

SECTION 00 52 00

COUNTY OF YOLO, CALIFORNIA

**CONSTRUCTION AGREEMENT FOR THE SECOND FLOOR TENANT
IMPROVEMENT**

100 West Court Street, Woodland, California

CONTRACT NO. _____

This Agreement for Construction ("Agreement") is entered into as of the Effective Date of September 28, 2021 as defined herein, between Broward Builders, Inc., a California Corporation ("Contractor"), and the County of Yolo ("County"), a political subdivision of the State of California.

1. SCOPE OF WORK. Contractor shall furnish all labor, services, transportation, materials, equipment, parts, and supplies necessary for **The Second Floor Tenant Improvement, 100 West Court Street, Woodland, California**, in accordance with the plans and specifications. Contractor shall complete Yolo County Second Floor Tenant Improvement Project per bid amount not to exceed ONE MILLION, THREE HUNDRED AND FORTY THOUSAND DOLLARS (\$1,340,000).

2. CONTRACT DOCUMENTS. The documents defined as the "Contract Documents" in Section 1.12 of the General Conditions, which are incorporated as if fully set forth herein by this reference, comprise the entire Agreement between the County and Contractor concerning the above-referenced project. The documents that describe the work to be performed are sometimes collectively referred to herein as the Plans and Specifications. In the event of any conflict between any of the provisions of the Contract Documents, the provision that requires the highest level of performance from Contractor for the County's benefit shall prevail. See Attached exhibits:

Exhibit A ~ Proposal Response, including all required forms

Exhibit B ~ Subcontractor List

Exhibit C ~ Technical Specifications, Drawings and Air Quality District Documents

Exhibit D ~ Performance Bond and Payment Bond

Exhibit E ~ General Provisions, General Conditions, General Requirements and Notice

Exhibit F ~ Project Plans

Exhibit F ~ Addendas

Exhibit G ~ Construction and Demolition Debris Plan

Exhibit H ~ Asbestos and Lead Survey Report

Exhibit I – Change Order Form

3. CONDUCT OF WORK, CONTRACT ADMINISTRATOR. Contractor shall perform the services described in the Contract Documents in a manner that causes the least possible inconvenience to County and the public and safeguards persons and property from any dangerous activities or conditions conducted or created by Contractor. County's Manager of Facilities Services and Capital Programs shall administer this Agreement for County. County's

Board of Supervisors may designate a different person to serve as Contract Administrator by giving advance written notice to Contractor.

(a) **Work Schedule.** Unless otherwise agreed pursuant to Section 3.01 of the General Conditions, Contractor shall begin work within ten (10) days after receiving the Contract Administrator's Notice to Proceed and shall complete the work within **150 calendar days** after receiving that notice. This work must be complete, operational, have a Temporary Occupancy Permit and be turned over to the County for its intended use for this milestone to be deemed complete. County understands the nature of weather and will allow for rain delays to the project, if applicable.

(b) **Liquidated Damages.** Contractor shall pay County **\$850.00** a day liquidated damages for each day's delay (excluding Saturdays, Sundays, and County observed holidays) in completing the work beyond the time specified for completion of work. All other aspects of the payment of such damages shall be governed by Section 3.12 of the General Conditions and other relevant provisions thereof.

4. INDEMNIFICATION. With the exception that this section shall in no event be construed to require indemnification by Contractor to a greater extent than permitted under the public policy of the State of California, Contractor shall indemnify, defend and hold harmless the County of Yolo and its officers, agents, employees and volunteers from and against any and all claims, damages, demands, losses, defense costs, expenses (including attorneys' fees) and liability of any kind or nature arising out of or resulting from performance of the work, provided that any such claim, damage, demand, loss, cost, expense or liability is caused in whole or in part by any negligent or intentional act or omission of the contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Contractor and/or Subcontractor's responsibility for such defense and indemnity obligations shall survive the termination or completion of this Agreement for the full period of time allowed by law. The defense and indemnification obligations of this agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained in this Agreement.

Any law firm or attorney retained to provide a defense on behalf of County pursuant to this provision shall be subject to approval by the County Counsel. Such approval may not be unreasonably withheld. **5. COMPENSATION.** All matters of compensation shall be governed by the General Conditions, including but not limited to Article 25 thereof.

6. INSURANCE. Contractor shall maintain the following insurance while performing the services covered by this Agreement. The comprehensive general liability insurance shall include broad form property damage insurance.

(a) **Minimum Coverages (as applicable)** - Insurance coverage shall be with limits not less than the following:

1. **Commercial General Liability** Occurrence form Insurance policy (ISO CG 00 01 or equivalent) covering all operations by or on behalf of Contractor, including coverage for:

- a) Premises and Operations
- b) Products and completed Operations
- c) Contractual Liability insuring the obligations assumed by Contractor in this agreement or Blanket Contractual Liability Coverage
- d) Broad Form Property Damage (including Completed Operations)
- e) Explosion, Collapse, and Underground Hazards
- f) Personal Injury Liability

Limits of liability shall be not less than:

\$5,000,000 each occurrence (combined single limit for bodily injury and property damage)

\$5,000,000 for Personal Injury Liability

\$5,000,000 for Products Completed Operations

\$10,000,000 General Aggregate

If the policy does not have an endorsement providing that the General Aggregate Limit applies separately, or if defense costs are included in the aggregate limits, then the required aggregate limits shall be \$10,000,000.

- 2. **Automobile Liability** – Insurance policy (ISO CA 00 01) covering Bodily Injury, Property Damage and contractual Liability coverage for “Any Auto” which includes coverage for any owned, hired, borrowed and non-owned automobile, trailer, and equipment coverage, with limits no less than \$1,000,000 occurrence (per accident for bodily injury and property damage) and \$2,000,000 policy aggregate.
- 3. **Workers’ Compensation** – Statutory Limits/**Employers’ Liability** – No less than \$1,000,000 per accident for bodily injury or disease.
- 4. **Builder’s Risk** – (Course of Construction) insurance utilizing an “All Risk” (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions.
- 5. **Contractor’s Pollution Legal Liability Insurance** – Limits of no less than \$2,000,000 per occurrence or claim, and \$2,000,000 policy aggregate.

- (b) The County, its officers, agents, employees and volunteers shall be named as additional insured on all but the workers’ compensation and professional liability coverages. . [NOTE: Evidence of additional insured may be needed as a separate endorsement due to wording on the certificate negating any additional writing in the description box.] It shall be a requirement under this agreement that any available insurance proceeds broader than or in excess of the specified minimum Insurance coverage requirements and/or limits shall be available to the Additional Insured. Furthermore, the requirements for coverage and limits shall be (1) the minimum coverage and limits specified in this

Agreement; or (2) the broader coverage and maximum limits of coverage of any Insurance policy or proceeds available to the named Insured; whichever is greater.

1. The Additional Insured coverage under the Contractor's policy shall be "primary and non-contributory" and will not seek contribution from the County's insurance or self insurance and shall be at least as broad as CG 20 01 04 13.
2. The limits of Insurance required in this agreement may be satisfied by a combination of primary and umbrella or excess Insurance. Any umbrella or excess Insurance shall contain or be endorsed to contain a provision that such coverage shall also apply on a primary and non contributory basis for the benefit of the County of Yolo (if agreed to in a written contract or agreement) before the County's own Insurance or self insurance shall be called upon to protect it as a named insured.
3. Said policies shall remain in force through the life of this Agreement and, with the exception of professional liability coverage, shall be payable on a "per occurrence" basis unless the County Risk Manager specifically consents in writing to a "claims made" basis. For all "claims made" coverage, in the event that the Contractor changes insurance carriers Contractor shall purchase "tail" coverage covering the term of this Agreement and not less than three years thereafter. Proof of such "tail" coverage shall be required at any time that the Contractor changes to a new carrier prior to receipt of any payments due.
4. The Contractor shall declare all aggregate limits on the coverage before commencing performance of this Agreement, and the County's Risk Manager reserves the right to require higher aggregate limits to ensure that the coverage limits required for this Agreement as set forth above are available throughout the performance of this Agreement.
5. Any deductibles or self-insured retentions must be declared to and are subject to the approval of the County Risk Manager. All self-insured retentions (SIR) must be disclosed to Risk Management for approval and shall not reduce the limits of liability. Policies containing any SIR provision shall provide or be endorsed to provide that the SIR may be satisfied either by the named Insured or Yolo County.
6. Each insurance policy shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the Director (ten (10) days for delinquent insurance premium payments).

7. Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII, unless otherwise approved by the County Risk Manager.
 8. The policies shall cover all activities of Contractor, its officers, employees, agents and volunteers arising out of or in connection with this Agreement.
 9. For any claims relating to this Agreement, the Contractor's insurance coverage shall be primary, including as respects the County, its officers, agents, employees and volunteers. Any insurance maintained by the County shall apply in excess of, and not contribute with, insurance provided by Contractor's liability insurance policy.
 10. The insurer shall waive all rights of subrogation against the County, its officers, employees, agents and volunteers.
- (c) Prior to commencing services pursuant to this Agreement, Contractor shall furnish the County with original endorsements reflecting coverage required by this Agreement. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All endorsements are to be received by, and are subject to the approval of, the County Risk Manager before work commences. Upon County's request, Contractor shall provide complete, certified copies of all required insurance policies, including endorsements reflecting the coverage required by these specifications.
- (d) During the term of this Agreement, Contractor shall furnish the County with original endorsements reflecting renewals, changes in insurance companies and any other documents reflecting the maintenance of the required coverage throughout the entire term of this Agreement. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. Upon County's request, Contractor shall provide complete, certified copies of all required insurance policies, including endorsements reflecting the coverage required by these specifications. Yolo County reserves the right to obtain a full certified copy of any Insurance policy and endorsements. Failure to exercise this right shall not constitute a waiver of right to exercise later.
- (e) Contractor agrees to include with all Subcontractors in their subcontract the same requirements and provisions of this agreement including the indemnity and Insurance requirements to the extent they apply to the scope of the Subcontractor's work. Subcontractors hired by Contractor agree to be bound to Contractor and the County of Yolo in the same manner and to the same extent as Contractor is bound to the County of Yolo under the Contract Documents. Subcontractor further agrees to include these same provisions with any Sub-subcontractor. A copy of the Owner Contract Document Indemnity and Insurance provisions will be furnished to the Subcontractor upon request. The General Contractor/**and or Contractor** shall require all Subcontractors to provide a valid certificate of insurance and the required endorsements included in the agreement

prior to commencement of any work and General Contractor/**and or Contractor** will provide proof of compliance to the County of Yolo.

- (f) Contractor shall maintain insurance as required by this contract to the fullest amount allowed by law and shall maintain insurance for a minimum of five years following the completion of this project. In the event Contractor fails to obtain or maintain completed operations coverage as required by this agreement, the County at its sole discretion may purchase the coverage required and the cost will be paid by Contractor.

7. COMPLIANCE WITH LAWS. Contractor shall comply with all relevant federal, state, and local statutes, regulations, ordinances, rules, orders, and other laws in effect when performing the services required by this Agreement, all as set forth in the General Conditions (including but not limited to Article 20 thereof).

8. INDEPENDENT CONTRACTOR. While performing the services required by this Agreement for Construction, Contractor shall act as an independent contractor, not as an employee of County, and thus shall be subject to the direction and control of County only for the final result. Contractor shall be solely responsible for paying all required employment taxes and for meeting all employment obligations related to its performance of the services, including but not limited to payment of worker's compensation, liability insurance, social security taxes (i.e., FICA), and tax withholding. Moreover, Contractor shall indemnify, defend (upon County's written request), and protect County from any liability County may incur to federal or state governments for such taxes and obligations. This Agreement does not entitle Contractor or its officers, employees, subcontractors, or agents to vacation pay, sick leave, retirement benefits, disability or unemployment insurance, or employee benefits of any kind from County.

9. INSPECTIONS. All inspections and any remedial action required in response thereto shall be governed by the General Conditions, including but not limited to Article 18 thereof.

10. PERFORMANCE BONDS. Within the time set forth in the Proposal and before performing any services pursuant to this Agreement, Contractor shall provide to County the bonds required by the General Conditions, including but not limited to Article 2 thereof. All other matters relating to bonds shall be governed by the General Conditions.

11. TERM OF AGREEMENT; EARLY TERMINATION. The term and termination of this Agreement shall be governed by the General Conditions, including but not limited to Article 27 thereof.

12. GUARANTY. Guarantees and warranties shall be governed by the General Conditions, including but not limited to Article 26 thereof.

13. AUDIT PROVISIONS. Contractor's records which shall include but not limited to accounting records, subcontract files, correspondence, change order files, and any other supporting evidence necessary to substantiate charges relating to this contract (all the foregoing hereinafter referred to as "records") shall be open to inspection and subject to audit and/or reproduction, during normal working hours, by County's agent or its authorized representative to

the extent necessary to adequately permit evaluation and verification of any invoices, payments, or claims submitted by the contractor or any of his payees pursuant to the execution of this Agreement. For the purpose of such audits, inspections, examination, and evaluations, the County's agent or authorized representative shall have access to said records from the effective date of this Agreement, for the duration of the work, and until six years after the date of final payment by County to Contractor pursuant to this Agreement.

14. MISCELLANEOUS.

(a) Notice. Except as provided in Section 6, all correspondence regarding this Agreement, including invoices, payments, and notices, shall be directed to the following persons at the following addresses and phone number:

County:

Kevin Yarris
Director, General Services
120 West Main Street Suite D
Woodland, CA 95695
Telephone: (530) 406-5005

Contractor:

Broward Builders, Inc
Randy Cantrell, Vice President
1200 E Kentucky Avenue
Woodland CA 95695
(530) 666-5635

If written, correspondence shall be sent by personal delivery (including overnight delivery service); by U.S. Mail, postage prepaid; or by fax during business hours. Notices must be actually received to be effective.

(b) Time of Essence. Time is of the essence of this Agreement.

(c) Interpretation. This Agreement shall be interpreted and applied in accordance with California law.

(d) Waiver. A party's failure to insist on strict performance of this Agreement or to exercise any right or remedy upon breach of this Agreement shall not constitute a waiver of such performance, right, or remedy. No waiver is binding unless set forth in a writing signed by the waiving party.

(e) Assignments and subcontracts. Contractor shall not assign this Agreement. Contractor may subcontract any of the services described in Section 1 (Scope of Work) with County's prior written consent. Contractor shall require each subcontractor to agree in writing to be bound by Section 4 (Indemnification) and Section 6 (Insurance) of this Agreement. County shall consider all subcontractors to be Contractor's employees, and

Contractor shall be responsible for their work.

(f) **Dispute Resolution.** Unless the General Conditions provide otherwise, if the Contract Administrator notifies Contractor that the work or any portion of it is unacceptable, then the Contract Administrator and Contractor shall meet at the Yolo County Office of County Administrator, 625 Court Street #202, Woodland, California, within five (5) days after Contractor receives the notice (excluding Saturdays, Sundays, and County observed holidays) and shall attempt in good faith to resolve their differences. Payment shall not constitute approval or acceptance of any defective work.

(g) **Integration.** This Agreement sets forth the parties' entire understanding regarding the matters set forth in Sections 1 through 14. It supersedes all prior Agreements and representations, written and oral, and may be modified only by a written Agreement approved by County's Board of Supervisors and signed by County and Contractor.

(h) **Effective date.** This Agreement shall be effective on the last date shown below.

COUNTY OF YOLO:

CONTRACTOR:
Broward Builders, Inc.
Randy Cantrell, Vice President

By: _____

Kevin Yarris
Director, General Services

By: _____

(Signature)

(Print Name & Title)

(Date)

Attest: Julie Dachtler, Senior Deputy Clerk
Yolo County Board of Supervisors

By: _____
Deputy (Seal)

APPROVED AS TO FORM

By:  _____
Philip J. Pogledich, Yolo County Counsel

**SECTION 00 41 00****Bid Schedule****Yolo County Second Floor Tenant Improvement, 100 West Court Street Project**Contractor / Company: Broward Builders, Inc.

Item No.	Description – Awarded Contractor is responsible and liable for all required and needed material quality and quantities.	Quantity Pricing	Individual Line Item Pricing
1.	General Conditions, Mobilizations, and Submittals,	LS	\$250,000.00
2.	Disconnecting and capping the water, sewer, electrical and communications during construction so the rest of building can continue to operate during abatement, demolition and new construction.	LS	\$10,000.00
3.	Abatement – All associated costs with removal, clearances to completion, also including submission of YSAQMD Air -District Questionnaire and Asbestos Notification forms with their payment of fees. Providing and paying for a Certified Asbestos Consultant as required for air monitoring and sample testing during on site removal and final clearances. Payment of all disposal fee costs.	LS	\$17,500.00
4.	Demolition all costs and fees including submission of Yolo County Construction and Demolition Debris Diversion Plan.	LS	\$86,571.00
5.	All new construction costs including electrical, plumbing, HVAC, sheetrock, ceilings, paint, carpet, etc.	LS	\$966,929.00
6.	Finals with Building Department	LS	\$1,500.00
7.	Site clean-up and Demobilization	LS	\$7,500.00
BASE BID TOTAL PRICE -Add up Line Item Numbers 1 thru 7			\$1,340,000.00
BASE BID TOTAL PRICE -Written in Words:			
One million three hundred forty thousand			

***All line items on Bid Schedule form must be completed for valid bids.**

**SECTION 00 41 00****BID FORM****Project: Second Floor Tenant Improvement, 100 West Court Street, Woodland, California**

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the County of Yolo ("The County") in the form included in the Contract Documents, Document 00520 Contract, to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of Contract Documents.
2. Bidder accepts all of the terms and conditions of the Contract Documents and the Notice to Bidders, including without limitation, those dealing with the disposition of Bid security. Bidder will sign and submit the Agreement with Bonds and other documents required by Document 00200 Instructions to Bidders, within ten (10) calendar days after receipt of the County's Notice of Award.
3. In submitting this Bid, Bidder represents:
 - (a) Bidder has examined copies of all of the Contract Documents and of the following Addenda (receipt of all of which is hereby acknowledged).

<u>Date</u>	<u>Number</u>
<u>8-6-2021</u>	<u>1</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

- (b) Bidder has visited the site and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as built conditions, and all local conditions and federal, state and local laws and regulations that in any manner may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;
 - (c) Bidder has examined thoroughly and understood all reports, drawings and/or reports, available for Bidding purposes and accepts the determination set forth in these documents and Document 00700 General Conditions of the limited extent of the



information contained in such reports and drawings upon which the Bidder may be entitled to rely. Bidder agrees that except for the information so identified, Bidder does not and shall not rely on any other information contained in such reports and drawings.

- (d) Bidder has conducted or obtained and has understood all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in paragraph 3(c) above) which pertain to the subsurface conditions, as built conditions, Underground Facilities and all other physical conditions at or contiguous to the site or otherwise which may affect the cost, progress, performance or furnishing of Work, as Bidder considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time and in accordance with the other terms and conditions of Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by Bidder for such purposes;
- (e) Bidder has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- (f) Bidder has given Project Manager prompt written notice of all conflicts, errors, ambiguities or discrepancies that it has discovered in or among the Contract Documents and as built and actual conditions and the written resolution thereof by Project Manager is acceptable to Bidder.

- 4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sum of money listed in the following Bid Schedule:

(continued next page)



Base Bid Total Price for the Second Floor Tenant Improvement, 100 West Court Street

\$ _____

(written) _____ Dollars

Enclosed find Bidder's Bond, certified check or cashier's check No. _____ of the
Travelers Casualty & Surety Co. _____ (Company/Bank), for \$ _____.

Dated this _____ 2nd _____ day of _____ September _____, 2021

5. Subcontractors are listed on the attached document 00 43 00, Subcontractors List.
6. The undersigned understands that the County reserves the right to reject this Bid, but that this Bid shall remain open and shall not be withdrawn for a period of ninety (90) calendar days from the date prescribed for its opening (to accommodate State financing process).
7. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Award, is mailed or delivered to the Undersigned within the stipulated time after the date set for the opening of this Bid, or at any other time thereafter before it is withdrawn, the undersigned will execute and deliver the documents required by Document 00 20 00 Instructions to Bidders including, but not limited to, Document 00 52 00 Agreement, Document 00 61 00 Performance Bond, and Document 00 62 00 Payment Bond and Escrow Bid Documents, all within ten (10) calendar days after personal delivery or after receipt in the mails of the Notice of Award.
8. Notice of Award or request for additional information may be addressed to the undersigned at the address set forth below.
9. The undersigned herewith encloses a cash, cashier's check, certified check or corporate surety bond in the amount of ten percent (10%) of the total of Bid Items and made payable to: County of Yolo and is subject to all conditions imposed by law.
10. The undersigned agrees to commence work under this Contract on the date established and to complete all work within the time specified in Document 00 52 00 (Contract).
11. The undersigned agrees that, in accordance with Document 00 70 00 General Conditions liquidated damages for failure to complete all work in the contract within the time specified are as set forth in Document 00 52 00 (Agreement).
12. The undersigned herewith encloses the completed Bidder's Bond – 00 42 00.
13. The undersigned herewith encloses the completed Subcontractors List – 00 43 00.
14. The undersigned herewith encloses the completed Bidder Information Sheet – 00 44 00.
15. The undersigned herewith encloses the completed List of Successful Projects form – 00 45 00.
16. The undersigned herewith encloses the completed Non-Collusion Affidavit – 00 45 10.



17. The undersigned herewith encloses the completed DAS Form 7 – 00 45 26.
18. The undersigned herewith encloses the completed Certification Against Lobbying – 00 45 46.
19. The names of all persons interested in the foregoing Bid as principals are:

Dennis Broward, President

Randy Cantrell, Vice President

(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full).

Name of Bidder: Broward Builders, Inc.
Legal Name of Corporation or Firm

CA Contractor's License No. 602146

DIR Registration No. 1000000001

Business Address 1200 E. Kentucky Avenue
Woodland, CA 95776

Email Address randy@browardbuilders.com

Telephone Number (530) 666-5635

Date of Bid September 2, 2021

Randy Cantrell

Signature of Bidder (Authorized to sign contracts on behalf of the Corporation or Firm)

Randy Cantrell
Printed Name

Vice President
Title



SECTION 00 44 00

BIDDER INFORMATION SHEET

The Bidder must check one of the following classifications that fit its type of business organization and furnish all information required under that classification.

Please type or print your answers.

Attach a copy of license(s) upon which you intend to rely.

☒ **BIDDER IS A CORPORATION**

The full name of the corporation as it appears on the State Contractor's License is:

Broward Builders, Inc.

Corporation is incorporated in the State of:

California

☐ **BIDDER IS AN INDIVIDUAL**

Bidder's name as it appears on State Contractor's License is:

☐ **BIDDER IS A PARTNERSHIP**

Bidder's firm name, individual or partnership, as it appears on State Contractor's License is:

The full names of all partners as they appear on State Contractor's License are:

County in which any Certificate of Doing Business Under Fictitious Name is filed – (If none, so state):

Accompanying this proposal is _____ Bidder's Bond _____ (NOTICE: INSERT THE WORDS "CASH (\$ _____)", "CASHIER'S CHECK", "CERTIFIED CHECK", OR "BIDDER'S BOND", AS THE CASE MAY BE) in amount equal to at least ten (10) percent of the total of the Bid.

The names of all persons interested in the forgoing proposal as principals are as follows:



IMPORTANT NOTICE: If the Bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and executive officer thereof; if a partnership, state name of partnership, also names of all individual partners; if Bidder or other interested person is an individual, state first and last names in full.

Broward Builders, Inc.

Dennis Broward, President

Randy Cantrell, Vice President

Licensed in accordance with an act providing for the registration of contractors,

License No. 602146 Classifications(s) A, B, C-8, C-9

(A copy of the afore-referenced license must be supplied at Notice of Award.)

ADDENDA: This Proposal is submitted with respect to the changes to the Contract included in addenda number/s

1
(Fill in addenda numbers if addendas have been received and insert, in this proposal, any Engineer's Estimate sheets that were received as part of the addenda)

CERTIFICATION OF BIDDER FOR PROPOSAL:

By my signature on this Proposal I certify, under penalty of perjury under the laws of the State of California, that the foregoing questionnaire and statements of Public Contract Code are true and correct. By my signature on this proposal I further certify, under penalty of perjury under the laws of the State of California and the United States of America, that the Non-collusion Affidavit required by Public Contract Code Section 7106 and Part 24 Debarment and Suspension Certification are true and correct.

The person or persons executing this proposal on behalf of a corporation or a member of partnership, shall be prepared to demonstrate by resolution, article, or otherwise, that such person is or that such persons are appropriately authorized to act in these regards for such corporation or partnership. Such authority shall be demonstrated to the satisfaction of the County of Yolo.

If the signature is by an agent other than an officer of a corporation or a member of a partnership, a power of attorney authorizing said act by the agent on behalf of his principal shall be submitted with the bid forms, otherwise the Bid may be disregarded as irregular and unauthorized.

The Bidder's execution on the signature portion of this Proposal shall constitute an endorsement and execution of those affidavits, declarations and certifications which are of this Proposal.

Executed this 2nd day of September, 2021 at Woodland, California.

Sign Here: Randy Cantrell

by

Randy Cantrell, Vice President

Name and Title of Bidder

**SECTION 00 45 00****LIST OF SUCCESSFUL PROJECTS**

Bidders must have experience in demolition and grading projects and bidders must list below a minimum of five similar projects of not less than 50% of the total work scope of this project and within the last eight years.

Bidder name: Broward Builders, Inc.

	Project Location	Project Description	Contract Dollar Amount	Name and Phone # of Owner's Representative
1	Woodland	Yolo County Main Jail Expansion	\$35,057,000	Mark Bryan (530) 406-4590
2	Woodland	100 W. Court Street, 1st Floor TI		Gene Wais
3	Woodland	Yolo County Juvenile Hall Gym	\$5,981,000	Gene Wais
4	Susanville	CCC Kitchen/Dining	\$16,047,000	Marvin Talusik (916) 255-0637
5	Auburn	CCC Auburn Campus & Dorm	\$21,144,000	Anthony Brown (916) 879-1021



SECTION 00 45 10

NON-COLLUSION AFFIDAVIT

Non-Collusion Affidavit To Be Executed By Bidder and Submitted with Bid

State of California)

) ss.

County of Yolo)

Randy Cantrell, being first duly sworn, deposes and says that he or she is

Vice President of Broward Builders, Inc. the party making the foregoing bid that the bid is not made in the interest of, or in behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in manner, directly or indirectly sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Broward Builders, Inc.

COMPANY NAME

1200 E. Kentucky Avenue, Woodland, CA 95776

COMPANY ADDRESS

Randy Cantrell

SIGNATURE OF OFFICER

Randy Cantrell, Vice President

TITLE

**SECTION 00 45 26****AGREEMENT TO TRAIN APPRENTICES****DAS Form 7****Joint Apprenticeship Committee Participation Requirement**

The County adopted a policy that one of requirements to be deemed a responsive bidder is that the bidder must be participating in a joint apprenticeship committee. The California Department of Industrial Relations defines a joint apprenticeship committee as a committee made up of equal number of members from labor and management. **Bidders must complete and submit the attached California Department of Industrial Relations' DAS-7 form that documents the bidder's participation in a joint apprenticeship committee.** The County will verify participation prior to the award.

***Subcontractors participating in this project are obligated to meet the requirements of Labor Code 1777.5.**

March 29, 2021

00 01

RECEIVED
DIR/DAS
SACRAMENTO

AGREEMENT TO TRAIN APPRENTICES

17 MAR 30 PM 3: 57

 District No. 06
 DAS File No. 10060
 Employer ID 1000000034

1000027126

NAME OF EMPLOYER Broward Builders, Inc.			
RAILROAD ADDRESS (STREET AND ADDRESS)	CITY	STATE	ZIP CODE
1200 E. Kentucky Ave.,	Woodland,	CA	95776
TELEPHONE NUMBER (530)666-5685			
ADDRESS OF TRAINING LOCATION (IF DIFFERENT)			
OCCUPATION(S)		ORIG CODE	
Construction Craft Laborer		47-2061.00	
NAME OF APPRENTICESHIP COMMITTEE AND STANDARDS Associated Builders & Contractors Northern California Chapter Construction Craft Laborer U. A. C.			
AREA COVERED BY APPRENTICESHIP STANDARDS & NAME AND ADDRESS OF PROJECT Alameda, Contra Costa, El Dorado, Fresno, Marin, Napa, Placer, Sacramento, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tuolumne, Yolo (18 Northern California Counties)			

THE OFFICIAL, whose signature follows, agrees on behalf of the above-named employer to train apprentices in the designated occupation in accordance with the apprenticeship standards and apprentice agreement and to comply with the provisions thereof

[SIGNED]

By

Printed name Dennis Broward

Title President

Date 2/17/17

THE APPRENTICESHIP COMMITTEE accepts and approves the employer as qualified to train apprentices under its standards in the designated occupation.

[SIGNED]

By

Printed name Sagit Woodbury

Title Apprenticeship Director

Date

3/28/17

Effective until:

☒ Revoked☐ End of Project. (Enter project name and address in Area Covered above)☐ Date☐ Other

Specify

Accepted:

DIVISION OF APPRENTICESHIP STANDARDS

EFFECTIVE DATE

2-17-17

[SIGNED]

By

JL-DZ-D

Apprenticeship Consultant

Date

4/10/17

REMARKS:

 STATE OF CALIFORNIA
 DEPARTMENT OF INDUSTRIAL RELATIONS
 DIVISION OF APPRENTICESHIP STANDARDS

AGREEMENT TO TRAIN APPRENTICES

District No.

05

DAS File No.

00076

Employer ID

NAME OF EMPLOYER			
Broward Builders, Inc.			
MAILING ADDRESS (STREET AND NUMBER)		CITY	STATE ZIP CODE TELEPHONE NUMBER
1200 E. Kentucky Ave., Woodland, CA 95776			(530) 666-5635
ADDRESS OF TRAINING LOCATION (IF DIFFERENT)			
OCCUPATION			
Drywall Finisher (Taper)			
NAME OF APPRENTICESHIP COMMITTEE AND STANDARDS			
DC 16 Drywall Finishers JATC			
AREA COVERED BY APPRENTICESHIP STANDARDS OR NAME AND ADDRESS OF PROJECT			
2020 W. Williams St. SFA, San Leandro, CA 94577			

THE OFFICIAL, whose signature follows, agrees on behalf of the above named employer to train apprentices in the designated occupation in accordance with the apprenticeship standards and apprentice agreement and to comply with the provisions thereof.

[SIGNED]

By

Randy Cantrell

Printed name Randy Cantrell

Title Vice President

Date 4/1/19

THE APPRENTICESHIP COMMITTEE accepts and approves the employer as qualified to train apprentices under its standards in the designated occupation.

[SIGNED]

By

Alex Beltran

Printed name

Title DOT

Date 4/1/19

Effective until:

☒ Revoked☐ End of Project☐ Date☐ Other

Accepted:

DIVISION OF APPRENTICESHIP STANDARDS

EFFECTIVE DATE

4/1/19

[SIGNED]

By

Apprenticeship Consultant

Date 5/28/20

REMARKS:

STATE OF CALIFORNIA
DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF APPRENTICESHIP STANDARDS

CHRIS PEDROZA
Executive Director

June 17, 2021

To Whom It May Concern:

As of this date, Broward Brothers, Inc. (044293-053006) is currently bound and signatory to the 2018-2023 Carpenters Master Agreement for Northern California.

Should you have any questions, please do not hesitate to contact this office.

Sincerely,



Chris Pedroza
Executive Director

CP: jm

OPERATING ENGINEERS JOURNEYMEN APPRENTICE TRAINING CENTER
FOR NORTHERN CALIFORNIA

14738 Cantova Way - Sloughhouse, CA 95683 - (916) 354-2029 - FAX (916) 354-1126

June 16, 2021

Re: Signatory Status

To Whom It May Concern,

The apprenticeship standards submitted by the Operating Engineers JATC were approved by the Federal Department of Labor in 2007 and the California Department of Industrial Relations, Division of Apprenticeship Standards in 1962. The apprenticeship program has operated continuously since its inception in 1962 and serves the 46 Counties of Northern California.

This letter is to advise you that Broward Builders, Inc. is approved to train apprentices by virtue of their signatory status with Operating Engineers Local #3 Union in Northern California.

All apprentices employed by Broward Builders, Inc. that perform operating engineer work are registered with both the State of California Division of Apprenticeship Standards and the Federal Department of Labor. The apprentices are active participants in the apprenticeship programs sponsored by Operating Engineers Local #3 - JATC Training Committee for Northern California. Furthermore, be advised that Operating Engineers Local #3 - JATC Training Committee for Northern California does maintain a graduation rate of at least 55%.

Operating Engineers JAC



Greg Gasaway

Director of Apprenticeship

NORTHERN CALIFORNIA CEMENT MASONS

JOINT APPRENTICESHIP
AND
TRAINING COMMITTEE

2600 Kitty Hawk Road
Suite 115
Livermore, CA 94551
TEL (925) 484-2271
FAX (925) 484-2312



Sent Via Email

June 17, 2021

RE: BROWARD BUILDERS, INC.

To Whom It May Concern:

Please be advised that Broward Builders, Inc. is a signatory employer under the Cement Masons Master Labor Agreement between the Associated General Contractors of California, Inc. and District Council of Plasterers and Cement Masons of Northern California.

Pursuant to the terms of said agreement, Broward Builders, Inc. is approved to employ and train Cement Mason apprentices under the Apprenticeship Standards of the Northern California Cement Masons Joint Apprenticeship and Training Committee and as certified by the State of California, Department of Industrial Relations, Division of Apprenticeship Standards, and the U.S. Department of Labor, Office of Apprenticeship.

If you have any questions or need further information, please do not hesitate to call.

Sincerely,

Veronica Godinez
Director

VG:mcm
(open:29 at:cc)



100 West Court Street
2nd Floor Tenant Improvement

SECTION 00 42 00

COUNTY OF YOLO BIDDER'S BOND

We, Broward Builders, Inc. as Principal, and
Travelers Casualty and Surety Company of America as Surety, are bound unto THE COUNTY OF
YOLO as Owner (Obligee), in the penal sum of ten percent (10%) of the total amount of the bid of the Principal
submitted to the Obligee for the work described below, for the payment of which sum we bind ourselves, jointly
and severally,

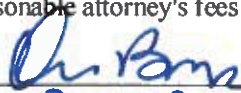
THE CONDITION OF THIS OBLIGATION IS SUCH, THAT:

WHEREAS, the Principal is submitting a bid to the Obligee, for the **Second Floor Tenant Improvement, 100 West Court Street** for which bids are to be opened in public in the Erwin Meier
Administration Building, 625 Court Street, Woodland, CA 95695.

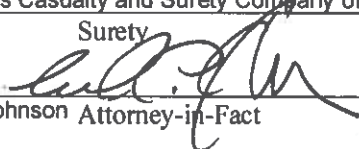
NOW THEREFORE, if Principal is awarded the Contract and, within the time and manner required
under the specifications, after the prescribed forms are presented to him for signature, enters into a written
contract, in the prescribed form, in accordance with the bid, and files two bonds with the Obligee, one to
guarantee faithful performance of the contract and the other to guarantee payment for labor and materials, as
required by law, then this obligation shall be null and void; otherwise it shall remain in full force.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall
pay all costs incurred by the Obligee in such suit, including reasonable attorney's fees to be fixed by the Court.

Dated: September 1, 2021


Dennis Broward
Broward Builders, Inc.
Principal

Travelers Casualty and Surety Company of America
Surety

By: 
Edward D. Johnson Attorney-in-Fact

ADDRESS OF SURETY FOR SERVICE OF NOTICE:

Travelers Casualty and Surety Company of America

11070 White Rock Rd., Ste. 130

Rancho Cordova, CA 95670

NOTE: Signature of those executing for the Surety shall be properly acknowledged and accompanied by a
Certificate of Acknowledgement



Permit Application

March 29, 2021

02 41 13 - 22

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

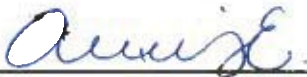
State of California
County of Placer)

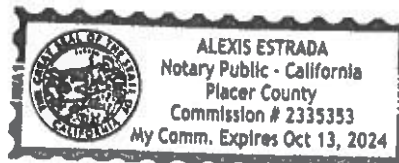
On September 1, 2021 before me, Alexis Estrada, Notary Public
(insert name and title of the officer)

personally appeared Edward D. Johnson,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are
subscribed to the within instrument and acknowledged to me that he/she/they executed the same in
his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the
person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing
paragraph is true and correct.

WITNESS my hand and official seal.

Signature  (Seal)





Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **Edward D. Johnson** of **ROSEVILLE**, **California**, their true and lawful Attorney(s)-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **21st** day of **April**, **2021**.



State of Connecticut

By: _____

Robert L. Raney, Senior Vice President

City of Hartford ss.

On this the **21st** day of **April**, **2021**, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of each of the Companies, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June**, **2026**



Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of each of the Companies, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of each of the Companies, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **1st** day of **September**, **2021**.



Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.

Please refer to the above-named Attorney(s)-in-Fact and the details of the bond to which this Power of Attorney is attached.

**SECTION 00 43 00****SUBCONTRACTOR LIST****Second Floor Tenant Improvement, 100 West Court Street**

The General Contractor shall list below all subcontractors who will be performing categories of work in excess of one-half (1/2) of one percent (1%) of the General Contractor's total bid price. All work not covered within the following list will be performed directly by the General Contractor. Yolo County will follow Public contract Code Section 4104, where bids submitted must contain at least the Subcontractors; name, location of the place of business, CSLB No., DIR No., and type of work to be performed. The County will allow the other required information about the subcontractor to be submitted up to 24 hours after the bid submittal deadline. Copy to use additional forms as necessary.

WORK TO BE PERFORMED	NAME OF SUBCONTRACTOR	BID PRICE	DIR REGISTRATION NO.	CA LICENSE TYPE AND NO.	MAILING ADDRESS	PHONE NUMBER
Demolition	Demolition Services & Grading	\$67,946.00	1000039367	1015534 A, B, C12 & C21	281 Generations Court Manteca, CA	209-740-0081
Abatement	Demolition Services & Grading	Included in Demo	1000039367	1015534 A, B, C12 & C21	281 Generations Court Manteca, CA	209-740-0081
Metals	Woodland Welding Works	\$16,130.00	1000005074	550297 C23, C51, C60	1955 E. Main Street Woodland, CA 95776	530-666-5531
Casework						
Insulation						
Roofing	Solano County Roofing	\$14,721.00	1000000777	495355 B, C2, C39, C43	4349 Cordelia Road Fairfield, CA 94534	707-864-6000

**SECTION 00 43 00****SUBCONTRACTOR LIST****Second Floor Tenant Improvement, 100 West Court Street**

The General Contractor shall list below all subcontractors who will be performing categories of work in excess of one-half (1/2) of one percent (1%) of the General Contractor's total bid price. All work not covered within the following list will be performed directly by the General Contractor. Yolo County will follow Public contract Code Section 4104, where bids submitted must contain at least the Subcontractors; name, location of the place of business, CSLB No., DIR No., and type of work to be performed. The County will allow the other required information about the subcontractor to be submitted up to 24 hours after the bid submittal deadline. Copy to use additional forms as necessary.

WORK TO BE PERFORMED	NAME OF SUBCONTRACTOR	BID PRICE	DIR REGISTRATION NO.	CA LICENSE TYPE AND NO.	MAILING ADDRESS	PHONE NUMBER
Tile	DC Tile Inc.	\$25,950.00	1000395451	605586 C54	1085 Alpine Way Colfax, CA 95713	530-268-0275
Acoustic Ceilings						
Flooring	B.T. Mancini Co., Inc.	\$52,995.00	1000002989	229210 B, C15, C61, C51, C39	8571 23rd Avenue Sacramento, CA 95826	916-381-3660
Painting	Silva Custom Painting	\$20,000.00	1000049644	794134 C33	3301 N. Park Dr. Sacramento, CA	916-601-4509
Toilet Compartments & Accessories	Murphy Specialties	\$18,167.00	1000004027	956735 C61/D34	905 Cotting Lane Vacaville, CA	707-761-8000
Fire Sprinklers	Frontier Fire Protection	\$12,280.00	1000010789	410573 C16	PO Box 495 Carmichael, CA	916-488-2052

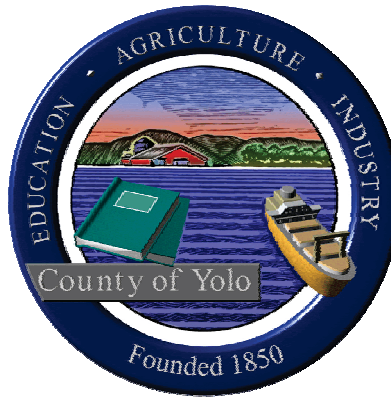
**SECTION 00 43 00****SUBCONTRACTOR LIST****Second Floor Tenant Improvement, 100 West Court Street**

The General Contractor shall list below all subcontractors who will be performing categories of work in excess of one-half (1/2) of one percent (1%) of the General Contractor's total bid price. All work not covered within the following list will be performed directly by the General Contractor. Yolo County will follow Public contract Code Section 4104, where bids submitted must contain at least the Subcontractors; name, location of the place of business, CSLB No., DIR No., and type of work to be performed. The County will allow the other required information about the subcontractor to be submitted up to 24 hours after the bid submittal deadline. Copy to use additional forms as necessary.

WORK TO BE PERFORMED	NAME OF SUBCONTRACTOR	BID PRICE	DIR REGISTRATION NO.	CA LICENSE TYPE AND NO.	MAILING ADDRESS	PHONE NUMBER
Plumbing	AP Plumbing & Fire, Inc.	\$68,482.00	1000019409	656592 C36 & C16	PO Box 292 Woodland, CA	530-666-2612
HVAC	Topnotch Mechanical	\$57,500.00	1000017371	972009 C20	1447 N. Market Blvd Sacramento, CA	916-367-2367
Electrical	Paschke Electric	\$280,000.00	1000010174	989061 C10	PO Box 211 Woodland, CA	530-661-2585

PROJECT MANUAL

Volume II: Technical Specifications



County of Yolo

100 West Court Street
Second Floor Tenant Improvement

Permit Application

MARCH 29, 2021



Kitchell CEM
2450 Venture Oaks Way, Suite 500
Sacramento, California 95833
Kitchell Job Number: 6721A3

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SECTION 00 01 05 CERTIFICATIONS

The technical specifications contained herein have been prepared by or under the direction of the following registered persons.

ARCHITECT

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.

Name: Christopher Lovin

Firm: Kitchell CEM

Reg. No.: C31877

Exp. Date: 11/30/2021



ELECTRICAL

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.

Name: Gerald Neuffer

Firm: Kitchell CEM

Reg. No.: E14881

Exp. Date: 06/30/2021



MECHANICAL-PLUMBING

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.

