Estimator	\$77.00/hr.	\$105.00/hr.	\$131.00/hr.
Senior Superintendent	\$77.00/hr.	\$105.00/hr.	\$131.00/hr.
Superintendent	\$72.00/hr.	\$99.00/hr.	\$122.00/hr.
CQC Inspector	\$77.00/hr.	\$105.00/hr.	\$131.00/hr.
Safety Manager	\$83.00/hr.	\$114.00/hr.	\$141.00/hr.

Field Engineer	\$94.00/hr.	\$129.00/hr.	\$159.00/hr.
Administrative Assistant	\$58.00/hr.	\$79.00/hr.	\$98.00/hr.
HVAC Chiller Tech [Wetside Applications]	\$90.00/hr.	\$123.00/hr.	\$153.00/hr.
HVAC Unitary Tech [Dryside Applications]	\$86.00/hr.	\$118.00/hr.	\$146.00/hr.
Pipefitter / Steamfitter	\$82.00/hr.	\$112.00/hr.	\$139.00/hr.
Sheet Metal Installation	\$64.00/hr.	\$88.00/hr.	\$108.00/hr.
Water Treatment	\$88.00/hr.	\$121.00/hr.	\$149.00/hr.
Plumber	\$85.00/hr.	\$116.00/hr.	\$144.00/hr.
Electrical [by PMAC]	\$68.00/hr.	\$93.00/hr.	\$115.00/hr.
HVAC Building Automation Tech – Controls/Programing	\$85.00/hr.	\$116.00/hr.	\$144.00/hr.
General Labor / Driver	\$43.00/hr.	\$59.00/hr.	\$73.00/hr.
In-House Design Services [Mech/Electric]	\$101.00/hr.	\$138.00/hr.	\$171.00/hr.
In-House Drafting [CAD] Design	\$80.00/hr.	\$110.00/hr.	\$136.00/hr.

See detailed Open Book Breakout Below:

5. Trade Service [TRA-SER] Price Guides/Summary:

Name/Date of Pricing Source: TradeService eDataFlex

Note: TRA-SER equipment pricing is also available as a stand-alone pricing option

Normal Business Hours [M-F 7am – 5pm]: .90 [List Price Column]

Other Hours [Weekends, holidays, etc.]: .90 [List Price Column]

Discount off Column Two when List Price not avail. TBD

Note: Labor rates are listed above in the UPB section; no additional mark-up is applied to these rates

Note: TRA-SER pricing may be combined with UPB pricing to provide a complete turn-key solution

6. Professional Services:

Professional Services

Design Services [Mechanical/Electrical]: \$105.00/hr.

Principal Engineering Services: \$130.00/hr.

Other Professional Services

Drafting [CAD] Design: \$83.00/hr.

Architect: \$130.00/hr.

7. Maintenance Services and Extended Warranties:

Factory or Misc. Formal Training / Instruction: Direct Cost

Maintenance Services Labor/Materials IAW standard JOC pricing [Trade Service/UPB]

Extended Warranties [if available through manufacturer and/or vendor] Direct Cost

Mohave Solicitation Number RFP 19F-0808

Member		Date	
Project Title			
Project Location			

Direct Project Cost

Division / Specialty	#	Quote Summary		Selected Quote
		Subcontractor	Quote Amount	
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
		Subtotal 1 (Total Direct Project Cost)		\$0.00
General Conditions (GCs) Adminfeeable				\$ -
General Conditions (GCs) Admin Fee				\$ -
General Conditions (GCs) Total Without Admin Fee				\$ -

Subtotal 2 (Direct Project Cost + General Conditions)		\$0.00
General & Administrative Cost (G&A) (Enter applicable G&A Percentage)	10.00%	% of Subtotal 2
		\$0.00
Subtotal 3 (Subtotal 2 + G&A)		\$0.00
Profit (Enter applicable profit percentage)	5.00%	% of Subtotal 3
		\$0.00
Subtotal 4 (Subtotal 3 + Profit)		\$0.00

Total Amount Subject to Mohave Admin Fees (based on costs including O&P)	\$0.00
General Conditions (GCs) (non-adminfeeable)	\$ -
Tax (Enter applicable tax rate)	\$0.00
Bond, if applicable (Enter applicable unit price)	\$0.00
Total Project Cost	\$0.00

* Provide vendor name & explanation if low quote is not selected.

NOTE: The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.

This worksheet is for the detailed information and pricing for quotations from subcontractors, and the General and Administrative Cost (G&A) and Profit.

To complete the portion required for your price proposal, place the percentage value your firm will use to calculate overhead and profit for the Direct Project Costs and General Conditions in the yellow highlighted cells.

This workbook will serve as your quoting template for all open book projects under an awarded contract. After completion of this worksheet, you may delete this textbox in your template.