Name: Ahmad Elkot

Firm: Kitchell CEM

Reg. No.: M38746

Exp. Date: 03/31/2022





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SECTION 00 01 10 - TABLE OF CONTENTS

00 01 00	Project Cover Sheet
00 01 05	Certifications
00 01 10	Table of Contents

TECHNICAL SPECIFICATIONS

DIVISION 02 – EXISTING CONDITIONS

02 41 13	Selective Demolition

DIVISION 05 – METALS

05 52 13	Pipe and Tube Railing

DIVISION 06 – WOOD AND PLASTICS

06 10 00	Rough Carpentry
06 40 23	Interior Architectural Woodwork
06 41 16	Plastic Laminate Faced Architectural Cabinets

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 21 00	Thermal Insulation
07 25 00	Weather Barrier
07 52 23	Tri-Polymer Alloy (TPA) Single Ply Roofing
07 62 00	Sheet Metal Flashing and Trim
07 84 13	Penetration Firestopping
07 92 00	Joint Sealants

DIVISION 08 – DOORS AND WINDOWS

08 11 13	Hollow Metal Door Frames
08 14 16	Flush Wood Doors
08 31 13	Access Doors and Frames
08 71 00	Door Hardware

DIVISION 9 – FINISHES

09 24 00	Cement Plastering
09 29 00	Gypsum Board
09 30 13	Ceramic Tile
09 51 23	Acoustical Tile Ceilings
09 65 13	Resilient Base and Accessories
09 65 16	Resilient Sheet Flooring
09 68 13	Tile Carpeting
09 91 23	Interior Painting



DIVISION 10 – SPECIALTIES

- 10 14 00 Signage
- 10 21 13.17 Phenolic Core Toilet Compartments
- 10 28 00 Toilet Accessories

DIVISION 12 - FURNISHINGS

- 12 36 61.16 Solid Surfacing Countertops

DIVISION 22 – PLUMBING REQUIREMENTS

- 22 05 00 Common Work Results for Plumbing
- 22 05 10 Basic Piping Installation Requirements
- 22 05 23 General-Duty Valves for Plumbing Piping
- 22 05 29 Hangers and Support for Plumbing Piping and Equipment
- 22 05 53 Identification for Plumbing Piping and Equipment

DIVISION 23 – HVAC REQUIREMENTS

- 23 05 00 Common Work Results for HVAC
- 23 05 29 Hangers and Supports for HVAC Piping and Equipment
- 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment
- 23 05 53 Identification for HVAC Piping and Equipment
- 23 05 93 Testing, Adjusting, and Balancing for HVAC
- 23 07 00 HVAC Insulation
- 23 07 19 HVAC Piping Insulation
- 23 09 23 Direct Digital Control System for HVAC
- 23 23 00 Refrigerant Piping
- 23 31 00 HVAC Ducts and Casings
- 23 31 16 Non-Metal Ducts
- 23 33 00 Air Duct Accessories
- 23 37 13 Diffusers, Registers and Grilles
- 23 81 26 Split-System Air Conditioners

DIVISION 26 – ELECTRICAL REQUIREMENTS

- 26 05 00 Common Work Results for Electrical
- 26 05 19 Low-Volt Power Conductors and Cables
- 26 02 26 Grounding and Bonding for Electrical
- 26 05 29 Hangers and Supports for Electrical
- 26 05 34 Outlet and Junction Boxes for Electrical
- 26 05 35 Raceway for Electrical Systems
- 26 05 53 Identification for Electrical Systems
- 26 08 13 Acceptance Testing
- 26 09 43 Distributed Digital Lighting Control System
- 26 27 26 Wiring Devices
- 26 28 16 Enclosed Switches and Circuit Breakers
- 26 50 00 Lighting



DIVISION 27 – LOW VOLTAGE

27 10 00 Structured Cabling System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 31 11 Fire Detection and Alarm

END OF SECTION 00 01 10



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SECTION 02 41 13 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Disconnecting, capping or sealing, abandoning in-place and/or removing building utilities.
 - 2. Selective demolition work, complete, as indicated, specified, and required for new work, including removal and disposal of demolished materials.
 - 3. Removal, protection, and storage of items designated to be reused.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners, brackets, or appurtenances needed for reattachment elsewhere.
- C. Demolish: The deconstructing, destroying, razing, tearing down, or wrecking of any facility including its foundation, covered by and as shown on these Contract Documents. As used herein, the word "demolition" shall include any partial demolition and any interior demolition and includes:

(1) proper disposal of recyclables, solid waste, and hazardous materials pursuant to applicable regulations and approved construction documents, if any, (2) termination of utilities serving the premises including permits and final inspections and approvals, (3) removal and/or modification of structures, foliage, utilities, or other elements as required, and (4) site cleanup and restoration including grading, landscaping, soil backfill, erosion control measures as required.

1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project Site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize protection requirements.
 - 4. Review procedures for dust and noise control.
 - 5. Review procedures for protection of adjacent structures scheduled to remain.
 - 6. Review items to be salvaged and returned to Owner.



1.5 PROJECT CONDITIONS

- A. Condition of Site or Structure: Owner assumes no responsibility for actual condition of items or portions of structures to be demolished.
- B. Protections:
 - 1. Provide protective measures as required to protect personnel and general public from injury due to selective demolition work.
 - 2. Provide adequate fire protection in accordance with local Fire Department requirements.
 - 3. Unless otherwise indicated, demolition waste becomes property of Contractor.
- C. Damages: Promptly repair, to the satisfaction of the Engineer, damages caused to contents by demolition work or due to insufficiency of protection provided, at no cost to Owner. Replace damaged work, as directed by the Owner, if not satisfactory.
- D. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- E. Explosives: Use of explosives will not be permitted.
- F. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practicable level. Comply with governing regulations pertaining to environmental protection.

1.6 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Except for materials indicated to be stockpiled or otherwise defined as Owner's property, cleared materials shall become Contractor's property and shall be removed or disposed of from the Project site.

1.7 INFORMATIONAL SUBMITTALS: (Comply with Division 01)

- A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection and for dust control. Indicate proposed locations and construction of barriers, fencing, barricades, noise-control devices, other devices, and warning signs around the construction perimeter.
 - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain, including means of egress from those buildings. Coordinate with requirements for building demolition
- B. Construction Staging Plan detailing means, materials and staging of the work.



- C. **Schedule of Demolition Activities:** Before commencing selective demolition work, submit for review and approval of the Engineer, a schedule showing the commencement, order, and completion dates for the various parts of this work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise protection. Indicate the following:
1. Detailed sequence of demolition work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
 2. Temporary or permanent interruption of utility services. Specify how long utility services will be interrupted.
 3. Shutoff and capping of utility services. Include sequence of decommissioning and demolition schedule for necessary utilities to remain active during construction phases.
 4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. **Predemolition Photographs:** Show existing conditions of all walls of all rooms in the Classroom Building, including finish surfaces that might be misconstrued as damage caused by demolition operations. Submit for review before the Work begins.
- E. **Submit utility disconnect plan.**
1. The Contractor shall have an approved utility disconnect plan at least 14 days prior to the start of the disconnect work for any utility. The plan shall demonstrate the Contractor's methods and sequencing to ensure that utilities to each structure or utility have been disconnected as required. The Contractor shall also advise the Owner's Representative in writing at least 72 hours in advance of the time of any deactivation of or connection to existing utilities, which are to be removed or abandoned. The Contractor shall be responsible for coordinating this work with the appropriate authorities such as, but not limited to, PG&E and AT&T in conjunction with PG&E demolition process for shared overhead facilities.
 2. Sequence necessary utilities to remain active until such time authorized by the Owner's representative to be demolished and disconnected. This includes, but not limited to, fire suppression utilities onsite, existing utilities, and site power.
- F. **Submit utility disconnect certifications as required.** Include contact information, and confirmed date of disconnect from each respective utility.
- G. **Submit methods and procedures for excavation, backfilling, compaction, and moisture addition or drying of all materials.**
- H. **Review and comply with ANSI/ASSE A10.6 Safety & Health Program Requirements for Demolition Operations and submit safety management plan.**
- 1.8 **CLOSEOUT SUBMITTALS**
- A. **Inventory:** Submit a list of items that have been removed and salvaged.
- B. **Landfill Records:** Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.



- C. The scope of activities identified in the specifications, and document references shall yield, but are not limited to, the following verified activities completed to the satisfaction of the owner for consideration of project acceptance:
 - 1. All utilities are verified demolished.
 - 2. Written confirmation that CA regional water quality control board requirements have been met and project permit rescinded.
 - 3. Removal and demolition of all propane facilities.
 - 4. All other demolition requirements of the contract documents.
 - 5. Written confirmation from all utility companies verifying the disconnection of all existing utilities.
- D. Record Drawings (As-builts): Provide as-builts and show all items demolished and/or abandoned. Show clearly on the drawings all elements demolished, regardless of whether indicated on the contract documents. Include all supplementary documentation (e.g.: Field Changes, Change Orders, etc.) on the as-builts.

1.9 FIELD CONDITIONS

- A. Owner may occupy portions of building adjacent to selective demolition area. Conduct demolition so a discontinuation of Owner's operations can be arranged. Buildings to be demolished will be vacated and their use discontinued before start of the demolition work operations.
- C. Inform Owner of discrepancies between existing conditions and Contract Documents and seek direction before proceeding with demolition.
- D. Storage or sale of removed items or materials is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations and operations of adjacent occupied buildings.
- B. The Contractor shall carefully coordinate the extent of the demolition in areas where existing utilities shall be reconnected to new facilities where existing facilities shall remain operational.



PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify locations of utilities to be disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
- D. Proceed in a systematic manner. Use such methods as required to complete work in accordance with demolition schedule and governing regulations.
- E. Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw or hand tools: do not use power driven impact tools.
- F. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner for review and direction.
- G. In addition to surveying elements to be removed, carefully consider all bearing loads and capacities for placement of equipment and materials on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, determine the case prior to the placement of such equipment or material.
- H. Verify that hazardous materials have been remediated with the Owner before proceeding with demolition operations.

3.2 PREPARATION

- A. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Protect items from damage during storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing utilities to be disconnected or abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services; mechanical/electrical systems serving areas to be selectively demolished; and utilities serving areas and structures to be demolished.



1. Arrange to shut off indicated utilities with utility companies. Owner will arrange shut-off of utilities when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.4 PROTECTION

- A. Existing Facilities: Protect structures and active utilities required to remain operational during sequence of demolition operations. Protect, as necessary, all existing walls to remain during both demolition and new work. Protect existing flooring with temporary coverings during both demolition and new work.
- B. Temporary Shoring, Underground Utilities: Maintain utility services to remain and protect from damage during demolition operations.
- C. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 72 hours notice to occupants of affected buildings if shutdown of service is required and approved by Owner during changeover.
- D. Comply with CAL-OSHA requirements regarding applicable trench bracing and shoring.
- E. If Contractor elects to slope top of trench in lieu of trench bracing, the trench width shall be maintained at least 2 feet above top of pipe before sloping begins. Sloping, unless otherwise approved by the Owner's Representative, shall not be steeper than 1(H):1(V).
- F. The Contractor shall furnish and install all shoring, sheeting and bracing required to support adjacent earth banks and structures for the protection and safety of all personnel working in the trench. All shoring, sheeting and bracing shall conform to the requirements of the State or local agencies having jurisdiction over such matters. Remove shoring, sheeting and bracing in a manner that will protect the workman and prevent caving of banks and damage to the pipe, excavation, backfill or adjacent property.
- G. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.
 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
- H. Disconnect Certification



1. Electric and telecom: Contractor shall submit certification for each building to be demolished and every electric line to be removed either shown on the plans or discovered during the Work has been permanently isolated from the electrical grid and telecom. Certification shall be performed and signed by a journeyman electrician.
 - I. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.
- 3.5 REPAIRS
- A. Promptly repair damage to adjacent structures or site elements to remain or identified for Protection in Place caused by demolition operations.
- 3.6 CLEANING
- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 1. Clean roadways of debris caused by debris transport.

END OF SECTION 02 41 13



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SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel tube handrails.
 - 2. Rectangular sections for guardrail extension.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Handrail brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.



1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- C. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- D. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.



2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed).
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- E. Woven-Wire Mesh: Intermediate-crimp, diamond pattern, 2-inch (50-mm) woven-wire mesh, made from 0.134-inch- (3.42-mm-) diameter wire complying with ASTM A 510 (ASTM A 510M).

2.4 MISCELLANEOUS MATERIALS

- A. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.



2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- J. Close exposed ends of railing members with prefabricated end fittings.
- K. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.



2.6 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.



3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

3.5 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - 6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.



3.6 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13



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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking, cants, and nailers.
 - 4. Wood furring.
 - 5. Wood sleepers.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. New materials forming the work. Do not utilize previously used materials.
- B. Products specified by Reference Standards or by description only: any product meeting those standards or description.



- C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- D. Maximum Moisture Content of Lumber: 19 percent maximum moisture content at time of installation.

2.2 LUMBER & TIMBER MATERIALS

- A. Beams 6x and thicker and posts 6x6 and larger: Douglas Fir-Larch species, Select Structural grade.
- B. All other framing not otherwise indicated: Douglas Fir-Larch species, No. 1 grade.
- C. Wall studs: Douglas Fir-Larch species, No. 1 grade.
- D. Sill Plates: Pressure Preservative treated Douglas Fir-Larch, No. 1 grade.
- E. 1x Roof or Wall Sheathing Boards: Douglas Fir-Larch species, No. 2 grade.

2.3 SHEATHING MATERIALS

- A. Telephone and Electrical Panel Boards: APA PS-1 Plywood. APA rated CD, exposure 1.

2.4 MISCELLANEOUS LUMBER & MATERIALS

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
- B. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- E. Subfloor Glue: APA AFG-01, waterproof.



- F. Building Paper: No. 15 asphalt felt, or spun bonded polyethylene as directed by the Architect.

2.5 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
- B. Nails: Common steel wire nails per ASTM F1667, all requirements of the 2016 California Building Code, Chapter 23 and the National Design Specifications (NDS).
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1, the requirements of the 2016 CBC, Chapter 23 and the NDS.
- E. Lag Screws: ASME B18.2.1, the requirements of the 2016 CBC, Chapter 23 and the NDS.
- F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

2.6 STRUCTURAL FRAMING CONNECTORS

- A. Galvanized Steel, sized to suit framing conditions or as shown on the drawings. Simpson Strong-Tie, or approved equivalent, installed per manufacturer's instructions for maximum rated capacities.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install structural framing connectors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.



1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
 - F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
 - G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
 - I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Table 2304.10.1, "Fastening Schedule," in 2019 California Building Code (CBC).
 - J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
 - K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 1. Comply with indicated fastener patterns where applicable.
 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.
- 3.2 WOOD BLOCKING, AND NAILER INSTALLATION
- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.



- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00



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SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
- B. Related Sections include the following:
 - 1. Section 09 91 23 “Interior Painting” for field painting interior architectural woodwork for opaque finish.
 - 2. Section 06 41 16 “Plastic Laminate Faced Architectural Cabinets” for cabinets and accessories.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Surface Definitions: Comply with WI's “Architectural Woodwork Standards” for definitions of “exposed”, “semi-exposed” and “concealed” surfaces for grades indicated and the following additional requirements:
 - 1. The following surfaces are to be considered “exposed” regardless of grade indicated:
 - a. Tops of cabinets without countertops.
 - b. Bottoms of wall hung cabinets, unless resting on construction below (concealing bottom).
 - c. Interior surfaces and shelves of open cabinets, or cabinets with glass doors.
 - d. Closure panels, fillers and trims exposed to view, or adjacent to an “exposed” cabinet surface.

1.4 ACTION SUBMITTALS

- A. Product Data: For panel products high-pressure decorative laminate adhesive for bonding plastic laminate solid-surfacing material cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures faucets, soap dispensers and other items installed in architectural woodwork.



1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product, signed by product manufacturer.

1.6 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide cabinets capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project.
 - 1. 2019 California Building Code, California Code of Regulations Title 24, Part 2, Volumes 1 and 2.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.
- D. Quality Standard: Unless otherwise indicated, comply with WI's "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.



1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: as specified on drawings.

2.2 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- E. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Wood Glues: 30 g/L.
 2. Contact Adhesive: 250 g/L.

2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.



- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
 - C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
 - D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
 - E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- 2.4 INTERIOR STANDING AND RUNNING TRIM FOR PAINTED FINISH
- A. Grade: Premium.
 - B. Material: Medium-Density Fiberboard.
 - C. Finish: Field paint.

2.5 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Finish Materials: Use finish materials that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.



1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- D. Shop Priming: Shop apply the prime coat including backpriming, if any, for items specified to be field finished. Refer to Section 09 91 23 "Interior Painting" for material and application requirements.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.



3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23



SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-faced architectural cabinets and counter tops.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product including, high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
- C. Samples for Initial Selection:
 - 1. Plastic laminates.
 - 2. PVC edge material.
 - 3. Thermoset decorative panels.
- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches (200 by 250 mm).
 - 2. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
 - b. Miter joints for standing trim.



3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product:
 1. Composite wood and agrifiber products.
 2. Thermoset decorative panels.
 3. High-pressure decorative laminate.
 4. Glass.
 5. Adhesives.
- B. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance Shop is a licensee of WI's Certified Compliance Program.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.



1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

- A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the project.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from WI certification program indicating that woodwork including installation complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. Reveal Dimension: 1/2 inch (13 mm).
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
- G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations.
 - 2. Match Architect's sample.
 - 3. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Solid colors with core same color as surface.
 - c. Wood grains, matte finish.



2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde].
 - 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 - 5. Softwood Plywood: DOC PS 1 medium-density overlay.
 - 6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."
- B. Back-Mounted Pulls: BHMA A156.9, B02011.
- C. Wire Pulls: Back mounted, solid metal.
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal.
- G. Drawer Slides: BHMA A156.9.
 - 1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
- H. Door and Drawer Silencers: BHMA A156.16, L03011.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.



3. Satin Stainless Steel: BHMA 630.

- J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Adhesive for Bonding Plastic Laminate: Urea formaldehyde free.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate cabinets to dimensions, profiles, and details indicated.
- C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- E. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.



PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi exposed surfaces.

END OF SECTION 06 41 16



SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass Fiber blanket.
- B. Related Requirements:
 - 1. Section 09 29 00 Gypsum Board

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Low-emitting product certification.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.



PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Provide insulation at all interior and exterior walls where finish material has been removed and at all new interior wall sections.
 - 1. Interior walls: R-13, to fill inside stud wall cavity.
 - 2. Exterior walls: R-19, to fill inside stud wall cavity.
 - 3. Underside of Roof Deck: R-30 (to match existing), where missing or disturbed by roof penetration construction.
- B. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.
 - 3. Low Emitting: Complies with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions.
- C. Recycled Content of Insulation: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50% percent.
- D. Glass-Fiber Blanket, paper-faced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Owens Corning; Fiberglass FS25.
 - 2. Manville; Flame Resistant FSK.
 - 3. Certainteed; Flame Resistant FSK.

2.2 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.



3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. Ft.
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 INSTALLATION OF INSULATION AT UNDERSIDE OF ROOF DECK

- A. Blanket Insulation: Provide at areas where insulation has been removed for roof-top mechanical equipment installation or pipe penetrations through the roof deck. Secure insulation to underside of roof deck using attachments or hanging devices, making sure insulation provides complete coverage of area indicated. Use largest widths and lengths as appropriate to minimize butt joints and overlapping. Install for a snug fit between edges of insulation and against side walls and/or ceiling joist members.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.



END OF SECTION 07 21 00



SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Building wrap.
 - 2. Flexible flashing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. DuPont Building Innovations: E. I. du Pont de Nemours and Company; Tyvek CommercialWrap.
 - b. Raven Industries, Inc; Fortress Pro Weather Protective Barrier.
 - c. Reemay, Inc; Typar HouseWrap.
 - 2. Water-Vapor Permeance: Not less than 20 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 - 3. Allowable UV Exposure Time: Not less than three months.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

- A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 20 mil.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. DuPont Building Innovations: E. I. du Pont de Nemours and Company; DuPont Flashing Tape.



- b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Vycor Butyl Self Adhered Flashing.
 - c. Protecto Wrap Company; BT-25 XL.
 - d. Raven Industries, Inc; Fortress Flashshield.
 - 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 07 25 00



SECTION 07 54 32 - TPA SINGLE PLY ROOFING SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. This guide specification describes typical application methods for a 60-mil, TPA (Tri-Polymer Alloy) single ply roof system by TREMCO Inc.
- B. Related Work
 - 1. Sheet Metal
 - 2. Sealants and Caulking
 - 3. Coatings

1.2 SCOPE OF WORK

- A. Work includes:
 - 1. Work extents is primarily limited to roofing system replacement/installation at removed mechanical curbs, and adjacent to new mechanical curbs and pipe penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Flashings: Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations of the following:
 - 1. FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
 - 2. FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components.
 - 3. NRCA Roofing and Waterproofing Manual (Fifth Edition) for construction details, as modified by FMG requirements indicated.
 - 4. SMACNA Architectural Sheet Metal Manual (Fifth Edition) for construction details.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain components for membrane roofing system to match existing roofing system. Tremco, Inc. is used as the guide for new material and installation.
- B. Upon completion of the installation, an authorized manufacturers' Technical Service Inspector shall inspect the completed roof to verify that the visible elements of the installation have been installed in accordance with the specifications, detail drawings,



and approved changes.

1.5 SUBMITTALS

- A. Product Data: Spec data sheets for roofing materials.
- B. MSDS: For all roofing materials.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered in the original, unopened containers.
- B. All products shall be delivered to the job site with the manufacturer's labels on each roll or container. When required, the label shall also indicate the specified code/insurance approvals.
- C. All materials shall be stored flat, elevated from the roof or deck, protected with waterproof covers as necessary to keep the materials dry. The plastic wrap on the TPA rolls is not intended as a waterproof cover.
- D. All materials shall be protected from damage.
- E. Materials damaged in handling or storage shall not be used without authorization by the manufacturer. Unsalvageable materials shall be replaced at the contractor's expense.
- F. Material Safety Data Sheets, available from the manufacturer, shall be reviewed.
- G. Coordinate material storage with Owner. Materials stored on roof shall be secured at all times.

1.7 JOB CONDITIONS

- A. TPA roofing systems shall not be installed during periods of precipitation. TPA membrane may be installed under certain adverse weather conditions (temperature and humidity), contact manufacturer for precautions that should be followed.
- B. Only as much of the new roofing as can be made weathertight each day shall be completed in accordance with the specifications, including all field flashings.
- C. All work shall be scheduled and executed without exposing the interior building area(s) to the effect of inclement weather. The existing building and its content shall be protected against all risks associated with installation of the roof system.
- D. All surface areas to receive new insulation, membrane or flashings, shall be thoroughly dry. Should surface moisture occur, the contractor shall provide necessary materials and equipment to dry the surface area affected prior to installation.
- E. All areas contaminated by dirt, debris, and dust shall be cleaned from surfaces by vacuuming, sweeping or power blowing.



- F. When storing material on the roof and during application, the roofing contractor shall ensure that overloading of the deck and structure does not occur.
- G. Any deteriorated deck or flashing substrate which is discovered shall be promptly reported to the City or designated representative.
- H. The roofing contractor shall investigate the structural deck on the building to determine the type and length of fastener required.
- I. If waste products, petroleum, grease, oil, solvents, mineral oil, and other contaminants come into contact with the TPA roofing membrane, contact manufacturer for precautions and cleaning procedures.
- J. Site clean-up, including both interior and exterior building areas that have been affected by the roof installation, shall be completed to the Owner's satisfaction. All landscaped areas affected shall be raked clean and seeded, as required.
- K. All roofing, insulation flashings and metal work removed during construction shall be immediately removed from the site to a regulated legal dumping area authorized to receive such materials.

1.8 HAZARDOUS MATERIALS HANDLING

- A. Areas of existing roof membrane and base flashings containing possible hazardous materials (Asbestos type) have been identified and results are limited to mastic material, and are available.
- B. The roofing contractor shall remove all such materials and dispose of in accordance with all Federal (EPA & OSHA), State, and local regulatory agencies under an approved certified abatement program. All contractors' employees shall follow OSHA guidelines for handling such materials under the provisions of HCS (Hazardous Communications Standard) as required to conform to OSHA and other safety requirements.

1.9 WARRANTY/GUARANTEE

- A. Guarantee:
 - 1. Upon project completion and Owner acceptance, effective upon complete payment, Contractor shall issue Owner a guarantee against defective workmanship and materials for a period of two (2) years.

PART 2 PRODUCTS

2.1 GENERAL

- A. All components of the Tremco TPA Single Ply System shall be manufactured, supplied, or accepted in writing by Tremco.

2.2 TRI-POLYMER ALLOY MEMBRANE



- A. The membrane shall be Tremco 60 mil TPA, a tri-polymer alloy, polyester reinforced roofing system as supplied by Tremco, Inc. or Owner approved equal. The sheet shall conform to the properties listed below. NOTE: The physical properties listed below are typical values.
1. Color: White (top)/Gray (bottom)
 2. Roll Size: 78" wide x 90' long
 3. Weight: 4.5 oz. ft² (nominal)
 4. Thickness ASTM D-751: 60 mil (nominal)
 5. Breaking Strength ASTM D-751: 350 lbs x 325 lbs
 6. Seam Strength ASTM D-638: 90%
 7. Elongation @ Break ASTM D-751: 40% X 30%
 8. Heat Aging ASTM D-3045: 80% x 80%
 9. Tear Strength ASTM D-751: 100 lbs x 100 lbs
 10. Low Temperature Bend ASTM D-2136: Pass (-40 F)
 11. Permeance ASTM E-96: 0.003 Perms
 12. Hydrostatic Resistance ASTM D-751: 400 psi
 13. Ozone Resistance ASTM D-1149: PASS – No cracks after 168 hours exposure at 100 degrees F.
- B. The roofing shall be non-fleece backed.
- 2.3 RELATED MATERIALS
- A. Flashings
1. TPA Membrane Flashing: TPA membrane.
 2. TPA Coated Metal: .020@ thick membrane laminated to 24 gauge G-90 galvanized steel with acrylic backwash coating.
 3. TPA Prefabricated Flashing: pipe boots, inside corners, outside corners.
- B. Flashing Adhesive: Tremco White Sheeting Bond or equal.
- C. Sealants: Tremco Tremseal D polyurethane sealant or equal.
- D. Seaming Procedure: Hot air welding, contact Tremco (or equal) for acceptable equipment and methods.
- E. Mechanical Termination: Manufacturer approved plates and screws.
- H. Membrane Fasteners:
1. Manufacturer recommended fasteners.
 2. Length: Sufficient to penetrate deck a minimum of ¾".
- I. Wood Nailers:
1. Minimum #2 lumber, wolmanized or pressure treated for rot resistance with a salt-based preservative. No creosote or asphaltic type preservations shall be allowed.
 2. Nailers under copings to be 2" x width of the wall.



PART 3 EXECUTION

3.1 PRE-JOB

- A. The Primary contractor, the manufacturer and Owner's representative shall conduct a pre-roofing conference before any work begins, so all parties involved in the installation of the roofing system construction, or who may work on or through the roofing system, understand their obligations with respect to the roofing membrane.

3.2 SUBSTRATE INSPECTION

- A. A proper substrate shall be provided to receive the TPA roofing system. The roofing contractor shall notify the Owner and Tremco of any defects in the substrate. Work shall not proceed until the substrate has been repaired or replaced.
- B. Remove all loose debris from the surface.

3.3 MEMBRANE INSTALLATION

- A. Placement:
 - 1. The Tremco TPA membrane shall be mechanically fastened to the structural deck. Contact Tremco for fastening requirements into different deck types.
 - 2. The perimeters and corners will require 2 – half sheets. Contact Tremco for additional information if the building is located where winds may exceed standard warranty conditions or special code provisions are required.
 - 3. The membrane shall be cut to fit neatly around all penetrations and roof projections.
 - 4. The roofing membrane shall be unrolled and positioned with a minimum 4 ½" overlap. Laps shall be shingled with, or run parallel to, the slope of the roof.
- B. Attachment:
 - 1. The TPA membrane is secured using Tremco plates and #14 fasteners.
 - 2. The spacing of the fasteners used to secure the TPA membrane sheets, prior to welding the seams, is 12" in the field and 6" at the perimeter.
 - 3. Secure the membrane with fasteners and plates around curbs and other penetrations with the same fastener spacing used to secure the perimeter sheets.
 - 4. Position and secure the edge of each field sheet prior to welding the adjacent sheet to it.
 - 5. Secure the membrane at all angle changes in the substrate using the same spacing used for the perimeter sheets. This procedure is required regardless of the cause of the angle change.
- C. Seaming:
 - 1. The overlapping sheets shall be welded using hot air welding equipment. The areas must be dry and must be clean. The contractor must ensure that dirt or debris does not interfere with the seaming process.
 - 2. The equipment settings and alignment adjustments must be checked continuously during each day to ensure complete fusion within the welded area and a smooth, wrinkle-free seam.



3. Welds using the automatic welder shall be a minimum of 1 1/2" wide.
4. All hand welds shall be a minimum of 2" wide.
5. Membrane to TPA metal seams can be welded using an automatic welder or hand held equipment. Minimum seam widths as outlined above must be followed. Fasteners that secure the coated metal flashing shall not be located within the seam. Provide sufficient flange width (min. 5.0") on all flashings to allow for this requirement. Automatic welder settings will differ from membrane to membrane settings when welding membrane to coated metal.
6. The seams shall be checked for continuity and integrity. All imperfections must be corrected.

D. Membrane Termination and Securement

1. The TPA membrane shall be secured at all terminations at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, rising wall, penthouse.
2. Securement shall be provided at all angle changes.
3. Securement shall be achieved if using TPA coated metal flashing, adequately fastened to treated wood nailers, or fasteners (and plates) spaced according to deck type.
4. All terminations and fasteners shall be sealed within a lap or covered with a strip of TPA membrane, its perimeter continuously welded to the field sheet.

3.4 MEMBRANE FLASHING

- A. All flashings shall be installed as shown on the detail drawings or the manufacturer's standard details. All TPA membrane shall be installed concurrently with the roof membrane as the project progresses. No temporary flashings shall be allowed without prior written approval of the authorized Tremco agent. If any water is allowed to enter under the new roofing due to incomplete flashings, the affected area shall be removed and replaced at contractor's expense.
- B. Flashings shall not be applied over existing thru-wall flashings or weep holes. All flashings shall extend a minimum of 8-inches above roof level unless previously accepted by Owner representative and an authorized Tremco agent.
- C. All TPA membrane base flashings shall be fully-adhered to a dry, smooth solvent-resistant and compatible substrate using Tremco White Sheeting Bond.
 1. When the surface is dry, TPA membrane flashings shall be cut to proper width and length, wall shall be coated evenly with Tremco White Sheeting Bond at a rate of approximately 1 gal/20sq.ft. using an 1/8" notched trowel, rates will vary depending on ambient temperature and surface condition. Allow Sheeting Bond to flash off 15 minutes minimum before covering with membrane. Adjust time for ambient conditions. Flashing membrane shall be rolled carefully onto the previously prepared substrate taking care to avoid wrinkles.
 2. No Sheeting Bond shall be applied to lap (seam) areas that are to be welded to flashings or adjacent membrane sheets by means of hot-air welding procedures.
 3. Care should be taken to ensure that the flashing does not bridge where there is a change of direction.



- D. The top of the installed flashing shall be fastened under metal counterflashing, over walls and under coping cap, or through metal reglet. The maximum distance between fasteners for TPA flashings shall be 8" through flat bar or through metal reglet.

3.5 ROOF PENETRATIONS

- A. All penetrations (pipes, supports, soil stacks, curbs, etc.) Passing through the roofing membrane shall be flashed in accordance with Tremco details. Curbs shall be raised to a minimum of 8" above the finished roof height where possible.
- B. The flashing seal shall be made directly to the penetration passing through the roof system unless the surface temperature of the penetration exceeds 140 F; surfaces with temperatures that exceed 140 F must have the flashing insulated from the heat source. Contact Tremco for assistance.
- C. Fabricate and install new TPA coated metal scuppers where they currently exist, per manufacturer's instructions.
- D. Use premolded corners to complete flashings of curbs, parapets, pitch pockets and other vertical surfaces.
- E. Use Tremco premolded boots to flash circular penetrations 1" to 8" diameter; boots must be pulled over the top of the penetration, do not split the boot.
- F. All others shall be field fabricated using TPA membrane or TPA coated metal.
- G. Sumped drains to be be roofed in, in accordance with Tremco warranty requirements.

3.6 MEMBRANE REPAIR

- A. Correction of damage to the membrane may be accomplished by hot-air welding a membrane section over the affected area.
- B. If the defect is not smooth, cut out and remove enough material to provide an even surface. If any mechanical fasteners are encountered, the repair should include provisions to fasten the repair materials.
- C. Repair materials shall overlap the field sheet a minimum of 3" to provide adequate room for a proper weld. Hand welds shall be a minimum of 2"; machine welds shall be a minimum of 1 ½".
- D. Cut all corners of repair materials round.

3.7 CLEANING

- A. Keep premises free from accumulation of waste and debris. At the completion of the work and as necessary during the progress of the work, remove from the premises surplus materials, waste, and debris.



- B. Upon completion, thoroughly clean surfaces in a manner that will not affect the finish appearance or weather tightness.
1. Pressure washing or washing and brooming dirt and debris is acceptable.

END OF SECTION 07 54 23



SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, flashings and counter flashings.

1.2 RELATED SECTIONS

- A. Section 07 92 00 - Joint Sealant.

1.3 REFERENCES

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- D. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Samples: Submit two samples illustrating metal finish color.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

1.6 PRE-INSTALLATION CONFERENCE

- A. Convene one week before starting work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.



- B. Prevent contact with materials which may cause discoloration or staining.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

- A. Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; heavyweight, minimum 22 gage 0.03 inch thick base metal, painted finish.

2.2 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers. Use EPDM washers at roof flashing as indicated on drawings.
- B. Underlayment: ASTM D 2178, glass fiber roofing felt.
- C. Primer: Zinc chromate type.
- D. Protective Backing Paint: Zinc molybdate alkyd.
- E. Sealant: Types as specified in Section 079200.
- F. Plastic Cement: ASTM D 4586, Type I.

2.3 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, interlocking with sheet. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams providing movement at maximum 10 feet on center.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.



3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

- A. See Division 01, for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION 07 62 00



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SECTION 07 84 13 – PENETRATION FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 DEFINITIONS

- A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

- A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
- B. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
- C. Openings and penetrations in fire-rated partitions or walls containing fire doors.
- D. Openings around structural members which penetrate floors or walls.

1.4 RELATED WORK OF OTHER SECTIONS

- A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
 - 1. Section 07 90 00 - Joint Sealants
 - 2. Section 09 29 00 - Gypsum Board
 - 3. Division 22 - Plumbing
 - 4. Division 23 - Heating, Ventilating, and Air Conditioning
 - 5. Division 26 - Electrical

1.5 REFERENCES

- A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"
- B. Test Requirements: UL 1479, "Fire Tests of Through-Penetration Firestops"



- C. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.
 - 1. UL Fire Resistance Directory:
 - a. Firestop Devices (XHJI)
 - b. Fire Resistance Ratings (BXRH)
 - c. Through-Penetration Firestop Systems (XHEZ)
 - d. Fill, Voids, or Cavity Material (XHHW)
 - e. Forming Materials (XHKU)
- D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
- E. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops."
- G. California Building Code
- H. NFPA 101 - Life Safety Code
- I. NFPA 70 - National Electric Code

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems that comply with specified requirements of tested systems.
- B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
- C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.7 SUBMITTALS



- A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified firestop systems to be used and manufacturer's installation instructions to comply with Section 01 30 00.
- B. Manufacturer's engineering judgment identification number and drawing details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.
- C. Submit safety data sheets provided with product delivered to job-site.

1.8 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. Firm with not less than 3 years experience with fire stop installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type and UL label where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

- A. Do not use materials that contain flammable solvents.
- B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.



- D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.1 FIRESTOPPING - GENERAL

- A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - 2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- F. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of one (1) as determined by ASTM G21.
- G. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturer as identified below:



1. **Basis of Design:**
Hilti, Inc., Plano, Texas
800-879-8000
www.us.hilti.com
2. Substitution requests shall be considered in accordance with contract provisions and the performance requirements outlined in this document.

2.3 MATERIALS

- A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- B. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
 1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
- C. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
 2. Hilti Fire Foam (CP 620)
 3. Hilti Flexible Firestop Sealant (CP 606)
 4. Hilti Firestop Silicone Sealant Gun Grade (CFS-S SIL GG)
 5. Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL)
- D. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
 1. Hilti Firestop Collar (CP 643N)
 2. Hilti Firestop Collar (CP 644)
 3. Hilti Wrap Strips (CP 648-E/648-S)
- E. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits or cables is expected, the following products are acceptable:
 1. Hilti Firestop Block (CFS-BL)
 2. Hilti Firestop Plug (CFS-PL)
- F. For single or cable bundles up to one inch diameter penetrating gypsum, masonry, concrete walls or wood floor assemblies the following product is acceptable:
 1. Hilti Firestop Cable Disc (CFS-D)

PART 3 - EXECUTION

3.1 PREPARATION



- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - 4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 - 5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.
- D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector, per requirements of Section 109, International Building Code 2000, ed.

3.3 INSTALLATION

- A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.
- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.
 - 1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
 - 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 - 3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.



- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- E. Manufacturer's Field Services: Contractor to ensure a manufacturer's direct representative is on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. Training will be done per manufacturer's written recommendations published in their literature and drawing details. During installation, contractor shall have manufacturer's representative provide periodic visual observations and written documentation of the results. Contact Hilti for support at 800.879.8000.

3.5 IDENTIFICATION & DOCUMENTATION

- A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.
- B. The Documentation Form for through penetrations is to include:
 - 1. A Sequential Location Number
 - 2. The Project Name
 - 3. Date of Installation
 - 4. Detailed Description of the Penetration's Location
 - 5. Tested System or Engineered Judgment Number
 - 6. Type of Assembly Penetrated
 - 7. A Detailed Description of the Size and Type of Penetrating Item
 - 8. Size of Opening
 - 9. Number of Sides of Assemblies Addressed
 - 10. Hourly Rating to be Achieved
 - 11. Installer's Name
- C. Copies of these documents are to be provided to the general contractor at the completion of the project.
- D. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - 1. The words: "Warning: Through Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.



4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.
- E. A firestop documentation manager software shall be used to document, track, and maintain the passive firestop systems throughout the construction and maintenance phase of the facility. The software solution shall be used to track and document every firestop system installed on the project and each subsequent addition, change, or removal of the firestop system. The firestop documentation shall be managed with a cloud-based software which allows the installer to use a standard smartphone or tablet device (either iOS, Android or Windows capable) to capture the relevant information for the installation. The following data shall be tracked for each penetration within the facility: product installed, system installed, date of installation, location of the penetration including a notation on the 2D plan image, F-rating, name of installer, photo (pre-installation and post-installation), and inspection status. The Owner and/ or Construction Manager may designate additional items to be tracked. The firestop documentation manager software must perform the following basic functions:
1. Create multiple projects/ facilities, add/create/ remove users for each project, upload documents including UL systems, 2D floor plans, product data, engineering judgments, etc.
 2. Define data to track using pre-defined input fields or creating custom input fields as desired.
 3. Capture multiple photos for each penetration, including a pre-installation and post-installation photo.
 4. Scan QR Code on Hilti identification label to link the program data to a specific penetration location.
 5. Annotate (mark) location of penetration on 2D floor plan.
 6. Create reports by filtering data and utilizing report templates.
 7. Online/ offline (for use in areas where data service is unavailable) synchronization of data between mobile device, online application and cloud-based system.
 8. Ability to transfer ownership of projects from one customer to another from construction phase to facility maintenance.
- F. Permanently attach Hilti identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping. Labels shall have a unique QR code for each penetration which can be scanned by the firestop documentation software to quickly identify the penetration attributes.
- G. Acceptable Software: Hilti CFS-DM, from Hilti Inc., Tulsa, OK. Tel (800) 879-8000 or Hilti (Canada) Corporation, Mississauga, Ontario (800) 363-4458 website: www.us.hilti.com or www.hilti.ca.com
1. Substitutions: Not permitted.
 2. Single Source: Obtain firestop documentation manager software and firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

3.6 ADJUSTING AND CLEANING



- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 LABOR USE TO INSTALL FIRESTOP SYSTEMS

- A. To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

END OF SECTION 07 84 13



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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Mildew-resistant joint sealants.
 - 5. Polysulfide joint sealants.
 - 6. Butyl joint sealants.
 - 7. Latex joint sealants.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.



- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.
- D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion-Test Reports: For each sealant application tested.
- G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.



1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of CALGreen for the Testing and Evaluation of Volatile Organic Chemical Emissions.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- E. Silicone Sealants:
 - 1. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.
 - 2. One-Part Nonacid-Curing Silicone Sealant: Type S (single component); Grade NS (nonsg). Tensile strength of 45 psi or less at percent elongation indicated below when tested per ASTM D 412 after 14 days at 77 deg. F (20 deg. C) and 50 percent relative humidity. Adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand



the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for uses indicated.

- a. Low-Modulus: 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
 - 1) Manufacturers: Subject to compliance with requirements, provide one of the following.
 - a) Dow Corning Corp. "Dow Corning 790"
 - b) General Electric Corp. "Silpruf 2000"
 - b. Medium-Modulus: 50 percent movement in both extension and compression for a total of 100 percent movement.
 - 1) Manufacturers: Subject to compliance with requirements, provide one of the following.
 - a) Dow Corning Corp. "Dow Corning 795"
 - b) General Electric Corp. "Silpruf 2000"
 - c. High-Modulus: 25 percent movement in both extension and compression for a total of 50 percent movement.
 - 1) Manufacturers: Subject to compliance with requirements, provide one of the following.
 - a) Dow Corning Corp. "Dow Corning 799"
 - b) General Electric Co. "Ultraglaze 4000"
 3. Structural Silicone: One part high strength, neutral cure, structural glazing, ASTM C 920, Type S (single component), NS (nonsag), Class 25 (minimum 25% increase and decrease of joint width).
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Dow Corning Corp. "Dow Corning 995"
 - 2) General Electric Co. "SCS 1000"
 4. One-Part Acid-Curing Silicone Sealant: Type S (single component); Grade NS (nonsag).
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Dow Corning Corp. "Dow Corning 999A"
 - 3) General Electric Co. "Ultraglaze 4000"
 3. Multi-Part Non-Staining, Nonacid-Curing Silicone Sealant:
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Dow Corning Corp. "Dow Corning 756"
 4. One-Part Mildew-Resistant Silicone Sealant: Type S (single component; Grade NS (nonsag); Class 25 (minimum 25% increase and decrease of joint width); formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.
 - a. For locations subject to food service contact, provide products complying with US Food and Drug Administration Regulation 21CFR- 177-6000.
 - b. Manufacturers: Subject to compliance with requirements, provide one of the following.
- F. Latex Joint Sealants:
1. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew- resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.



- a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Pecora Corp. "AC-20"
 - 2) Sonneborn Building Products Div.; Rexnord Chemical Products, Inc. "Sonolac"
 - 3) Tremco Inc. "Tremco Acrylic Latex 834"
2. Silicone Emulsion Sealant: Manufacturer's standard one part, nonsag, mildew-resistant, silicone-emulsion sealant complying with ASTM C 834 and ASTM C 920, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 12-1/2 percent.
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Dow Corning Corp. "Trade Mate Paintable Silicone Sealant".
- G. Butyl-Polyisobutylene Sealant:
 1. Butyl-Polyisobutylene Sealant: Manufacturer's standard, solvent-release-curing, butyl-polyisobutylene sealant complying with AAMA 809.2, recommended for concealed joints.
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Protective Treatments, Inc. "PTI 404"
- H. Butyl-Polyisobutylene Tape Sealant:
 1. Butyl-Polyisobutylene Tape Sealant: Manufacturer's standard, solvent-free, butyl-polyisobutylene tape sealant with a solids content of 100 percent; complying with AAMA 804.1; formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without reinforcement thread to prevent stretch.
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Pecora Corp. "Extru-Seal Tape"
 - 2) Pecora Corp. "Shim-Seal Tape"
 - 3) Protective Treatments, Inc. "PTI 606"
 - 4) Tremco Inc. "Tremco 440 Tape"
- I. Compression Seals:
 1. Preformed Foam Sealant: Manufacturer's standard preformed, recompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in recompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
 - a. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with joint substrates and other joint sealers.
 - b. Impregnating Agent: Manufacturer's standard. Density: Manufacturer's standard.
 - c. Backing: Pressure sensitive adhesive, factory applied to one side, with protective wrapping.
 - d. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) Emseal Corp. "Emseal Greyflex"
 - 2) Illbruck "Will-Seal 150"



- 3) Illbruck "Will-Seal 250"
 2. Preformed Hollow Neoprene Gasket: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with requirements indicated for size, profile and cross-sectional design.
 - a. Manufacturers: Subject to compliance with requirements, provide one of the following.
 - 1) The D.S. Brown Co.
 - 2) Watson-Bowman & Acme Corp.
 - J. Joint Sealant Backing: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 1. Closed-Cell Polyethylene Foam Joint Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of flexible, nongassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 2. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-15 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
 3. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- 2.2 MISCELLANEOUS MATERIALS
- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
 - B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
 - C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.



3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.



3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at [locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 of joint length for each kind of sealant and joint substrate.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints



were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces (Type A).
 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - e. Control and expansion joints in ceilings and other overhead surfaces.
 - f. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces (Type B).
 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces (Type C).



1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of walls and partitions.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement (Type D)
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors windows.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces (Type E)
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00



SECTION 08 11 13 - HOLLOW METAL DOOR FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hollow-metal door frames.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Door Frames:
 - 1. Windsor Republic Doors; www.republicdoor.com.
 - 2. Steelcraft; www.steelcraft.com.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.



2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 INTERIOR DOOR FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Hollow-Metal Door Frames: NAAMM-HMMA 860. Shown in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm) for frames that receive hollow-metal doors; minimum thickness of 0.042 inch ((1.0 mm))for frames that receive hollow-core wood doors.
 - b. Materials: Metallic-coated steel sheet, minimum thickness of 0.042 inch.
 - c. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
 - d. Construction: Knocked down.
 - 3. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-(9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.



2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.



3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - b. Compression Type: Not less than two anchors in each frame.
 - c. Post installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 5. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
 7. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.



- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.



2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13



SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Stained finish flush wood doors.
- B. Finish requirements:
 - 1. Intent is to have finish match the existing wood doors on site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
 - 7. Fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For stained finish wood doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish
 - 2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Provide Samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
 - 3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.



1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is a licensee of WI's Certified Compliance Program.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 17 and 50 percent during remainder of construction period.

1.8 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.
 - 4. Warranty Period for Hollow-Core Interior Doors: Two year(s) from date of Substantial Completion.



PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Algoma Hardwoods, Inc., Algoma, WI.
- B. Eggers Industries, Neenah, WI.
- C. Marshfield Door Systems, Inc., Marshfield, WI
 - 1. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WI's "Architectural Woodwork Standards."
 - 1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- C. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
- D. Hollow-Core Doors:
 - 1. Construction: Institutional hollow core.
 - 2. Blocking: Provide wood blocking with minimum dimensions as follows:
 - a. 5-by-18-inch (125-by-460-mm) lock blocks at both stiles.
 - b. 5-inch (125-mm) top rail blocking.
 - c. 10-inch (250-mm) bottom rail blocking.
 - d. 2-1/2-inch (64-mm) mid rail blocking.
- E. Construction: Fabricate doors in accordance with door quality standard specified.
- F. Cores Constructed with Stiles and Rails:
 - 1. Provide solid blocks at lock edge for hardware reinforcement.
 - 2. Provide solid blocking for other through-bolted hardware.
- G. Fit door edge trim to edge of stiles after applying veneer facing.

2.3 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with NFPA 80 requirements for fire-rated doors.



- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber rabbeted meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.

2.4 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Clear, transparent finish, to match existing, adjacent doors.
- C. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- D. Use only paints and coatings that comply with the testing and product requirements of CALGreen for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.



3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - b. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16



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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Requirements:
 - 1. Section 23 33 00 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ALLOWANCES

- A. Access doors and frames are part of an access door and frame allowance.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
- D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.



2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Bilco.
- B. Milcor.
- C. Or equal.
- D. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- E. Flush Access Doors with Exposed Flanges
 - 1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 - 2. Locations: Wall and ceiling.
 - 3. Door Size: 24 inches x24 inches.
 - 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage
 - a. Finish: Factory finish.
- F. Hardware:
 - 1. Latch: Cam latch operated by screwdriver.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. Provide mounting holes in frames for attachment of units to metal or wood framing.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
 - 1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.



- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
 - 2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13



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SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
- B. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For plastic protective trim units in each finish, color, and texture required for each type of trim unit indicated.
- C. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
 - 1. Sample Size: Full-size units or minimum 2-by-4-inch (51-by-102-mm) Samples for sheet and 4-inch (102-mm) long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.



- b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - c. Format: Use same scheduling sequence and format as in the Contract Documents.
 - d. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - 5) Fastenings and other pertinent information.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For electrified door hardware, from the manufacturer.
 - 1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the



course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of door hardware from a single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: Comply with applicable provisions in CBC 11-B, 2010 ADA Standards for Accessible Design and ICC A117.1 for door hardware on doors in an accessible route.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Maximum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Closers: Adjust door and gate closer sweep periods so that, from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.
- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1.
1. In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Requirements for access control.
 5. Address for delivery of keys.



- G. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Inspect and discuss preparatory work performed by other trades.
 - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 - 4. Review sequence of operation for each type of electrified door hardware.
 - 5. Review required testing, inspecting, and certifying procedures.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys to Owner by registered mail or overnight package service.

1.9 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.



1.11 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 MORTISE LOCKSETS AND LATCHSETS

- 1. Mortise Lock Manufacturers:
 - a. Schlage Lock Co.; L9000-03 Series, with Lever Handle Protection Device.
- 2. Description: ANSI A156.13, Grade 1, mortise with antifriction latchbolt with 1-inch throw and 2-3/4-inch backset. Provide with strikes appropriate to location and function.
- 3. Cylinders
 - a. Manufacturer's standard cylinder body with cylinder plug removable only by removal of cylinder body from lock case.
 - b. Cylinder Plug: Open at rear to allow clearing of obstructions.
 - c. Key Cutting, Cylinder Maintenance, Rekeying: Possible using industry standard equipment. Cylinders requiring manufacturer-specific equipment will not be accepted.
 - d. Interchangeable cores removable by use of special change key will not be accepted.
- 4. Handles:
 - a. Solid stainless steel levers, circular in cross section, 2 inch minimum clearance between inside of handle at midpoint and mounting surface, return to within ½ inch of door face.
 - b. Manufacturers:
 - 1) Schlage Model 03 or equal.
- 5. Lock Types (as indicated on the Drawings):
 - a. Type L9040: ANSI Function 22, Privacy Lock.
 - 1) Schlage Lock Company; L9040.
 - b. Type L9050: ANSI Function 82, Office Lock.
 - 1) Schlage Lock Company; L9453.
 - c. Type L9010: ANSI Function 75, Passage Latch.
 - 1) Schlage Lock Company; L9010.

2.2 LOCK PROTECTORS

- A. Manufacturers:
 - 1. Pull-Push Plates: 8200
 - a. Glynn-Johnson; Finish US32D



2.3 DOOR CLOSERS

- A. Closer - 2210
 - 1. Manufacturer:
 - a. LCN; Model 2210
 - 2. Description
 - a. Adjustable; concealed in head.
 - b. Provide back check on closers at exterior doors swinging out.

2.4 ELECTRONIC CARD READER

- A. Card reader
 - 1. Manufacturer:
 - a. USF

2.5 BUTTS AND HINGES

- A. Description: Slim line barrel design; non-rising pin; hospital tips.
- B. Size butts to door size and weight, to clear trim, and allow 170 degree minimum door swing.
- C. Type 1 – IHTCB 1961
 - 1. Manufacturers:
 - a. Stanley Hardware Division/Stanley Works; IHTCB 1961.
 - b. Hager Hinge Co.; IHTAB850HT
 - c. Substitution per Division 01.
 - 2. Description:
 - a. Finish: Stainless steel.
- D. Type 2 - FM100-HT
- E. Markar Architectural Products

2.6 DOOR STOPS

- A. Stop – Wall Stop (Interior Use)
 - 1. Manufacturers:
 - a. Hager, Model 255S.
 - b. Glynn-Johnson, Model FB-18S.
 - c. Trimco, 1209 KC.

2.7 DEADBOLTS

- A. Deadbolts – B661P
 - 1. Manufacturers:
 - a. Schlage Lock Company; Model B661P.
 - b. Substitutions per Division 01.
 - 2. Description: One Way Deadbolt Lock: Key operates deadbolt on one side only. Blank plate on other side.



2.8 THRESHOLDS, WEATHERSTRIPPING, SMOKE GASKETS, AND KICK PLATES

- A. Thresholds – 2005_T
 - 1. Manufacturers:
 - a. Pemko; Model 2005_T
 - b. Reese Enterprises; Model 5204B.
 - c. Zero; Model 654B.
 - d. Substitutions per Division 01
 - 2. Description
 - a. Set thresholds in mastic and fasten with flat head screws on six inch centers.
 - b. Provide required bolt cutouts.
- B. Weatherstripping / Smoke Gaskets – S88D
 - 1. Manufacturers:
 - a. Pemko; Model S88D.
 - b. Reese Enterprises; Model 797B.
 - c. Zero; Model 188N.
- C. Kick Plates – 12-inches, extending full width of door.

2.9 FASTENERS AND ADHESIVES

- A. Fasteners
 - 1. Exposed Screws, Bolts, Nuts: ASTM A307 Grade A.
 - 2. Screw Thread Adhesive Sealant.
 - 3. Exposed screws shall match hardware finish or, if exposed in surfaces of other work, match finish of other work.
 - 4. Manufacture hardware to conform to template.
 - 5. Through bolt surface mounted closers.
 - 6. Provide non-corrosive fasteners.
- B. Adhesives
 - 1. Epoxy; minimum 2300 psi.
 - 2. Manufacturer and Product:
 - a. Hilti; C100.

2.10 MANUFACTURED UNITS

- A. Provide hardware for fire rated openings in compliance with UL and NFPA 80.
- B. Furnish items of hardware for proper door swing.
- C. On doors that might prove dangerous to visually impaired persons, provide knurling on knobs or lever handles. Doors include, but are not limited to, doors to mechanical rooms, electrical closets, loading platforms or stairs.

2.11 FINISHES

- A. Provide US32D/BHMA 630 finish on all hardware, unless otherwise indicated.



2.12 KEYING

- A. Keying Schedule will be provided by County after Shop Drawing Hardware Schedule has been approved.
- B. Provide for up to 6 cut keys plus one blank key per lock. Do not cut keys prior to receipt of keying schedule. Final quantities of each key will be determined by the keying schedule.
- C. Keys shall be delivered to County, who will be responsible for key issue during construction.
- D. Keys shall be engraved with up to 5-digit identification as directed by the County. No other identifying characters shall appear on key.
- E. Provide and set up complete visible card indexed system with key tags and control slips.
- F. Construction Keying
 - 1. Furnish split key construction master keying with four construction master keys.
 - 2. Upon completion of any portion of Project and when directed by the County, Contractor shall extract split key inserts in the presence of County and determine that permanent keys operate their respective locks.
 - 3. After permanent key is tested, return keys in packets to County for storage.
 - 4. Turn split key inserts and extractor keys over to County for future use.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Metal Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.



3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
 - D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).
 - E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 1. Replace construction cores with permanent cores as directed by Owner.
 2. Furnish permanent cores to Owner for installation.
 - F. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 - G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
 - H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
 - I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- 3.4 FIELD QUALITY CONTROL
 - A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.



3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SCHEDULE

- A. See drawings.

END OF SECTION 08 71 00



SECTION 09 24 00 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior vertical plasterwork (stucco).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.5 FIELD CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than 40 deg F.
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 - PRODUCTS

2.1 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide CEMCO; California Expanded Metal Products Co. Diamond Metal Lath (Expanded) without paper, 2.5 pounds per square yard, or comparable product by one of the following:



- a. CEMCO; California Expanded Metal Products Co.
- b. ClarkDietrich Building Systems.
- c. Phillips Manufacturing Co.

2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. ClarkDietrich Building Systems.
 - c. Phillips Manufacturing Co.
 3. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating. CEMCO No. 36 Foundation Sill Screed or equal.
 4. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating. CEMCO No 2-A Corner Bead or equal.
 5. Drip Screed: Extruded from aluminum, ASTM B209, anodized coating. Fry-Reglet DS-875-875 or equal.
 6. Vent Screed: Extruded from aluminum, ASTM B209, anodized coating. Fry-Reglet PCS-75-V-200 or equal.
 7. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges. CEMCO #66 Expanded Flange Case Bead or equal.
 8. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint. CEMCO #15 Double "V" Control Joint or equal.
 9. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges. CEMCO #XJ-15 Double "J" Control Joint or equal.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.
- C. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.
- D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.



2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
- B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- C. Perlite Aggregate: ASTM C 35.
- D. Exposed Aggregates for Finish Coats:
- E. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. El Rey Stucco Solutions; a Parex USA, Inc. brand.; Perma-Flex Smooth Finish.
 - b. Senergy, BASF Wall Systems, Inc.; Senerflex Fine.
 - c. SonoWall, BASF Wall Systems, Inc.; StuccoTex Fine Finish
 - d. Sto Corp.; StoPowerwall Fine Finish.
 - e. Stuc-O-Flex International, Inc.; Elastomeric Finish, Fine.
 - 2. Color: Match existing finish.

2.5 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.
- B. Job-Mixed Finish-Coat Mixes:
 - 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
- C. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.



- B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.3 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C 1063.
 - 1. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
 - 1. Install lath-type, external-corner reinforcement at exterior locations.
- C. Control Joints: Locate as approved by Architect for visual effect and as follows:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft..
 - b. Horizontal and Other Nonvertical Surfaces: 100 sq. ft..
 - 2. At distances between control joints of not greater than 18 feet o.c.
 - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 - 4. Where control joints occur in surface of construction directly behind plaster.
 - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
 - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.
- C. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

3.6 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.



3.7 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00



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SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
 - 3. Texture finishes.
- B. Related Requirements:
 - 1. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work. Intent is to match existing texture within space.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.



PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- 1. Georgia-Pacific Gypsum, LLC, Gypsum Wallboard Products (GP), DENS product line.
- 2. United States Gypsum Co. (USG)
- B. Gypsum Wall and Ceiling board: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm) and 1/2 inch (12.7mm)
 - 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 1/2 inch (12.7 mm), regular type.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Georgia-Pacific Gypsum, LLC, Gypsum Wallboard Products (GP), DENS product line.
- B. United States Gypsum Co. (USG)
- C. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
 - 1. Use at locations behind wall tile.
 - 2. Thickness: 1/2 inch (12.7 mm), regular type.



3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- D. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
 1. Use at wet locations above cementitious backer units/wall tile.
 2. Georgia-Pacific Gypsum, LLC, Gypsum Wallboard Products (GP), DENS product line.
 3. United States Gypsum Co. (USG)
 - a. Core: 5/8 inch (15.9 mm).

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints beveled panel edges and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, , use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Cementitious Backer Units: As recommended by backer unit manufacturer.
 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.



2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E 84.
- C. Texture to match adjacent existing finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.



- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8 inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2 inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: Where required for fire-resistance-rated assembly or sound-rated walls.
 - 3. Ceiling Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multi-Layer Application:



1. Stagger joints as required as shown on drawings and per sound wall assembly requirements

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. Bullnose Bead: Use where indicated.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints rounded or beveled edges and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At all panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.



3.7 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00



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SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Floor tile.
 - 2. Wall tile.
 - 3. Waterproof membrane, for thinset applications.
 - 4. Crack isolation membrane.
 - 5. Metal edge strips.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.



- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches (300 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory.
 - 4. Stone thresholds in 6-inch (150-mm) lengths.
 - 5. Metal edge strips in 6-inch (150-mm) lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a Trowel of Excellence member of the Tile Contractors' Association of America.
 - 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
 - 3. Installer employs Ceramic Tile Education Foundation Certified Installers.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.



- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Waterproof membrane.
 - 2. Crack isolation membrane.
 - 3. Cementitious backer units.
 - 4. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.



- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type (CT-1): Factory-mounted unglazed ceramic floor tile.
1. DalTile Corp.
 2. American Olean Tile Company.
 3. Buchtal Corp
- B. Face Size: as shown on drawings
1. Thickness: 3/8 inch (9.5 mm).
 2. Wearing Surface: Nonabrasive, smooth
 3. Retain "Dynamic Coefficient of Friction" Subparagraph below if required; ANSI A137.1 includes requirement below for tile used on surfaces of "commercial spaces that will be regularly walked on when wet."
 4. Dynamic Coefficient of Friction: Not less than 0.42.
 5. Finish: Mat, opaque.
 6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 7. Grout Color: As selected by Architect from manufacturer's full range.
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved with surface bullnose top edge, face size 6" high.
 - b. Wainscot Cap: Surface bullnose, face size 3" high.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproofing and Tile-Setting Adhesive: One-part, fluid-applied product, with a VOC content of 65 g/L or less intended for use as both waterproofing and tile-setting adhesive in a two-step process.

2.6 SETTING MATERIALS

- A. Dry-Set Portland Cement Mortar (Thinset): TCA Installation method # F113A-16 ANSI A118.1.
- B. Dry-Set Portland Cement Mortar (Thinset): TCA Installation method # W260-16 ANSI A118.1.



1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils (0.1 mm) thick.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 1. Grout sealers shall comply with requirements of FloorScore certification.
 2. Grout sealers shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Small-Scale Environmental Chambers."

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.



1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed thickset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.



- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Floor Tile: 1/8 inch.
 - 2. Ceramic Wall Tile: 1/8 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and



plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation (CT-1): TCNA F113A-16 and cementitious bond coat (thinset).
 - a. Bond Coat: cementitious.
 - b. Grout: Sand-portland cement grout.
- B. Interior Wall Installations:
 - 1. Ceramic Tile Installation (CT-2): TCNA W202; thinset mortar.
 - a. Thinset Mortar: Dry-set portland cement mortar.
 - b. Grout: Sand-portland cement grout.

END OF SECTION 09 30 13



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SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical tiles for ceilings.
 - 2. Concealed suspension systems.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.
- C. Scope of work: See drawings for extent of existing ceiling grid to remain, and new tiles and suspension grid system to tie-into existing. Ceiling grid tie-in should appear seamless when complete. Existing system should be field verified prior to start of work; specified suspension system product herein are intended to match existing field conditions.

1.3 ACTION SUBMITTALS

- A. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Concealed Suspension-System Members: 6-inch- (150-mm-) long Sample of each type.
 - 3. Exposed Moldings and Trim: Set of 6-inch- (150-mm-) long Samples of each type and color.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.



1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.



2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL TILES, GENERAL

- A. Low-Emitting Materials: Acoustical tile ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations:
 1. Acoustical Ceiling Tile: Obtain each type from single source from single manufacturer.
 2. Suspension System: Obtain each type from single source from single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from single source from single manufacturer.
- D. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.
- E. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
 1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL TILES

- A. Manufacturers
 1. Armstrong World Industries, Inc; Fissured Series.
 2. USG Interiors; - Fissured.
 3. Celotex; Hytone – Fissured.
- B. Classification: Provide tiles complying with ASTM E 1264 for type, form, and pattern as follows:
- C. Description: Modulated, cast or molded incombustible mineral fiber; border units for tiles less than full size.
- D. Design: Fissured



- E. Field Size:
 - 1. 2 x 4 feet, 3/4-inch thick.
- F. Edges: Square.
- G. NRC Range: 0.60 to 0.70
- H. Continuous Ceiling STC Range: 30 34 dB; 11 frequency range
- I. Flame Spread Classification, ASTM E84: 0 25.
- J. Light Reflectance Classification: LR 1.
- K. Finish and Color: Factory applied, washable, in manufacturer's standard white color.
- L. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm) diameter wire.
- E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.



2.5 METAL SUSPENSION SYSTEM

- A. Manufacturers
 1. Chicago Metallic Corp; 1800 System for non-rated assemblies.
 2. Armstrong Industries.
 3. USG Interiors, Inc.; DX System.
 4. Roblin Industries.
- B. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z90) coating designation.

2.6 MISCELLANEOUS PRODUCTS

- A. Perimeter Trim:
 1. Molded plastic channel type trim.
 2. White color closely keyed to tile color.
 3. Required for each installation area, unless otherwise indicated
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips and complying with seismic design requirements and the following:
 1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.
 2. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for



compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.



10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
 2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.
 3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.
1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.



- B. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 23



SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

- A. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:



1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE.

- A. Manufacturers
1. Burke Flooring Products.
 2. Roppe Rubber Corp.
 3. Johnsonite.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed or preformed.
- G. Inside Corners: Job formed or preformed.
- H. Colors: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
1. Adhesives shall have a VOC content of 50 g/L or less.
 2. Adhesives shall comply with the testing and product requirements of CALGreen for the Testing and Evaluation of Volatile Organic Chemical Emissions.



- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m in 24 hours).
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.



3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13



SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes vinyl sheet flooring.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm sections).
- D. Samples for Initial Selection: For each type of resilient sheet flooring indicated.
- E. Product Schedule: For resilient sheet flooring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.



1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient sheet flooring during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. Close spaces to traffic during resilient sheet flooring installation.
- C. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- D. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore certification.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of CALGreen for the Testing and Evaluation of Volatile Organic Chemical Emissions.

2.2 VINYL SHEET FLOORING

- A. Manufacturer:
 1. Armstrong, Linorette-NATURCote.
 2. Azrock Floor Products Div:
 3. Tarkett Inc
- A. Product Standard: ASTM F 1913.
- B. Thickness: 0.080 inch (2.0 mm).



- C. Wearing Surface: Smooth.
- D. Sheet Width: As standard with manufacturer.
- E. Seamless-Installation Method: Heat welded.
- F. Colors and Patterns: As selected by Architect from full range of industry colors

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50g/L or less.
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions.
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: As selected by Architect from manufacturer's full range to contrast with flooring.
 - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
 - a. Bonding compound shall have a VOC content of 510 g/L or less.
 - b. Bonding compound shall comply with the testing and product requirements of CALGreen for the Testing and Evaluation of Volatile Organic Chemical Emissions.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch (25-mm) radius provided or approved by resilient sheet flooring manufacturer.
 - 2. Cap Strip: Square metal provided or approved by resilient sheet flooring manufacturer.
 - 3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.



1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.
 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 1. Maintain uniformity of flooring direction.



2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 3. Match edges of flooring for color shading at seams.
 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Seamless Installation:
1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.
- I. Integral-Flash-Cove Base: Cove resilient sheet flooring 6 inches (152 mm) up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
1. Apply two coat(s).



- E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16



SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes modular carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Samples for Initial Selection: For each type of carpet tile.
 - 1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
- C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.



1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.9 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.



PART 2 - PRODUCTS

2.1 CARPET TILE - CPT-1

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Shaw Mindful Play 5T187 or comparable product by one of the following:
 - 1. Bentley Prince Street, Inc.
 - 2. Interface, LLC.
 - 3. Mannington Mills, Inc.
 - 4. Milliken & Company.
- C. Color: As selected by Architect from manufacturer's full range.
- D. Fiber Content: Solution Q Extreme nylon
- E. Pile Characteristic: Level-loop pile.
- F. Gauge: 1/10 inch.
- G. Density: 10 per inch .
- H. Pile Thickness: inches for finished carpet tile according to ASTM D 6859.
- I. Surface Pile Weight: 16 oz./sq. yd..
- J. Secondary Backing: Manufacturer's Eecoworx tile.
- K. Backing System: synthetic.
- L. Size: 24 by 24 inches .
- M. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.



- B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
 - 1. VOC Content: Comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Floor Slabs: Verify that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.



- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer .
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.



END OF SECTION 09 68 13



SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.
 - 1. Gypsum board.
- B. Related Requirements:
 - 1. Section 09 29 00 – GYPSUM BOARD.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.



1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.



PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Paints and Coatings:
 - 1. Dunn Edwards
 - 2. Sherwin Williams.
 - 3. ICI Paints.
- B. Primer Sealers:
 - 1. Dunn Edwards
 - 2. Sherwin Williams.
 - 3. ICI Paints.
- B. Or approved substitutions.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Provide coatings that comply with the most stringent requirements specified in the following:
 - 1. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Flat Paints and Coatings: 50 g/L.
 - 3. Nonflat Paints and Coatings: 150 g/L.
 - 4. Dry-Fog Coatings: 400 g/L.
 - 5. Primers, Sealers, and Undercoaters: 200 g/L.
 - 6. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 7. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 8. Pretreatment Wash Primers: 420 g/L.
 - 9. Floor Coatings: 100 g/L.
 - 10. Shellacs, Clear: 730 g/L.
 - 11. Shellacs, Pigmented: 550 g/L.
- D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of CALGreen for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources.
- E. Colors: As indicated on drawings.



2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.



- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Plastic conduit.
 - f. Tanks that do not have factory-applied final finishes.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.



2. Paint the following work where exposed in occupied spaces:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Plastic conduit.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Wood Substrates: Architectural woodwork.
 1. Latex over Latex Primer System:
 - a. Prime Coat: Primer, latex, for interior wood:
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1)
 - d. Topcoat: Latex, interior, gloss (MPI Gloss Level 6, except minimum gloss of 65 units at 60 degrees)
- B. Spray-Textured Ceiling Substrates:
 1. Latex, Flat System: Spray applied.
 - a. Prime Coat: Latex, interior, flat, matching topcoat.



- b. Topcoat: Latex, interior, flat (MPI Gloss Level 1).
- C. Gypsum Board and Plaster Substrates:
- 1. Latex over Latex Sealer System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - b. Prime Coat: Latex, interior, matching topcoat.
 - c. Intermediate Coat: Latex, interior, matching topcoat.
 - d. Topcoat: Latex, interior, flat (MPI Gloss Level 1).
 - 2. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1).

END OF SECTION 09 91 23



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SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provision and installation of interior and exterior room identification signs, geometric restroom signs and interior and exterior directional and informational signs including signs for accessible features and regulatory signs.
- B. Metal signs
- C. Decals
- D. Support posts

1.2 RELATED SECTIONS

- A. Division 01: General Conditions
- B. Section 08 14 16 - FLUSH WOOD DOORS

1.3 RELATED CODES AND STANDARDS

- A. Accessible signs shall conform with the following requirements as indicated:
 - 1. California Building Code (CBC) Title 24, 2016 Edition.
 - 2. ADA Accessibility Guidelines (ADAAG, latest adopted edition).
 - 3. Contracted Grade 2 Braille shall be used whenever Braille symbols are specifically required (CBC Section 118-703.3 Braille).
 - 4. Means of Egress Identification: CBC 11 B-216.1 and 11 B-703.1.
 - 5. Tactile Exit Signs: CBC 1013.4.
 - 6. Restroom Identification Symbols: CBC 11 B-216.8 and 118-703.7.2.6.
 - 7. Signs and Identification: CBC 118-216.1 and 118-703 .1.
 - 8. International Symbol of Accessibility: CBC 11 B-703.7.2.1.
 - 9. Direction and Information Signs: CBC 11 B-703.1.
 - 10. Symbols of Accessibility: CBC 11 B-703.7.
 - 11. Finish and Contrast: CBC 11 B-703.5.1.
 - 12. Character Proportions: CBC 11 B-703.2.4.
 - 13. Character Height: CBC 11 B-703.2.5.
 - 14. Raised Characters and Pictorial Symbol Signs: CBC 11 B-703.2 and 11 B-703.6. Braille: CBC 11 B-703.3.
 - 15. Mounting Height and Location: CBC 11 B-703.4.1 and 118-703.4.2.
 - 16. Symbols of Accessibility: CBC 11 B-703.7.2.
 - 17. Color of Symbol: CBC 118-703.7.2.1.

1.4 SUBMITTALS

- A. Submit manufacturer's technical data and installation for each type of sign required.



- B. Submit shop drawings listing sign size, type style and letter heights and construction detail.
- C. Submit one full size sample sign with tactile characters, Braille and subsurface text or pictogram to demonstrate fabrication technique and Braille measurements which shall be used on proposed project.
- D. Submit samples of background colors, character colors, and one inch high print outs of "I," "O" and "X" from proposed type styles. Indicate which type styles shall be used for required tactile characters and for required visual characters.
- E. Submit proposed sign schedule to comply with scoping requirements above.
- F. Submit under provisions of Division 01.
- G. All signage shall be designed and constructed to comply with the signage specifications and drawings.

1.5 QUALITY ASSURANCE, MATERIALS AND FABRICATION TECHNIQUES

- A. Quality Assurance:
 - 1. Manufacturers shall submit 3 references showing products for projects completed within the last 6 years. Both tactile and non-tactile signage shall be included in the work.
 - 2. Manufacturer's Two-Year Warranties.
 - 3. Contractor shall provide labor and materials to repair or replace defective signs as directed by Owner. Defects shall include:
 - a. Tactile characters and/or Braille dots which come off or are removed.
 - b. Discoloration, wear and scratching off of the surface color.
 - c. All signs and sign components, except for damage by mishandling by Owner, including installation by Owner, or vandalism.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver to project site in manufacturer's original, unopened and undamaged packaging. Store in original packaging under protecting cover and protect from damage, Handle materials in such a manner as to prevent damage to products or finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Sign Material
 - 1. Metal, Toilet Room Wall Signs, Directional Signs and Exit Signs: 0.040 inch thick, Type 304 stainless steel.
 - a. Finish: Electrostatic powder coat with a medium blue background with white text or white background with blue text, numerals and graphics/pictogram that provides a minimum of a 70% contrast.
 - b. Blue shall be equal to Federal Blue No. 15980 in Federal Specifications 595C.
 - 2. Restroom gender use sign shall be a total of 1/4" thick aluminum material.



- B. Metal room identification signs will have 1/8 inch radius unless otherwise shown on Drawing. Corners die cut with burr on rear side of sign with mounting holes (quantity of holes as shown on Drawings).
- C. Fasteners: One-way tamper resistant screw# 90090A 155 (1.25" minimum, 1" minimum embedment into wall) for wood, masonry or concrete application and self drilling tamper resistant pan head pin in head torx (1 ") #92970A for metal application with fastener anchors as appropriate for wall material.
- D. Numerals and upper case letters on metal signs will be minimum 1 inch high (vertical dimension unless otherwise shown on Drawings) embossed text and numerals shall comply with CBC 11 B-703.2 and 11 B-703.6. Vertical dimension of lower case letters shall be proportional to height of upper case letters.
 - 1. Raised tactile characters shall be raised 1/32 inch minimum and shall be San Serif uppercase and lowercase characters and numerals accompanied by corresponding Grade 2 Braille.
 - 2. Raised tactile characters shall have beveled edges. (2013 CBC)
- E. Decals shall be a heavy gauge sticker.

2.2 SUBSTRATE

- A. Interior plaques shall have eased or rounded edges and corners.

2.3 GENERAL

- A. Non-glare (non-reflective) materials shall be used for all signs which identify, direct to, or give information about facilities and their use.
- B. Characters shall have a minimum of 70 percent contrast with their backgrounds on all signs which identify, direct to, or give information about facilities and their use.
- C. Characters on all signs which identify, direct to, or give information about facilities and their use shall comply with CBC 11 B-703.2.4 & 11 B-703.2.6.
- D. Type styles of characters on all signs which identify, direct to, or give information about facilities and their use shall not be italic, oblique, or decorative in style.
- E. Non-tactile characters (letters, numbers and symbols) shall be Helvetica Regular
 - 1. Characters shall be uppercase unless otherwise shown on Drawings.
 - 2. Upper case letters shall be 1 inch high (unless otherwise shown on Drawings, maximum 1 1/4 inch high).
 - 3. Height of lower case letters (where shown on Drawings) shall be proportional to height of upper case letter.

2.4 TACTILE CHARACTERS

- A. Characters required to be tactile shall be San Serif.
 - 1. Characters shall be raised 1/32 inch minimum and a maximum of 1/16 inch from the background.



2. Characters shall be uppercase unless otherwise shown on Drawings. Signs shall have tactile characters where shown on Drawings.
 3. Upper case tactile letters shall be 1 inch high (unless otherwise shown on Drawings, maximum 1 ¼ inch high).
 4. Height of lower case letters (where shown on Drawings) shall be proportional to height of upper case letter.
- B. A closest minimum points of 1/8" shall be space provided. between the top surfaces of adjacent characters measuring between the two closest points shall be provided.
- C. Drawing Coordination: Sign Specification size, text, mounting locations requirements and other requirements shall be as stipulated in this Specification Section unless other shown on Drawings.

2.5 BRAILLE

- A. Braille text shall comply with CBC 11 B-703.3.
- B. Braille on metal signs shall be embossed domes California Contracted Grade 2 Braille. All Braille shall be fabricated by a method which produces a rounded or domed dot shape. All Braille dots shall be solid or filled from behind so they cannot be crushed or indented.
- C. Braille dot, cell spacing and dot height shall follow specifications as per CBC11 B-703.3 and 11 B-703.3.1.
- D. There shall be no Braille indication of capital letters except for proper names, individual letters or acronyms, or beginnings of sentences.
- E. Braille shall be centered directly below raised print characters.
- F. Braille shall be located on the sign 3/8 inch below the corresponding tactile characters, flush left or centered to the characters depending on the sign layout. (CBC 11B-703.2.9 AND 11B-703.3.0).
- G. Spacing between Braille and raised characters shall be between 3/8" to 1/2".

2.6 NON-TACTILE GRAPHICS AND TEXT

- A. Non-tactile graphics/pictogram and text shall screen printed on the surface and complying with Paragraph 2.01.A.1.a of this Specification Section.
- B. Identifying pictograms shall be located above the tactile text in a clear, six inch high field.
- C. Non-tactile text shall be upper case and one inch high (unless otherwise shown on Drawings), and shall comply with CBC 11B-703.2.4, 11B-703.5.1, 11B-703.5.4, 11B-703.5.5 and 11B-703.6.2.

2.7 MISCELLANEOUS

- A. Furnish all items required for the proper installation of all signage including but not limited to



tamper resistant fasteners, adhesives, sealants, metal sleeve spacers, etc.

PART 3 - EXECUTION

3.1 GENERAL

- A. Signs shall be installed with edges horizontal and vertical and face plumb.
- B. Install signs with tamper resistant screws and anchors at all wall conditions except glass.
- C. Screw length shall be sufficient for minimum 1 inch embedment.
- D. Signs mounted onto glass:
 - 1. Sign shall be attached to glass with clear silicone adhesive designed to secure sign material to glass (double stick tape with cushion is not permitted). Contractor shall apply sealant around perimeter of sign.
 - 2. Where interior and exterior signs are to be mounted, signs shall be the same size (the larger sign size shall dictate the size of the smaller sign) and located "back-to-back".
 - 3. Where only an interior or exterior sign is mounted, a "blank sign" (the same size as the sign) shall be installed and located "back-to-back".
- E. The Contractor is solely responsible for the identification of the material onto which signs are to be mounted. The Contractor shall furnish and install all materials necessary for the proper installation of each sign.
- F. Contractor shall notify the Architect of any conflicts between the Drawings, Specifications and the requirements of the CBC and ADA prior to the submission of the Bid Form. No increase of the Contract Sum and no extension of the Contract Time shall be granted for the resolution of CBC, ADA and Contract Documents conflicts.
- G. Permanent identification signs for rooms or spaces shall be installed on the wall adjacent to the latch side of the door.

3.2 ADJUST AND CLEAN

- A. Clean and Touch-up: Remove all packing and protection blemishes and thoroughly clean and polish all finish surfaces. Restore any marred or abraded surfaces to their original condition by touching up in accordance with the manufacturer's recommendations. Touch-up shall not be obvious.
- B. Defective Work: Remove and replace all defective work which cannot be properly repaired, cleaned or touched-up with no additional cost to the owner.
- C. Protect installed work during the construction period to prevent abuse and damage.

3.3 CLEAN UP

- A. Upon completion of the work of this section, remove all surplus materials, rubbish and debris from the premises.



END OF SECTION 10 21 13.17



SECTION 10 21 13.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Sections:
 - 1. Section 06 10 00 "Rough Carpentry"
 - 2. Section 10 28 00 "Toilet Accessories"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show overhead support or bracing locations.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
 - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for toilet compartments, prepared on square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.



1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 75 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in CBC chapter 11B for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Bradley Corporation; Mills Partitions.
 - 3. Or equal
- B. Toilet-Enclosure Style: Floor anchored and overhead braced.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch thick doors, pilasters, and panels. To match existing.
- E. Brackets (Fittings):
 - 1. Per manufacturer.
- F. Phenolic-Panel Finish:
 - 1. Color and Pattern: To be selected by Architect from submitted full range of colors.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. Hinges, Latch and Keeper, Coat Hook, Door Bumper, and Door Pull.



- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:



- a. Pilasters and Panels: 1/2 inch .
 - b. Panels and Walls: 1 inch.
 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
 - C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
- 3.3 ADJUSTING
- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.17



SECTION 10 28 00 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.



1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
 - 1. Bobrick.
 - 2. American Specialties, Inc. (ASI).
 - 3. Bradley.
 - 4. General Accessory Manufacturing Company (GAMCO).
 - 5. McKinney Parker.

2.2 SCHEDULE

- A. Men's and Women's Toilet Rooms:
 - 1. Paper Towel Dispenser and Waste Receptacle, surface-mounted: Bobrick B-380349, stainless steel, satin finish.
 - 2. Soap Dispenser counter-mounted: Bobrick B-824, stainless steel, satin finish.
 - 3. Toilet Seat Cover Dispensers: Bobrick B-221, Surface mounted stainless steel, satin finish.
 - 4. Toilet Tissue Dispenser: Bobrick B-2888, Surface mounted, stainless steel, satin finish.
 - 5. Sanitary Napkin Disposal: Bobrick B-254, stainless steel, satin finish with tumbler lock.
 - 6. Coat hooks: Bobrick B-2116, Stainless Steel, satin finish. Heavy duty with concealed mounting. Provide one coat hook at each toilet stall, and coordinate location with toilet partition submittal.
 - 7. Mirror: Bobrick B-165.1836, Stainless Steel Channel frame with mitered corners.
 - 8. Grab Bars: Bobrick B-6809.99-36 and B-6809.99-42. Anchor grab bars on steel plate, secure steel plate to wall studs

2.3 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 MATERIALS

- A. Stainless steel: AAMA Type 302/304 complying with ASTM A 167.
- B. Sheet steel:
 - 1. Cold-rolled commercial quality, complying with ASTM A 336, 20 gage minimum.
 - 2. Galvanized steel: ASTM A 653 LQ, G60 zinc coating, 20 gage minimum.



- C. Mirrors: 1/4 in. "Silvering Quality" float glass with silver coating, copper protective coating and 2-mil thick protective paint; complying with CS 27.
- D. Mounting devices: Galvanized steel.
- E. Fasteners: Stainless steel where exposed; may be galvanized steel where concealed. Provide spanner head design where exposed.

2.5 FABRICATION

- A. Fabricate units with seamless one piece flanges on exposed faces.
 - 1. Miter corners, weld and grind smooth and flush with parent metal so that welds are invisible on exposed surfaces.
 - 2. Open joints (not fully welded) on exposed surfaces are not acceptable.
 - 3. Conceal anchoring devices.
- B. Hang doors or panels on continuous stainless steel piano hinges.
- C. Master-key locked dispensing units. Key coin boxes of coin-operated dispensing units separately from the lock on the unit.
- D. Grind edges smooth, both inside and out.
- E. Finish exposed surfaces with an AISI No. 4 finish running in the same direction (horizontal or vertical) for all accessories, except where a knurled surface is specified for grab bars.

2.6 UNDERLAVATORY GUARDS

- A. Underlavatory Guard:
 - 1. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
 - 2. Material and Finish: Antimicrobial, molded plastic, white.

2.7 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.



- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00



SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.
 - 5. Solid surface material sinks.

1.3 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.4 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
 - a. Avonite Surfaces.
 - b. E. I. du Pont de Nemours and Company.
 - c. Formica Corporation.
 - d. LG Chemical, Ltd.
 - e. Samsung Chemical USA, Inc.
 - f. Wilsonart International Holdings, Inc.



2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WT's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front: Beveled.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch- thick, solid surface material.
- D. Backsplashes: 3/4-inch- thick, solid surface material.
- E. Fabricate tops with shop-applied edges[and backsplashes] unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
 - 2. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
 - 1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.



3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 12 36 61.16



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SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Pipe, tube, and fittings
2. Miscellaneous piping materials/products.
3. Valves.
4. Piping specialties.
5. Pipe escutcheons.
6. Mechanical sleeve seals.
7. Fire barrier penetration seals.
8. Fabricated piping specialties.
9. Motors and drives.

B. American Society of Mechanical Engineers (ASME).

1. ASME B31.1-2007 - Power Piping.
2. ASME B31.9-2004 - Building Services Piping.
3. ASME B16.20-2000 - Metallic Gaskets for Pipe Flanges; Ring-Joint, Spiral-Wound, and Jacketed
4. ASME B16.21-2005 - Nonmetallic Flat Gaskets for Pipe Flanges.
5. ASME B16.10-2000 (R2003) - Face-to-Face and End-to-End Dimensions of Valves.
6. ASME B16.34-2004 - Valves Flanged, Threaded and Welding End.

C. National Certified Pipe Welding Bureau (NCPWB) - Standard Procedure Specifications.

D. ASME SEC IX - ASME Boiler and Pressure Vessel Code - Section IX: Welding and Brazing Qualifications.

E. ANSI Standards.

1. ANSI B16.20.1-2000 - Metallic Gaskets for Pipe Flanges - Ring Joint, Spiral-Wound, and Jacketed.

F. AWWA Standards

1. AWWA C111-2007 - Rubber - Gasket Joints for Ductile - Iron Pressure Pipe and Fittings.

G. MSS Compliance:

1. MSS SP-25-1998 - Marking System for Valves, Fittings, Flanges and Unions.
2. MSS SP-72-1999 - Ball Valves with Flanged or Butt-Welding Ends for General Service.
3. MSS SP-80-2003 - Bronze Gate, Globe, Angle and Check Valves.
4. MSS SP-70-2006 - Gray Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP-85-2002 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
6. MSS SP-78-2005 - Gray Iron Plug Valves, Flanged and Threaded Ends.
7. MSS SP-71-1997 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.

H. FCI Compliance:



1. FCI 73-1-1998 - Pressure Rating Standard for “Y” Type Strainers.
2. FCI 78-1-1998 - Pressure Rating Standard for Pipeline Strainers Other than “Y Type.

1.2 DEFINITIONS

- A. “Piping” includes, in addition to pipe, all fittings, flanges, valves, hangers and other accessories related to such piping.
- B. “Wiring” includes in addition to conductors, all raceway, conduit, fittings, boxes, switches, hangers and other accessories related to such wiring.
- C. “Concealed” means hidden from sight in chases, furred spaces, shafts, hung ceilings or embedded in construction.
- D. “Exposed” means not installed underground or “concealed” as defined above.
- E. “Provide” means to furnish and install.