Item Number (optional)	Item Description	Quantity	Unit of Measure	Unit Price	Total	Remarks
Admin Fee Items						
	Project General Manager		hr	\$ 94.00	\$ -	
	Project Manager		hr	\$ 83.00	\$ -	
	Estimator		hr	\$ 77.00	\$ -	
	Senior Superintendent		hr	\$ 77.00	\$ -	
	Superintendent		hr	\$ 72.00	\$ -	
	CQC Inspector		hr	\$ 77.00	\$ -	
	Safety Manager		hr	\$ 83.00	\$ -	
	Field Engineer		hr	\$ 94.00	\$ -	
	Administrative Assistant		hr	\$ 58.00	\$ -	
	HVAC Chiller Tech		hr	\$ 90.00	\$ -	
	HVAC Unitary Tech		hr	\$ 86.00	\$ -	
	Pipefitter / Steamfitter		hr	\$ 82.00	\$ -	
	Sheet Metal Installation		hr	\$ 64.00	\$ -	
	Water Treatment		hr	\$ 88.00	\$ -	
	Plumber		hr	\$ 85.00	\$ -	
	Electrical (by PMAC)		hr	\$ 68.00	\$ -	
	HVAC Building Automation		hr	\$ 85.00	\$ -	
	General Labor / Driver		hr	\$ 43.00	\$ -	
	Design Services [Mech/Electrical]		hr	\$ 101.00	\$ -	
	Drafting [CAD] Design		hr	\$ 80.00	\$ -	
	Architect		hr	\$ 123.00	\$ -	
	Principal Architect		hr	\$ 130.00	\$ -	
	Plans / Specs / Drawings			\$ -	\$ -	
	Temporary Electric			\$ -	\$ -	
	Electricity Usage			\$ -	\$ -	
	Water Usage (incl. bottled water)			\$ -	\$ -	
	Temporary Toilet Usage			\$ -	\$ -	
	Cellular / Mobile Service			\$ -	\$ -	
	Trash Service - Tonnage			\$ -	\$ -	
	Trash Service - Rental			\$ -	\$ -	
	Trash Service - Dumps			\$ -	\$ -	
	Temp. Fences & Barriers			\$ -	\$ -	
	Project ID Signs			\$ -	\$ -	
	Trailer Set-up & Remove			\$ -	\$ -	
	Trailer Rental			\$ -	\$ -	
	Field Office Expense			\$ -	\$ -	
	Postage / Messengers / Fedex			\$ -	\$ -	
	Safety Related - (Labor)			\$ -	\$ -	
	Safety Related - (Materials)			\$ -	\$ -	
	Gasoline / Fuel			\$ -	\$ -	
	Final Clean			\$ -	\$ -	
				\$ -	\$ -	
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NOTE: The workbook contains cells that include formulas to calculate total costs. Do not override the formulas within these cells.

This worksheet is for general conditions, services, or costs not identified or included in the subcontractor quotations. To complete the portion required for your price proposal, provide the information as applicable below:

- Provide the labor and/or service unit price for the yellow highlighted cells in the section titled, Admin Fee Items: Unit Price. Additionally, include the unit of measure (e.g. per hour, per day, per week, etc.) as applicable in the Unit Of Measure column.
- Provide additional costs as applicable for yellow highlighted cells in the section titled, Non-Admin Fee Items. Non-Admin Fee items are costs that is "passed-through" to member at cost to the contract vendor. Mohave shall not collect administration fees on the above non-admin fee items.
- Add line items to the Admin and/or Non-Admin Fee schedules as necessary.
- Only services/costs identified in this price schedule will be allowed under an awarded contract.
- This workbook will serve as your quoting template for all open book projects under an awarded contract.

This workbook will serve as your quoting template for all open book projects under an awarded contract. After completion of this worksheet, you may delete this textbox in your template.

8. Other Charges – Miscellaneous Pricing:

100% Performance/Payment Bonds:	1.50% of project cost
Note: P/P bonds are calculated based on the <u>total</u> project cost [base price + tax]	
Meals and Incidental Expenses (M&IE):	Per AZ State rates
Transportation and Lodging:	Per AZ State rates
Note: M&IE, travel, and lodging are only applicable outside 50 mile radius of Tucson & Phoenix offices	
Expedited Shipping:	Direct Cost
Factory or Misc. Formal Training / Instruction:	Direct Cost
Credit Card / P Card Fees [when applicable]:	Direct Cost + 1%
Mobilization	No additional charges other than allowed as pre-priced line items in the UPB, Open Book, or TRA-SER
Maintenance Services	Labor/Materials IAW standard JOC pricing
Extended Warranties [if available through manufacturer and/or vendor]	Direct Cost
Permits or other direct construction fees:	Direct Cost
Additional Print Sets or Extra O&M Manuals	Direct Cost
Miscellaneous Admin Fees Not Included Above [E.g. Native American TERO or other tribal fees, etc.]:	Direct Cost

9. Quick Pay Discounts:

Will you offer members a quick pay discount if payment is made within 10 or 20 days? Yes _____ No **X**