1.3 SUBMITTALS

- A. General
 1. Comply with the requirements of Division 1 and the specific requirements of the Sections of Division 22.
 2. Submit all similar equipment together as part of the same submittal. For example:
 - a. All water heaters shall be contained in the same submittal.
 - b. All pumps shall be contained in the same submittal.
 3. Contractor shall review all submittals prepared by each supplier and mark all copies as acceptable to the Contractor. This acceptance shall signify that all required service connections are shown and in the proper location to meet the installation requirements and that the equipment can fit in the space allowed.
 4. Do not order equipment until submittals have been reviewed and approved by the Owner’s Representative.
 5. Each item submitted shall be labeled or identified the same as on the drawings.
 6. Mark submittal “Exactly as Specified” or accompanied by a letter from the supplier explaining in detail what difference, if any, exists between the submitted item and the specified item. Failure to point out the differences will be considered cause for disapproval. The Owner’s Representative will not assume any responsibility for differences concealed or otherwise not brought to their attention, and the Contractor will be required to correct any deficiencies or differences discovered at a later date, and assume responsibility for any delays, damage, and/or expenses incurred by others due to such action.
 7. Brands or trade names are mentioned to set standards of quality only; use no substitute materials, however, unless approved in writing by the Owner’s Representative. Approval of substitute materials does not relieve the Contractor of responsibility for providing a workable and functioning system as specified.
 8. Submittals will be checked for general conformance with the design concept but acceptance by the Owner’s Representative in no manner is meant to verify that dimensions, quantities, or location of services are as necessary to meet the job requirements. This remains the responsibility of the Contractor.
- B. Shop Drawings



1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be coordinated, dimensioned, indicate equipment and piping in relation to architectural and structural features as well as other building systems. Include minor piping, drains, air vents, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, etc.
 2. Required Drawings: Prepare and submit drawings for all areas and all plumbing work. Scale shall be minimum $3/8" = 1'-0"$ in mechanical rooms, fan rooms, and mechanical areas, and minimum $1/4" = 1'-0"$ elsewhere.
- C. Coordination Drawings
1. General: Coordination drawings are defined as “shop drawings” which also indicate, on the same drawings, the major utilities of all other trades. “Coordination drawings” shall indicate location and elevations of structural slabs and beams, architectural elements, domestic water piping, plumbing vents, sanitary drains, storm drains, fire protection piping, lighting fixtures, electrical conduits (2-inch and larger), ductwork, penetrations of walls and roof, fire dampers, fire/smoke dampers, automatic dampers, terminal boxes, air outlets, access panels, ceiling mounted equipment and controls, gas piping, flues, fans, air handling equipment, etc.
 2. Submit coordination drawings for the following:
 - a. Entire building.
 - b. Other areas for which space is limited.
 3. It is the intent of the coordination drawings to ensure coordination of all major utilities, prior to the start of installation. This is a substantial effort which will require careful and detailed coordination and planning to ensure appropriate information is available, from all trades, in a timely manner. The coordination drawing effort shall be integrated into the project schedule and monitored to ensure conformance.
 4. Conflicts between trades, which cannot be resolved through generally accepted practice of coordination between trades, shall be clouded on the coordination drawings and an appropriate description of the problem noted for review by the Owner’s Representative.
 5. Nonconforming M/E work installed within designated coordination areas is subject to removal and replacement by installing contractor at no additional cost to Owner.
 6. Coordination drawings shall be signed and dated by individual trade constructors. By act of signature and submittal of singular combined coordination drawings, each trade contractor acknowledges coordination of their portion of the Work with all other plumbing, mechanical, electrical, architectural, and structural work contractors.
- D. Product Data
1. General: Manufacturer’s specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, location and size of field connections, and accessories. Include certified drawings on major equipment such as boilers, water chillers, cooling towers, controls, pumps, and tanks.
 2. Motors: Submit manufacturer’s name, type, RPM, HP (KW), full load amps, efficiency, and power factor.
 3. Part Load Performance: Submit equipment data to indicate performance characteristics throughout ranges of possible load conditions.
 4. Include operating weight and location of center of gravity of each item of equipment in manufacturer’s cut sheet for purposes of seismic calculation.



5. Pipes and Pipe Fittings: Submit schedule showing pipe material data, sizes, fitting valve type k factor, working pressure for each service.
 6. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
 7. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
 - a. Strainers: include pressure drop or chart for each type and size.
 - b. Meters and gauges: include scale range for each service.
- E. Test Reports
1. Manufacturer's Tests
 - a. Factory Tests: As specified for specific equipment.
 - b. Field Tests: As specified.
 2. System Pressure Tests: As specified under "Testing" article. Test log of pressure tests on each system. Indicate date of test, scope of test, test pressure, duration, and observers.
- F. Certification
1. Seismic Restraints: As specified under Section 22 05 29 and 22 05 48.
 2. Welding Certificates.
 3. Brazing Certificates.
- G. Operating and Maintenance Manuals: Include, but not limited to, the following:
1. List of all equipment with Manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item. Include phone number and address of service facilities
 2. System Description: Description of start-up, operating, and shutdown procedures.
 3. Controls: Diagrams and description of operation sequence of each system.
 4. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts lists with part numbers, and belt and sheave data. Mark each sheet with equipment identification number and actual installed condition.
 5. Materials and Accessories: Manufacturer's brochures parts lists with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
 6. Certificate of factory tests, field tests and code compliance as specified.
 7. Wiring and controls schematics.
 8. Trouble shooting directions.
 9. Maintenance procedures and frequencies.
 10. Description of special tools.
 11. Copies of warranties.
 12. Safety precautions.
 13. Emergency contingencies.
- H. Record Documents
1. Comply with the Conditions of the Contract and the requirements of Section 22 05 53.
 2. Indicate mains and branches of piping systems, with valves and control devices located and numbered per valve schedule, concealed unions located, and with items requiring maintenance located (i.e. traps, strainers, expansion compensators, vents, etc.). Indicate actual inverts and horizontal locations of underground piping.



3. Indicate equipment locations (exposed and concealed), dimensioned from prominent building lines.
 4. Identify approved substitutions, Contract Modifications, and actual equipment and materials installed.
- I. Samples: When specified under applicable Sections.
- 1.4 QUALITY ASSURANCE
- A. Perform all work in accordance with following rules (codes, standards and regulations):
1. Codes
 - a. California Building Code, Latest Edition: CBC
 - b. California Fire Code, Latest Edition: CFC
 - c. California Electrical Code, Latest Edition: CEC
 - d. California Plumbing Code, Latest Edition: CPC
 - e. California Mechanical Code, Latest Edition: CMC
 - f. California Occupational Safety Health Act: OSHA
 - g. California Code of Regulations: CCR
 - h. CCR Title 24 California Energy Code: CEC
 - i. Applicable Local Codes and Ordinances.
 2. Standards
 - a. Air Conditioning and Refrigeration Institute: ARI
 - b. Air Movement and Control Association, Inc.: AMCA
 - c. Canadian Gas Association: CGA
 - d. American National Standards Institute: ANSI
 - e. American Society of Heating, Refrigeration, and Air Conditioning Engineers: ASHRAE
 - f. American Society of Mechanical Engineers: ASME
 - g. American Society of Plumbing Engineers: ASPE
 - h. American Society of Testing and Materials: ASTM
 - i. American Water Works Association: AWWA
 - j. American Welding Society: AWS
 - k. Associated Air Balance Council: AABC
 - l. Factory Mutual: FM
 - m. International Association of Plumbing and Mechanical Officials: IAPMO
 - n. Institute of Boiler and Radiator Manufacturers: IBR
 - o. Manufacturer's Standardization Society of the Valves and Fittings Industry: MSS
 - p. National Electrical Manufacturers Association: NEMA
 - q. National Electrical Testing Association: NETA
 - r. National Environmental Balancing Bureau: NEBB
 - s. National Fire Protection Association: NFPA
 - t. Plumbing and Piping Industry Council: PPIC
 - u. Sheet Metal and Air Conditioning Contractors National Association, Inc.: SMACNA
 - v. Underwriters' Laboratories: UL
 3. Regulations
 - a. California State Fire Marshal: CSFM
 - b. California State Department of Public Health: CSDPH
 - c. Safety Orders of Division of Industrial Safety: SODIS
 - d. TIER 1: Energy Standard for State Buildings: TIER 1



4. Where standards of Contract Documents for materials and/or workmanship are higher than those of applicable rules, Contract Documents shall take precedence; otherwise the rules shall govern.
 5. Nothing in the Contract Documents is to be interpreted as permitting the Work not conforming to the rules.
 6. Should there be any direct conflict between the rules and the Contract Documents, the rules shall govern.
 7. Charges for all materials and labor required for the compliance with rules and regulations shall be included in the Contract Price.
- B. Certifications: Provide proof of code compliance for equipment as follows:
1. Gas Fired Equipment and Safety Devices: Per applicable standards and bear label of CGA.
 - a. Fuel-burning heating appliances shall bear permanent and legible factory-applied nameplate on which shall appear: manufacturer's name; approved fuel input rating, expressed in Btu/hr.; model and serial numbers; instructions for lighting, operation, and shutdown; type fuel approved for use; and symbol of approved agency certifying compliance of equipment with recognized standards.
 2. Electrical Equipment and Safety Devices: Per applicable standards of NEC; UL listed or classified.
 3. Pressure Vessels and Pressure Safety Devices: Per applicable standards and bear label of ASME.
 4. Energy Conservation: Comply with applicable codes. Provide equipment and materials certified by manufacturer per California energy code as applicable.
 5. Equipment: Provide UL listed or classified equipment where required by code officials. Verify such requirements.
- C. Repair or replace, to the satisfaction of the Owner, any damage to Work of this Section and damage caused by Work of this Section.
- D. Workmanship shall be first class throughout and performed only by competent and experienced workmen in a manner satisfactory to the Owner. Constant supervision of the Work, either by the Contractor or his competent representative, shall be maintained.
- E. Work shall be installed so as not to delay the progress of construction and shall be properly coordinated with other trades.
- F. Use only new materials in perfect condition. Inspect all materials upon arrival at job site and immediately remove defective items from site.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
 - B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.



- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.6 SUBSTITUTIONS

A. General

- 1. Base manufacturer is indicated in equipment schedules.
- 2. In Specification, additional acceptable manufacturer(s) may be indicated.
- 3. Other manufacturers, materials, or methods shall not be used unless approved in writing by the Owner's Representative.
- 4. The burden of proof as to the equality of any proposed substitute manufacturer, material, or method shall be upon the Contractor.
- 5. The Owner's Representative's decision shall be final.

- B. Requests for substitution review and acceptance shall be accomplished by table of comparison listing pertinent features of both specified and proposed materials, such as materials of construction, performance, dimensions, weights, replacement or maintenance access, motor type, horsepower, voltage, phase, service factor. Review of proposed substitutions will not be made until receipt of satisfactory comparison tabulation.

- C. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Owner's Representative. If first proposed product submittal is rejected, Contractor shall then submit the first-named or scheduled product.

- D. Contractor shall be responsible for all costs and coordination due to the substitution, such as impacts on electrical requirements, weight, openings in slabs and roofs, structural framing, housekeeping pad size, etc.

1.7 JOB CONDITIONS

- A. Cause as little interference or interruption of existing utilities and services as possible. Schedule Work which will cause interference or interruption in advance with Construction Manager.
- B. Examine Contract Documents to determine how other Work will affect execution of plumbing Work.
- C. Determine and verify locations of all existing utilities.
- D. Arrange for, coordinate, and pay costs incidental to providing utility company services indicated.
- E. Establish lines and levels for each system and coordinate with other systems to prevent conflicts and maintain proper clearances and accessibility.

PART 2 PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping sections for pipe, tube, fittings materials joining methods. Comply with governing regulations.



2.2 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

- A. Welding Materials: Provide welding materials to comply with installation requirements.
 - 1. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.
- B. Gaskets for Flanged Joints: ASME B16.21; full-faced for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.

2.3 VALVES

- A. General: Refer to Section 22 05 23.

2.4 PIPING SPECIALITIES

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service or, if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, equipment connections. Where more than one type is indicated, selection is Installer's option.
- B. Dielectric Unions and Flanges
 - 1. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion. Pressure rating equal to or greater than that of nearby valves.
 - 2. Manufacturers
 - a. B & K Industries, Inc.
 - b. Capital Mfg. Co.; Div. of Harsco Corp.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Perfection Corp.
 - f. Rockford-Eclipse Div.
 - g. Victaulic/Clearflow.
 - h. Calpico.

2.5 PIPE ESCUTCHEONS

- A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All escutcheons shall be vandal proof.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid brass or solid sheet brass pipe escutcheons.
- C. Pipe Escutcheons for Dry Areas: Provide solid solid sheet metal escutcheons.



- D. Manufacturers
 - 1. Chicago Specialty.
 - 2. Producers Specialty.
 - 3. Sanitary-Dash.

2.6 MECHANICAL SLEEVE SEALS

- A. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
- B. Sleeve: To be furnished by same manufacturer of seals; schedule 40 galvanized steel pipe or Century line sleeves, with integral anchor and waterstop collar.
- C. Manufacturers
 - 1. Thunderline Link Seal.
 - 2. Metraflex Metraseal.

2.7 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for plumbing components such as piping.
 - 1. Piping: Provide fire stopping material as specified in Section 07 84 00.

2.8 FABRICATED PIPING SPECIALTIES

- A. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges:
 - a. 3-inch and smaller: 0.040-inch/20 gauge thick.
 - b. 4 to 6-inch: 0.064-inch/16 gauge thick.
 - c. Over 6-inch: 0.079-inch/14 gauge thick.
 - 2. Steel Pipe: See Section "Mechanical Sleeve Seals".

PART 3 EXECUTION

3.1 PIPING INSTALLATION

- A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16-inch misalignment tolerance.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if



- not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other clearance to 1/2-inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- C. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
 - D. Electrical and Elevator Equipment Spaces: Do not run piping through transformer vaults, electrical rooms and other electrical or electronic equipment spaces and enclosures, unless piping or ductwork is for equipment serving that electrical space.
 - E. Comply with ASME B 31.1.
 - F. Pressures: Do not install piping, valves or piping specialties where exposed to system pressures greater than their rated working pressures.
 - G. Sloping, Air Venting and Draining:
 - 1. Slope piping as indicated, true to line and grade, and free of traps and air pockets. Unless indicated otherwise, slope piping in direction of flow as follows:
- | <u>Service</u> | <u>Inclination</u> | <u>Min. Slope</u> |
|-------------------------|--------------------|-------------------|
| Cooling Coil Condensate | Down | 1/8" per foot |
| Drain | | (1-percent) |
- H. Install piping free of sags and bends. Support requirements are specified in Section 22 05 29.
 - I. Fittings
 - 1. Provide standard, manufactured fittings in all cases. Field fabricated fittings are prohibited. Bushings are prohibited on pressure piping.
 - 2. Weld-O-Lets and Thread-O-Lets may be used for non-galvanized steel piping if main pipe size is at least three standard pipe sizes larger than branch pipe, e.g. 2-inch main and 1-inch branch.
 - 3. Provide insulating couplings at connections of ferrous piping to non-ferrous piping.

3.2 INSTALLATION OF VALVES

- A. General: Except as otherwise indicated, comply with the following requirements:
 - 1. Install valves where required for proper operation and isolation of equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
 - 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.



- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- D. Fluid Control: Except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ASME B31.9. Where throttling is indicated or recognized as principal reason for valve, install globe valves.
- E. Installation of Check Valves
 - 1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
 - 2. Wafer Check Valves: Install between two flanges in horizontal or vertical position, position for proper direction of flow. Provide silent type wafer check valves at pump discharge locations.
 - 3. Lift Check Valve: Install in piping line with stem vertically upward, position for proper direction of flow.
- F. Install globe valves to close against pressure.
- G. Install plug valve with seat toward equipment to be isolated.
- H. Valve Discharge Piping: Provide discharge pipe to atmosphere from all relief and safety valves, sized with area equal to sum of outlet areas of all valves connected thereto, unless indicated larger.

3.3 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surfaces.
- B. Dielectric Unions and Flanges: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- C. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
- D. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

3.4 INSTALLATION OF FABRICATED PIPING SPECIALTIES

- A. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs.
 - 1. Do not install sleeves through structural members, except as detailed on Drawings, or as reviewed by the Owner's Representative.
 - 2. Install sleeves accurately centered on pipe runs.



3. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run.
 4. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation.
 5. Pack 100 percent of annular space between sleeve and pipe or pipe insulation. Provide acoustical sealant at each end of pipe sleeve to seal packing in place.
 - a. At fire-rated walls, partitions, floors, roofs, and ceilings: Packing shall be through-penetration firestop.
 - b. At non-fire-rated walls, partitions, floors, roofs, and ceilings: Packing shall be fiberglass insulation, with density of 1.5 pcf.
 6. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves.
 7. Extend floor sleeves 1 inch above level floor finish.
 8. Provide temporary support of sleeves during placement of concrete and other work around sleeves.
 9. Provide temporary closure to prevent concrete and other materials from entering sleeves.
- B. Type of Sleeves
1. Install sheet-metal sleeves at walls and partitions.
 2. Install schedule 40 pipe sleeves in concrete slabs.
 3. Install mechanical sleeve seals at exterior penetrations; below grade, and at slabs-on-grade.
- C. Mechanical Sleeve Seals: Install in accordance with the manufacture's instructions.
- 3.5 PIPING EXPANSION PROVISIONS
- A. General: Install domestic hot water piping with at least four elbows or tees at following locations.
1. Between piping mains and risers.
 2. Between equipment and pump or tank.
 3. Between piping main and equipment.
- B. Expansion Loops: Fabricate expansion loops as indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Provide pipe anchor and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.
1. At Contractor's option, pipe anchors may be insulated lugged anchors; Pipe Shields, Inc.; Model #C4000 Series. Comply with requirements for insulated pipe supports in Section 22 05 29.
 2. At Contractor's option, pipe guides may be guided insulated pipe supports; Pipe Shields, Inc.; Model #B3000 or B7000 Series. Comply with requirements for insulated pipe supports in Section 22 05 29.
- 3.6 INSTALLATION OF EQUIPMENT AND DEVICES
- A. Install all equipment in accord with manufacturer's recommendations and in accordance with the equipment's listing (if applicable).
- B. Access



1. Install all equipment and devices to permit easy access for maintenance.
 2. Maintain easy access to all equipment and devices installed as part of Division 22 Work, including but not limited to, motors, drives, valves, actuators, etc.
 3. Proper access shall include:
 - a. Valves may be operated.
 - b. Control devices may be adjusted.
 - c. Equipment access panels may be opened.
 - d. Normal maintenance work such as lubrication of bearings, etc., may be performed readily within arm's reach of access opening.
 4. Relocate items which interfere with access.
 5. When possible, install Work in accessible locations to avoid the need for access panels.
 6. Provide access panels in ceilings, partitions, enclosures, etc. as required in order to achieve easy access to all equipment and devices provided or installed under Division 22 Work. Many access panel locations may be indicated on the Drawings. Provide additional access panels as required.
 - a. For non-security walls, partitions, ceilings, enclosures, etc.: Provide non-security access panels as Work of Division 22.
 - b. For security walls, partitions, ceilings, enclosures, etc.: Provide security access panels as Work of Division 22.
 7. Coordinate with the Owner's Representative to achieve acceptable locations of access panels.
 8. Coordinate all access panel locations with other trades and the Contractor.
 9. Where possible, avoid locating access panels in secure areas.
 10. Provide stainless steel access panels in areas subject to moisture.
- C. Provide all necessary anchoring devices and supports.
1. Use structural supports suitable for equipment, or as indicated.
 2. Check loadings and dimensions of equipment with shop drawings.
 3. Do not cut or weld to building structural members, unless specifically indicated.
 4. Provide all required equipment supports, including those not detailed on architectural and mechanical Drawings.
 5. Comply with Section 22 05 29.
- D. Verify that equipment will fit support layouts indicated.
1. Where substitute equipment is used, revise indicated supports to fit, at no additional cost to the Owner.
- E. Coordinate size and location of roof penetrations, floor penetrations, and wall openings with Work of other Sections.
- F. Install rain hoods and metal counter flashings as indicated and as required to make all penetrations of plumbing work through walls and roofs, water and weather-tight. Furnish all clamps, waterproofing material and labor necessary.
- G. Install floor mounted equipment on 6-inch high concrete pad, 6 inches larger on each side than base of unit, unless otherwise specified, indicated, or equipment manufacturer's recommendation calls for. Coordinate size and location of equipment pads and curbs with Work of other Sections.



- H. In Mechanical Rooms, Mechanical Areas, Fan Rooms, etc., coordinate locations of floor drains, floor sinks, etc. with locations of equipment and housekeeping pads. Locate drains to properly serve equipment and to result in orderly routing of drain piping, while minimizing tripping hazards, etc.
- I. In areas other than mechanical rooms, do not install piping, or equipment in exposed manner unless indicated otherwise.

3.7 ADJUSTING AND CLEANING OF VALVES

- A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- C. Valve Identification: Tag each valve in accordance with Section 22 05 53.

3.8 ADJUSTING AND CLEANING OF PIPING SPECIALTIES

- A. Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.
- B. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

3.9 EQUIPMENT VIBRATION

- A. Mechanical Balance: Pumps, motors, and drives, when equipment is installed and in normal operation, shall be within the following maximum limits, unless specified more restrictively for individual equipment items:
 - 1. 600 RPM and Less: 0.003-inch displacement, peak-to-peak.
 - 2. Over 600 RPM: 0.10-inch per second velocity, peak.
- B. Pulley Run-Out: When equipment is installed and in normal operation, pulley run-out in radial and axial directions not to exceed 0.001 inches.
- C. Field Tests: If requested, test equipment to determine compliance with specified requirements. Measure vibration displacement and velocity in vertical direction relative to floor. Make measurements on bearing housings (not end caps), or other heavy structural element directly connected to bearing housing, at each end of equipment.
- D. Field Balancing: Balance and retest equipment as required for compliance with specified requirements.

3.10 CLEANING, FLUSHING, INSPECTING

- A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush clean interior of piping. Upon completion of flushing, completely drain systems at low points; remove, clean and replace



strainer baskets and refill systems. Inspect each run of each system for completion of joints, supports and accessory items.

1. Inspect pressure piping in accordance with procedures of ASME B31.1.

END OF SECTION 22 05 00



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SECTION 22 05 10 - BASIC PIPING INSTALLATION REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements to furnish and install site piping.
 - 2. Special tools.
 - 3. Tape wrap.
 - 4. Coal Tar Epoxy Coating.
 - 5. Heat Shrink Wrap.
 - 6. Pipe locating wire.
 - 7. Closure sections.
 - 8. Joint lubricant.
 - 9. Feeler gauge.
 - 10. Couplings.

1.2 REFERENCES

- A. ANSI/NSF 60 - Standard for Drinking Water Treatment and Chemicals - Health Effects.
- B. AWWA/ANSI C104/A21.4-90 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- C. AWWA/ANSI C110/A21.10-87 - Ductile-Iron and Gray-Iron Fittings for Water.
- D. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch (100 mm through 300 mm) for Water Transmission and Distribution.
- E. AWWA C210 - Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
- F. AWWA C651 - Disinfecting Water Mains.
- G. NFPA 25 - Standards for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

1.3 DESCRIPTION

- A. Provide all materials as required that will result, upon completion, in a functioning system in compliance with performance requirements specified, and any modifications resulting from reviewed shop and field coordination drawings.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Group shop drawings and product data of related systems, products, and accessories in a single complete submittal.



- C. Submit complete data on pipe, fittings, linings, coatings, and any manufacturer's installation instructions for pipelines assembled in the field from standard pieces.
- D. Prior to fabricating, purchase, or laying of any onsite pipe, or conduit, submit an electronic three-dimensional CAD (Land Desktop 2004) formatted coordination model of all existing and proposed underground pipe and conduit routings showing how contractor will route pressure pipelines and electrical conduits above or below gravity sewers and storm drain pipeline. Pipes and conduits shall be modeled to scale as three-dimensional surfaces, color-coded or otherwise identified as to type of utility. Utilities shall be placed in the model to true horizontal and vertical scale using project datum and layout coordinates. Contractor will be provided a DXF conversion of three-dimensional finish contour grading, and a two-dimensional line string model of site utilities as shown on the drawings. Line string DXF model has no diameter associated with individual utilities and contractor is to verify horizontal and vertical point of connection with individual buildings. Submit Certification of Compliance that utilities will be installed in accordance with approved utility coordination model unless otherwise directed. Maintain correct as-built conditions on coordination model. Submit as-built copy of model to Owner's Representative prior to project closeout.
- E. Color, DVD, log sheets and written report detailing CCTV inspection of gravity pipelines.

1.5 REGULATORY REQUIREMENTS

- A. Fire Protection: Conform to National Fire Protection Association.
- B. Plumbing: Conform to 2018 UPC with California Amendments, 2017 California Plumbing Code.
- C. Mechanical: Conform to 2018 UMC with California Amendments, 2019 California Mechanical Code.
- D. Seismic: Conform to Chapter 23 of CCR Title 24.
- E. Structural: Conform to 2018 IBC with California Amendments, 2019 California Building Code.
- F. Electrical: Conform to 2017 NEC with California Amendments, 2019 California Electrical Code.
- G. Fire: Conform to 2018 IFC with California Amendments, 2019 California Fire Code.

1.6 PROJECT/SITE CONDITIONS

- A. Install work at locations shown on Drawings. If prevented by project conditions, prepare drawings showing proposed rearrangement of work. Include changes to Work specified in other sections. Obtain permission of Owner's Representative before proceeding with rearrangement.
- B. Examine related work and surface before starting work on any section
 - 1. Report to Owner's Representative, in writing, conditions which will prevent proper provision of this work.



2. Beginning work of any section without reporting unsuitable conditions to Owner's Representative constitutes acceptance of conditions.
3. Cause as little interference or interruption of existing utilities and services as possible. Notify Owner's Representative of any interruption.
4. Keep roads clear of materials and debris.

1.7 PRODUCT STORAGE AND PROTECTION

A. Storage

1. Exercise care in handling and storing of materials and equipment to avoid damage.
2. Store materials and equipment onsite in enclosures or under protective coverings.
3. Do not store materials and equipment directly on the ground.
4. Store equipment containing electrical motors, controls, and wiring in indoor, heated, clean, dry locations.

B. Protection

1. Protect all work and materials and equipment against loss or damage.
2. Close all pipe openings with caps or plugs.
3. Clean and deliver all work and equipment in an unblemished, new conditions.

1.8 FIELD QUALITY CONTROL

A. Repair or replace defective or damaged work, as directed by Owner's Representative.

B. Perform indicated tests to demonstrate satisfactory workmanship, operation, and performance.

1. Conduct tests in presence of Owner's Representative and, if requested, inspectors of agencies having jurisdiction, including local State Fire Marshall Representative.
2. Arrange date of tests in advance with Owner's Representative, manufacturer, and installer.
3. Give all inspectors minimum of 48 hours notice.
4. Furnish or arrange for use of electrical energy, steam, water, air, oxygen, or gas required for tests.

C. Repair or replace equipment and systems damaged, found inoperative, or defective, and continue remedial measures and retests until satisfactory results are obtained.

1.9 DRAWINGS

A. Drawings in general are diagrammatic and indicate sizes and locations only. Detailed connections to equipment and methods of installation for a complete installation are not shown.

B. Scaled dimensions shall be considered approximate.

C. Before proceeding with work check and verify dimensions required for a complete operating system.

1.10 REVIEW OF CONSTRUCTION

A. Work may be reviewed at any time by Owner's Representative.



- B. Advise Owner's Representative that work is ready for review at following times
 - 1. Prior to backfilling buried work.
 - 2. Prior to concealment of work in walls and above ceilings.
 - 3. When all requirements of contract have been completed.
 - C. Neither backfill nor conceal work without consent of Owner's Representative.
- 1.11 AS-BUILT DRAWINGS
- A. Contractor to maintain current As-Built Drawings and provide same to Owner's Representative at close of construction.
 - B. Include all change orders, field changes, adjustments, substitutions and deletions.
 - C. Show sizes, invert elevations, and location of underground piping and related work.
- 1.12 POINT OF MANUFACTURE
- A. Owner's Representative shall have free access to those parts of the manufacturer's plant that are involved in work performed under this Specification. The manufacturer shall afford the inspector, without charge, all reasonable facilities for determining whether the pipe or appurtenances meet the requirements of this Specification.
 - B. Inspection by Owner's Representative shall not relieve contractor of responsibility to furnish material conforming in all respects to the requirements of this specification.
 - C. If plant inspection and/or testing is requested by Owner's Representative, manufacturer shall notify Owner's Representative at least 72 hours in advance of date, time, and place of product testing.

PART 2 PRODUCTS

2.1 SPECIAL TOOLS

- A. Furnish to Owner's Representative at completion of work:
 - 1. One set of any special tools required to operate, adjust, dismantle, or repair equipment furnished under any section of this Division.
 - 2. "Special Tools": Those not normally found in possession of mechanics or maintenance personnel.

2.2 TAPE WRAP

- A. Tape Wrap: 15 mil, butyl rubber adhesive, polyethylene-backed tape as produced by Polyken Division of the Kendall Company, Boston, MA; Royston Laboratories, Inc., Pittsburg, PA.

2.3 COAL TAR EPOXY COATING

- A. Coal Tar Epoxy Coating for Protection of Metal: Self-priming coal tar; Tnemec 46N-413, Carboline 300M, Ameron 78HB.



2.4 HEAT SHRINK WRAP

- A. Heat Shrink Wrap Pipe Joints: Use Raychem or Canuso of appropriate size and shape for flexible couplings and flange joints.

2.5 PIPE LOCATING WIRE AND MARKER

- A. Pipe Locating Wire: Bare AWG No. 10, soft drawn, single-strand copper wire.
- B. Provide at least six mil PVC electrical tape insulation around wire where adjacent to metal pipe, valves, and in all valve boxes.
- C. Pipe marker shall be internal with locating wire color coded for use with different utility pipe systems, and marked with the utility tape every 24 inches. Provide 4 mil thick, 4-inch wide polyethylene marker.

2.6 CLOSURE SECTIONS

- A. Furnish and install all necessary closures. Closure sections shall consist of one or more flexible couplings and plain-end pipe of lengths required to effect the closure. Pipe and couplings for closure sections shall conform to the pipe and flexible couplings specified for the principal parts of the pipeline.

2.7 JOINT LUBRICANT

- A. Furnish joint lubricant with the pipes as recommended by the pipe manufacturer.
- B. Lubricant for Water Pipes: Water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopeia No. P39.

2.8 FEELER GAUGE

- A. Furnish sufficient feeler gauges of the proper size, type, and shape for checking the rubber gaskets.

2.9 FLEXIBLE COUPLINGS

- A. Flexible Couplings for Use With Steel Pipe: Dresser, Style 38; Smith Blair, Style 411. Use transition coupling for connecting steel pipe to PVC pipe, material shall be equal to couplings used for steel pipe, Protecting coat couplings.
- B. Flexible Couplings for Use With Ductile Iron Pipe or PVC With Ductile Iron Pipe Sizes: Dresser, Style 38, 40, or 138; Smith Blair, Style 411 or 431. Protecting coat couplings.
- C. Bolts and Nuts for Exposed Conditions: Zinc-coated. Bolts, nuts and washers for buried service shall be Type 304 stainless steel.
- D. Middle rings and followers shall be fusion epoxy lined and coated.



2.10 TRANSITION COUPLINGS

- A. Transition couplings used to connect pipes with small differences in outside diameter shall be Dresser, Style 162; Smith Blair, Style 413 Protecting coat couplings.
- B. Bolts, nuts, and middle rings shall be as specified for flexible couplings.
- C. Middle rings and followers shall be fusion epoxy lined and coated (System 29, Section 09 96 00).

2.11 THRUST TIES

- A. Provide thrust ties where shown and where required to restrain the force developed by 1 1/2 times the operating pressures specified.
 - 1. Ductile Iron Pipe: Attach with socket clamps against a grooved joint coupling or flange.
- B. Anchor studs perpendicular to longitudinal pipe axis are unacceptable.
- C. Use type 304 stainless steel ties and hardware.

2.12 SERVICE SADDLES

- A. Service Saddles: Smith Blair, Series 317; Romac, Model 202S. Service saddles shall be capable of withstanding 200 psi internal pressure without leakage or overstressing. The run diameter shall be compatible with the outside diameter of the pipe on which the saddle is installed. Taps shall have iron pipe threads. Saddles shall have malleable or ductile iron bodies and stainless steel straps, stainless steel hex nuts with washers, and neoprene seals. Service saddles shall be double-strap or wide band design. Saddles for PVC pipe shall be specifically designed for PVC pipe. Service saddles for use on PVC pipe shall provide full support around the circumference of the pipe. The saddle shall have a bearing area of sufficient width along the axis of the pipe so that the pipe will not be distorted when the saddle is tightened. The service clamps shall not have lugs or other protrusions that will dig into the pipe when the saddle is tightened, a U-bolt type of strap that does not provide sufficient bearing area or a clamping arrangement that is not fully contoured to the outside diameter of the pipe. Saddles shall have a wedge or taper type gasket for a watertight installation.

2.13 FLANGED COUPLING ADAPTERS

- A. Flanged coupling adapters for ductile iron piping shall be Smith Blair, Series 912; Dresser, Style 127.
- B. Bolts, nuts, and protective coatings for steel components shall be as specified hereinbefore for flexible couplings.
- C. Middle rings and followers shall be fusion epoxy lined and coated.

2.14 SLAB, FLOOR, ROOF, AND WALL PENETRATIONS

- A. General: Provide ductile iron wall pipe with thrust collar unless otherwise specified or shown.
- B. Ductile Iron Wall Pipe



1. For penetrations through concrete walls.
 2. Diameter and Ends: Same as connecting ductile iron pipe.
 3. Thickness: Equal to or greater than remainder of pipe in line, pressure rating - 150 psi minimum.
 4. Fittings: In accordance with the applicable Detail Piping Specification.
 5. Provide taps for stud bolts in flanges set flush with wall face.
 6. Thrust Collars
 - a. Provide for all wall pipes.
 - b. Rated for thrust load developed at 250 psi.
 - c. Safety Factor: Minimum of two.
 - d. Material and Construction
 - 1) Ductile iron or cast iron, cast integral with wall pipe wherever possible.
 - 2) Fabricate by welded attachment of ductile iron thrust collar to pipe where casting impossible.
 - a) Perform in pipe manufacturer's shop by qualified welders as specified herein.
 - b) Welds: Electric arc welds of ductile iron with NI-55 or FC-55, nickel-iron-carbon weld rod.
 - c) Continuously weld on each side all around.
- C. Pipe Sleeves
1. Fabricate of 3/16 inch minimum thickness steel pipe.
 2. Abovegrade in Nonsubmerged Areas: Hot-dip galvanized after fabrication.
 3. Belowgrade or in Submerged or Damp Environments: Lined and coated after fabrication with System No. 2 as specified in Section 109 96 00 - High Performance.
 4. Seep Ring
 - a. Provide 3/16 inch minimum thickness center flange for water stoppage on sleeves in exterior or water-bearing walls.
 - b. Outside Diameter: Three inches greater than wall pipe outside diameter.
 - c. Continuously fillet weld on each side all around.
 5. Existing Walls: Holes drilled with a rotary drill may be provided in lieu of sleeves.
- D. Modular Mechanical Seal
1. Provide for existing wall penetrations by pipe sleeve.
 2. Type: Interconnected synthetic rubber links shaped and sized to continuously fill annular space between pipe and wall sleeve opening.
 3. Assemble interconnected rubber links with Type 316 stainless steel bolts, nuts, and pressure plates.
 4. Size modular mechanical seals according to manufacturer's instructions for the size of pipes shown to provide a watertight seal between pipe and wall sleeve opening.
- 2.15 STEEL CASING PIPE
- A. Smooth steel pipe fabricated in sections for welded field joints.
 - B. Conform to AWWA C200.
 - C. Size and thickness as shown on Drawings or required by Owner's Representatives.
 - D. Interior and exterior coating - Coal tar epoxy conforming to AWWA C210 20 mils total dry film thickness applied in two or more coats.



PART 3 EXECUTION

3.1 INSERTS, SLEEVES, AND EXPANSION PLUGS

- A. Lay out work in advance of pouring concrete slabs or walls, and furnish and set inserts and sleeves necessary to complete the work.
- B. Size inserts and required reinforcing rod to support the load applied.
- C. Expansion plugs shall be selected for at least five times the load applied.

3.2 PREPARATION AND HANDLING

- A. Pipe and fittings shall be inspected for dirt, damage, or defects prior to being installed or lowered into the trench. The interior and exterior protective coating shall be inspected, and all damaged areas patched with material similar to the original whole sections or replaced with new undamaged pipe. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installing.
- B. Use proper implements, tools, and facilities for the safe and proper protection of the pipe. Handle pipe in a manner which avoids damage to the pipe. Do not drop or dump pipe onto the ground or into trenches.
- C. When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer and approved by the Owner's Representative.

3.3 INSTALLATION OF EXPOSED PIPING

- A. Unless shown otherwise, piping shall be parallel to building lines. Hangers on adjacent piping shall be aligned where possible on common size ranges.
- B. All pipe flanges shall be set level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. Boltholes in all flanges shall straddle vertical centerline of pipes.
- C. Unions shall be installed where required for piping or equipment installation, even though they are not shown on the drawings.
- D. Plastic flanges at any joint with a raised face shall be bolted up using a filler gasket. The filler gasket shall bear the bolt load uniformly and remove the flange moment from that part of the flange protruding beyond the outer edge of the raised face.
- E. Pipe taps to the pipe barrel are unacceptable. Pipe tap connections to ductile iron piping shall only be made at a tapping boss of a fitting, valve body, or equipment casting.
- F. Piping shall be installed without springing or forcing the pipe in a manner which would set up stresses in the pipe, valves, or connected equipment.
- G. Required straight runs of piping upstream and downstream of flow measuring devices shall be smooth.



- H. Where valve handwheels are shown, valve orientation shall be as shown. Where valve handwheels are not shown, valves shall be oriented to permit easy access to the handwheels, and to avoid interferences.

3.4 VENTS AND DRAINS

- A. Vent the high points and drain the low points of all pressure pipelines, except gravity flow services, whether shown on the Drawings or not. Unless otherwise shown or directed, use 3/4-inch ball valves on pipelines 2-1/2 inch and larger and 1/2-inch ball valves on pipelines two inches and smaller.

3.5 INSULATED JOINTS

- A. Install insulated joints between all connections of metallic pipe with dielectric coatings and metallic pipe with cement-mortar coatings.
- B. Insulating joints shall be installed between copper pipe and any other metallic pipe.
- C. Insulated joints shall be installed between ductile iron and any other type of metallic pipe or any existing ductile iron pipe unless otherwise shown. Insulated joints are not required between metallic pipe and nonmetallic pipe.
- D. Do not insulate joints between steel pipe and iron valves or other appurtenances or vice versa.
- E. Insulated joints may consist of flanges, flexible couplings, insulating unions, or other type of joints as specified in these specifications, unless otherwise shown or directed.
- F. Cover and protect insulated joint during painting of aboveground adjacent piping to prevent short circuiting.
- G. Install insulated joints at all connections of pipes with cathodic protection to equipment and buildings.

3.6 CORROSION PROTECTION OF ATMOSPHERIC EXPOSED ACCESSORIES

- A. All atmospheric exposed surfaces of black and hot-dip galvanized steel, brass, copper and bronze piping components including, but not limited to, pipe hangers, supports, expansion joints, pipe guides, flexible couplings, vent and drain valves, and fasteners shall be painted in accordance with Section 09 96 00.
- B. Pipe support systems shall be painted No. 70, light gray, as specified in ANSI Z53.1; Tnemec Co., Inc. No. 2050.

3.7 HEAT SHRINK WRAP

- A. Apply in accordance with manufacturer's instructions to surfaces that are cleaned, prepared, and primed.



3.8 WALL PIPES AND PIPE SLEEVES

- A. Wall pipes and pipe sleeves embedded in concrete walls, floors, and on slabs shall be embedded as specified in Section 03 30 00 and as shown. Support all pipes embedded in concrete walls, floors, and slabs with formwork to prevent contact with the reinforcing steel.

3.9 INSTALLATION OF FLEXIBLE COUPLINGS, FLANGED COUPLINGS ADAPTERS, GROOVED JOINT COUPLINGS, AND SERVICE SADDLES

- A. Clean oil, scale, rust, and dirt from the pipe to provide a clean seat for the gasket. Care shall be taken that the gaskets are wiped clean before they are installed. Flexible couplings and flanged coupling adapter gaskets may be lubricated with soapy water or manufacturer's standard lubricant before installation on the pipe ends. Install in accordance with the manufacturer's recommendations. Bolts shall be tightened progressively on opposite sides a little at a time until all bolts have a uniform tightness. Use torque-limiting wrenches.

3.10 PIPING SYSTEMS TESTING

A. General

1. Prior to acceptance of work, test piping systems in the presence of the Owner's Representative and authorities having jurisdiction per respective and applicable governing codes and requirements of this section. All water piping shall be tested prior to backfilling per NFPA and the State Fire Marshall requirements.
2. Provide necessary equipment and materials and make necessary test connections required to properly execute tests.
3. Use only potable water for hydrostatic testing of potable water lines.
4. Contractor may use [Site Name] water system as source for test water. Submit plan to protect water system from contamination prior to use.
5. Remake leaking gasket joints with new gaskets and new flange bolting. Destroy old bolting. Where welded joints fail, submit proposed method of repair for approval by the Owner's Representative. Testing shall take place during steady state ambient temperature conditions.
6. Other than standard piping flanges, plugs, caps and valves, use only commercially manufactured expandable elastomer plugs for sealing off piping for test purposes. The safe test pressure rating of any plug shall be not less than two times the actual test pressure being applied. Do not use expandable elastomer plugs for piping which could develop sufficient reactive force to cause damage to a structure, other piping, or cause moving of thrust or anchor provisions in case of blow-out.
7. Remove components from piping systems during testing whenever the component may sustain damage from the test pressure or test media. After completion of the test, reinstall the component and retest at the component pressure rating with suitable media.
8. Check system components such as valves for functional operation under system test pressure.
9. Duration of test shall be as specified per manufacturer.
10. Prepare and maintain records of piping systems tests. Record Owner's Representative and contractor personal responsibilities, dates, test gauge identification numbers, ambient temperature, pressure ranges, rates of pressure drop and leakage rates.
11. The connections between new underground piping and the existing shall not be separately tested. Pressure specified in governing code shall be maintained on the joint for not less than 30 minutes.



In the event testing demonstrates leakage rates in excess of specified limits, determine source(s) of leakage, repair or replace defective materials and workmanship and retest installation until compliance with specified requirements.

12. Take necessary precautions to vent the expansion force of compressed air trapped during high pressure hydrostatic pressure testing to preclude injury and damage. The Owner's Representative may require the removal of any system component including plugs and caps to ascertain whether the water has reached all parts of the system if purging or vent valves are not provided during construction.

B. Preparation and Execution

1. Buried Pressure Piping: Conduct final acceptance tests on buried pressure piping that is to be hydrostatically tested after the trench has been completely backfilled, except water piping shall be tested prior to backfilling. The contractor may, if field conditions permit, partially backfill the trench and leave the joints open for inspection and conduct an initial test, except water pipe tests.

C. Hydrostatic Leak Tests

1. Equipment: Furnish two graduated containers; two pressure gauges; one hydraulic force pump, and suitable hose and suction pipe as required.
2. Buried Water Fire Suppression Water Piping.
 - a. Water piping shall be tested in accordance with NFPA.
 - b. Where any section of pipe is provided with concrete thrust blocking, do not make the pressure test until at least five days have elapsed after the thrust blocking is installed. If high-early-strength concrete is used for thrust blocking, the time may be reduced to two days. When testing cement-mortar lined piping, slowly fill the section of pipe to be tested with water and allow to stand for 24 hours under slight pressure to allow the cement-mortar lining to absorb water.
 - c. Expel all air from the piping system prior to testing and apply and maintain the specified test pressure by means of the hydraulic force pump. Valve off the piping system when the test pressure is reached and conduct the pressure test for two hours, reopening the isolation valve only as necessary to restore the test pressure. The pump suction shall be in a barrel or similar device, or metered so that the amount of water required to maintain the test pressure may be measured accurately. This measurement represents the leakage, which is defined as the quantity of water necessary to maintain the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula.
 - 1) $L = SD(P)^2 / 133,200$
 - 2) In the above formula
 - 3) L=Allowable leakage, in gallons per hour
 - 4) S=Length of pipe tested, in feet
 - 5) D=Nominal diameter of pipe, in inches
 - 6) P=Test pressure during the leakage test, in pounds per square inch
 - d. Correct any leakage greater than the allowance determined under this formula.
 - e. Maximum test length shall be the shortest length that can be isolated by closing adjacent valves or the length between a valve and an end cap.

D. Gravity Sewers: Gravity sewers shall be air tested as follows:



Time of Testing: Test pipe after backfilling has been completed. The Contractor, at his option and expense, may make other earlier tests to ensure compliance with the tests specified herein.

1. Procedure

- a. After all plugs are in place and securely blocked, introduce air slowly into the pipe section to be tested until the internal air pressure reaches 5.0 pounds per square inch. Allow a minimum of two minutes for the air temperature to stabilize.
- b. Pipe and joints being air tested shall be considered satisfactory when tested at an average pressure of 3.0 pounds per square inch when (1) the total rate of air loss from the section being tested does not exceed 2.0 cubic feet per minute, or (2) the section of lines does not lose air at a rate greater than 0.0030 cubic foot per minute per square foot of internal pipe surface.

3.11 INTERIM CLEANING

- A. Care shall be exercised during fabrication to prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, etc., within piping sections. All piping shall be examined to assure removal of these and other foreign objects prior to assembly. Shop cleaning may employ any conventional commercial cleaning method if it does not corrode, deform, swell, or otherwise alter the physical properties of the material being cleaned.

3.12 FLUSHING

- A. Following assembly and testing and prior to final acceptance, all potable water pipelines installed under this section shall be flushed with water and all accumulated construction debris and other foreign matter removed. Use only potable water for flushing potable water pipelines. Flushing velocities shall be a minimum of 2.5-feet per second. Cone strainers shall be inserted in the connections to attached equipment and left there until cleaning has been accomplished to the satisfaction of the Owner's Representative. Accumulated debris shall be removed through drains two inches and larger or by dropping spools and valves.

3.13 CORROSION PROTECTION FOR BURIED, SUBMERGED, AND CONCRETE-ENCASED PIPE

- A. All ductile iron pipe shall be cement-lined in accordance with ANSI A21.4/AWWA C104, except where otherwise noted.
- B. Coat cast and ductile iron pipe and fittings.
 1. Coat with coal-tar epoxy per AWWA C210 and manufacturer's recommendations. Provide two coats minimum. Minimum DFT 20 mils.
 2. All abraded areas of coal-tar epoxy coatings shall be cleaned and repaired to provide a protective covering equal to the original and acceptable to the Owner's Representative.
- C. Buried ductile iron piping shall be installed with polyethylene bagging in accordance with ANSI/AWWA C105/A21.5-88. Installation shall be in accordance with Methods A and C of the indicated standard.
- D. Tape Wrap - Steel and Other Metal Pipe
 1. Field apply tape wrap on appurtenances and short lengths of buried metallic piping not otherwise protected. Apply in accordance with manufacturer's instructions.



2. Clean pipe and appurtenances with power brushes to remove rust, scale, or other material. Grind or file smooth any sharp burrs that will damage the wrap and solvent clean to remove oils and greases. Apply primer and spiral wrap with a 50 percent overlap to form a double layer. Apply with enough tension to make wrap conform to the surface without wrinkles, but do not stretch excessively. Roll or press the overlap seams to ensure complete bonding.
- E. Heat shrink wrap flange and flexible pipe joints per manufacturer's recommendations.

3.14 DISINFECTION

- A. Pipelines intended to carry potable water shall be disinfected before placing in service. Disinfecting procedures shall conform to AWWA C651-86 and ANSI/NSF 60, as hereinafter modified or expanded.
1. Complete flushing before disinfecting.
 2. Disinfecting Mixture
 - a. Disinfecting mixture shall be a chlorine-water solution having a free chlorine residual of 40 to 50 ppm. Prepare disinfecting mixture by injecting: (1) a liquid chlorine gas-water mixture; (2) dry chlorine gas; or (3) a calcium or sodium hypochlorite and water mixture into the pipeline at a measured rate while fresh water is allowed to flow through the pipeline. The combined mixture of fresh water and chlorine solution or gas shall be of the specified strength.
 - b. Apply disinfecting mixture by means of a standard commercial solution feed chlorinating device. Dry chlorine gas shall be fed through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas or the gas itself must provide means for preventing the backflow of water into the chlorine cylinder.
 - c. If the calcium hypochlorite procedure is used, first mix the dry powder with water to make a thick paste, then thin to approximately a one percent solution (10,000 ppm chlorine). If the sodium hypochlorite procedure is used, dilute the liquid with water to obtain a one percent solution. The following proportions of hypochlorite to water will be required.

<u>Product</u>	<u>Quantity</u>	<u>Water</u>
Calcium Hypochlorite ^a (65 - 70 percent C1)	1 pound	7.5 gallon
Sodium Hypochlorite ^b (5.25 percent C1)	1 gallon	4.25 gallon

^aComparable to commercial products known as HTH, Perchloron, and Pittchlor.

^bKnown as liquid laundry bleach, Clorox, Purex, etc.

3. Point of application: Inject disinfecting mixture into the pipeline to be treated at the beginning of the line through a valve and a suitable connection to the top of the pipeline. Clean water from the existing system or another source shall be controlled so as to flow slowly into the newly installed piping during the application of chlorine. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Use check valves if necessary.



4. Retention Period
 - a. Treated water shall be retained in the pipeline long enough to destroy all nonspore-forming bacteria. With proper flushing and the specified solution strength, 24 hours is adequate. At the end of the retention period, the disinfecting mixture shall have a strength of at least 10 ppm of chlorine.
 - b. Operate all valves, hydrants, and other appurtenances during disinfection to assure that the disinfecting mixture is dispersed into all parts of the line, including dead ends, new services, and similar areas that otherwise may not receive the disinfecting solution.
 - c. Do not place concentrated quantities of commercial disinfectant in the line before it is filled with water.
 - d. After chlorination, flush the water from the pipeline until the water through the line is equal chemically and bacteriologically to the permanent source of supply.
5. Dispose of disinfecting water in an acceptable manner that will protect receiving waters from harmful or toxic concentrations of chlorine. The disinfecting water shall be retained onsite in open detention basins or other methods approved by the Owner's Representative.

3.15 VALVES

- A. Install valves in accordance with the manufacturer's recommendations. Operating stems shall be vertical unless otherwise indicated or approved by Owner's Representative.

3.16 LOCATING WIRE AND MARKER TAPE

- A. Pipe locating wire shall be provided for the entire length of all pressure pipelines except for metallic piping.
- B. Install locating wire by strapping to the pipe or tubing with PVC tape, polyethylene backed tape, or tie locks. Test pipe locating wire with pipe locator equipment prior to final acceptance of pipeline.
- C. Stub the locating wire up inside each valve box. Sufficient excess length shall be provided at terminal connections to allow continuation of locating wire to the terminal connection.
- D. Wire splices shall be made with compression fittings or soldering; wrapped with Tac-Tape, Aqua-Seal; and wrapped with electrical tape. Prevent bare copper wire from contacting metallic appurtenances including, but not limited to, pipe, buried valves, or fittings.

END OF SECTION 22 05 10



SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Gate valves.
 - 2. Globe valves.
 - 3. Ball valves.
 - 4. Butterfly Valves.
 - 5. Angle Valves.
 - 6. Swing Check Valves.
 - 7. Strainers.
 - 8. Drain valves.
 - 9. Non-Lubricated Plug Valves.
 - 10. Lubricated Plug Valves.
 - 11. Self-Contained Automatic Valves.
 - 12. Valve Operators.
 - 13. Accessories

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Piping, Below Ground: 160 psig.
 - 2. Domestic Water Piping, Above Ground: 125 psig.

1.3 SUBMITTALS

- A. Submit in accordance with Division 1.
- B. Product Data for each valve type. include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application. Include pressure drop curve or chart for each type and size of valve.
- C. Maintenance Data for valves to include in the operating and maintenance manuals as specified in Division 1 for the following:
 - 1. Trap primers.
 - 2. Strainers.
 - 3. Hot water return balancing valve assemblies.
 - 4. Water pressure reducing valves.
 - 5. Temperature and Pressure Relief valves.
 - 6. Gas Pressure Regulators.



- D. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing. Submit spare parts list for each type of valve. Include this data in Maintenance Manual.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Comply with the requirements specified in Division 1.
- B. ASME Compliance: Comply with ASME B31.9, Building Services Piping, for materials and installation.
- C. ASSE Compliance: Comply with ASSE Standards for mixing valve applications.
- D. MSS Compliance: Comply with the various MSS Standard Practice documents as follows:
1. MSS SP-67-2016 - Butterfly valves
 2. MSS SP-70-2016 - Gray Iron Gate Valves, Flanged and Threaded Ends.
 3. MSS SP-71-2016 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 4. MSS SP-78-2016 - Gray Iron Plug Valves, Flanged and Threaded Ends.
 5. MSS SP-80-2016 - Bronze Gate, Globe, Angle, and Check Valves.
 6. MSS SP-85-2016 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
 7. MSS SP-110-2016 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- E. ANSI Compliance:
1. ANSI B16.1-2016 - Gray Iron Pipe Flanges and Flanged Fittings.
 2. ANSI B16.10-2016 - Face-to-Face and End-to-End Dimensions of Valves.
 3. ANSI Z21.22-2016 - Relief Valves for Hot Water Supply Systems.
 4. ANSI Z21.41-2016 - Quick Disconnect Devices for Use with Gas Fuel Appliances.
- F. ASTM Compliance:
1. ASTM A276-2016 - Stainless Steel Bars and Shapes.
 2. ASTM A351-2016 - Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts.
 3. ASTM B61-2016 - Steam or Valve Bronze Castings.
 4. ASTM B62-2016 - Composition Bronze or Ounce Metal Castings.
 5. ASTM B98-2016 - Copper-Silicon Alloy Rod, Bar, and Shapes.
 6. ASTM B127-2016 - Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
 7. ASTM B139-2016 - Phosphor Bronze Rod, Bar, and Shapes.
 8. ASTM B164-2016 (R2008) - Nickel-Copper Alloy Rod, Bar, and Wire.
 9. ASTM B194-2016 - Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
 10. ASTM B584-2016 - Copper Alloy Sand Castings for General Applications.
 11. ASTM D429-2016 (R2003) - Rubber Property - Test for Adhesion to Rigid Substrates.
 12. ASTM D1784-2016 - Rigid PolyVinyl Chloride (PVC) Compounds and Chlorinated PolyVinyl Chloride (CPVC) Compounds.
- G. Valves: Manufacturer's name and pressure rating marked on valve body.
- H. Welding Materials and Procedures: Conform to ASME SEC IX and applicable state regulations.
- I. Welders Certification: In accordance with ASME SEC IX.



- J. NSF Compliance:
 - 1. Comply with NSF/ANSI 61, Drinking Water System Components - Health Effects, for potable domestic water plumbing specialties.
- K. Valve Identification: Comply with MSS SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
- L. Valve Types; Provide valve of 'same type' by 'same manufacturer.'

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set bail and plug valves open to minimize exposure of functional surfaces.
 - 4. Set butterfly valves closed or slightly open.
 - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use handwheels and stems as lifting or rigging points.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Strainers:
 - a. Furnish stainless steel screens of quantity of identical units not less than 10 percent of amount of each type and size installed.
 - 2. Furnish gasket material of quantity of identical units not less than 10 percent of amount of each type and size installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gate Valves:
 - a. Crane.
 - b. Jenkins.
 - c. Lunkenheimer.
 - 2. Globe Valves:
 - a. Crane.
 - b. Jenkins.



- c. Lunkenheimer.
- 3. Ball Valves:
 - a. Kitz Corporation of America.
 - b. Conbraco Industries, Inc.: Apollo Division.
 - c. NIBCO Inc.
- 4. Butterfly Valves:
 - a. Kitz Corporation of America.
 - b. Conbraco Industries, Inc.: Apollo Division.
 - c. NIBCO Inc.
- 5. Angle Valves:
 - a. Crane.
 - b. Jenkins.
 - c. Lunkenheimer.
- 6. Check Valves:
 - a. Kitz Corporation of America.
 - b. NIBCO Inc.
 - c. Stockham Valves & Fittings, Inc.
 - d. Walworth.
- 7. Strainers:
 - a. Kitz Corporation of America.
 - b. Conbraco Industries, Inc.: Apollo Division.
 - c. NIBCO Inc.
- 8. Drain valves:
 - a. Kitz Corporation of America.
 - b. Conbraco Industries, Inc.: Apollo Division.
 - c. NIBCO Inc.
- 9. Plug Valves (Non-Lubricated):
 - a. Kitz Corporation of America.
 - b. Canbraco Industries Inc: Apollo Division
 - c. NIBCO Inc.

2.2 VALVES - BASIC, COMMON FEATURES

- A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, the Contractor shall confirm selection of the valve with the OWNER Representative. Valves shall be of same make for all these services.
- B. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators (If Applicable): Use specified operators and handwheels, except provide the following special operator features:
 - 1. Handwheels: For valves other than quarter turn.
 - 2. Lever Handles: For quarter-turn valves 6 inches and smaller, except for plug valves, which shall have square heads. Furnish Owner with 1 wrench for every 10 plug valves.



3. Chain-wheel Operators: For valves 4 inches and larger, installed 96 inches or higher above finished floor elevation. Furnish and install chain-wheel operators on valves located more than 3 feet above accessible ceiling or access doors with the chain extended to within 6 inches of the ceiling.
 4. Gear-Drive Operators: For quarter-turn valves 8 inches and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. Threads: ASME B16.4 for cast iron and ASME B16.15 for bronze valves
- H. Flanges: ASME B16.24 for bronze valves.
- I. Solder Joint: ANSI/ASME B16.18.
1. Caution: Where soldered end connections are used, use solder having a melting point below 840 degrees F for gate, globe, and check valves; below 421 degrees F for ball valves.
- 2.3 GATE VALVES
- A. Up to and including 2-inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, single wedge threaded ends.
 - B. Over 2-inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged ends.
- 2.4 GLOBE VALVES
- A. Up to and including 2-inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, screwed ends, with back seating capacity repackable under pressure.
 - B. Over 2-inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.
- 2.5 BALL VALVES
- A. Ball Valves, 2-inches and Smaller: MSS SP-110 compliant; ANSI B1.20.1 (threaded end) and ANSI B16.18 (soldered end); Class 150 SWP and 600 psi non-shock CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; machined solid chrome-plated brass ball, full port valves; blowout proof stem design; bronze or brass stem; multi-fill PTFE seats and seals; true adjustable packing; soldered end or threaded connection. (Note: Standard and reduced port and hollow ball design not acceptable). Ball shall be vented to allow relief of any trapped media between body and ball. 1/4-inch through 2-inch valve shall be CSA approved for gas service of 1/2 psi at the appliance, and 5 psi from appliance to the meter.
 1. Operator: Vinyl-covered steel lever handle.
 2. Operator: Lever operators with lock.



3. Stem Extension: For valves installed in insulated piping provide 2 inches extended handle of non-thermal conductive material. Provide protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation
 4. Memory/Balancing Stop: For operator handles.
- B. Ball Valves, 2-1/2 inches through 4 inches: MSS SP-110; ANSI B1.20.1; Class 150 SWP and 600 psi non-shock CWP, ASTM B 283 bronze body and bonnet, 3-piece or 2-piece construction; machined solid chrome-plated brass ball, full port valves; blowout proof stem design; bronze or brass stem; multi-fill PTFE seats and seals; adjustable packing; soldered end or threaded connection. (Note: Standard and reduced port and hollow ball design not acceptable).
1. Operator: Vinyl-covered steel lever handle.
 2. Operator: Lever operators with lock.
 3. Stem Extension: For valves installed in insulated piping provide 2 inch extended handle of non-thermal conductive material. Provide protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation
 4. Memory/Balancing Stop: For operator handles.

2.6 BUTTERFLY VALVES

- A. Butterfly Valves: 4 inches thru 12 inches: MSS SP-67 and API 609, 200 psi CWP, 150 psi maximum pressure differential (except 14 inches through 24 inches which shall be rated at 150 psi), ASTM A536.84 ductile-iron body and bonnet, extended neck, stainless-steel stem, molded-in or bonded-in EPDM or Buna N seat, EPDM or Buna N stem seals, wafer, lug, or grooved style; valve shall be bi-directional and suitable for dead-end service in either direction at the full working pressure of the valve with the downstream flange removed for up to 96 hours.
1. Disc Type: Nickel-plated ductile iron.
 2. Disc Type: Aluminum bronze.
 3. Disc Type: Elastomer-coated ductile iron.
 4. Disc Type: Epoxy-coated ductile iron.
 5. Operator for Sizes 2 inches to 6 inches: Standard lever handle with memory stop.

2.7 ANGLE VALVES

- A. Up to and including 2-Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, screwed ends, with back seating capacity repackable under pressure.
- B. Over 2-Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.8 CHECK VALVES (SWING)

- A. Swing Check Valves, 3 inches and Smaller: MSS SP-80; Class 125, 200psi CWP and Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B62 cast-bronze body and cap, rotating bronze disc with integral seat or composition seat, threaded or soldered end connections:



- B. Swing Check Valves, 3 inches and Larger: MSS SP-71, Class 125, 200psi CWP, ASTM A126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.

2.9 SPRING LOADED CHECK VALVES (SUMP PUMP DISCHARGE)

- A. Up to 2 inches:
 - 1. Class 125, cast bronze. Stainless steel stem, Buna N Disc, Teflon seat ring, beryllium copper spring, screwed ends.
- B. 2-1/2 inches and larger:
 - 1. 125 pounds water or flanged cast iron body, renewable bronze seat and disc, stainless steel spring.

2.10 STRAINERS (Y-TYPE)

- A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64 inch round perforations, unless otherwise indicated.
 - 1. Pressure Rating: 125 psig minimum steam working pressure, unless otherwise indicated.
 - 2. 2 inches and Smaller: Bronze body, with female threaded ends.
 - 3. 2-1/2 inches and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.
 - 4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.
 - a. Drain: Factory installed, hose-end drain valve.
 - 5. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.

2.11 HOT WATER RETURN BALANCING VALVE ASSEMBLY

- A. Hot water return balancing valves shall be a multi-function valve that incorporates an isolation ball valve, a 20-mesh strainer and flow control cartridge in the same body. Valve shall not be replaced by functionally equivalent separate components that increase the material and labor cost of the project. Five (5) year warranty on the valves.

2.12 TRAP PRIMER VALVES

- A. Trap priming of floor drains and floor sinks shall be accomplished in one of the following methods (Comply with plumbing drawings and piping diagrams for type for trap primer specified or depicted):
 - 1. Trap primer elbow (for concealed flush valves).
 - 2. Vacuum breaker trap primer.
 - 3. Automatic trap primer (TP-1).
 - 4. Sink trap primer.
- B. Trap Primer Elbow: Sloan Model VBF-21-A1 or A2 which includes cast brass 1-1/2 inch slip joint elbow; water deflector to control the amount of water diverted from the flush; compression elbow for 3/8 inch tubing to floor drain and two slip joint coupling nuts with gaskets.



- C. Vacuum Breaker Trap Primer: Sloan Model VBF-272-A which includes one-piece, chrome plated flush connection; water deflector to control the amount of water diverted from the flush; 3/8 inch elbow and flex-bend tube connection from vacuum breaker to wall; diverter wall flange and fittings; chrome plated wall flange and fitting to connect 1/2 inch NPT pipe. Model VBF-A1 also includes high back pressure vacuum breaker and one-piece bottom hex coupling nut.
- D. Automatic Trap Primer Valve (TP-1): ASSE 1018, water-supply-fed type, with the following characteristics
 - 1. Trap primer shall be pressure drop activated and be of all brass construction including a brass body with 1/2 inch male NPT inlet and 1/2 inch NPT discharge. Internal components shall consist of a stainless steel debris screen, brass piston and brass discharge jet. Lubricated O-rings shall be EPDM and seal O-rings shall be nitrile. Trap primers shall be installed on domestic cold water pipe of 1-1/2 inch diameter or less and shall be located where they will be subject to frequent pressure drops of at least 10 psi. Working pressure shall be 35 to 75 psi. Provide distribution units as required for more than one drain. Trap primers shall be UPC certified and IAMPO listed.
 - 2. Trap Primer Distribution Units shall be Precision Plumbing Products Model DU-2, DU-3, or DU-4. Distribution units shall consist of a 2 inch diameter copper body with 3/8 inch female NPT brass discharge fittings and 1/2 inch male NPT composite top with nitrile O-ring.
 - 3. Allow 1 foot of drop for every 20 feet of distance from primer to floor drain.
 - 4. Flush system prior to installing trap primers.
 - 5. Cycle primers 6 times to assure proper operation.
- E. Sink Outlet: Zurn Model Z1021 to be used in conjunction with 1-1/4 inch sink outlet.
 - 1. Trap primer, chrome plated polished cast brass body with cleanout, ground joint elbow with 1-1/2 inch NPT outlet, 1-1/2 inch slip nuts and washers, and reducing washer for 1-1/4 inch sink tail piece hookup, escutcheon and rigid polished chrome primer line with 1/2 inch compression fittings.

2.13 DRAIN VALVES

- A. Hose-End Drain Valves: MSS SP-110 compliant; ANSI B1.20.1 (threaded end) and ANSI B16.18 (soldered end); Class 150 SWP and 600 psi non-shock CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; machined solid chrome-plated brass ball, full port valves; blowout proof stem design; bronze or brass stem; multi-fill PTFE seats and seals; adjustable packing; threaded or soldered end connection. (Note: Standard and reduced port and hollow ball design not acceptable).
 - 1. Operator: Vinyl-covered steel fever handle.
 - 2. Operator: Lever operators with lock.
 - 3. Stem Extension: For valves installed in insulated piping provide 2 inches extended handle of non-thermal conductive material. Provide protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation
 - 4. Memory/Balancing Stop: For operator handles.
 - 5. Inlet: Threaded or solder joint.
 - 6. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap.
 - 7. Cap: Die cast brass.
 - 8. Chain: Brass.



2.14 PLUG VALVES (NON-LUBRICATED)

- A. 2½-inches and larger:
 - 1. MSS SP-78, 150 psi, cast iron body and plug, non-lubricated, Teflon packing, flanged ends. Provide lever operator or wrench.\
- B. Use ball valves 2 inches and smaller, comply with Article 2.3.
- C. Use non-lubricated plugs only when shut off valves are also provided.
- D. For below grade polyethylene piping, use thermoplastic plug valves molded from polyethylene resin which conforms to ASTM D1248, Type II, Class B with antioxidants, Category 5, grade P23. Valves shall be plain-end for heat-fusion joining in the pipeline. Valves shall have elastomer seats, plug seals, and ground water seal. Plug shall be retained in body by a plug retainer Valves shall have 2 inch square nut operators.

2.15 PLUG VALVES (LUBRICATED)

- A. Up to and including 2 inches: Semi-steel, tapered plug, screwed gland type, threaded body.
- B. 2-1/2 inches through 4 inches: Semi-steel, 2-bolt cover, tapered plug, flanged body.
- C. 6 inches and Over: Semi-steel, bolted gland type, tapered plug, flanged body.
- D. Operator:
 - 1. Lever operator with memory stop smaller than 6 inches.
 - 2. Gear operator 6 inches and larger.

2.16 VALVE OPERATORS

- A. General
 - 1. Valve operator types describe only general characteristics of operators.
 - 2. Provide operators compatible with valve with which it will be used and of same manufacturer, or product that is recommended by valve manufacturer.
 - 3. Size operator to operate valve for full range of pressures and velocities specified.
 - 4. Valve operators shall open by turning counterclockwise.
- B. Manual Operators
 - 1. General
 - a. Provide manual handwheel operators unless otherwise shown or specified.
 - b. Galvanize and paint ferrous handwheels same color as valve and associated pipeline.
 - c. When maximum force required to operate valve under full operating head exceeds 40 pounds, provide gear reduction operators.
 - d. Gear operators totally enclosed and lubricated.
 - e. Quarter-turn valve operators: self-locking type to prevent disc or plug from creeping and provide with position indicators to show position of valve disc or plug.
 - f. Worm and gear type operators: self-locking worm-gears, one-piece design, of gear bronze material, accurately machine cut. Worm hardened alloy steel, with thread ground and polished.



- g. Geared traveling nut type operators: threaded steel reach rods with internally threaded bronze or ductile iron nut.
- h. Provide safety isolation valves and lockout valves with handles, handwheels, or chain wheels painted "safety yellow." Equip handles to take padlock and wheels, chain and padlock. Isolation valves are valves that shut off source of stored energy (such as compressed air or water pressure) and that, if opened, could endanger safety or life.
- 2. Exposed Operators
 - a. Furnish with geared operators, extension stems, floor stands, and other elements to permit operation from normal operating level.
 - b. Lever type operators: means of being fixed in any given position to prevent accidental movement; rugged, noncorrosive construction; fully compatible with valve.
- 3. Buried Operators
 - a. Provide buried service operators on valves larger than 2½ inches with 2 inch AWWA operating nut.
 - b. Provide buried operators on valves two inches and smaller with cross handle for operation by forked key.
 - c. All moving parts of valve and operators enclosed in housing to prevent contact with soil.
 - d. Design buried service operators for quarter-turn valves to withstand 450 foot-pounds of input torque at FULLY OPEN or FULLY CLOSED positions without damage to valve or operator and grease pack and gasket to withstand submersion in water to 10 psi.
 - e. Install valves with extension stems, as required, and valve boxes.

2.17 ACCESSORIES

- A. Valve Operator Tags
 - 1. Provide valve operator with 1-1/2 inch minimum diameter heavy brass or stainless steel tag.
 - 2. Tag shall bear valve number.
 - 3. Attach tags to operator with key rings so that ring and tag cannot be removed.
 - 4. Numbers and letters block type, 1/4 inch high.
- B. T-Handled Operating Wrenches: Provide two galvanized operating wrenches, four feet long. Provide two galvanized operating keys for cross handled valves.
 - 1. Manufacturers:
 - a. Mueller, Model .
 - b. Clow Corp, Model.
- C. Valve Boxes
 - 1. Provide Buffalo two-piece sliding type, cast iron, with five 1/4 inch shaft valve boxes of appropriate length for installation. Cast word WATER, or SEWAGE into top of lid, as appropriate for service.
 - a. If required, provide extension pieces of manufacturer's standard type.
 - 2. Covers: bolt-down type with Type 304 stainless steel removable screws conforming to Section 05 05 23 - Tamper Proof Metal Fasteners.
 - 3. Complete with all necessary bases and accessories.

March 29, 2021



4. Manufacturers
 - a. Mueller, Model .
 - b. Clow Corp., Model.
 - c. Kennedy Valve, Model.
- D. Extension Stems for Valve Operators
 1. Where depth of valve is such that centerline is more than three feet below grade, provide operating extension stems to bring operating nut six inches below surface of ground and/or box cover.
 2. Construct extension stems of steel, complete with two inch square operating nut.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 APPLICATION

- A. Provide unions on both sides of all valves except valves that have flanged connections. Provide unions at piping connections to all equipment or apparatus unless equipment or apparatus have flanged connections.
- B. Provide brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Provide ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. Note: Ball valves shall be limited to pipe sizes 4 inches and smaller.
- D. Provide ball or butterfly valves for throttling, bypass, or manual flow control services.
- E. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment, for pressure reducing valves as indicated on Drawings.



- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide listed has shutoff valves in natural gas systems for shut-off service.
- H. Provide hot water return balancing valves in domestic hot water recirculating systems where indicated on the Plumbing Drawings and Piping Diagram.
- I. Provide butterfly valve for main domestic water shutoff.
- J. Provide isolation shutoff valves and unions at inlet and outlet sides of all water pressure reducing valves, water/gas solenoid valves and gas pressure regulators.

3.3 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to 1/4 inch/foot, 2 percent, minimum unless indicated otherwise on Drawings. Maintain gradients.
- B. Install piping so that entire system is drainable. Provide drain valves with hose connections at low points.
- C. Connect branch piping to top of mains.

3.4 INSTALLATION

- A. Install valves as indicated, according to manufacturer's written instructions.
- B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.
- C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the center of the pipe.
- F. Install valves in a position to allow full stem movement.
- G. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.

3.5 SOLDERED CONNECTIONS

- A. Cut tube square and to exact lengths.
- B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.
- C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.
- D. Open ball valves to fully open position.



- E. Remove the cap and disc holder of swing check valves having composition discs.
- F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.
- G. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.
- H. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
 - 1. Use soft solders having a maximum melting point of 570 degrees F (299 degrees C).
 - 2. E.G.: 95-5 tin-antimony = 460 degrees F (238 degrees C); 96-4 tin-silver = 430 degrees F (221 degrees C).
- I. Do not use hard solder with a melting point of 840 degrees F (449 degrees C) or higher, because resultant crack on a valve surface may cause fluid leakage.
- J. Prepare copper tubes conforming to ASTM B88, Seamless Copper Water Tubes.
- K. The maximum service pressure and temperature of solder jointed valves are limited by the properties of solder and tube materials. Information on typical solder materials are provided below:

<u>Solders</u>	<u>Max. Temp. Degree F</u>	<u>Maximum Working Pressure</u>					
		<u>Size 1/4~1-inch</u>		<u>Size 1 1/4~2-inch</u>		<u>Size 2 1/2~3-inch</u>	
		<u>MPa</u>	<u>psi</u>	<u>MPa</u>	<u>psi</u>	<u>MPa</u>	<u>psi</u>
95-5 TA	100	3.45	500	2.76	400	2.07	300
(H95 Sb-5A)	150	2.76	400	2.41	350	1.90	275
96-4TA	200	2.07	300	1.72	250	1.38	200
(H96 Ag-3.5A)	250	1.38	200	1.12	175	1.03	150

3.6 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.
- D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.



- E. Do not apply an excessive force when threading pipes into valve bores. It will cause seat deformation and operational difficulty. Adequate threading torques are given below:

Valve Size	1/4~1/2- inch	3/4- inch	1- inch	1¼- inches	1½- inches	2- inches	2½- inches	3~4- inches
Threading Torque (Nm)	20~	39~	49~	59~	69~	78~	108~	127~
	29	49	59	69	78	88	118	137

3.7 FLANGED CONNECTIONS

- A. Align flange surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.
- C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.8 VALVE END SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
1. Copper Tube Size, 2-1/2 inches and Smaller: Solder ends.
 2. Copper Pipe Sizes, 3 inches and Larger: Flanged end.

3.9 APPLICATION SCHEDULE

- A. General Application: Use ball and butterfly valves for shutoff duty; and ball for throttling duty. Comply with the requirements of piping system Specification Sections for specific valve applications and arrangements.
- B. Natural Gas Systems: Use the following valve types:
1. Ball Valves: UL listed / CSA approved for gas service, Class 150, 600 psi.
 2. Plug Valves: Approved for gas service, Class 150 psi.

3.10 PROTECTION AND CLEANING

- A. Clean interior and exterior of valves prior to installation. Remove dirt and debris as work progresses.
- B. Protect valves during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

Place plugs in ends of uncompleted valves at end of day and when work stops.

3.11 STARTUP SERVICES

- A. Before operating systems, perform these steps:
1. Remove all plugs used during testing of piping systems and plugs used for temporary sealing of piping and valves during installation.



2. Open all valves.
 3. Remove and clean all debris from inside and outside of valves.
 4. Replace all strainer screens with new.
- B. Check valves and verify proper settings, adjustments, and operation. Verify drain grates are secure to drain body using detention type screws.
- 3.12 ADJUSTING
- A. Adjust valves and correct deficiencies discovered during startup services.
- 3.13 PLUMBING VALVE SCHEDULES
- A. Provide valves as scheduled on the following "Data Sheets." Each Data Sheet begins with a new page.



BALL VALVE DATA SHEET

Ball Valves: 2 inches and smaller (two-piece):

MANUFACTURER	SOLDER ENDS
Kitz	#69
Conbraco (Apollo)	77-204 thru 208
Nibco	S-585-70
MANUFACTURER	THREADED ENDS
Kitz	#68
Conbraco (Apollo)	77-204 thru 208
Nibco	S-585-70

Ball Valves: 2-1/2 inch (three piece and two piece):

MANUFACTURER	SOLDER ENDS
Kitz	#69
Conbraco (Apollo)	82-209-01
Nibco	S-595Y
MANUFACTURER	THREADED ENDS
Kitz	#68
Conbraco (Apollo)	82-209-01
Nibco	S-595Y

Ball Valves - 3 inch (three piece and two piece)

MANUFACTURER	SOLDER ENDS
Kitz	#69
Conbraco (Apollo)	82-240-01
Nibco	S-585-70
MANUFACTURER	THREADED ENDS
Kitz	#68
Conbraco (Apollo)	82-209-01
Nibco	S-595Y

Ball Valves - 4 inch (three piece and two piece):

MANUFACTURER	SOLDER ENDS
Kitz	#68 (use threaded with C x MIP adapters)
Conbraco (Apollo)	82-24A-01
Nibco	S-585-70
MANUFACTURER	THREADED ENDS
Kitz	#68
Conbraco (Apollo)	82-209-01
Nibco	S-595Y

Comply with Article 2.2 and 2.5 for valve description and accessories.



BUTTERFLY VALVE DATA SHEET

Butterfly Valves: 2 inches and larger.

The following are model numbers for wafer-type, with nickel-plated ductile-iron disc;

MANUFACTURER	LEVER	GEAR
Kitz	5112-E-L	5112-E-G
Conbraco (Apollo)	6X13X-01	6W13X-02
Nibco	WD-20103	WD-20105

The following are model numbers for lug-type, with nickel-plated ductile-iron disc:

MANUFACTURER	LEVER	GEAR
Kitz	6112-E-L	6112-E-G
Conbraco (Apollo)	6L13X-01	6L-13X-02
Nibco	LD-20103	LD-20105

The following are model numbers for wafer--type, with aluminum-bronze disc:

MANUFACTURER	LEVER	GEAR
Kitz	5122-E-L	5112-E-G
Conbraco (Apollo)	6W 14X-01	6VW14X-02
Nibco	WD-20003	WD-20005

The following are model numbers for lug-type, with aluminum-bronze disc:

MANUFACTURER	LEVER	GEAR
Kitz	6122-E-L	6122-E-L
Nibco	LD-2000-3	LD-2000-5
Conbraco	6L14X-01	6W14X-02

Comply with Article 2.6 for valve description and accessories.



SWING CHECK VALVE DATA SHEET

Swing Check Valves - 2 inch and Smaller--

	CLASS125 THREADED ENDS	CLASS 125 SOLDER ENDS	CLASS 150 THREADED ENDS	CLASS 150 SOLDER ENDS
MANUFACTURER				
Kitz	22	23	29	30
Crane	37	1342	137	
Nibco	T-413	S-413	T-433	

Swing Check Valves - 2-1/2 inch and Larger:

MANUFACTURER	CLASS 125	CLASS 175
Kitz	78	x
Crane	373	x
Nibco	F-918	x
Stockham	G-931	G-940

x means not available.

Comply with Article 2.8 for valve description and accessories.



DRAIN VALVE DATA SHEET

Drain Valves:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Kitz	68C	69C
Conbraco (Apollo)	77-101 thru 109	77-204 thru 209
Nibco	T-585-70-HC	S-585-70-HC

Comply with Article 2.13 for valve description and accessories.



STRAINER DATA SHEET

Strainers: 2 inches and smaller.

MANUFACTURER	THREADED ENDS	SOLDERED ENDS
Kitz	#15	#16
Spirax Sarco	BT/TBT	
Mueller	351/352	

Strainers: 2-1/2 inches and 3 inches.

MANUFACTURER	THREADED ENDS	FLANGED ENDS
Kitz	#15 (2-1/2" & 3")	

Strainers: 2 inches through 12 inches.

MANUFACTURER	THREADED ENDS	FLANGED ENDS
Kitz	(see above)	#80
Comply with Article 2.10 for valve description and accessories.		

END OF SECTION 22 05 23



SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Pipe hangers and supports.
 - 2. Vertical piping clamps.
 - 3. Hanger-rod attachments.
 - 4. Building attachments.
 - 5. Pipe shields.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP 90 [-Date], Guidelines on Terminology for Pipe Hangers and Supports.

1.3 SUBMITTALS

- A. Submit in accordance with Division 1.
- B. Shop Drawings: Sealed by a Professional Structural Engineer licensed in the State of California.
 - 1. Support and Bracing Shop Drawings: Submit plans, sections, details, schedules and other information necessary to describe support hangers and bracing for all plumbing systems. Submittal shall indicate location and type of all hangers and supports. Each attachment to the building structure shall have vertical and horizontal point loads identified.
 - 2. Shop drawings for each type of hanger and support, indicating dimensions weights, required clearances, and methods of component assembly.
- C. Calculations: Sealed by a Professional Structural Engineer licensed in the State of California.
 - 1. Prepare design drawings and calculations for support and seismic restraint of piping and equipment.
- D. Product Data
 - 1. Product data for products and materials indicated.
 - 2. Manufacturer's technical bulletins and installation/application instructions.
 - 3. Material Safety Data Sheets (MSDS).
 - 4. Manufacturer's data (catalog cuts and data sheets), for each manufactured component including hangers, attachments, inserts, thermal shields anchors and guides, auxiliary framing and wall seals. Provide a project specific hanger and support schedule indicating all devices, manufacture and model, where used. Cross reference to product data and specification paragraph. Data shall demonstrate that components comply with Specifications.



- E. Maintenance Data: Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual in accordance with requirements of Division 1.
 - F. Certificates
 - 1. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
 - G. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.
 - H. Qualification Data
 - 1. For manufacturer as specified in the "Quality Assurance" Article.
- 1.4 DESIGN REQUIREMENTS
- A. Design and calculations for support and seismic bracing shall be performed under the direct supervision of and sealed by a Professional Structural Engineer licensed in the State of California and experienced in the design of this Work.
 - B. Where not fully called for in the Contract Documents, design of plumbing hangers and supports shall be the plumbing contractor's responsibility. Design shall conform to accepted engineering practice using a safety factor of 2-1/2.
 - C. Vibration Isolation: Comply with the requirements of Section 22 05 48.
 - D. Seismic Restraints: Comply with the seismic design criteria outlined in Section 22 05 48.
- 1.5 QUALITY ASSURANCE
- A. Manufacturer's qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
 - B. Codes and Standards
 - 1. Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports and anchors.
 - 2. Qualify welding processes and welding operators according to AWS D1.1.
 - a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
 - 3. Qualify welding processes and welding operators according to ASME Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications.
 - 4. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - a. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems
 - b. Listing and Labeling Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.



5. MSS Standard Compliance:
 - a. Provide pipe hangers and supports of which materials design and manufacture comply with MSS SP-58. Select and apply pipe hangers and supports, complying with MSS SP-69.
 - b. Fabricate and install pipe Local and supports, complying with MSS SP-89.
 - c. Terminology used in this Section is defined in MSS SP-90.

1.6 COORDINATION

- A. Coordinate resiliently supported Work with other trades to avoid rigid contact with the building. Inform other trades such as drywall, plastering, or electrical, to avoid any contact which would reduce the vibration isolation.

1.7 CONFLICTS AND DISCREPANCIES

- A. Bring to the Owner's Representative's attention prior to installation any conflicts with other trades which will result in unavoidable contact to equipment, piping, etc., described herein, due to inadequate spaces, etc. Corrective work necessitated by conflicts after installation shall be at Contractor's expense.
- B. Bring to the Owner's Representative's attention prior to installation any discrepancies between the Contract Documents and field conditions, changes required due to specific equipment selection, etc., prior to installation. Corrective Work necessitated by discrepancies after installation shall be at Contractor's expense.

PART 2 PRODUCTS

2.1 GENERAL

- A. Corrosion Resistance: Provide hot-dip galvanized steel, cadmium plating, or other approved corrosion resistant materials for exterior Work and for Work which will be subject to outdoor exposure during construction.

2.2 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 1. Superstrut, Gold Gal V.
 2. B-Line Systems, Inc.
 3. Tolco.

2.3 MANUFACTURED HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. General: Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide felt-lined hangers and supports for copper piping systems in direct contact with



- copper piping components including galvanized coatings where installed for piping and equipment that will not have a field applied finish. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper piping.
- B. Thermal-Hanger Shield Inserts: 100 psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Shield Insert shall cover entire circumference of pipe and be of length indicated by manufacturer for pipe size and thickness of insulation by CSS Pre-Insulated Supports.
 - C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated type, drive-pin attachments are not acceptable.
 - D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
 - E. Adjustable Steel Clevises Hangers: MSS Type 1.
 - F. Yoke Type Pipe Clamps: MSS Type 2.
 - G. Steel Double Bolt Pipe Clamps: MSS Type 3.
 - H. Steel Pipe Clamps: MSS Type 4.
 - I. Pipe Hangers: MSS Type 5.
 - J. Adjustable Swivel Pipe Rings: MSS Type 6.
 - K. Adjustable Steel Bond Hangers: MSS Type 7.
 - L. Adjustable Band Hangers: MSS Type 9.
 - M. Adjustable Swivel Rings, Band Type: MSS Type 10.
 - N. Split Pipe Pins: MSS Type 11.
 - O. Extension Split Pipe Clamps: MSS Type 12.
 - P. U-Bolts: MSS Type 24.
 - Q. Clips: MSS Type 26.
 - R. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
 - 1. Plate: Unguided type.
 - 2. Plate: Guide type.
 - 3. Plate: Hold-down Clamp type.
 - S. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.
 - T. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.



- U. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.
- V. Single Pipe Rolls: MSS Type 41.
- W. Adjustable Roller Hangers: MSS Type 43.
- X. Pipe Roll Stands: MSS Type 44.
- Y. Pipe Rolls and Plates: MSS Type 45.
- Z. Adjustable Pipe Roll Stands: MSS Type 46.
- AA. Makeshift, field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42.

2.4 VERTICAL PIPING CLAMPS

- A. General: Except as otherwise indicated, provide factory-fabricated vertical piping clamps complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide felt-lined or copper-plated clams for copper-piping systems.
- B. For vertical mid-span supports of piping 4 inch and under, use Hubbard Enterprises/HOLDRITE Stout Brackets with Hubbard Enterprises/HOLDRITE Stout Clamps or two-hole pipe clamps (MSS Type 26).
- C. Two-Bolt Riser Clamps: MSS Type 8.
- D. Four-Bolt Riser Clamps: MSS Type 42.

2.5 HANGER-ROD ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods.
- B. Steel Turnbuckles: MSS Type 13.
- C. Steel Clevises: MSS Type 14.
- D. Swivel Turnbuckles: MSS Type 15.
- E. Malleable Iron Sockets: MSS Type 16.
- F. Steel Weldless Eye Nuts: MSS Type 17.



2.6 BUILDING ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Powder-actuated fasteners are not acceptable.
- B. Concrete Inserts
 - 1. Cast-in-Place Concrete Inserts: MSS Type 18.
 - 2. Post-Installed Anchors: Proprietary type, designed for intended uses, and ICC ESR evaluated.
 - a. Manufacturers
 - 1) ITW Ramset/Red Head.
 - 2) Simpson.
 - 3) Hilti Co.
- C. Top Beam C-Clamp: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. Welded Beam Attachments: MSS Type 22.
- G. C-Clamps: MS Type 23.
- H. Top Beam Clamps: MSS Type 25.
- I. Side Beam Clamps: MSS Type 27.
- J. Steel Beam Clamps with Eye Nut: MSS Type 28.
- K. Linked Steel Clamps with Eye Nut: MSS Type 29.
- L. Malleable Beam Clamps: MSS Type 30.
- M. Steel Brackets: One of the following for indicated loading:
 - 1. Light Duty: MSS Type 31.
 - 2. Medium Duty: MSS Type 32.
 - 3. Heavy Duty: MSS Type 33.
- N. Side Beam Brackets: MSS Type 34.
- O. Plate Lugs: MSS Type 57.
- P. Horizontal Travelers: MSS Type 58.
- Q. Powder-Actuated Fasteners: Not allowed.



2.7 INSULATED PIPE SUPPORTS (PIPE SHIELDS)

- A. All insulated lines shall be protected at the point of support by insulated pipe supports provided and installed by the pipe erector.
- B. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes:
 - 1. ASME B31.1, MSS SP-58, MSS SP-69, and MSS SP-89.
- C. Manufacturers
 - 1. Pipe Shields Incorporated (PSI).
 - 2. Michigan.
 - 3. B-Line.
- D. Insulated Pipe Supports
 - 1. Pipe supported on rod hangers PSI, Michigan, B-Line.
 - 2. Pipe supported on Flat Surfaces PSI, Michigan, B-Line.
 - 3. Pipe supported on pipe rolls PSI, Michigan, B-Line.
 - 4. Pipe Guides PSI, Michigan, B-Line.
 - 5. Anchors PSI, Michigan, B-Line.
 - 6. Riser Pipe Supports PSI, Michigan, B-Line.
- E. Insulation
 - 1. 360-degree insulation, encased in 360-degree sheet metal shield.
 - 2. Provide assembly of same thickness as adjoining pipe insulation.
 - 3. Insulating Material:
 - a. Cold Piping (below 50 degrees F): Urethane foam, 100 psi compressive strength.
 - b. Hot piping (above 50 degrees F): Calcium silicate, 100 psi compressive strength, treated with water repellent.

2.8 MISCELLANEOUS MATERIALS

- A. Auxiliary Steel
 - 1. Provide auxiliary structural steel as required for supports, anchors, guides, seismic restraints and vibration isolators.
 - 2. All structural steel systems to be designed in accordance with AISC Steel Handbook.
 - 3. All systems to be secured to building structure in a method acceptable to and approved by the Owner's Representative.
 - 4. Steel Work: Fabricate neatly. Grind off excess burrs and welding spatter. Paint with rust inhibitive primer.
- B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A36.
- C. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C404, Size No.2). Mix at a ratio of 1.0 part cement to 2.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS Standards.



- E. Pipe Alignment Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.
 - 1. Manufacturers
 - a. Hyspan.
 - b. Metraflex.
- F. Plenum Rated Pipe Clamps: ASTM E84 25/50 plastic clamps from Hubbard Enterprises/Holdrite.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive the Work. Notify the Owner's Representative, in writing, of any conditions requiring corrective action.
- B. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 GENERAL

- A. Install devices in accordance with manufacturer's recommendations and approved shop drawings.
- B. Support of pipe tubing and equipment shall be accomplished through means of engineered products specific to each application. Makeshift field devised methods will not be allowed.
- C. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.3 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the Work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors and associated Work, Installer shall meet at Project site with Contractor, Installer of each component of associated Work, Inspection and testing agency representatives (if any), Installers of other Work requiring coordination with Work of this Section and the Owner's Representative for purpose of reviewing material selections and procedures to be followed in performing the Work in compliance with requirements specified.

3.4 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in



- MSS SP-69, or per schedules below, whichever is more severe. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms.
1. For plumbing piping, support spacing shall be per California Plumbing Code (CPC).
 2. For fire protection piping, support spacing shall be per code and NFPA 13.
- B. Loading on Steel Beams
1. Do not place eccentric loads on steel beams for loads greater than 50 pounds.
 2. For loads greater than 50 pounds, use attachments which create concentric loading.
- C. Cast-in Place Concrete Inserts
1. Install before concrete is placed. Fasten inserts securely to forms.
 2. Install with reinforcing bar through opening at top of insert or with steel plate to distribute load, as detailed on Drawings.
 3. Maximum load per insert in slabs shall be 200 pounds, with a minimum spacing of 5 feet in any direction. For loads greater than 200 pounds, or where spacing cannot be maintained, make attachment to building structure or auxiliary steel, rather than to slab.
- D. Post-Installed Concrete Anchors: Maximum tension load per insert shall not exceed ICC ESR published values.
- E. Powder-Actuated Fasteners: Not allowed.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports of smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping. Install in accordance with Seismic Restraint manual Guidelines for Mechanical Systems (SMACNA).
1. Materials, design and type numbers per MSS-58.
- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Support fire protection piping independently of other piping.
- D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, felt-lined.
- E. Provisions for Movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- F. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.



- G. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.1 Power Piping Codes are not exceeded.
- H. Insulated Piping: Comply with the following installation requirements:
1. Provide insulated pipe support (pipe shield) at each support of insulated piping.
 2. Select model of insulated pipe support according to published recommendations of insulated pipe support manufacturer, based on pipe size, pipe material, fluid medium, fluid temperature, support spacing, and type of support.
 3. Submit tabulation showing proposed uses of insulated pipe supports for different applications.
- I. Provide pipe supports on all DWV vertical piping penetrating floor slabs.
- J. All hanger components shall be Superstrut Gold Galv.
1. Vertical Piping: Superstrut C720 clamps attached to the pipe above each floor to rest on the floor. Provide copperplate on copper tubing. Provide additional support at base of cast iron risers. Provide intermediate support for vertical piping greater than 12 feet in length.
 2. Individually Suspended Piping: Superstrut J-Hanger or Clevis, complete with threaded rod. Copper pipe will be used in conjunction with felt lined hangers.

<u>Pipe Size</u>	<u>Rod Size</u>
2-inch and smaller	3/8 inch
2-1/2 to 3-1/2-inch	1/2 inch
4 to 5-inch	5/8 inch
6-inch	3/4 inch
8-inch and up	7/8 inch
 3. Provide 3/8 inch or support of PVC and CPVC and provide continuous support.
 4. Trapeze Suspension: Superstrut 1-5/8-inch width channel in accordance with manufacturers published load ratings. No deflection to exceed L/180 of a span.
 5. Trapeze Supporting Rods: Shall have a safety factor of 5; securely anchor to building structure.
 6. Pipe Straps: Superstrut 702 isolate copper pipe with two layers of 2-inch wide 10 mil polyvinyl tape (Cush-A-Strip or Cush-A-Clamps). Where used for seismic support systems, provide Superstrut 702 or C708 series pipe straps.
- K. Concrete Inserts: Superstrut C302 continuous insert or 452-TB spot insert. Do not use actuated fasteners for support of overhead piping unless approved by the Owner's Representative.
1. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
 2. Install concrete inserts in new construction prior to placing concrete. Superstrut 452-TB, C745, or C302.
 3. Install post-installed concrete anchors after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.



- L. Steel Connectors: Beam clamps with retainers.
1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts washers, and other accessories
- M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- N. Support to Structure
1. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Owner's Representative.
- O. Rubber Neoprene Pipe Isolators
1. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls as indicated on the Drawings.
 2. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. Superstrut S716 or A716.
- P. Pipe Hangers and Support Spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and space at or within following maximum limits. Note that spacing listed are recommended maximums; increased spacing requirements due to California Building Code requirements, CCR Title 24, or other regulations in force and applicable for this contract shall be adhered to.

Pipe Diameter	Steel Fluid	Steel Vapor	Copper Fluid
1/2 to 1-inch	6	8	6
1-1/4 to 1-1/2-inch	8	10	6
Over 2-inch	10	10	10

- Q. For cast iron soil piping.
1. Support piping at every other joint for piping length of less than 4 feet.
 2. For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
 3. Hanger shall not be installed on the coupling.
 4. Provide support at each horizontal branch connection.
 5. Provide Superstrut Seismic Manual Stamped OPA-0003 using Seismic Restraint Manual tables.
- R. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
- S. Provide rigid insulation and a 12-inch long, 18-gauge galvanized sheet metal shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering or CSS Pre-Insulated Calcium Silicate Support.
- T. Insulate copper tubing from ferrous materials and hangers with felt lined hangers.



- U. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
- V. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.6 ADJUSTING AND CLEANING

- A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
- B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.7 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint and exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1 requirements for touching up field-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Section 09 90 00, Painting and Coding.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

3.8 INSPECTION AND INSTRUCTION

- A. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such enclosure.

3.9 FIELD QUALITY CONTROL

- A. Licensed Engineer's Report: Prepare hanger and support installation report. Include seal and signature of Registered Structural Engineer, licensed in the State of California, certifying compliance with Specifications.

END OF SECTION 22 05 29



SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Pipe Markers.
 - 2. Valve Tags.
 - 3. Equipment Nameplates.
 - 4. Underground Marking Tape.
 - 5. Chart and Diagram Frames.

1.2 REFERENCES

- A. ASME A13.1-2007 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Indicate model, type, and application usage.
- C. Submit list of wording, symbols, letter size, letter style, and color coding for each system and vault cover.
- D. Submit valve numbering scheme, valve chart and schedule, including valve tag number, location, function type, and valve manufacturer's name and model number.

1.4 COORDINATION

- A. Coordinate with Owner's Representative for preferred color schemes and service abbreviations and valve and equipment numbering schemes prior to submittal review.
- B. Coordinate installation of identifying devices with completion of covering of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment. If not installed before ceiling is installed, the Contractor shall remove ceiling at no additional cost to the OWNER and install identifying devices.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Seton Name Plate Corp.



B. Brimar.

C. Brady.

2.2 PIPE MARKERS

A. Markers: ASME A13.1.

1. Pressure sensitive vinyl (self sticking) material.
2. Mechanically fastened type: Snap on or strap on.
 - a. For dirty, greasy, or oily pipe where pressure sensitive markers may not perform satisfactorily.
3. All weather film for outdoor exposed piping.
4. Provide 360 degree and pipe flow arrows and fluid being conveyed.
5. Size of letters legend:

OUTSIDE DIAMETER OF PIPE OR PIPE COVERING	LENGTH OF COLOR FIELD	SIZE OF LETTERS AND ARROWS
3/4 to 1-1/4 inch	8 inch	1/2 inch
1-1/2 to 2 inch	8 inch	3/4 inch
2-1/2 to 6 inch	12 inch	1-1/4 inch
8 to 10 inches	24 inch	2-1/2 inch
Over 10 inches	32 inch	3-1/2 inch

2.3 VALVE TAGS

A. Tags: Brass or anodized aluminum type.

1. Brass: Minimum 19 gauge, polished, 2-inch diameter with following lettering:
 - a. Service: 1/4-inch stamped black filled letters.
 - b. Valve numbers: 3/8-inch stamped black filled letters.
2. Aluminum: 2 inch diameter, 0.032 inch thick, with following lettering:
 - a. Service: 1/4-inch engraved letters.
 - b. Valve numbers: 3/8-inch engraved letters.

B. Fasteners: 4 ply 0.018 copper or monel wire meter seals, brass “S” hooks or No. 16 brass jack chain.

2.4 EQUIPMENT NAME PLATES

A. 1/8-inch rigid plastic or bakelite with 4 edges beveled, with black background and white border and letters.

1. Two 3/8-inch mounting holes.
2. Minimum 1/2-inch high lettering.
3. Commercial quality, rust resisting nuts and bolts with backwashers, self tapping screws or rivets.

2.5 UNDERGROUND MARKING TAPE

A. General: Provide underground pipe marking tape on all pipes buried beneath the ground. Provide a continuous length of tape 12 inches below the finished earth surface directly above



- the buried pipe. Provide a second continuous length of tape 12 inches above the top of the buried pipe if the top of the pipe is lower than 36 inches from the top of the finished earth surface.
- B. Tape: 5 mil inert plastic film for underground use.
 - C. Resistant to alkalis, acids and other destructive agents found in soil; information in Civil Engineers Soils Report.
 - D. Minimum tensile strength: 120 pounds per 6 inch width.
 - E. Minimum elongation: 500 percent.
 - F. Provide detectable underground tape above all buried pipes on the Project. Provide a continuous printed message repeated every 16 to 36 inches warning of pipe buried below similar to (i.e., "CAUTION GAS LINE BURIED BELOW").
 - G. Color code:
 - 1. Blue: Water systems, domestic and fire.
 - 2. Green: Sanitary and storm sewer system.
 - H. Provide tape widths of 2, 3, 6, 9, and 12-inches for lines buried 10, 20, 30, 40, and 50 inches or greater, respectively.

2.6 CHART AND DIAGRAM FRAMES

- A. Chart and diagram frames: Extruded aluminum with plexiglass or glass windows.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 VALVE AND EQUIPMENT IDENTIFICATION

- A. Designate all equipment and valves by distinguishing numbers and letters on charts and/or diagrams.
 - 1. Tag and locate following equipment items:
 - a. Valves.
 - b. All items indicated on equipment schedules and plumbing fixtures.
 - 2. Designation shall match that indicated.
- B. Install tags on all devices with numbers and letters corresponding to charts.
- C. Fasten tags securely to devices with tag fasteners in manner for easy reading.
- D. Attach equipment nameplates in conspicuous location, directly on item of equipment or apparatus such as starters and pumps.



- E. For unsuitable surfaces, such as high temperature or lack of space, use copper or brass rings or chains to attach tags.
- F. Furnish four charts.
 - 1. Mount 1 chart in frame and secure on wall in location directed by Owner's Representative.
 - 2. Include remaining 3 sets in "Operation and Maintenance Manuals".
 - 3. Show valve tag numbers on project as-built drawings.
- G. Provide safety sign for each piece of exposed mechanical equipment that may start automatically. Comply with the requirements of Section 10 14 00.

3.3 PIPE IDENTIFICATION

- A. Locate pipe markers as follows:
 - 1. Next to each valve and fitting, except on plumbing fixtures and equipment.
 - 2. At each branch or riser take off.
 - 3. At each passage through walls, floors and ceilings.
 - 4. At each pipe passage to underground.
 - 5. On all horizontal pipe runs every 20 feet, at least once in each room and each story traversed by piping system.
 - 6. Identify piping contents, flow direction, supply and return.

Install markers with tape color bands over each end of marker, extending around pipe and overlapping a minimum of 30 degrees.

3.4 SERVICE ABBREVIATIONS

- A. Coordinate with Owner's Representative for preferred color schemes and service abbreviations as indicated below:

CD	Cooling Coil Condensate Drain Piping (Gravity)
PCD	Pumped Cooling Coil Condensate Drain Piping
CW	Domestic Cold Water
F	Fire Protection Water Service
HW (x-degrees F)	Domestic Hot Water Supply (indicate temperature)
HWC (x-degrees F)	Domestic Hot Water Circulating (indicate temperature)
NPW	Non-Potable Water
OD	Overflow Drain
SD	Storm Drain
SS	Sanitary Sewer (in mechanical chases and exposed to view)
SP	Sprinkler System
V	Vent (in mechanical chases and exposed to view)

3.5 INSTALLATION OF UNDERGROUND MARKING TAPE

- A. Install underground marking tape directly above all outside utility lines.
- B. Allow 12 inches between tape and line, and install as close to grade level as feasible.

END OF SECTION 22 05 53



SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Copper pipe and fittings for above and below ground installation.
2. Pipe wrap for all domestic water piping installed below ground and inside grout-filled block walls.
3. Insulation for copper pipe through concrete, grade beams and footings.
4. Dielectric unions and fittings.

B. This Contractor shall furnish all labor, materials, pipe supports, sleeves, hangers, tools, equipment and perform all work and services necessary for furnishing and installation of a complete domestic water piping system. Although all work is not specifically shown or specified, all valves, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work.

C. Domestic water piping installed below ground and under slab in all buildings (i.e. trap primer lines, etc) shall be supported either from the structural slab or direct burial. Scope and direction is indicated on the Plumbing Plans.

D. Related Sections

1. Section 07 81 23 – Intumescent Fireproofing.
2. Section 22 05 00 - Common Work Results for Plumbing.
3. Section 22 05 23 - General-Duty Valves for Plumbing Piping.
4. Section 22 05 29 - Hangers and Supports for HVAC Piping and Equipment.
5. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
6. Section 22 07 19 - Plumbing Insulation.
7. Section 22 40 00 – Plumbing Fixtures

1.2 REFERENCES

- A. ASME B31.9 -2004 Building Services Piping, for materials, products, and installation.
- B. NSF 61, Drinking Water System Components-Health Effects: Sections 1 through 9, for potable domestic water piping and components.
- C. ASME BPVC -2017 SEC IX: Welding and Brazing Qualifications.
- D. ASTM E814 -2017: Fire Tests of Through-Penetration Fire Stops.
- E. ASTM F708 -2014: Design and Installation of Rigid Pipe Hangers.
- F. AWWA C651 -2014: Disinfecting Water Mains.
- G. ANSI/UL 1479: Fire Tests of Through-Penetration Firestops.
- H. MSS SP-58 -2018: Pipe Hangers and Supports - Materials, Design, and Manufacture.



- I. ANSI/MSS SP-69 -2003: Pipe Hangers and Supports - Selection and Application.
- J. NCPWB: Procedure Specifications for Pipe Welding.
- K. ANSI/AWWA C111 -2006 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings/A21.11
- L. ANSI/AWWA C153/A21.53 -2006- Ductile Iron Compact Fittings for Water Service, depending on size of piping for settlement joints.
- M. ANSI/AWWA C105/A21.5 -2005 - Polyethylene Encasement for Ductile Iron Pipe Systems, for polyethylene jacket.

1.3 DEFINITIONS

- A. Water Service Piping: Water piping outside the building that conveys water to the building.
- B. Water Distribution Piping: Water piping from a point approximately 5-feet outside the building that conveys water to fixtures and equipment throughout the building.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Service Piping, Below Ground: 160 psig.
 - 2. Domestic Water Distribution Piping, Above Ground: 125 psig.

1.5 SUBMITTALS

- A. Product Data for below and above ground pipe, fittings, couplings, hangers, pipe coating and pipe wrap for pipe installed below ground, seismic bracing and thrust and/or restraint or blocking at base of domestic water riser. Provide manufacturer's catalog information.
- B. Shop Drawings
 - 1. For underground and above ground systems, and all mechanical and plumbing chases. Include plans, elevations, sections, and details.
 - 2. In accordance with Sections 22 05 29.
- C. Calculations: In accordance with Sections 22 05 29.
- D. Water Samples: Specified in Disinfection of Domestic Water Piping System Article in Part 3.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Settle joints shall be FM approved.



1.7 RECORDS

- A. Provide record of all pipe tests and provide as part of O & M Manual.
- B. Include certificate of Tests in O&M Manual.
- C. Include certificate of Health Department approval of domestic water quality in O&M Manual.
- D. Provide certificate of Domestic water piping system disinfecting and include in O & M Manual..

1.8 DRAWING SCHEDULE

- A. Refer to sheet notes and schedule on Drawings for model numbers, symbols, etc. for additional information concerning products specified in this section.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

- A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe Fittings and Applications."
- B. Hard Copper Tube: ASTM B88, Type L, water tube, drawn temper for above ground and in wall installation.
- C. Set Copper Tube: ASTM B88, Type K, water tube, annealed temper for below ground installation.

1. COPPER PIPE AND FITTINGS

- a. Soft Copper Tube: ASTM B88, Types K (ASTM B88M, Types A and B), water tube, annealed temper.
 - 1) Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2) Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
 - 3) Copper Unions: MSS SP-123/ASME B16.18, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
 - a) Threaded Ends: Threads conforming to ASME B1.20.1.
- b. Hard Copper Tube: ASTM B88, Types L (ASTM B88M, Types B and C), water tube, drawn temper.
 - 1) Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2) Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.



- 3) Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
 - a) Threaded Ends: Threads conforming to ASME B1.20.1.
- 4) Copper, Grooved-End Fittings: ASTM B75 (ASTM B75M) copper tube or ASTM B584 bronze castings.
 - a) Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to ANSI/AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.
- 5) Alternate Fitting Option: For piping 4-inches and smaller, copper press fittings conforming to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Fittings shall be as manufactured by _____ or approved equal. Fittings shall be IAPMO and UPC listed.

2.2 JOINING MATERIALS

- A. Solder, brazing, and welding filler metals are specified in Section 22 05 00, Common Work Results for Plumbing.

2.3 VALVES

- A. Comply with Section 22 05 03.

2.4 PIPE WRAP BELOW GROUND AND WITHIN GROUT-FILLED BLOCK WALLS

- A. General: Provide pipe wrap for all copper pipe installed below ground and for all horizontal and vertical copper pipe installed inside grout-filled block walls.
 1. Cleaning: Remove loose scale, rust, dirt, oil and grease before wrapping. Wire brush as required; use solvent for removal of oil and grease.
 2. Provide Calpico Inc. pipe wrapping polyvinyl tape, 20-mil thickness, with identification as per IAPMO-CPC Code for all horizontal and vertical copper piping installed inside grout-filled block walls.
 3. Encase in one layer of an ANSI/AWWA C105, 8-mil polyethylene jacket all ground copper pipe installed below ground. Install jacket per ANSI/AWWA C105/A21.5.
 4. Encase in two layers of an ANSI/AWWA C105, 8-mil polyethylene jacket, all ductile iron pipe installed below ground. Install jacket per ANSI/AWWA C105/A21.5.

2.5 PIPE INSULATION THROUGH CONCRETE, GRADE BEAMS AND FOOTINGS

- A. General: Provide a minimum 1-inch thick pipe insulation for all copper pipe installed through concrete footings, grade beams, etc.
 1. Cleaning: Remove loose scale, rust, dirt, oil and grease before wrapping.
 2. IMOC, IMCOSHIELD, non-slit pre-lubricated polymer foam insulation.

2.6 DIELECTRIC PIPE FITTINGS

- A. General: Provide dielectric pipe fittings, unions and waterways to protect domestic water copper pipe from deterioration caused by galvanic and stray current corrosion. Provide dielectric fitting, union or waterway where dissimilar metals are used in piping systems.



1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
2. Insulating Material: Suitable for system fluid, pressure, and temperature.
3. Dielectric Unions: Factory-fabricated, union assembly for 250 psig minimum working pressure at a 180 degrees F temperature.
 - a. Manufacturers: Epco Sales, Inc.; Watts Industries, Inc. - Water Products Division or Zurn Industries, Inc. - Wilkins Division.
4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150 or 300 psig minimum pressure to suit system pressures.
 - a. Manufacturers: Epco Sales, Inc. or Watts Industries, Inc. - Water Products Division.
5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for 150 or 300 psig minimum working pressure to suit system pressures.
 - b. Manufacturers: Advance Products & Systems, Inc. ; Calipco, Inc. or Pipeline Seal and Insulator, Inc.
6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 degrees F temperature.
 - a. Manufacturers: Calpico, Inc. or Lochinvar Corp.
7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 degrees F temperature. Nipples shall be listed by IAPMO/UPC and SBCCI PST and ESI.
 - a. Manufacturers: Precision Plumbing Products, Inc.; Sioux Chief manufacturing Co.,Inc, Perfection Corp. or Victaulic Co. of America.

2.7 PIPE ESCUTCHEONS

- A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons shall be vandal proof.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.
- C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.
- D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.8 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.
 1. Piping: Provide fire stopping material as specified in Section 07 81 23.



PART 3 EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED PIPING

- A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.
- B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.
- C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.2 PIPING AND FITTINGS APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Grooved joints may be used on aboveground grooved-end piping.
- D. Underground Domestic Water Service Entrance Piping: Use the following piping materials:
 - 1. 6 inches and Smaller: Soft copper tube, Type K, cast-copper-alloy, soldered-joint pressure fittings; and soldered joints with Alloy Sn95 solder.
 - 2. All copper pipe installed below finished grade and slab shall be encased in one layer of an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.
- E. Aboveground Domestic Water Distribution Piping: Use the following piping materials:
 - 1. 6 inches and Smaller: Hard copper tube, Type L wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges and soldered joints with Alloy Sn95 solder.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use full port ball or butterfly valves.
 - 2. Hot Water, Balancing Duty: Calibrated balancing valves, comply with the requirements of Section 22 05 23.
 - 3. Drain Duty: Hose-end drain valves.
 - 4. Isolation Duty: Use full port ball valves.
 - 5. Back Flow: Swing check valves.
- B. All iron body valves installed below finished grade shall be encased in two layers on an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

3.4 PIPING INSTALLATION

- A. Contamination Prevention:



1. Pipe interiors shall be kept free of debris.
 2. Interior surfaces of domestic water pipes, valves and fittings shall be protected against contamination, as well as debris. All openings in pipelines shall be closed with watertight plugs when work is halted on the system. Sealing and packing materials shall not support growth of bacteria. Trenches that become wet shall be treated with calcium hypochlorite granules to prevent bacterial growth.
- B. General:
1. The installation of the domestic water systems shall conform to the latest edition of California Plumbing Code (CPC) and this specification.
 2. Piping installation shall be coordinated with respect to space available for HVAC, fire protection and electrical installation. In case of conflict in the routing of the piping and ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows; shall not encroach on aisles, passageways and equipment and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Pipe shall not be bent. Cutting or weakening of structural members to facilitate piping installation is not permitted.
 3. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall run parallel with the lines of the building unless otherwise noted on the drawings. Service pipe, valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1-inch from such other work and not less than 1-inch between finished covering on the different services.
- C. Comply with the requirements of Section 22 05 00.
- D. Install underground copper tubing according to CDA's "Copper Tube Handbook."
- E. Install wall penetration system at service pipe penetration through foundation wall. Make installation watertight. Comply with Section 22 05 00.
- F. Install butterfly valve, hose-end drain valve, strainer, pressure gauge, temperature gauge, and test tee with valve, inside building Mechanical Room at water service entrance. Comply with Section, 22 05 19 for temperature and pressure gauges.
- G. Install aboveground domestic water piping level without pitch and plumb.
- 3.5 JOINT CONSTRUCTION
- A. Comply with Section 22 05 00 for basic piping joint construction.
 - B. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder; and ASTM B828 procedure, unless otherwise indicated.
 - C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
 - D. Option for fittings: Copper press connections. Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully



inserted into the fitting and tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.6 VALVE INSTALLATION

- A. General: Valves shall be installed at the locations shown on the drawings, as required by code and for isolation of equipment, plumbing fixtures, etc. All valves shall be installed with the stems between the horizontal the 90 degrees vertical. Provide access to all concealed valves by means of access doors furnished and installed by the Contractor.
- B. Sectional Valve: Install sectional valves close to water main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated. Use ball valves for piping 4 inches and smaller. Use butterfly valves for piping 5 inches and larger.
- C. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball valves for piping 4-inches and smaller. Use butterfly valves for piping 5 inches and larger.
- D. Drain Valves: Install drain valves specified in Section 22 11 19 on each plumbing equipment item located to drain equipment for service and repair. Install drain valves at base of each water riser, at low points in horizontal piping, and where required to drain water distribution piping system.
 - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
 - 2. Install stop-and-waste drain valves where indicated.
- E. Balancing Valve: Install balancing valve on the hot water and hot water return loops as indicated on the Drawings and Riser Diagrams Comply with Section 22 05 23 for balancing valves.
- F. Check Valves: Install swing check valve on discharge side of each pump and elsewhere as indicated. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping.
- G. Mechanical and Plumbing Chases: Install ball valve on each branch serving each plumbing chase.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with the requirements of Section 22 05 29 for seismic-restraint devices and pipe hanger and supports.
- B. Install hangers for horizontal and vertical piping with the following maximum spacing and minimum rod sizes:
 - 1. Support vertical copper tube at each floor.
 - 2. Install supports for vertical copper tubing every 10 feet.
- C. Conform to Table below for maximum spacing of supports:



<u>Pipe Material</u>	<u>Horizontal In Feet</u>	<u>Vertical In Feet</u>	<u>Rod Size In Inches</u>
Copper Tubing 1-1/4 inches and smaller:	6	10	3/8 inch
Copper Tubing 1-1/2 inches and larger:	10	10	1/2 inch

- D. Support horizontal and vertical piping inside each mechanical chase using cold formed metal framing (“Superstrut”), comply with requirements of Section 22 05 29.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water distribution piping to exterior water service entrance piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to the following:
1. Water Heaters: Install cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Install cold and hot water supply piping in sizes indicated, but not smaller than required by the latest edition of California Plumbing Code (CPC) and/or authorities having jurisdiction. Refer to Section 22 40 00.
 3. Equipment: Connect cold and hot water supply piping to equipment as indicated, but not smaller than equipment connections and as required by CPC. Provide ball valve and union for each connection; provide drain valve on drain connection. Use flanges instead of unions for 5-inches and larger.

3.9 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
1. Do not enclose, cover, or put piping into operation until all piping is inspected and approved by local plumbing official and/or authority having jurisdiction.
 2. During progress of the installation, notify local plumbing official and/or authority having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the local plumbing official and/or authority having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping system before concealing or closing-in after roughing-in and prior to setting fixtures.
 - b. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements of the latest edition of California Plumbing Code.
 3. Reinspection: When a plumbing official finds that a piping system will not pass test or inspection, Contractor shall make the required corrections and arrange for reinspection by the plumbing official.
 4. Reports: Prepare inspection reports and have them signed by the local plumbing official and/or authority having jurisdiction. A copy of all inspection reports to be included in the O & M Manuals.



5. Provide written report to Architect and Engineer that all copper piping installed below ground and inside grout filled block walls have been coated and wrapped with approved pipe wrap. Written report shall be included in the O & M Manuals.
- B. Test domestic water distribution piping as follows:
1. Test for leaks and defects in new water distribution piping system and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water distribution piping until it has been tested and approved. Expose work that was covered or concealed before it has been tested and approved for testing.
 3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
 5. Prepare reports for tests and required corrective action.
- 3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM
- A. Prior to starting work, verify system is complete and clean.
- B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Disinfect potable domestic water distribution piping as follows:
1. Purge new domestic water distribution piping systems before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed by that authority, the procedures described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 of outlets.
 - e. If final disinfectant residual test less than 25 mg/L, repeat treatment.
 - f. Flush disinfectant from system until residual equal to that of incoming water or 1.0mg/L.
 - g. Take samples no sooner than twenty-four (24) hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651. Provide laboratory results to Owner's Representative. Obtain approval from local health department.



- D. Prepare and submit reports of purging and disinfecting activities.
- E. Completely flush all domestic hot and cold water risers to eliminate all debris in the lines before using any flush valves.
- F. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 STARTUP SERVICES

- A. Verify incoming water pressure and temperature.
- B. Replace all strainer screens with new at all mechanical and plumbing equipment.
- C. Fill water systems. Check potable water expansion tanks to determine that they are not air bound and that system is completely full of water.
- D. Before operating systems, perform these steps.
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open all valves to full open position.
 - 3. Open throttling valves to proper setting.
 - 4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
 - 5. Remove and clean strainer screens and aerators. Close drain valves and replace drain plugs.
 - 6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used, clean, and ready for use.
- E. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- F. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 PROTECTION

- A. Protect piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 22 11 16



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SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Hub and Spigot pipe and Fittings (below ground).
 - 2. No-Hub Pipe, fittings (above ground).
 - 3. No-Hub Heavy Duty Couplings (above ground).
 - 4. Settlement Joints.
 - 5. Pipe Escutcheons.
 - 6. Fire Barrier Penetration Seals.
- B. This Contractor shall furnish all labor, materials, sleeves, hangers, supports, tools, equipment and perform all work and services necessary for furnishing and installation of a complete sanitary waste and vent piping system. Although all work is not specifically shown or specified, all appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work.
- C. This Contractor shall furnish to Owner's Representative a digital record of all underground sanitary waste and vent and grease waste and vent piping prior to issuing Certificate of Occupancy. Contractor shall review with the Owner's Representative entire underground waste and vent system for each building. All blockages and debris found shall be removed and piping systems replaced at no cost to the OWNER.
- D. Related Sections
 - 1. Section 07 84 13 – Penetration Firestopping
 - 2. Section 22 05 00 - Common Work Results for Plumbing.
 - 3. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
 - 4. Section 22 05 10 – Basic Piping Installation Requirements
 - 5. Section 22 05 48 – Vibration and Seismic Controls for Piping and Equipment.
 - 6. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
 - 7. Section 22 13 19 - Sanitary Waste Piping Specialties.
 - 8. Section 22 40 00 – Plumbing Fixtures

1.2 DEFINITIONS

- A. Sanitary Waste and Vent Piping: Piping inside the building that conveys waste water and vapors from fixtures and equipment throughout the building.
- B. Service Entrance Piping: Sanitary sewerage piping to a point approximately 5 feet outside each building between outside building sewer piping and inside sewer piping.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.



2. Indirect Waste and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data for settlement joints, hub and spigot pipe and fittings, No-hub pipe, fittings, and heavy duty couplings, hangers, supports, pipe wrap for pipe installed below ground and installed in grout filled block walls, thrust and/or restraints or blocking at base of each sanitary stack, and seismic bracing. Provide manufacturers catalog information.
- B. Shop Drawings
 1. For underground and above ground systems, and all mechanical and plumbing chases. Include plans, elevations, sections, and details.
 2. Details for the installation of the sanitary waste and vent piping for to be supported from the structural slab.
 3. In accordance with Sections 22 05 29.
- C. Calculations: In accordance with Sections 22 05 29.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of CISPI, IAMPO and the specified testing agency.
- B. Comply with the provisions of ASME B31.9 "Building Services Piping," for materials, products, and installation.
- C. All cast iron pipe and fittings shall be manufactured in the United States. Pipe shall bear the label or stamp that the cast iron was manufactured in the United States, with collective trademark of the Cast Iron Soil Pipe Institute.
- D. Submittal for No-Hub heavy duty couplings to include copy of compliance to the requirements of FM 1680 Class I.
- E. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.



1.7 TESTING

A. Records:

1. Provide record of all pipe tests and include in O&M Manual.
2. Include certificate of all Tests in O & M Manual.
3. Include digital record of all underground sanitary waste; and vent piping systems in O&M Manual.

1.8 DRAWING SCHEDULE

- ### A.
- Refer to schedules on drawings for model numbers, symbols, and additional information concerning products specified in this section.

PART 2 PRODUCTS

2.1 PIPING MATERIALS MANUFACTURERS

- ### A. Manufacturers:
- Subject to compliance with requirements, provide products in each category, by one of the following listed from that category:

1. No-Hub Cast Iron Pipe and Fittings:
 - a. AB&I, Oakland, California.
 - b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
 - c. Tyler Pipe Industries, Tyler, Texas.
2. No-Hub Heavyweight Couplings:
 - a. Anaco, Inc., Oakland, California; Husky SD4000-Orange Shield.
 - b. Clamp-All Corporation, Haverhill, MA; Clamp All Hi Torque 125.
 - c. No other couplings are acceptable.

2.2 COPPER TUBE AND FITTINGS

- ### A.
- Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.
- ### B.
- Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
- ### C. Copper Pressure Fittings:
1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- ### D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- ### E.
- Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.3 HUB AND SPIGOT SOIL, WASTE AND VENT PIPING

- ### A.
- Hub and Spigot Pipe and Fittings:



1. Service Cast Iron pipe and fittings shall be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi.
2. Pipe and fittings shall comply with ASTM A74. Compression gaskets shall be hydrostatically (water) tested by the manufacturer to verify compliance.
3. Joints shall be made with an elastomeric compression gasket meeting requirements of ASTM C564.

2.4 CAST-IRON NO-HUB SOIL, WASTE AND VENT PIPING AND FITTINGS

- A. No-Hub Pipe: Hubless cast iron pipe and fittings shall be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi. Pipe and fittings shall comply with ASTM A888 and CISPI 301. Each length of pipe shall be hydrostatically (water) tested by the manufacturer to verify compliance. All systems shall utilize a separate waste and vent system.
- B. Joints for Hubless Cast Iron Pipe and Fittings Above Grade: Couplings for joining hubless cast iron soil pipe and fittings conforming to ASTM A888, shall be 3 inches wide for nominal pipe sizes 1-1/2 to 4 inches in diameter, 4 inches wide for nominal pipe sizes 5 to 10 inches in diameter. Shields shall have a minimum thickness of 0.015 inches (28 gauge) type 304 stainless steel. Worm drive clamps shall be type 304 stainless steel with a minimum clamp torque of 80 in/lbs. Sealing Gasket shall be neoprene conforming to ASTM C564. Couplings shall conform to FM 1680, Class 1 or ASTM C1540.
 1. Alternate to above, cast iron split clamps secured by stainless steel bolts and nuts with neoprene gasket conforming to ASTM C564, as manufactured by MG Coupling Company.
 2. FM approved couplings may be hung with one hanger per length of pipe for 10-foot lengths and at every third fitting where they are contiguous in conformance with manufacturers installation instructions.

2.5 ABS PIPE AND FITTINGS (CAFETERIA BUILDING ONLY)

- A. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- B. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- C. Solvent Cement: ASTM D 2235.
 1. ABS solvent cement shall have a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 PIPE WRAP FOR BELOW GROUND PIPING

- A. General: Provide pipe wrap for all cast iron pipe installed below ground.

2.7 PIPE ESCUTCHEONS

- A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with



- nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons shall be vandal proof.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.
 - C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.
 - D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.8 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.
 - 1. Piping: Provide fire stopping material as specified in Section 07 84 13.

2.9 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Unshielded, Nonpressure Transition Couplings:
 - a. Manufacturers
 - 1) Fernco Inc.
 - 2) Froet Industries LLC.
 - 3) Mission Rubber Company.
 - a. Manufacturers Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 2) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
 - 4. Shielded, Nonpressure Transition Couplings:
 - a. Manufacturers
 - 1) Cascade Waterworks Mfg.
 - 2) Mission Rubber Company.
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 5. Pressure Transition Couplings:
 - a. Manufacturers
 - 1) Jay R. Smith Mfg. Co
 - 2) JCM Industries, Inc



- 3) Romac Industries, Inc.
 - b. Standard: AWWA C219.
 - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - d. Center-Sleeve Material: Manufacturer's standard.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:
1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 2. Dielectric Unions:
 - a. Manufacturers
 - 1) WATTS
 - 2) Wilkins
 - 3) Zurn Industries, LLC
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 150 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
 3. Dielectric Flanges:
 - a. Manufacturers
 - 1) WATTS
 - 2) Wilkins
 - 3) Zurn Industries, LLC
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 150 psig minimum at 180 deg F..
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
 4. Dielectric-Flange Insulating Kits:
 - a. Manufacturers
 - 1) Calpico, Inc
 - 2) Central Plastics Company
 - 3) Pipeline Seal and Insulat.
 - b. Description:
 - 1) Nonconducting materials for field assembly of companion flanges.
 - 2) Pressure Rating: 150 psig.
 - 3) Gasket: Neoprene or phenolic.
 - 4) Bolt Sleeves: Phenolic or polyethylene.
 - 5) Washers: Phenolic with steel backing washers.

PART 3 EXECUTION

3.1 PIPING INSTALLATION



- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
 - B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- 3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING WHERE BUILDING IS SLAB-ON-GRADE
- A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.
 - B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.
 - C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.
- 3.3 SPECIALTY PIPE FITTING INSTALLATION
- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.
 - B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
 - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
- 3.4 PIPE SUPPORT FOR BUILDING WITH SUPPORTED SLABS
- A. Attach all sanitary drainage piping to structural slab as indicated on the underground plumbing plans for each building.
- 3.5 PIPING APPLICATIONS
- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
 - B. Underground, Sanitary Piping: Use the following:
 - 1. 2 to 8 inches: Use service weight hub and spigot cast-iron pipe and fittings.
 - 2. Encase all underground piping in two (2) layers of ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5 Standards.
 - C. Aboveground, Sanitary Piping: Use the following:
 - 1. 2 to 8 inches: Use hubless cast-iron pipe; hubless cast-iron pipe fittings; and hubless cast-iron heavy duty stainless steel couplings.



2. 2 to 8 inches: Solid wall ABS Pipe – ASTM D 2661 Schedule 40. (Cafeteria Building only. No piping Material substitutions allowed.)
- 3.6 SANITARY AND GREASE WASTE AND VENT PIPING INSTALLATION
- A. General: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - B. Make changes in direction for sanitary and grease waste drainage piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
 - C. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in piping and pull past each joint as completed.
 - D. Install sanitary piping at the following minimum slopes, except where another slope is indicated on the plumbing drawings:
 1. Building Sanitary and Grease Waste Drain: 1/4 inch per foot (2 percent) downward in direction of flow for piping 6 inches and smaller; unless otherwise indicated on the Drawings.
 2. Horizontal Storm Drainage Piping: 1/4 inch per foot (2 percent) downward in direction of flow, unless otherwise indicated on the Drawings.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
 - E. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
 - F. Do not enclose, cover, or put piping into operation until it is inspected and approved by local plumbing inspector or authorities having jurisdiction.
 - G. Underground Horizontal Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - H. Trench shall be wide enough to assemble joints.
 - I. Trench Bottom shall be stable enough to support the complete barrel of the pipe. If possible, barrel to rest on even undisturbed soil. If it becomes necessary to excavate deeper than needed, place and tamp back fill material to provide an appropriate bed. Holes shall be provided at each joint for the couplings to allow for continuous support of the barrel along the trench bottom.



- J. Maximum deflection (change in the direction of the line) shall not exceed ½-inch per foot of pipe.
- K. Maintain proper alignment during backfilling, stabilize the pipe in proper position by partial backfilling and cradling.
- L. Piping laid on grade shall be adequately secured to prevent misalignment when slab is poured.
- M. Closet bends installed under slabs shall be adequately secured.
- N. Aboveground Horizontal Piping, Suspended: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- O. Support horizontal pipe and fittings at sufficiently close intervals to maintain alignment and prevent sagging or grade reversal. Support each length of pipe at every coupling, located not more than 18-inches for the joint.
- P. Support terminal ends of all horizontal runs or branches at each change of direction or alignment with approved hanger.
- Q. Closet bends installed above ground shall be firmly secured.
- R. Horizontal pipe and fittings 6 inches and larger shall be braced to prevent horizontal movement. Provide at every branch opening or change of direction by the use of braces, blocks, rodding or other suitable method to prevent movement or joint separation.
- S. Vertical Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- T. Support vertical piping at sufficiently close intervals to maintain alignment and to support the weight of the pipe and its contents. Support stacks at their bases and at each floor level. Provide riser clamps not to exceed 15'-0".
- U. If vertical piping is to stand free of any support or if no structure element is available for stability during construction, secure the piping in its proper position by means of adequate stakes or braces fastened to the pipe.
- V. Closet bends installed above ground shall be firmly secured.
- W. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- X. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- Y. Install piping to permit valve servicing.
- Z. Install fittings for changes in direction and branch connections.
- AA. Install piping to allow application of insulation.



BB. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

CC. Install aboveground ABS piping according to ASTM D 2661.

DD. Plumbing Specialties:

1. Install drains in sanitary drainage gravity-flow piping.

3.7 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Hubless Joints: Make with heavyweight rubber gasket.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.

3.8 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing Piping".

B. Shutoff Valves:

1. Install shutoff valve on each grease interceptor discharge and inlet.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

3.9 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.



5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Install hangers for ABS piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 2. NPS 3: 48 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- H. Install supports for vertical ABS piping every 48 inches.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.
- J. Conform to Table below for maximum spacing of supports:

<u>Pipe Material</u>	<u>Horizontal In Feet</u>	<u>Vertical In Feet</u>
Cast Iron Soil Pipe	5	15

- K. Pipe Attachments: Install the following:
 1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
 2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight runs to 100 feet and less.
- L. Support cast-iron soil pipe and fittings not included in Table, at a maximum horizontal spacing of 5 feet, except 10-foot sections of pipe may be supported at 10-foot spacing and at a maximum vertical spacing of 15 feet.

3.10 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.



- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
- F. Connect sanitary waste drainage piping to the following:
 - 1. Plumbing Fixtures and Equipment: Connect drainage piping in sizes indicated on Plumbing Drawings.

3.11 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.12 FIELD QUALITY CONTROL

- A. During installation, notify local plumbing official or authority having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements.
- B. Reinspection: If local plumbing official and/or authority having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by local plumbing official and/or authority having jurisdiction. A copy of all inspection reports shall be included in the O&M Manuals.



3.13 TESTING

- A. Test sanitary and vent piping according to procedures of local plumbing inspector and as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in piping installation. Tightly close all openings in the piping system, torque all couplings to recommended 80 in/lbs and all bends, changes of direction and ends of runs should be properly restrained prior to testing. Contractor shall have the option of hydrostatic or air test the system(s) as followings:
 - a. Hydrostatic or Water Test: Prior to the hydrostatic test expelled all air from the system. A hydrostatic test of 10 feet of hydrostatic pressure (4.3 pounds per square inch) shall be performed. Test system for a minimum of 15 minutes, water level must not drop. Inspect joints for leaks.
 - b. Air Test: The system shall be pressurized to a maximum of 6 psi utilizing a gauge graduated to no more than 3 times the test pressure. The gauge shall be monitored during the 15 minute test. A reduction of more than 1 psi during the test period indicates failure of the test.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch water column. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.14 CLEANING

- A. Clean interior and exterior of piping prior to installation. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.15 STARTUP SERVICES

- A. Before operating systems, perform these steps:
 - 1. Remove all plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
- B. Check plumbing equipment and verify proper settings, adjustments, and operation.



- C. Check plumbing specialties and verify proper settings, adjustments, and operation.
- D. Refer to Part I, article 1.2/F.

3.16 PROTECTION

- A. Protect all piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 22 13 16



SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Cleanouts.
 - 2. Floor Drains.
 - 3. Flashing Materials.
- B. Coordinate electrical requirements with electrical contractor prior to commencing Work.
- C. Related Sections
 - 1. Section 08 31 13 - Access Doors and Frames.
 - 2. Section 22 05 00 - Common Work Results for Plumbing.
 - 3. Section 22 05 23 - General Duty Valves for Plumbing Piping.
 - 4. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
 - 5. Section 22 11 16 - Domestic Water Piping.
 - 6. Section 22 13 16 - Sanitary Waste and Vent Piping for Piping and Connections.
 - 7. Section 22 40 00 - Plumbing Fixtures.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Sanitary Waste and Vent Piping: 10-foot head of water.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 00 and 01 33 23.
- B. Shop Drawings
 - 1. Shop drawings and elevations of interceptor.
 - 2. Waterproofing and tie-down details for fully immersed interceptor.
 - 3. In accordance with Section 22 05 29.
- C. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
 - 1. Flashing Materials.
 - 2. Cleanouts.
 - 3. Floor Drains.
- D. Calculations
 - 1. Calculations for fully immersed interceptor.
 - 2. In accordance with Section 22 05 29.
- E. Field test reports.



1.4 QUALITY ASSURANCE

- A. Design Concept: Drawings indicate capacities, size, profiles, and dimensional requirements of plumbing specialties and system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided such deviations do not change the design concept or intended performance. Refer to Division 1.
- B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of interceptors of types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
- C. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Codes and Standards:
 - 1. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
 - 2. PDI Compliance: Test and rate grease interceptors in accordance with PDI Standard G101, Testing and Rating Procedure for Grease Interceptors.
 - 3. Comply with State Health Department.

1.5 EXTRA MATERIALS

- A. Deliver extra materials to OWNER. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.
- B. Operating Keys (Handles): Furnish 1 extra key for each key-operated hose bibb and hydrant installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle material carefully to prevent damage, and/or breaking. Do not install damaged or broken material; replace with new.
- B. Store material in clean dry place. Protect from weather, dirt, water, construction debris, and physical damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Floor Drains / Floor Sinks:
 - 1. Jay R.Smith Mfg. Co., Smith Industries, Inc.
 - 2. Zurn by Hydromechanics Div., Zurn Industries, Inc.
 - 3. Wade Div., Tyler Pipe.



- B. Cleanouts:
 - 1. Jay R. Smith Mfg. Co., Smith Industries, Inc.
 - 2. Zurn by Hydromechanics Div., Zurn Industries, Inc.
 - 3. Wade Div., Tyler Pipe.

2.2 CLEANOUTS

- A. General: Size cleanouts as indicated on Drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.
- B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring. The Product Data Sheets at end of Part 3 of this Section indicate deck plate shape, top-loading classification, access cover, finish, and other specific features.
- C. Products: Subject to compliance with requirements, provide one of the products specified in each Sanitary Waste Piping Specialties Product Data Sheet at end of this Section.

2.3 FLOOR DRAINS

- A. General: Size outlets as indicated on Product Data Sheet or drawings.
- B. Floor Drains/Floor Sink: ASME A112.6.3, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. The Product Data Sheet at end of Part 3 of this Section indicates shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features. Provide removable sediment baskets for building.
- C. Products: Subject to compliance with requirements, provide one of the products specified in each Sanitary Waste Piping Specialties Product Data Sheet at end of this Section.

2.4 MISCELLANEOUS PIPING SPECIALTIES

- A. Piping specialties such as escutcheons, dielectric fittings, sleeves, and sleeve seals are specified in Section 22 05 00, Common Work Results for Plumbing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with Section 22 05 00 for piping joining materials, joint construction, and basic installation requirements.

3.2 PIPING SPECIALTY INSTALLATION



- A. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.
- B. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4-inch size. Use 4-inch size for larger drainage piping except where larger size cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping 4-inches and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil or waste stack.
- C. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
- D. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- E. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.
- F. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer's written instructions.

3.3 FLOOR DRAIN INSTALLATION

- A. Install drains according to manufacturer's written instruction, in locations indicated.
- B. Trap drains connected to sanitary building drain.
- C. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
- D. Position drains for easy accessibility and maintenance.

3.4 CONNECTIONS

- A. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by plumbing code.
- B. Locate drainage piping runouts as close as possible to bottom of floor slabs supporting fixtures or drains.
- C. Electrical Connections: Power wiring and disconnect switches are specified in Division 26.
 - 1. Grounding: Connect unit components to ground according to the National Electrical Code and Section 26 05 26.



3.5 FLASHING INSTALLATION

- A. Provide flashing Manufactured in a single piece except where large pans, sumps; or other drainage shapes are required.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with membrane waterproofing.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum sleeve length of 10-inches, and skirt or flange extending at least 8-inches around pipe..
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8-inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 3-inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Section 07 60 00.
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe or secure flashing into cast-iron sleeve having calking recess.

3.6 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each, trap seal primer system.
 - 1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 2. Requirements for nameplates and signs are specified in Section 22 05 00.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and grease recovery units and their installation, including piping and electrical connections. Report results in writing.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.8 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.



- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems. Comply with the requirements of Division 1.

3.10 STARTUP SERVICES

- A. Preparation: Perform the following checks before start-up:
 - 1. Systems tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.
 - 3. There is clear space for servicing of specialties.
- B. Before operating systems, perform these steps:
 - 1. Close drain valves.
 - 2. Open valves to full open position.
 - 3. Verify drainage and vent piping are clear of obstructions. Flush with water until clear.

3.11 ADJUSTING

- A. Adjust operation and correct deficiencies discovered during startup services.

3.12 SANITARY WASTE PIPING SPECIALTIES SCHEDULES

- A. Provide plumbing specialties as scheduled on the following "Data Sheets." Each Data Sheet begins with a new page.



SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Cleanout Type: FCO.

Description: Floor cleanout with round adjustable scorated nickel bronze top, lead seal and "Lekeromate" seal.

Appropriate Standard: ASME A112.36.2M.

Material: Cast-iron body.

Shape: Round.

Top-Loading Classification: Medium Duty.

Cover Finish: Provide round top.

Closure Plug: Brass.

Products: J.R.Smith 4020
Wade.
Zurn.



SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Cleanout Type: CO.

Description: Cleanout; cast iron caulk ferrule with lead seal plug.

Appropriate Standard: ASME A112.36.2M.

Material: Cast-iron body.

Shape: Round.

Top-Loading Classification: --

Cover Finish: --

Closure Plug: --

Products: J.R.Smith 4400
Wade.
Zurn.



SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Floor Drain Type: 2" FD-1

Description: 2-inch drain, 2" outlet size.

Appropriate Standard: ANSF A112.6.3; ASSE; PDI; ASPE

Material: Cast-iron.

Shape: Round top.

Dimensions of Top: 5 inch Diameter

Top-Loading Classification: Medium Duty.

Cover and Body Top Finish: Nickel bronze.

Manufacturer: J.R.Smith 2005C-NB-U.
Wade Series W-1100
Zurn Series Z-415



SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Floor Drain Type: 3" FD-2.

Description: 3-inch floor drain, 3" outlet size as indicated on Floor Plan.
Provide with ½-inch trap primer tapping.

Appropriate Standard: ASME A112.6.3; ASSE; PDI; ASPE

Material: Cast-iron.

Shape: Round.

Dimensions of Top: 6-inch diameter.

Top-Loading Classification: Medium Duty.

Cover and Body Top Finish: Nickel bronze.

Manufacturer: J.R.Smith 2005C-NB-U.
Wade Series W-1100.
Zurn Series Z-415.



SANITARY WASTE PIPING SPECIALTIES DATA SHEET

Vent Cap, Type: VC-1

Description: Vandal proof hooded vent cap for all vent termination

Body Material: Galvanized cast iron dome secured with recessed Allen socket set screws.

Available Products:	J.R.Smith	1748.
	Josam	
	Wade	
	Zurn	



INTERCEPTOR DATA SHEET

Grease Interceptor:	<u>GI / QH-1.</u>
Description:	Concrete: The grease interceptor tank shall be constructed of precast concrete having a 28-day minimum compressive strength of 4500 PSI using a Type I Portland Cement.
Steel Reinforcement:	The grease interceptor shall be designed for H-20-44 traffic loading as defined by AASHTO using a 30% impact factor. Structural reinforcement placement shall be in accordance with ACI. All reinforcement shall comply with ASTM A615 Grade 60, or ASTM A706 Grade 60. Bar bending shall comply with the latest ACI standards. Lifting inserts to be installed for handling and be installed per manufacturer's requirements.
Manhole Access:	Grease interceptor shall have adequate manhole access covers and frames to permit access for cleaning all areas of the interceptor. Each manhole access shall be minimum 24-inch diameter clear opening and shall be water-tight. Cast iron frame/covers shall conform to ASTM A48, Class 30 and be traffic duty. Manhole covers shall be placed at grade elevation by using concrete extension. Manhole covers to be provided with vandal resistant pentahead bolts as specified in Specification Section 05 05 23. Provide sampling well as indicated on the Drawings.
Sampling Box:	Concrete: "same as above".

END OF SECTION 22 13 19



SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Water Closets (Commercial).
2. Urinals (Commercial).
3. Lavatories (Commercial).
4. Service Sinks (Commercial).
5. Electric Water Coolers.

B. Related Sections

1. Section 07 90 00 - Joint Protection.
2. Section 22 05 00 - Common Work Results for Plumbing.
3. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
4. Section 22 11 16 - Domestic Water Piping.
5. Section 22 13 16 - Sanitary Waste and Vent Piping.
6. Section 22 13 19 - Sanitary Waste Piping.

1.2 REFERENCES

- A. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
- B. ANSI/ASME A112.6.1M-1997 (R2017) - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- C. ANSI/ASME A112.18.1-2018 - Plumbing Fixture Fittings.
- D. ANSI/ASME A112.19.1M-1994 (R2018) - Enameled Cast Iron Plumbing Fixtures.
- E. ANSI/ASME A112.19.2M-2018 - Vitreous China Plumbing Fixtures.
- F. ANSI/ASME A112.19.4M-1994 (2009) - Porcelain Enameled Formed Steel Plumbing Fixtures.
- G. ASME A112.19.5-2016 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- H. ANSI Z358.1-2014 - Emergency Eyewash and Shower Equipment.
- I. ANSI/ARI 1010-2002 - Self-Contained, Mechanically Refrigerated Drinking water Coolers.
- J. CRR Title 24, Part 2, Section 511 and Part 5, Chapter 15.
- K. Energy Policy Act of 2005 (EPACT)
- L. IAPMD/UPC



1.3 DEFINITIONS

- A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.
- B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.
- C. Appliance: Device or machine designed and intended to perform a specific function.
- D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.
- E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.
- F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.
- G. Fixture: Installed receptor connected to the water distribution system that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.
- H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.
- I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
 - 1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.
 - 2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
 - 3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
 - 4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.
- J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1.
- B. Product Data: For each type of plumbing fixture specified, provide catalogue illustrations, sizes, rough-in dimensions, utility sizes including fixture and trim, fittings, accessories,



- appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- C. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring, as required.
 - D. Maintenance Data: Include fixture trim exploded view and replacement paints list. Plumbing fixtures to include in maintenance manuals specified in Division 1.
 - E. Warranty: Submit manufacturer's standard warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixture having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixture is on the proposer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.6 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.7 DELIVERY, STORAGE, HANDLING. AND PROTECTION

- A. Deliver plumbing fixtures in manufacturer's protective packing, crafting, and covering. Inspect for damage. Report damage to OWNER field responsible.



- B. Store and protect plumbing fixtures from damage on elevated platforms in a dry location by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Furnish quantity of identical units not less than 5 percent of amount of each type and size installed.
 - 3. Faucet, Laminar-Flow Fittings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
 - 4. Faucet, Flow-Control Fittings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
 - 5. Flushometer Repair kits: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
 - 6. Toilet Seats: Furnish quantity of identical units not less than 10 percent of amount of each type toilet seat installed.

PART 2 PRODUCTS

2.1 WATER CLOSET (ADA COMPLIANT) WC-1

- A. Manufacturers:
 - 1. American Standard, Inc.
 - 2. Kohler
 - 3. Crane Plumbing/Fiat Products.
- B. Description:
 - 1. Material: Vitreous China.
 - 2. Color: White
 - 3. Bowl Configuration: Elongated, siphon action bowl.
 - 4. Passageway: 2-1/4 inch.
 - 5. Mounting and Outlet: Floor mounted, back outlet.
 - 6. Rim Height: 16 1/2-inches above finished floor. (ADA Compliant). Coordinate mounting heights with Architectural Drawings.
 - 7. Water Consumption: 1.28 gpf.
 - 8. Wall Construction: As indicated on Architectural Drawings.
 - 9. Fittings and Accessories: Provide the following compatible components:
 - a. Toilet Seat: Type 1

2.2 URINAL (ADA COMPLIANT) UR-1

- A. Manufacturers:
 - 1. American Standard, Inc.
 - 2. Kohler
 - 3. Crane Plumbing/Fiat Products
- B. Description:



1. Material: Vitreous China.
2. Color: White.
3. Bowl Configuration: Elongated, top spud.
4. Spud Size: 3/4 inch.
5. Passageway: 2 inch.
6. Mounting and Outlet: Wall mounted, back outlet.
7. Rim Height: Coordinate mounting heights with Architectural Plans and Elevations.
8. Consumption: 0.125 gpf.
9. Wall Construction: Type of Wall as indicated on Architectural Drawings.
10. Fittings and Accessories: Provide the following compatible components:
 - a. Manual flush valve
 - b. Support: J.R. Smith, urinal support for off-the floor urinals for washout type urinal, Model 0637 with bearing plate.

2.3 LAVATORY (ADA COMPLIANT) L-1

- A. Manufacturers:
 1. American Standard, Inc.
 2. Kohler
 3. Crane Plumbing/Fiat Products
- B. Description:
 1. Material: Vitreous China
 2. Color: White
 3. Lavatory Size: 21-1/4 inches x 18-1/8 inches.
 4. Mounting and Outlet: counter mounted, wall outlet.
 5. Rim Height: ADA Compliant. (Coordinate mounting height with Architectural Plans and Elevations.)
 6. Wall Construction: Type of wall indicated on Architectural.
 7. Faucet, Fittings and Accessories: Provide the following compatible components:
 - a. Faucet: Kohler American Standard, single control lavatory battery sensor activated faucet.
 - b. Supplies: Lavatory Type 1
 - c. Drain: American Standard Grid Drain
 - d. Trap: Lavatory Type 1
 - e. Support Type: J.R.Smith, lavatory supports with concealed arms; floor mounted with "Pro-Set" uprights, Model 0700.

2.4 SINK KS-1

- A. Manufacturers:
 1. American Standard, Inc.
 2. Kohler
 3. Crane Plumbing/Fiat Products
- B. Description:
 1. Fixture: Kitchen Sink.
 2. Material: stainless steel, 20ga
 3. Sink Type: Single compartment sink; 3 hole punch.
 4. Sink Dimensions: 22 inch by 18 inch.
 5. Inside Bowl Dimensions: 18 inch by 14 inch by 10 1/2 inch.



6. Mounting: counter flush mounted
7. Faucet, Fittings and Accessories: Provide the following compatible components.
 - a. Faucet: American Standard
 - b. Drain: American Standard.
 - c. Trap: American Standard.

2.5 DRINKING FOUNTAIN DF-1

- A. Manufacturers:
 1. Haws.
 2. Elkay.
 3. Sunroc.
- B. ADA compliant, stainless steel wall-hung barrier free single wall mount water cooler with side-mounted bubbler with mouth guard, integral refrigerated air-cooled water chiller, 8.0 gph at 90 degree F ambient, 80 degree F inlet water, 50 degrees F outlet water, front self-closing push bars with feather touch water control and secured bottom access panel.
 1. Provide 18-gauge stainless steel back splash, extend 4 inch beyond EWC all sides.
 2. Provide 1/2-inch supply, 1-1/4-inch trap, 17-gauge P-trap, shut off valve and cleanout.
 3. Install thermostatically controlled heater model mounted within wall cavity.
 4. Cover unprotected ventilation openings with 12-gauge stainless steel plate, perforated with 1/8-inch diameter holes at 3/16 inches on center.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for potable cold water and hot water supplies and soil and for waste and vent piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.
- B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
 1. Carriers for following fixtures:
 - a. Wall-hanging water closets.
 - b. Wall-hanging fixtures supported from wall construction.
 2. Chair carriers for the following fixtures:
 - a. Wall-hanging lavatories and sinks.
 - b. Wall-hanging electric water coolers.
 3. Heavy-duty chair carriers for the following fixtures:



- a. Accessible lavatories.
- b. Fixtures where specified.
4. Reinforcement for the following fixtures:
 - a. Wall-mounted lavatories required to be secured to wall.
 - b. Wall-mounted sinks required to be secured to wall.

3.3 INSTALLATION OF PLUMBING FIXTURES

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-hanging fixtures with tubular waste piping attached to supports.
- F. Install counter-mounting fixtures in and attached to casework.
- G. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 1. Exception: Use ball valve if stops are not specified with fixture. Comply with Section 22 05 23, "General-Duty Valves for Plumbing Piping" for general-duty valves.
- I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- L. Install toilet seats on water closets.
- M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.



- O. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- P. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- Q. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with Section 22 05 00, for escutcheons.
- R. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. The drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Connect water supplies from water distribution piping to fixtures.
 - 2. Connect drain piping from fixtures to drainage piping.
 - 3. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
 - 4. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
 - 5. Ground equipment.
 - a. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.6 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.



- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

3.7 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Clean to new condition. Do the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.

3.8 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00



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SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Piping materials and installation common to most piping systems.
2. Dielectric unions and flanges.
3. Escutcheons.
4. Mechanical sleeve seals.
5. Sleeves.
6. Motors and drives.
7. Combination magnetic starters.
8. Equipment guards.
9. Equipment installation requirements common to equipment Sections.
10. Adjusting and cleaning.

1.2 REFERENCES

A. American Society of Mechanical Engineers (ASME).

1. ASME B31.9-2016 - Building Services Piping.
2. ASME B16.20-2016 - Metallic Gaskets for Pipe Flanges: Ring Joint Spiral Wound and Jacketed.
3. ASME B16.10-2016 (R2003) - Face to Face and End to End Dimensions of Valves.
4. ASME B16.34-2016 - Valves Flanged, Threaded and Welding End.

B. National Certified Pipe Welding Bureau (NCPWB).

C. Standard Procedure Specifications

D. ANSI Standards.

1. ANSI B16.20 - 2000 - Metallic Gaskets for Pipe Flanges: Ring Joint Spiral Wound and Jacketed.

E. AWWA Standards

1. AWWA C111/A21.11-07: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

F. MSS Compliance:

1. MSS SP-25-1998 - Marking System for Valves, Fittings, Flanges and Unions.
2. MSS SP-72-1999 - Ball Valves with Flanged or Butt-Welding Ends for General Service.
3. MSS SP-80-2003 - Bronze Gate, Globe, Angle and Check Valves.
4. MSS SP-70-1998 - Cast Iron Gate Valves, Flanged and Threaded Ends.
5. MSS SP-85-2002 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
6. MSS SP-78-2005A - Gray Iron Plug Valves Flanged and Threaded Ends.

G. FCI Compliance:

1. FCI 73-1-1998 - Pressure Rating Standard for "Y" Type Strainers.



2. FCI 78-1-1998 - Pressure Rating Standard for Pipeline Strainers other than "Y Type.

1.3 DEFINITIONS

- A. "Piping" includes, in addition to pipe, all fittings, flanges, valves, hangers and other accessories related to such piping.
- B. "Wiring" includes in addition to conductors, all raceway, conduit, fittings, boxes, switches, hangers and other accessories related to such wiring.
- C. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings or embedded in construction.
- D. "Exposed" means not installed underground or "concealed" as defined above.
- E. "Provide" means to furnish and install.

1.4 SUBMITTALS

- A. General
 1. Comply with the requirements of Division 1 and the specific requirements of the Sections of Division 23.
 2. Submit all similar equipment together as part of the same submittal. For example:
 - a. All roof exhaust fans shall be contained in the same submittal.
 - b. All air outlets shall be contained in the same submittal.
 3. Contractor shall review all submittals prepared by each supplier and mark all copies as acceptable to the Contractor. This acceptance shall signify that all required service connections are shown and in the proper location to meet the installation requirements and that the equipment can fit in the space allowed.
 4. Do not order equipment until submittals have been reviewed and approved by the Owner's Representative.
 5. Each item submitted shall be labeled or identified the same as on the Drawings.
 6. Mark submittal "Exactly as Specified" or accompanied by a letter from the supplier explaining in detail what difference, if any, exists between the submitted item and the specified item. Failure to point out the differences will be considered cause for disapproval. The Owner's Representative will not assume any responsibility for differences concealed or otherwise not brought to their attention, and the Contractor will be required to correct any deficiencies or differences discovered at a later date, and assume responsibility for any delays, damage, and/or expenses incurred by others due to such action.
 7. Brands or trade names are mentioned to set standards of quality only; use no substitute materials, however, unless approved in writing by the Owner's Representative. Approval of substitute materials does not relieve the Contractor of responsibility for providing a workable and functioning system as specified.
 8. Submittals will be checked for general conformance with the design concept but acceptance by the Owner's Representative in no manner is meant to verify that dimensions, quantities, or location of services are as necessary to meet the job requirements. This remains the responsibility of the Contractor.
- B. Shop Drawings



1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be coordinated, dimensioned and indicate equipment, piping, and ductwork in relation to architectural and structural features as well as other building systems. Include Minor piping, drains, air vents, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, dampers etc.
2. Required Drawings: Prepare and submit drawings for all areas and all mechanical work. Scale shall be minimum $3/8" = 1'-0"$ in mechanical rooms, fan rooms, and mechanical areas, and minimum $1/4" = 1'-0"$ elsewhere.

C. Coordination Drawings

1. General: Coordination drawings are defined as "shop drawings" which also indicate, on the same drawings, the major utilities of all other trades. "Coordination Drawings" shall indicate location and elevations of structural slabs and beams, architectural elements, domestic water piping, plumbing vents, sanitary drains, storm drains, fire protection piping, lighting fixtures, electrical conduits (2-inch and larger), ductwork, penetrations of walls and roof, fire dampers, fire/smoke dampers, automatic dampers, terminal boxes, air outlets, access panels, ceiling mounted equipment and controls, gas piping, flues, fans, air handling equipment, etc.
2. Submit coordination drawings for the following:
 - a. Entire housing building.
 - b. Other areas for which space is limited.
3. It is the intent of the coordination drawings to ensure coordination of all major utilities, prior to the start of installation. This is a substantial effort which will require careful and detailed coordination and planning to ensure appropriate information is available, from all trades, in a timely manner. The coordination drawing effort shall be integrated into the project schedule and monitored to ensure conformance.
4. Conflicts between trades, which cannot be resolved through generally accepted practice of coordination between trades, shall be clouded on the coordination drawings and an appropriate description of the problem noted for review by the Owner's Representative.
5. Nonconforming M/E work installed within designated coordination areas is subject to removal and replacement by installing contractor at no additional cost to Owner.
6. Coordination drawings shall be signed and dated by individual trade constrictors. By act of signature and submittal of singular combined coordination drawings, each trade contractor acknowledges coordination of their portion of the Work with all other plumbing, mechanical, electrical, architectural, and structural work contractors.

D. Product Data

1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, location and size of field connections, and accessories. Include certified drawings on major equipment such as boilers, water chillers, cooling towers, controls, pumps, and tanks.
2. Motors: Submit manufacturer's name, type, RPM, HP (KW), full load amps, efficiency, and power factor.
3. Part Load Performance: Submit equipment data to indicate performance characteristics throughout ranges of possible load conditions.
4. Include operating weight and location of center of gravity of each item of equipment in manufacturer's cut sheet for purposes of seismic calculation.



5. Pipes and Pipe Fittings: Submit schedule showing pipe material data, sizes, fitting valve type k factor, working pressure for each service.
 6. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
 7. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
 - a. Strainers: include pressure drop or chart for each type and size.
 8. Meters and gauges: include scale range for each service.
- E. Test Reports
1. Manufacturer's Tests
 - a. Factory Tests: As specified for specific equipment.
 - b. Field Tests: As specified.
 2. System Pressure Tests: As specified under "Testing" article. Test log of pressure tests on each system. Indicate date of test, scope of test, test pressure, duration, and observers.
 3. Balancing Reports: As specified under Section 23 05 93.
- F. Certification
1. Seismic Restraints: As specified under Sections 23 05 29.
 2. Controls: As specified under Section 23 09 23.
 3. Welding Certificates.
 4. Brazing Certificates.
- G. Operating and Maintenance Manuals: Include, but not limited to, the following:
1. List of all equipment with Manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item. Include phone number and address of service facilities
 2. System Description: Description of start-up, operating, and shutdown procedures.
 3. Controls: Diagrams and description of operation sequence of each system.
 4. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts lists with part numbers, and belt and sheave data. Mark each sheet with equipment identification number and actual installed condition.
 5. Materials and Accessories: Manufacturer's brochures parts list with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
 6. Certificate of factory tests, field tests and code compliance as specified.
 7. Wiring and controls schematics.
 8. Trouble shooting directions.
 9. Maintenance procedures and frequencies.
 10. Description of special tools.
 11. Copies of warranties.
 12. Safety precautions.
 13. Emergency contingencies.
- H. Record Documents
1. Comply with the Conditions of the Contract and the requirements of Section 23 05 53.
 2. Indicate ductwork mains and branches, size and location, for both exterior and interior; locations of dampers, control devices, filters, and terminal units requiring maintenance or repair.



3. Indicate mains and branches of piping systems, with valves and control devices located and numbered per valve schedule, concealed unions located, and with items requiring maintenance located (i.e. traps, strainers, expansion compensators, vents, etc.). Indicate actual inverts and horizontal locations of underground piping.
4. Indicate equipment locations (exposed and concealed), dimensioned from prominent building lines.
5. Identify approved substitutions, Contract Modifications, and actual equipment and materials installed.

I. Samples: When specified under applicable Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
- B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.6 SUBSTITUTIONS

- A. General:
 1. Base manufacturer is indicated in equipment schedules.
 2. In Specification, additional acceptable manufacturer(s) may be indicated.
 3. Other manufacturers, materials, or methods shall not be used unless approved in writing by the Owner's Representative.
 4. The burden of proof as to the equality of any proposed substitute manufacturer, material, or method shall be upon the Contractor.
 5. The Owner's Representative's decision shall be final.
- B. Requests for substitution review and acceptance shall be accomplished by table of comparison listing pertinent features of both specified and proposed materials, such as materials of construction, performance, dimensions, weights, replacement or maintenance access, motor type, horsepower, voltage, phase, service factor. Review of proposed substitutions will not be made until receipt of satisfactory comparison tabulation.
- C. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Owner's Representative. If first proposed product submittal is rejected, Contractor shall then submit the first-named or scheduled product.
- D. Contractor shall be responsible for all costs and coordination due to the substitution, such as impacts on electrical requirements, weight, openings in slabs and roofs, structural framing, housekeeping pad size, etc.



1.7 JOB CONDITIONS

- A. Cause as little interference or interruption of existing utilities and services as possible. Schedule Work which will cause interference or interruption in advance with Construction Manager.
- B. Examine Contract Documents to determine how other Work will affect execution of mechanical Work.
- C. Determine and verify locations of all existing utilities.
- D. Arrange for, coordinate, and pay costs incidental to providing utility company services indicated.
- E. Establish lines and levels for each system and coordinate with other systems to prevent conflicts and maintain proper clearances and accessibility.

PART 2 PRODUCTS

2.1 PIPE, TUBE AND FITTINGS

- A. Refer to individual Division 23 piping sections for pipe, tube, fitting materials joining methods. Comply with governing regulations.

2.2 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

- A. Welding Materials: Provide welding materials to comply with installation requirements.
 - 1. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.
- B. Gaskets for Flanged Joints: ASME B16.21; full-faced for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.

2.3 PIPING SPECIALITIES

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service or, if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, equipment connections. Where more than one type is indicated, selection is Installer's option.
- B. Dielectric Unions and Flanges
 - 1. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion. Pressure rating equal to or greater than that of nearby valves.
 - 2. Manufacturer:
 - a. Capitol Mfg. Co.; Div. of Harsco Corp.
 - b. Epco Sales, Inc.
 - c. Rockford-Eclipse Div.



2.4 PIPE ESCUTCHEONS

- A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All escutcheons shall be vandal proof.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid brass or solid sheet brass pipe escutcheons.
- C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.
- D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.5 MECHANICAL SLEEVE SEALS

- A. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
- B. Sleeve: To be furnished by same manufacturer of seals; schedule 40 galvanized steel pipe or Century line sleeves, with integral anchor and waterstop collar.
- C. Manufacturer: Thunderline Link Seal or Metraflex Metraseal.

2.6 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork.
 - 1. Piping: Provide fire stopping material as specified in Section 07 84 00.
 - 2. Ductwork: Provide fire damper or fire/smoke damper. For penetrations where fire damper or fire/smoke damper is not required by code, provide fire stopping material as specified in Section 07 84 00.

2.7 FABRICATED PIPING SPECIALTIES

- A. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges:
 - a. 3-inch and smaller: 0.040-inch/20 gauge thick.
 - b. 4 to 6-inch: 0.064-inch/16 gauge thick.
 - c. Over 6-inch: 0.079-inch/14 gauge thick.
 - 2. Steel Pipe: See "Mechanical Sleeve Seals" article.



2.8 MOTORS AND DRIVES

A. Motor controls and power wiring.

1. Provided as part of Division 26 work, unless indicated otherwise, including motor control switches, starters, disconnects, conduit and wiring, except for low voltage control wiring required for temperature controls.
2. Where equipment is specified with factory pre-wired controls and is furnished instead with components shipped loose, mechanical contractor shall be responsible for coordinating the complete installation and assume any additional costs.
3. See Section 23 09 23 for control wiring.

B. Motors

1. Ball or roller bearing type, high efficiency type, with starting and running characteristics consistent with torque and speed requirements of driven machine.
2. Use motors rated in accordance with NEMA performance standards to carry full nameplate load continuously at maximum temperature rise of 72 degrees F above ambient with service factor of 1.15.
3. Motors driven by variable frequency drives shall be rated for inverter duty and shall meet the requirements of NEMA MG-1 part 31.4.4.2.
4. Where substitute manufacturers are provided with different control panels, starters, or electrical characteristics from scheduled equipment, contractor shall coordinate complete installation and assume any additional costs.
5. Do not allow power requirements of driven machine to exceed nominal nameplate rating of motor furnished.
6. Do not include service factor when selecting motor horsepower.
7. Motors exposed to moisture or rain shall be totally enclosed, fan cooled (TEFC). Others may be open drip proof (ODP), unless otherwise indicated.

C. Motor electrical power characteristics: 460 volt, 3 phase, 60 Hz for 1/2 HP and larger; 115 volt, 1 phase, 60 Hz for smaller than 1/2 HP, unless noted otherwise.

D. Efficiency

1. Requirements apply to all motors, 1/2 HP and larger, except for refrigeration compressors, and for fans which run only in emergency mode, such as chemical exhaust fans.
2. Ratings in accordance with IEEE 112b Rating Method.
3. Motors shall be labeled as NEMA "Premium" Efficient, with efficiencies as follows, based on 1750 RPM.;
 - a. Motors with other than 1750 RPM shall be same type motor as would meet requirements for 1750 RPM motors.

E. Belt Drives

1. Manufacturers: Browning, Gates, Woods, or Dayton.
2. Belts: V-belt drives rated at 1-1/2 times the motor horsepower. High quality commercial-grade rubber with polyester reinforcing.
 - a. Provide two belts minimum for motor sizes 2 HP and larger.
3. Sheaves: Per ARI Standard 435-78.

Motor HP
0-100

Fan RPM
1800

Sheave
Adjustable or Fixed



15 and Above	0-1800	Fixed
0-3	1801 & above	Adjustable or Fixed
5 & above	1801 & above	Fixed

4. Adjustments: Fan static pressures shown and related RPM's are only approximate. Adjust sheaves or change drives to obtain required performance.
5. Provide metal belt guard having sides of galvanized steel and expanded metal face with openings for fan tachometer readings. Belt guard shall be sized to allow either sheave to be increased by two sizes.
6. Spare Parts: Provide one complete set of spare belts for all equipment items. When two or more pieces of equipment require identical belts, provide quantity of spare belts sufficient to serve two pieces of equipment. (For example, if there are three identical fans, each requiring two fan belts, then provide four spare fan belts.)
 - a. Obtain receipt from Owner.
 - b. Identify each belt by equipment ID.
 - c. For fans with two or more belts, fasten set of belts together to prevent separation during storage.

2.9 COMBINATION MAGNETIC STARTERS

- A. These requirements apply to starters which are provided as part of mechanical equipment such as air handling units, air conditioning units, etc.
- B. Circuit breaker type with motor circuit protector. Provide external operator handles for circuit breakers. Color code handles to display red in ON position and black in OFF position; design handle with up-down motion and with down position indicating OFF. Construct handles which permit locking handle in OFF position with three padlocks. Provide NEMA 4X weatherproof type enclosure. 24 VAC control circuit type; provide with integral 24 VAC transformer.

2.10 EQUIPMENT GUARDS

- A. Use suitable structural frames with minimum 12-gauge, 3/4-inch galvanized mesh, or expanded metal mesh.
- B. Attach to equipment by removable clips and bolts with swing nuts, or other approved connectors.
- C. At belts, provide opening for measuring RPM's.
- D. Provide at all belts, couplings, moving machinery and equipment in accord with OSHA.
- E. Design for easy access to belts and other items requiring replacement.
- F. Provide holes in guards for tachometer readings and checking of belt tension.
- G. Install in least obstructive manner as possible, with respect to equipment operation. For example, keep fan drive guards as far out of inlet air stream as practical, so as to minimize effect losses.



PART 3 EXECUTION

3.1 PIPING INSTALLATION

- A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16-inch misalignment tolerance.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other clearance to 1/2 inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- C. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- D. Electrical and Elevator Equipment Spaces: Do not run piping or ductwork through transformer vaults, electrical rooms and other electrical or electronic equipment spaces and enclosures, unless piping or ductwork is for equipment serving that electrical space.
- E. Comply with ASME B31.1.
- F. Pressures: Do not install piping, valves or piping specialties where exposed to system pressures greater than their rated working pressures.
- G. Sloping, Air Venting and Drainin
 - 1. Slope piping as indicated, true to line and grade, and free of traps and air pockets. Unless indicated otherwise, slope piping in direction of flow as follows:
- H. Install piping free of sags and bends. Support requirements are specified in Section 23 05 29.
- I. Refrigerant: Clean, dehydrate, and cap refrigerant piping. Take care to ensure that entire system is clean and dry during installation. Clean tubing by means of swab saturated in methyl alcohol or refrigerant 12 drawn through tubing as many times as necessary to thoroughly clean and dry interior of tubing and to eliminate formation of copper oxide. Before refrigerant lines are silver brazed, flush all air from tubing and pass slow-running stream of dry nitrogen through system during brazing process. Purge lines completely and maintain nitrogen flow at steady rate of not less than three cubic feet per hour. After brazing, interior of refrigerant lines must be clean and bright.
- J. Fittings



1. Provide standard, manufactured fittings in all cases. Field fabricated fittings are prohibited. Bushings are prohibited on pressure piping.
2. Weld-O-Lets and Thread-O-Lets may be used for non-galvanized steel piping if main pipe size is at least three standard pipe sizes larger than branch pipe, e.g. 2-inch main and 1-inch branch.
3. Provide insulating couplings at connections of ferrous piping to non-ferrous piping.

3.2 INSTALLATION OF VALVES

- A. General: Except as otherwise indicated, comply with the following requirements:
 1. Install valves where required for proper operation and isolation of equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- D. Fluid Control: Except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ASME B31.9. Where throttling is indicated or recognized as principal reason for valve, install globe valves.
- E. Installation of Check Valves
 1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
 2. Wafer Check Valves: Install between two flanges in horizontal or vertical position, position for proper direction of flow. Provide silent type wafer check valves at pump discharge locations.
 3. Lift Check Valve: Install in piping line with stem vertically upward, position for proper direction of flow.
- F. Install globe valves to close against pressure.
- G. Install plug valve with seat toward equipment to be isolated.
- H. Valve Discharge Piping: Provide discharge pipe to atmosphere from all relief and safety valves, sized with area equal to sum of outlet areas of all valves connected thereto, unless indicated larger.

3.3 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surfaces.



- B. Dielectric Unions and Flanges: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- C. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
- D. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

3.4 INSTALLATION OF FABRICATED PIPING SPECIALTIES

- A. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs.
 - 1. Do not install sleeves through structural members, except as detailed on Drawings, or as reviewed by the Owner's Representative.
 - 2. Install sleeves accurately centered on pipe runs.
 - 3. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run.
 - 4. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation.
 - 5. Pack 100 percent of annular space between sleeve and pipe or pipe insulation. Provide acoustical sealant at each end of pipe sleeve to seal packing in place.
 - a. At fire-rated walls, partitions, floors, roofs, and ceilings: Packing shall be through-penetration firestop.
 - b. At non-fire-rated walls, partitions, floors, roofs, and ceilings: Packing shall be fiberglass insulation, with density of 1.5 pcf.
 - 6. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves.
 - 7. Extend floor sleeves 1 inch above level floor finish.
 - 8. Provide temporary support of sleeves during placement of concrete and other work around sleeves.
 - 9. Provide temporary closure to prevent concrete and other materials from entering sleeves.
- B. Type of Sleeves
 - 1. Install sheet-metal sleeves at walls and partitions.
 - 2. Install schedule 40 pipe sleeves in concrete slabs.
 - 3. Install mechanical sleeve seals at exterior penetrations; below grade, and at slabs-on-grade.

- C. Mechanical Sleeve Seals: Install in accordance with the manufacturer's instructions.

3.5 PIPING EXPANSION PROVISIONS

- A. General: Install domestic hot water piping with at least 4 elbows or tees at following locations.
 - 1. Between piping mains and risers.
 - 2. Between equipment and pump or tank.
 - 3. Between piping main and equipment.



- B. Expansion Loops: Fabricate expansion loops as indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Provide pipe anchor and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.
 - 1. At Contractor's option, pipe anchors may be insulated lugged anchors; Pipe Shields, Inc., Model #C4000 Series. Comply with requirements for insulated pipe supports in Section 23 05 29.
 - 2. At Contractor's option, pipe guides may be guided insulated pipe supports; Pipe Shields, Inc., Model #B3000 or B7000 Series. Comply with requirements for insulated pipe supports in Section 23 05 29.

3.6 TESTING

- A. General: Provide labor and test equipment including test pumps, gauges, instruments and other equipment required. Use test quality pressure gauges, instruments and other equipment required. Use test quality pressure gauges with range of approximately twice test pressure. Use calibrated gauges and instruments.
- B. Piping
 - 1. General: Remove from systems, during testing, equipment which would be damaged by test pressure. Replace removed equipment after testing. Systems may be tested in sections as work progresses; however, any previously tested portion shall become a part of any later test of composite system.
 - 2. Correct leaks by remaking joints with new material; makeshift remedies will not be permitted. Test time accrues only while full test pressure is on system. Test before backfilling, concealing, insulating or making connections to potable water system.
 - 3. Test Schedule: Test each section of systems at one and one-half times the maximum working pressure of that section, but at not less than scheduled test pressure. Obtain maximum working pressures from the Owner's Representative if not indicated on Drawings. Unless indicated otherwise, scheduled tolerance is "no pressure loss", except that due to temperature change, in 24 hour period.
- C. Valves
 - 1. General Service Valves: Test bonnets for tightness. Test operate from closed-to-open-to-closed position while under test pressure.
 - 2. Automatic Valves: Test, including solenoid valves, water regulating valves, pressure reducing valves, pressure relief valves, safety valves and temperature and pressure relief valves for proper operation at settings indicated.
 - 3. Safety Valves: Test relief valves, safety relief valves, safety valves and temperature and pressure relief valves 3 times.
- D. Piping Specialties: Test thermometers, pressure gauges, flow measuring devices, and water meters for accurate indication; automatic water feeders, air vents, trap primers, vacuum breakers, and other specialties for proper performance.
- E. Hangers and Supports: With systems in normal operation, test hangers, supports and rods to ensure they are plumb and supporting proper share of load. Additionally support systems and equipment that sway, crawl, or vibrate.
- F. Ductwork: Comply with the requirements of Section 23 31 00.



- G. Ductwork Specialties
 - 1. Verify fire dampers, fire/smoke dampers, smoke dampers, and two position AVD's (automatic volume dampers) are 100% open, unless damper is indicated to be closed during normal operation.
- H. Buried Pipe and Equipment Wrapping and Coating: Test surfaces with standard 8,000 to 10,000 volt electrical holiday detector.
- I. Other Materials and Equipment
 - 1. Rotation: Verify.
 - 2. Motor Amperage: Verify operating motor amperage does not exceed motor nameplate rating.
 - 3. Test as specified; as recommended by equipment manufacturer; and as otherwise necessary or directed to assure they are complete, operable, and ready for use.

3.7 ADJUSTING AND CLEANING

- A. Inspect all equipment and put in good working order.
- B. Clean all exposed and concealed items
 - 1. Clean air surfaces of all coils, fans (including fan wheels and motors), air handler plenums and air filter frames.
 - 2. Clean floor drains, cleanouts, and plumbing fixtures.
 - 3. Clean specialties such as traps and strainers. Replace strainer screens with new prior to system commissioning.
- C. Ductwork: Blow-out ducts with fans before connecting terminal units. Clean ducts before installing air outlets.
- D. Equipment and Materials: Remove foreign materials including dirt, grease, splashed paint, and plaster, etc. Restore damaged finishes to original condition.
- E. Piping: Flush clean interior of piping. Upon completion of flushing, completely drain systems at low points; remove, clean, and replace strainer baskets and refill systems.
- F. Gas: After testing of natural gas system, and before any gas is put into line, blow out entire system of piping to remove scale and dirt; purge air by filling system with gas.
- G. Adjusting: Adjust equipment and system components as indicated or as otherwise required to result in intended system operation. Thereafter, as a result of system operation, or as directed, make readjustments as necessary to refine performance and to effect complete system tune-up.

3.8 SPECIAL TOOLS

- A. Furnish to Owner not later than when OWNER takes possession of equipment.
- B. Definition of Special Tools: Identified in or otherwise implied by, the manufacturer's operation and maintenance manuals for the furnished equipment, or which are otherwise required for the operation, with the manufacturer's recommended procedures for operation, adjustment and maintenance. Special tools do not include those required for major repairs



normally done by factory trained or otherwise specialized service personnel, nor do they include those normally found in the possession of OWNER's on site maintenance personnel.

3.9 MANUFACTURER'S START-UP ASSISTANCE

- A. Where the services of a factory authorized service representative are specified for the start-up of certain pieces of equipment, arrange to have the manufacturer of such equipment perform start-up and check-out service. Manufacturer shall provide a letter which shall be on the manufacturer's letterhead, shall list the equipment, shall certify that the equipment has been examined, that it has been installed in accordance with the manufacturer's installation instructions, started up, adjusted, and checked out in accordance with the manufacturer's instructions, and is operating properly. The letter shall be addressed to the OWNER and shall be signed by an authorized representative of the manufacturer.

3.10 CLEANING, FLUSHING, INSPECTING

- A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush clean interior of piping. Inspect each run of each system for completion of joints, supports and accessory items. Upon completion of flushing, completely drain systems at low points; remove, clean and replace strainer baskets and refill systems.
 - 1. Inspect pressure piping in accordance with procedures of ASME B31.

3.11 ADJUSTING AND CLEANING OF VALVES

- A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- C. Valve Identification: Tag each valve in accordance with Section 23 05 53.

3.12 ADJUSTING AND CLEANING OF PIPING SPECIALTIES

- A. Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.
- B. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

3.13 EQUIPMENT VIBRATION

- A. Mechanical Balance: Fans, pumps, motors, and drives, when equipment is installed and in normal operation, shall be within the following maximum limits, unless specified more restrictively for individual equipment items:
 - 1. 600 RPM and Less: 0.003-inch displacement, peak-to-peak.
 - 2. Over 600 RPM: 0.10-inch per second velocity, peak.



- B. Pulley Run-Out: When equipment is installed and in normal operation, pulley run-out in radial and axial directions not to exceed 0.001-inch.
- C. Field Tests: If requested, test equipment to determine compliance with specified requirements. Measure vibration displacement and velocity in vertical direction relative to floor. Make measurements on bearing housings (not end caps), or other heavy structural element directly connected to bearing housing, at each end of equipment.
- D. Field Balancing: Balance and retest equipment as required for compliance with specified requirements.

END OF SECTION 23 05 00



SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Pipe Hangers and Supports.
 - 2. Vertical Piping Clamps.
 - 3. Hanger-Rod Attachments.
 - 4. Building Attachments.
 - 5. Pipe Shields.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP 90, Guidelines on Terminology for pipe hangers and supports.

1.3 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards
 - 1. Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports and anchors.
 - 2. Qualify welding processes and welding operators according to AWS D1.1, Structural Welding Code-Steel.
 - a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
 - 3. Qualify welding processes and welding operators according to ASME Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications.
 - 4. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - a. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems
 - b. Listing and Labeling Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.
 - 5. Licensed Engineer: Prepare hanger and support design drawings and calculations for seismic restraint of piping and equipment. Include seal and signature of Registered Structural Engineer licensed in the State of California certifying compliance with Specifications.
 - 6. MSS Standard Compliance:
 - a. Provide pipe hangers and supports of which materials design and manufacture comply with MSS SP-58. Select and apply pipe hangers and supports, complying with MSS SP-69.
 - b. Fabricate and install pipe Local and supports, complying with MSS SP-89.
 - c. Terminology used in this Section is defined in MSS SP-90.



- C. Corrosion Resistance: Provide hot-dip galvanized steel, cadmium plating, or other approved corrosion resistant materials for exterior work and for work which will be subject to outdoor exposure during construction.
 - D. Coordination
 - 1. Coordinate resiliently supported work with other trades to avoid rigid contact with the building. Inform other trades such as drywall, plastering, or electrical, to avoid any contact which would reduce the vibration isolation.
 - E. Conflicts and Discrepancies
 - 1. Bring to the Owner's Representative's attention prior to installation any conflicts with other trades which will result in unavoidable contact to equipment, piping, etc., described herein, due to inadequate spaces, etc. Corrective work necessitated by conflicts after installation shall be at Contractor's expense.
 - 2. Bring to the Owner's Representative's attention prior to installation any discrepancies between the Specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation. Corrective work necessitated by discrepancies after installation shall be at Contractor's expense.
 - F. Inspection and Instruction
 - 1. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such enclosure.
- 1.4 VIBRATION ISOLATION
- A. Comply with the requirements of Section 23 05 48.
- 1.5 SEISMIC RESTRAINTS
- A. Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Include the following:
 - 1. Manufacturer's data (catalog cuts and data sheets), for each manufactured component including hangers, attachments, inserts, thermal shields anchors and guides, auxiliary framing and wall seals. Provide a project specific hanger and support schedule indicating all devices, manufacture and model, where used. Cross reference to product data and specification paragraph. Data shall demonstrate that components comply with Specifications.
 - 2. Support and Bracing Shop Drawings: Submit plans, sections, details, schedules and other information necessary to describe support hangers for all HVAC systems. Submittal shall indicate location and type of all hangers and supports. Each attachment to the building structure shall have vertical and horizontal point loads identified.
 - 3. Maintenance Data: Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual in accordance with requirements of Division 1.
 - 4. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
 - 5. Shop drawings for each type of hanger and support, indicating dimensions weights, required clearances, and methods of component assembly.
 - 6. Licensed Engineers hanger and support drawings specified in the "Quality Assurance" Article



7. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

PART 2 PRODUCTS

2.1 GENERAL

- A. Where not fully called for in the Contract Documents, design of HVAC hangers and supports shall be the Mechanical Contractor's responsibility. Design shall conform to accepted engineering practice using a safety factor of 2-1/2.

2.2 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 1. Superstrut, Gold Galv.
 2. B-Line Systems, Inc.
 3. Tolco.

2.3 MANUFACTURED HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. General: Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide felt-lined hangers and supports for copper piping systems in direct contact with copper piping components including galvanized coatings where installed for piping and equipment that will not have a field applied finish. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper piping.
- B. Thermal-Hanger Shield Inserts: 100 psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Shield Insert shall cover entire circumference of pipe and be of length indicated by manufacturer for pipe size and thickness of insulation by CSS Pre-Insulated Supports.
- C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated type, drive-pin attachments are not acceptable.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- E. Adjustable Steel Clevises Hangers: MSS Type 1.
- F. Yoke Type Pipe Clamps: MSS Type 2.
- G. Steel Double Bolt Pipe Clamps: MSS Type 3.
- H. Steel Pipe Clamps: MSS Type 4.



- I. Pipe Hangers: MSS Type 5.
 - J. Adjustable Swivel Pipe Rings: MSS Type 6.
 - K. Adjustable Steel Bond Hangers: MSS Type 7.
 - L. Adjustable Band Hangers: MSS Type 9.
 - M. Adjustable Swivel Rings, Band Type: MSS Type 10.
 - N. Split Pipe Pings: MSS Type 11.
 - O. Extension Split Pipe Clamps: MSS Type 12.
 - P. U-Bolts: MSS Type 24.
 - Q. Clips: MSS Type 26.
 - R. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
 - 1. Plate: Unguided type.
 - 2. Plate: Guide type.
 - 3. Plate: Hold-down Clamp type.
 - S. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.
 - T. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.
 - U. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.
 - V. Single Pipe Rolls: MSS Type 41.
 - W. Adjustable Roller Hangers: MSS Type 43.
 - X. Pipe Roll Stands: MSS Type 44.
 - Y. Pipe Rolls and Plates: MSS Type 45.
 - Z. Adjustable Pipe Roll Stands: MSS Type 46.
 - AA. Makeshift, field devised methods of HVAC pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42.
- 2.4 VERTICAL PIPING CLAMPS
- A. General: Except as otherwise indicated, provide factory-fabricated vertical piping clamps complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published



product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide felt-lined or copper-plated clamps for copper-piping systems.

- B. For vertical mid-span supports of piping 4-inch and under, use Hubbard Enterprises/HOLDRITE Stout Brackets with Hubbard Enterprises/HOLDRITE Stout Clamps or two-hole pipe clamps (MSS Type 26).
- C. Two-Bolt Riser Clamps: MSS Type 8.
- D. Four-Bolt Riser Clamps: MSS Type 42.

2.5 HANGER-ROD ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods.
- B. Steel Turnbuckles: MSS Type 13.
- C. Steel Clevises: MSS Type 14.
- D. Swivel Turnbuckles: MSS Type 15.
- E. Malleable Iron Sockets: MSS Type 16.
- F. Steel Weldless Eye Nuts: MSS Type 17.

2.6 BUILDING ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Powder-actuated fasteners are not acceptable.
- B. Concrete Inserts
 - 1. Cast-in-Place Concrete Inserts: MSS Type 18.
 - 2. Post-Installed Anchors: Proprietary type, designed for intended uses, and ICC ESR evaluated.
 - a. Manufacturers
 - 1) Simpson.
 - 2) Hilti Co.
 - 3) ITW Ramset/Red Head.
- C. Top Beam C-Clamp: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.



- F. Welded Beam Attachments: MSS Type 22.
 - G. C-Clamps: MS Type 23.
 - H. Top Beam Clamps: MSS Type 25.
 - I. Side Beam Clamps: MSS Type 27.
 - J. Steel Beam Clamps with Eye Nut: MSS Type 28.
 - K. Linked Steel Clamps with Eye Nut: MSS Type 29.
 - L. Malleable Beam Clamps: MSS Type 30.
 - M. Steel Brackets: One of the following for indicated loading:
 - 1. Light Duty: MSS Type 31.
 - 2. Medium Duty: MSS Type 32.
 - 3. Heavy Duty: MSS Type 33.
 - N. Side Beam Brackets: MSS Type 34.
 - O. Plate Lugs: MSS Type 57.
 - P. Horizontal Travelers: MSS Type 58.
 - Q. Powder-Actuated Fasteners: Not allowed.
- 2.7 INSULATED PIPE SUPPORTS (PIPE SHIELDS)
- A. All insulated lines shall be protected at the point of support by insulated pipe supports provided and installed by the pipe erector.
 - B. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes:
 - 1. ASME B31.1, MSS SP-58, MSS SP-69, and MSS SP-89.
 - C. Manufacturer: Pipe Shields Incorporated (PSI)
 - D. Insulated Pipe Supports
 - 1. Pipe supported on rod hangers.
 - 2. Pipe supported on Flat Surfaces.
 - 3. Pipe supported on pipe rolls.
 - 4. Pipe Guides.
 - 5. Anchors.
 - 6. Riser Pipe Supports.
 - E. Insulation
 - 1. 360-degrees insulation, encased in 360-degrees sheet metal shield.
 - 2. Provide assembly of same thickness as adjoining pipe insulation.
 - 3. Insulating Material:



- a. Cold Piping (below 50 degrees F): Urethane foam, 100 psi compressive strength.
- b. Hot piping (above 50-degrees F): Calcium silicate, 100 psi compressive strength, treated with water repellent.

2.8 MISCELLANEOUS MATERIALS

- A. Auxiliary Steel:
 1. Provide auxiliary structural steel as required for supports, anchors, guides, seismic restraints and vibration isolators.
 2. All structural steel systems to be designed in accordance with AISC Steel Handbook.
 3. All systems to be secured to building structure in a method acceptable to and approved by the Project Structural Engineer.
 4. Steel Work: Fabricate neatly. Grind off excess burrs and welding spatter. Paint with rust inhibitive primer.
- B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A36.
- C. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C404, Size No.2). Mix at a ratio of 1.0 part cement to 2.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS Standards.
- E. Pipe Alignment Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.
 1. Manufacturers
 - a. Hyspa.
 - b. Metraflex.
- F. Plenum Rated Pipe Clamps: ASTM E84 25/50 plastic clamps from [Hubbard Enterprises/Holdrite].

PART 3 EXECUTION

3.1 GENERAL

- A. Install devices in accordance with manufacturer's recommendations.
- B. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
- C. Support of pipe tubing and equipment shall be accomplished through means of engineered products specific to each application. Makeshift field devised methods will not be allowed.



- D. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the Work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors and associated Work, Installer shall meet at Project site with Contractor, Installer of each component of associated Work, Inspection and testing agency representatives (if any), Installers of other Work requiring coordination with Work of this Section and the Owner's Representative for purpose of reviewing material selections and procedures to be followed in performing the Work in compliance with requirements specified.

3.3 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms.
- B. Loading on Steel Beams
 - 1. Do not place eccentric loads on steel beams for loads greater than 50-pounds.
 - 2. For loads greater than 50 pounds, use attachments which create concentric loading.
- C. Cast-in Place Concrete Inserts
 - 1. Install before concrete is placed. Fasten inserts securely to forms.
 - 2. Install with reinforcing bar through opening at top of insert or with steel plate to distribute load, as detailed on Drawings.
 - 3. Maximum load per insert in slabs shall be 200 pounds, with a minimum spacing of 5 feet in any direction. For loads greater than 200 pounds, or where spacing cannot be maintained, make attachment to building structure or auxiliary steel, rather than to slab.
- D. Concrete Wedge Anchor Inserts: Maximum tension load per insert shall not exceed manufacturer's published rating.

Powder-Actuated Fasteners: Not allowed.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports of smaller diameter pipe. Do not use wire or perforated metal to



support piping, and do not support piping from other piping. Install in accordance with Seismic Restraint manual Guidelines for Mechanical Systems (SMACNA).

1. Materials, design and type numbers per MSS-58.
- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, felt-lined.
- D. Provisions for Movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.1 Power Piping Codes are not exceeded.
- G. Insulated Piping: Comply with the following installation requirements:
 1. Provide insulated pipe support (pipe shield) at each support of insulated piping.
 2. Select model of insulated pipe support according to published recommendations of insulated pipe support manufacturer, based on pipe size, pipe material, fluid medium, fluid temperature, support spacing, and type of support.
 3. Submit tabulation showing proposed uses of insulated pipe supports for different applications.
- H. Provide pipe supports on all DWV vertical piping penetrating floor slabs.
- I. All hanger components shall be Superstrut Gold Galv.
 - Vertical Piping: Superstrut clamps attached to the pipe above each floor to rest on the floor. Provide copperplate on copper tubing. Provide additional support at base of cast iron risers. Provide intermediate support for vertical piping greater than 12 feet in length.
 - 1. Individually Suspended Piping: Superstrut J-Hanger or Clevis, complete with threaded rod. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support. Copper pipe will be used in conjunction with felt lined hangers.

Pipe Size	Rod Size
2-inch and Smaller	3/8-inch
2-1/2-inch to 3-1/2-inch	1/2-inch
4-inch to 5-inch	5/8-inch
6-inch	3/4-inch
8-inch and up	7/8-inch
 - 2. Provide 3/8 inch or support of PVC and CPVC and provide continuous support.
 - 3. Trapeze Suspension: Superstrut 1-5/8-inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed L/180 of a span.



4. Trapeze Supporting Rods: Shall have a safety factor of 5; securely anchor to building structure.
 5. Pipe Straps: Superstrut 702 isolate copper pipe with two thicknesses of 2-inch wide 10-mil polyvinyl tape (Cush-A-Strip or Cush-A-Clamps). Where used for seismic support systems, provide Superstrut 702 or C708 series pipe straps.
- J. Concrete Inserts: Superstrut C302 continuous insert or 452-TB spot insert. Do not use powder-actuated fasteners for support of overhead piping unless approved by the Owner's Representative.
1. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
 2. Install concrete inserts in new construction prior to placing concrete. Superstrut 452-TB, C745, or C302.
 3. Install post-installed concrete anchors after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.
- K. Steel Connectors: Beam clamps with retainers.
1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts washers, and other accessories
- L. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- M. Support to Structure
1. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Owner's Representative.
- N. Rubber Neoprene Pipe Isolators
1. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Architectural Drawings shall show location of acoustical walls.
 2. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. Superstrut S716 or A716.
- O. Pipe Hangers and Support Spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and space at or within following maximum limits. Note that spacing listed are recommended maximums; increased spacing requirements due to California Building Code requirements, CCR Title 24, or other regulations in force and applicable for this contract shall be adhered to.

Pipe
Diameter

Steel
Fluid

Steel
Vapor

Copper
Fluid



1/2 to 1-inch	6	8	6
1-1/4 to 1-1/2-inch	8	10	6
Over 2-inch	10	10	10

- P. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
- Q. Provide rigid insulation and a 12-inch long, 18 gauge galvanized sheet metal shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering or CSS Pre-Insulated Calcium Silicate Support.
- R. Insulate copper tubing from ferrous materials and hangers with felt lined hangers.
- S. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
- T. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power-actuated fasteners will not be allowed.

3.5 ADJUSTING AND CLEANING

- A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
- B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.6 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint and exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1 requirements for touching up field-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Section 09 90 00.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

3.7 FIELD QUALITY CONTROL

- A. Licensed Engineer's Report: Prepare hanger and support installation report. Include seal and signature of Registered Structural Engineer, licensed in the State of California, certifying compliance with Specifications.

END OF SECTION 23 05 29



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SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Vibration Isolators.
 - 2. Seismic Restraints.
 - 3. Flexible Connectors.
- B. Related Sections
 - 1. Section 23 05 00 - Common Work Results for HVAC.
 - 2. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

- A. ASHRAE - Guide to Average Noise Criteria Curves.
- B. SMACNA "Guidelines for Seismic Restraints of Mechanical Systems", OSHPD Approval No. R-0001.

1.3 QUALITY ASSURANCE

- A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- B. All items of a given type shall be the product of the same manufacturer.
- C. Provide necessary design for avoidance of excessive noise and vibration in building due to operation of machinery or equipment, or due to interconnected piping or conduit.
- D. Installation of all vibration isolation units, and associated hangers and bases, shall be under direct supervision of vibration isolation manufacturer's representative.

1.4 REGULATORY REQUIREMENTS

- A. Provide seismic restraints for pipes and equipment, including pipes above roofs, supported from below in accordance with the requirements of the California Code of Regulations, Title 24, Parts 3, 4, and 5.

SUBMITTALS

- B. Submit in accordance with Division 1.
- C. Shop drawings and product data; submittal shall include:
 - 1. Concrete and steel details for equipment.
 - 2. Vibration isolation devices: Catalog cuts, isolation efficiencies and rated static deflections.



3. Welds or anchor bolt locations.
 4. Reinforcing and template steels.
 5. Number and locations of seismic restraints for each piece of equipment; specific details of restraints including anchor bolts for mountings and maximum load at each location.
 6. Spring O.D., free operation, and solid height of springs and ratio of horizontal to vertical stiffness.
 7. Number and location of vibration isolators for each piece of equipment including actual operating load for each vibration isolator.
- D. Seismic calculations for each seismic restraint sized and signed by registered Structural Engineer licensed in the State of California.
- E. Manufacturer's installation instructions.
- F. Manufacturer's Installation Report as specified in the "Field Quality Control" Article.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Manufacturers
1. Mason Industries, Inc.
 2. Vibration Mountings and Controls, Inc.
 3. Vibration Eliminator Company.
 4. Peabody Noise Control, Inc.
- B. Manufactured Units.
1. Isolator Type "PN": three layers of 1/4-inch neoprene waffle pad bounded between 16 gauge sheet metal shims or 3/4-inch thick neoprene waffle pad consisting of 2-inch square modules separated by thin web. Load distribution top plate utilized as required with additional 1/5 inch thick washer and bushing when pads are anchored to structure.
 2. Isolator Type "NM": Double deflection neoprene mountings having a minimum static deflection of .35 inch. Metal surfaces neoprene covered to avoid corrosion. Friction pads top and bottom.
 3. Isolator Type "NML": Neoprene mountings with integral seismic restraints and consisting of captive steel insert embedded in neoprene. Mountings may be used in tension and shear as well as compression. Neoprene pad may be bonded to base plate for additional deflection as required.
 4. Isolator Type "MS": Spring type, free standing and laterally stable without any housing, complete with 1/4-inch neoprene acoustical friction pad or neoprene cup between base plate and support. Provide leveling height and solid spring height in submittals.
 5. Isolator Type "MSL": Spring type mountings designed to resiliently resist seismic forces in all directions. Snubbing in all modes with adjustment to limit upward, downward and horizontal travel to a maximum of 1/4 inch before contacting snubbers. Provide spring with same characteristics as described in Type MS mountings. Provide mountings with leveling bolts that must be rigidly bolted to equipment, and with ports or openings to verify possible overload conditions. In submittals include spring diameter, deflections, compressed spring height and solid spring height.



6. Isolator Type “HN”: Vibration hangers which contain minimum .35-inch static deflection neoprene element. Neoprene rod isolation bushing shall pass through hanger box lower hole to prevent metal to metal contact.
7. Isolator Type “HS”: Vibration hangers which contain steel spring seated in 1/4-inch thick neoprene cup with integral rod isolation bushing. Bushing shall pass through lower hanger box hole to prevent metal-to-metal contact. Provide spring diameters and hanger box lower hole sizes large enough to permit hanger rod to swing through 30 degree arc. Provide minimum additional travel to solid equal to 50 percent of rated deflection.

2.2 SEISMIC RESTRAINTS

A. Manufacturers

1. Midland-Ross Superstrut.
2. Pipe Shields, Inc.
3. B-Line.

B. Restraint Types

1. Type R-1: Provide directional seismic restraints with interlocking steel members restrained by replaceable, minimum 1/4-inch thick bridge bearing neoprene bushing, capable of rotation after installation to verify isolation system is out of contact with restraints. Incorporate minimum air gap of 1/8 inch in snubber design in all directions before contact is made between rigid and resilient surfaces.
2. Type R-2: Restraints of all isolated suspended piping, ductwork and equipment using steel cables arranged to achieve required all-directional restraint and sized to resist seismic loads. Indicate proposed method of achieving sufficient slack to avoid short circuiting vibration isolators in submittal drawing.

C. General Requirements

1. Provide seismic restraints for all vibration isolated equipment, ductwork and piping.
2. Restrain supported and suspended equipment and piping by devices capable of restraint in all three mutually orthogonal directions.
3. For suspended equipment, utilize stranded steel aircraft cable plus modifications to isolators to prevent excessive vertical motion.
4. Seismic restraints must be installed and adjusted so equipment and piping vibration isolation is not degraded by utilization of restraints.

2.3 FLEXIBLE CONNECTORS

A. Manufacturers

1. Mason Industries, Inc.
2. Amber Booth.

B. Neoprene Connectors

1. Use flexible EPDM connectors on equipment as indicated on drawings or on equipment schedule, manufactured of multiple layers of frictioned nylon cord with EPDM cover and liner. Do not use steel wire or rings as internal pressure reinforcement. Provide straight connectors with two spheres with a centered molded external ductile iron ring to maintain two spherical shapes. Two inch and smaller sizes may have threaded ends. Provide floating flanges with recess to lock bead wire in raised face EPDM flanges. Use



tapered twin sphere connectors as described above where line size changes are required in straight piping runs.

2. Flanged equipment may be directly connected to neoprene elbows in size range 2-1/2 to 12 inches, if piping makes 90 degree turn and flanges are equal sized. Long radius reducing EPDM elbows may be used in place of steel or cast iron elbows at pump connections.
 3. When pressure would cause connector to extend beyond its rated elongation, employ control rods using 1-1/2-inch thick bridge-bearing neoprene washer bushings designed for maximum loading of 1000 psi.
 4. Provide twin sphere connectors with minimum rating of 250 psi at 170 degree F and 165 psi at 250 degree F. Provide elbows and reducing twin spheres with minimum pressure rating of 220 psi at 170 degree F and 145 psi at 250 degree F. Limit neoprene materials to 220 degree F. Certified safety factors shall be a nominal 4 to 1 with minimum acceptable test results of 3.6 to 1. Tests shall cover burst, flange leakage, extension without control rods and flange retention at 50 percent of burst pressure without control rods.
 5. Include in submittals test reports by independent consultants showing minimum reduction of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies.
- C. Flexible Stainless Steel Hose
1. Provide flexible stainless steel hose with stainless steel braid and carbon steel fittings. Provide flanged fittings for sizes 3-inch and larger, and make nipples for smaller sizes. Use bronze braided flexible hose with female sweat ends for copper lines. Install hoses on equipment side of shut-off valves horizontally and parallel to equipment shafts whenever possible. Flexible metal hose shall be Type BSS or BFF.

PART 3 EXECUTION

3.1 GENERAL

- A. Isolate plumbing equipment from building structure by means of noise and vibration isolators.
- B. Install isolators in accordance with manufacturer's written instructions.
- C. Vibration isolators must not cause change of position of equipment or piping resulting in piping stresses or misalignment.
- D. Make no rigid connections between equipment and building structure that degrade noise and vibration isolation system.
 1. Loop electrical conduit connections to isolated equipment to allow free motion.
- E. Do not use isolator leveling bolts as jacking screws.
- F. Verify that installed isolators and mounting systems permit equipment motion in all directions.
- G. Install vibration isolators for motor driven equipment.



3.2 SEISMIC CONTROL

- A. Provide seismic restraints for pipes and equipment per CBC, CMC, and CPC, including pipes above roofs, supported from below.
- B. Design and provide restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.
- C. Provide approved resilient restraining devices as required to prevent equipment and piping motion in excess of 1/4 inch.
- D. Provide capability of safely accepting external forces without failures.
- E. Do not short circuit vibration isolation systems or transmit objectionable vibration or noise.
- F. Provide restraint for piping in mechanical rooms for pipe sizes covered by SMACNA.
- G. Designs: Where designs, etc., are neither indicated nor referenced, submit such designs, together with supporting calculations prepared by Structural Engineer registered in the State of California. Calculations shall substantiate seismic restraint capability to safely accept external forces without failure and maintain equipment in position.
- H. Rigidly Supported Piping
 - 1. Where required for all systems, except sprinkler piping system, restrain per SMACNA seismic standards.
- I. Flexibly Supported Piping
 - 1. Provide and locate restraints to allow normal operation of systems without transmitting vibrations to building structure.
 - 2. Locations of Restraints: Per SMACNA and Factory Mutual where applicable.
 - 3. Construction of Restraint: Steel cables, installed slack, may be used.

3.3 EQUIPMENT ISOLATION AND SEISMIC CONTROL

- A. Position equipment and structural base on blocks or wedges at proper operating height. Set steel bases for 1-inch clearance between pad and base. Set concrete bases for 2-inch clearance.
- B. Provide operating load conditions prior to transferring base isolator loads to springs and remove wedges.
- C. Adjust or provide additional resilient restraints to flexibly limit startup equipment lateral motion to 1/4 inch.
- D. Prior to startup, clean out all foreign matter between bases and equipment.
- E. Verify that there are no isolation short circuits in the base, isolators or seismic restraints.
- F. Position all corner or side seismic restraints with equipment operating for proper operating clearance.



3.4 PIPING ISOLATION AND SEISMIC RESTRAINT

- A. Isolate piping outside of shafts as follows:
 - 1. Water piping 1-1/4 inch and larger in mechanical equipment rooms: Within 50 feet or 100 pipe diameters whichever is smaller, of connected rotating equipment and pressure reducing stations.
 - a. Piping where exposed on roof.
- B. Provide spring isolators on piping connected to isolated equipment as follows:
 - 1. Up to 4 inches in diameter, first 3 points of support.
 - 2. 1.5 to 8 inches in diameter, first 4 points of support.
 - 3. 10 inches and over in diameter, first 6 points of support.
 - 4. Static deflection of first point shall be twice deflection of isolated equipment.
- C. Locate Isolators:
 - 1. Close to building structure.
 - a. Hanger boxes butted to ceiling structure.
 - 2. Between building structure and supplementary steel if required.
- D. Supplementary steel to be sized for maximum deflection of 0.08 inches at center span.
- E. Seismic restraint spacing shall be in accordance with specified hanger spacing.
- F. Provide Seismic Restraint For All Piping:
 - 1. In equipment room.
 - 2. On roofs.
 - 3. In shafts and in ceiling of occupied spaces.

3.5 FIELD QUALITY CONTROL

- A. Provide inspection by manufacturer's representative of all vibration isolating devices after installation of all devices.
- B. Submit written report by manufacturer regarding installation error, improper selection of devices, and other faults that could affect performance of system. Include report on steps to properly complete isolation work.

END OF SECTION 23 05 48



SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe Markers.
 - 2. Valve Tags.
 - 3. Equipment Nameplates.
 - 4. Underground Marking Tape.
 - 5. Duct Labels.

1.2 REFERENCES

- A. ASME A13.1-2007 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Indicate model, type, and application usage.
- C. Submit list of wording, symbols, letter size, letter style, and color coding for each system and vault cover.
- D. Submit valve numbering scheme, valve chart and schedule, including valve tag number, location, function type, and valve manufacturer's name and model number.

1.4 COORDINATION

- A. Coordinate with Owner's Representative for preferred color schemes and service abbreviations and valve and equipment numbering schemes prior to submittal review.
- B. Coordinate installation of identifying devices with completion of covering of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment. If not installed before ceiling is installed, the Contractor shall remove ceiling at no additional cost to the Owner and install identifying devices.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Seton Name Plate Corp.



B. Brimar.

C. Brady.

2.2 PIPE MARKERS

A. Markers: ASME A13.1.

1. Pressure sensitive vinyl (self sticking) material.
2. Mechanically fastened type: Snap on or strap on.
 - a. For dirty, greasy, or oily pipe where pressure sensitive markers may not perform satisfactorily.
3. All weather film for outdoor exposed piping.
4. Provide 360 degree and pipe flow arrows and fluid being conveyed.
5. Size of letters legend:

<u>OUTSIDE DIAMETER OF PIPE OR PIPE COVERING</u>	<u>LENGTH OF COLOR FIELD</u>	<u>SIZE OF LETTERS AND ARROWS</u>
3/4 to 1-1/4 inch	8 inch	1/2 inch
1-1/2 to 2 inch	8 inch	3/4 inch
2-1/2 to 6 inch	12 inch	1-1/4 inch
8 to 10 inches	24 inch	2-1/2 inch
Over 10 inches	32 inch	3-1/2 inch
Ductwork		2-1/2 inch

2.3 VALVE TAGS

A. Tags: Brass or anodized aluminum type.

1. Brass: Minimum 19 gauge, polished, 2-Inch diameter with following lettering:
 - a. Service: 1/4-inch stamped black filled letters.
 - b. Valve numbers: 3/8-inch stamped black filled letters.
2. Aluminum: 2-inch diameter, 0.032-inch thick, with following lettering:
 - a. Service: 1/4-inch engraved letters.
 - b. Valve numbers: 3/8-inch engraved letters.

B. Fasteners: 4 ply 0.018 copper or monel wire meter seals, brass “S” hooks or No. 16 brass jack chain.

2.4 EQUIPMENT NAME PLATES

A. 1/8-inch rigid plastic or bakelite with 4 edges beveled, with black background and white border and letters.

1. Two 3/8-inch mounting holes.
2. Minimum 1/2-inch high lettering.
3. Commercial quality, rust resisting nuts and bolts with backwashers, self-tapping screws or rivets.



2.5 UNDERGROUND MARKING TAPE

- A. General: Provide underground pipe marking tape on all pipes buried beneath the ground. Provide a continuous length of tape 12 inches below the finished earth surface directly above the buried pipe. Provide a second continuous length of tape 12 inches above the top of the buried pipe if the top of the pipe is lower than 36 inches from the top of the finished earth surface.
- B. Tape: 5 mil inert plastic film for underground use.
- C. Resistant to alkalis, acids and other destructive agents found in soil; information in the Geotechnical Report.
- D. Minimum tensile strength: 120 pounds per 6-inch width.
- E. Minimum elongation: 500 percent.
- F. Provide detectable underground tape above all buried pipes on the Project. Provide a continuous printed message repeated every 16 to 36 inches warning of pipe buried below similar to (i.e., "CAUTION GAS LINE BURIED BELOW").
- G. Color code:
 - 1. Yellow: Natural gas.
- H. Provide tape widths of 2, 3, 6, 9, and 12 inches for lines buried 10, 20, 30, 40, and 50 inches or greater, respectively.

2.6 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 degrees F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.



1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.7 STENSILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4-inches for ducts; and minimum letter height of 3/4-inch for access panel and door labels, equipment labels, and similar operational instructions.
 1. Stencil Material: Aluminum.
 2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.8 CHART AND DIAGRAM FRAMES

- A. Chart and diagram frames: Extruded aluminum with plexiglass or glass windows.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 VALVE AND EQUIPMENT IDENTIFICATION

- A. Designate all equipment, valves, dampers and terminal units by distinguishing numbers and letters on charts and/or diagrams.
 1. Tag and locate following equipment items:
 - a. Valves.
 - b. Dampers.
 - c. All items indicated on equipment schedules except registers, grilles and diffusers.
 2. Designation shall match that indicated.
- B. Install tags on all devices with numbers and letters corresponding to charts.
- C. Fasten tags securely to devices with tag fasteners in manner for easy reading.
- D. Attach equipment nameplates in conspicuous location, directly on item of equipment or apparatus such as starters, pumps, fans, HVAC units and control panels.
- E. For unsuitable surfaces, such as high temperature or lack of space, use copper or brass rings or chains to attach tags.
- F. Furnish 4 charts.
 1. Mount 1 chart in frame and secure on wall in location directed by Owner's Representative.
 2. Include remaining 3 sets in "Operation and Maintenance Manuals".
 3. Show valve tag numbers on project as-built drawings.



- G. Provide safety sign for each piece of exposed mechanical equipment that may start automatically.

3.3 PIPE IDENTIFICATION

- A. Locate pipe markers as follows:
 - 1. Next to each valve and fitting, except on plumbing fixtures and equipment.
 - 2. At each branch or riser take off.
 - 3. At each passage through walls, floors and ceilings.
 - 4. At each pipe passage to underground.
 - 5. On all horizontal pipe runs every 20 feet, at least once in each room and each story traversed by piping system.
 - 6. Identify piping contents, flow direction, supply and return.
- B. Install markers with tape color bands over each end of marker, extending around pipe and overlapping a minimum of 30 degrees.

3.4 SERVICE ABBREVIATIONS

- A. Coordinate with Owner's Representative for preferred color schemes and service abbreviations as indicated below:
 - 1. G (xxx psi) Natural Gas (indicate pressure).
 - 2. REF Refrigerant (exposed)

3.5 INSTALLATION OF UNDERGROUND MARKING TAPE

- A. Install underground marking tape directly above all outside utility lines.
- B. Allow 12 inches between tape and line, and install as close to grade level as feasible.

3.6 CONTROL DIAGRAMS AND INSTRUCTIONS

- A. Provide HVAC control and systems instructions and diagrams in wall mounted frames. Mount framed diagrams in conspicuous, easily accessible places in equipment rooms housing appropriate HVAC system.
- B. Diagrams and instructions may be reduced in size provided they are legible and lettering is not smaller than "elite" type of standard typewriter.

3.7 DUCTWORK IDENTIFICATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than



- 1-inch high is needed for proper identification because of distance from normal location of required identification.
- C. Access doors: Provide duct labels or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.
 - D. Concealed doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.
 - E. Access doors for fire-dampers, smoke dampers, and fire/smoke dampers: Permanently identify on the exterior by a label with letters not less than 1/2 inch in height reading "FIRE DAMPER", "SMOKE DAMPER", or "FIRE/SMOKE DAMPER". Comply with requirements of CMC.

END OF SECTION 23 05 53



SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Testing, adjustment, and balancing of air systems.
2. Measurement of final operating condition of HVAC systems.
3. Sound measurement of equipment operating conditions.
4. Vibration measurement of equipment operating conditions.
5. Flow testing and balancing of following systems:
 - a. Domestic water systems.

1.2 REFERENCES

- A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.3 TOLERANCES

- A. Adjust air handling systems to plus or minus 5 percent for supply, return and exhaust systems from figures indicated.
- B. Adjust hydronic systems to plus or minus 10 percent of design conditions indicated.
- C. Indicate system air leakage loss. Loss shall not exceed 3 percent.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Name of adjusting and balancing agency for approval within 30 days after award of Contract.
- C. Test Reports: Report Forms.
 1. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
 2. Forms shall include the following information:
 - a. Title Page:
 - 1) Company name, address, telephone number.
 - 2) Project name, location.
 - 3) Project Architect
 - 4) Project Engineer
 - 5) Project Contractor
 - 6) Project Altitude
 - b. Instrument List:
 - 1) Instrument description; manufacturer; model; serial number; range; calibration date.



- c. Air Moving Equipment:
 - 1) Location; manufacturer; model; air flow, specified and actual; return air flow, specified and actual; outside air flow, specified and actual; total static pressure (total external), specified and actual; inlet pressure; discharge pressure; fan RPM.
- d. Exhaust Fan Data:
 - 1) Location; manufacturer; model; air flow, specified and actual; total static pressure (total external), specified and actual; inlet pressure; discharge pressure; fan RPM.
- e. Return Air/Outside Air Data:
 - 1) Identification/location; design air flow; actual air flow; design return air flow; actual return air flow; design outside air flow; actual outside air flow; return air temperature; outside air temperature; required mixed air temperature; actual mixed air temperature; design outside/return air ratio; actual outside/return air ratio.
- f. Electric Motors:
 - 1) Manufacturer; HP/BHP; phase, voltage, amperage; nameplate, actual, no load; RPM; service factor; starter size, rating, heater elements.
- g. V-Belt Drive:
 - 1) Identification/location; required driven RPM; driven sheave, diameter and RPM; belt, size and quantity; motor sheave, diameter and RPM; center to center distance, maximum, minimum, and actual.
- h. Duct Traverse:
 - 1) System zone/branch; duct size; area; design velocity; design air flow; test velocity; test air flow; duct static pressure; air temperature; air correction factor.
- i. Air Distribution Test Sheet:

Air terminal number; room number/location; terminal type; terminal size; area factor; design velocity; design air flow; test (final) velocity; test (final) air flow); percent of design air flow.
- j. Pump Data:
 - 1) Identification/number; manufacturer; size/model; impeller; service; design flow rate, pressure drop, BHP; actual flow rate, pressure drop, BHP; discharge pressure; suction pressure; total operating head pressure; shut off, discharge and suction pressures; shut off, total head pressure.
- k. Cooling Coil Data:
 - 1) Identification/number; location; service; manufacturer; air flow, design and actual; entering air DB temperature, design and actual; entering air WB temperature, design and actual; leaving air DB temperature, design and actual; leaving WB temperature, design and actual; air pressure drop, design and actual.
- l. Sound Level Report:
 - 1) Location; octave bands - equipment off; octave bands - equipment on.
- m. Vibration Test:
 - 1) Location of points:
 - a) Fan bearing, drive end.
 - b) Fan bearing, opposite end.
 - c) Motor bearing, center (if applicable).
 - d) Motor bearing, drive end.
 - e) Motor bearing, opposite end.



- f) Casing (bottom or top).
 - g) Casing (side).
 - h) Duct after flexible connection (discharge).
 - i) Duct after flexible connection (suction).
 - 2) Test readings:
 - a) Horizontal, velocity and displacement.
 - b) Vertical, velocity and displacement.
 - c) Axial, velocity and displacement.
 - 3) Normally acceptable readings, velocity and acceleration.
 - 4) Unusual conditions at time of test.
 - 5) Vibration source (if non-complying).
- n. Prior to commencing work, draft reports indicating adjusting, balancing, and equipment data required.
- o. Draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner's Representative and for inclusion in operating and maintenance manuals.
- p. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- q. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

D. Closeout Submittals.

E. Project Record Documents:

- 1. Submit record documents under provisions of Division 1.
- 2. Accurately record actual locations of balancing valves and rough setting.

1.5 QUALITY ASSURANCE

- A. Agency shall be company specializing in adjusting and balancing of systems specified in this Section with minimum three years documented experience certified by AABC. Perform Work under supervision of AABC Certified Test and Balance Engineer or registered Professional Engineer.
- B. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
- C. Pre-Installation Meetings:
 - 1. Convene a conference two weeks prior to commencing work of this Section, under provisions of Division 1.

1.6 SEQUENCING AND SCHEDULING

- A. Sequence work under provision of Division 1.
- B. Sequence work to commence after completion of systems, and schedule completion of work before Substantial Completion of Project.
- C. Provide assistance in final adjustment and test of smoke control system with Fire Authority.



1.7 TESTING AND STARTUP PROCEDURE

- A. The following procedures shall be used for starting and testing of each item of equipment.
- B. Prior to testing and/or starting, clean inside each piece of equipment and provide clean filters and strainers. Owner's Representative will inspect.
- C. Prior to equipment startup, submit in writing to Owner's Representative approval to begin Checking Equipment/Test Procedure and Startup Procedure. Submit manufacturer's recommendations for startup/testing.
- D. Checking Equipment/Test Procedure:
 1. Fans:
 - a. Record serial numbers, model, brand, etc.
 - b. Lubricate where necessary.
 - c. Check belts.
 - d. Check rotation.
 - e. Check voltage and phase.
 - f. Check for free movement.
 - g. Turn fan on and begin testing.
 2. Package Units:
 - a. Record serial numbers, model, brand, etc.
 - b. Lubricate where necessary.
 - c. Check belts.
 - d. Check rotation.
 - e. Check voltage and phase.
 - f. Check for free movement.
 - g. Check terminal connections.
 - h. Turn on power 24 hours prior to starting to allow crankcase heaters to warm up.
 - i. Check gas connections and turn on if necessary.
 - j. Turn unit on and begin testing.
 3. Split Systems/Heat Pumps:
 - a. Record serial numbers, model, brand, etc.
 - b. Lubricate where necessary.
 - c. Check rotation.
 - d. Check voltage and phase.
 - e. Check for free movement.
 - f. Evacuate lines as per manufacturer's recommendations and hold to 48 hours without leak.
 - g. Request the presence of a Owner's Representative.
 - h. In the presence of a Owner's Representative:
 - 1) Demonstrate that the lines have been evacuated to the recommended micron level and are holding without leaks.
 - 2) Turn on vacuum pump, close valve on pump and turn pump off.
 - 3) Demonstrate that lines are holding a vacuum.
 - i. Open suction and liquid valves.
 - j. Turn unit on.
 - k. Install gages and add a small amount of refrigerant if necessary to compensate for the line length and evaporator coil.
 - l. Begin testing unit.



4. Evaporative Cooling Equipment:
 - a. Record serial numbers, model, brand, etc.
 - b. Lubricate where necessary.
 - c. Check belts.
 - d. Check rotation.
 - e. Check voltage and phase.
 - f. Check for free movement.
 - g. Turn on fans and pump.
 - h. Begin testing unit.
 - i. Check pump discharge valve setting.
 - j. Check pump strainer. They must be clean.
 - k. Check all discharge nozzles. They must be clean.
 - l. Check bleed off setting to maintain a pH value acceptable to Owner's Representative as per unit manufacturer's recommendations based on the water supply analyses.
 - 1) Provide water supply analyses.
- E. Startup Procedure:
 1. Fans:
 - a. Check control sequence of fan. Check interlocks.
 - b. Correct deficiencies.
 - c. Request the presence of a Owner's Representative and control Subcontractor for startup test.
 - d. In the presence of a Owner's Representative:
 - 1) Check control sequence of fan. Check interlocks.
 2. Package Units:
 - a. Initiate test mode outlined in factory startup manual and verify each stage of operation, i.e. fan operation, and first and second stage of heating and cooling.
 - b. Turn system to automatic operation at thermostat.
 - c. Check that unit cools, heats and fan runs.
 - d. Request the present of a Owner's Representative and Control Subcontractor for startup test.
 - e. In the presence of a Owner's Representative:
 - 1) Turn unit off.
 - 2) Set time clocks to manual mode.
 - 3) Turn unit back on.
 - 4) Initiate test mode outlined in factory startup manual and verify each stage of operation, i.e. fan operation, and first and second stage of heating and cooling.
 - 5) Set room thermostat to automatic operation and place a thermostat in the leaving air.
 - 6) Remove outside air thermostat from unit and place in ice water. Verify operation of economizer mode and first and second stage of cooling during simulated winter and cool-summer conditions.
 - 7) Set room thermostat to higher setting and verify operation of heat cycle.
 - 8) Replace all covers on unit and put time clock in automatic mode.
 - f. If all items are found satisfactory, unit is turned into 5-day test as follows:
 - 1) Run system at 60 degrees for 24 hours regardless of seasonal load and system design,
 - 2) Run system at 80 degrees for 24 hours regardless of seasonal load and system design.



- 3) Run system at control temperature for 72 hours using a temperature recorder.
 - g. If system satisfies above set of requirements, system is deemed satisfactory.
 - h. Verify with Owner's Representative for actual room temperature required during heating and cooling.
 3. Split Systems/Heat Pumps:
 - a. Initiate test mode outlined in factory startup manual to verify defrost cycle.
 - b. Turn system to automatic operation at thermostat.
 - c. Check that unit cools, heats and fan runs.
 - d. Request the presence of a Owner's Representative and Control Subcontractor for startup test.
 - e. In the presence of a Owner's Representative:
 - 1) Turn unit off.
 - 2) Set time clocks to manual mode.
 - 3) Turn unit back on.
 - 4) Initiate test mode outlined in factory startup manual to verify defrost cycle.
 - 5) Turn system to automatic operation at thermostat.
 - 6) Check that unit cools, heats and fan runs.
 - 7) Replace all covers on unit and put time clock in automatic mode.
 - f. If all items are found satisfactory, unit is turned into 5-day test:
 - 1) Run system at 60 degrees F cooling for 24 hours regardless of seasonal load and system design.
 - 2) Run system at 80 degrees F heating for 24 hours regardless of seasonal load and system design.
 - 3) Run system at indoor design temperature for 72 hours using a temperature recorder.
 - g. If system satisfies above set of requirements, system is deemed satisfactory.
 - h. Verify with Owner's Representative for actual room temperature required during heating and cooling.
 4. Evaporative Cooling Equipment:
 - a. Check damper operation.
 - b. Check pump operation.
 - c. Check bleed and flush operation.
 - d. Turn system to automatic operation at thermostat.
 - e. Check that heating and cooling cycles operate per manufacturer's sequence of operation.
 - f. Request the presence of a Owner's Representative and Control Subcontractor for startup test.
 - g. In the presence of a Owner's Representative:
 - 1) Turn unit off.
 - 2) Set time clocks to manual operation.
 - 3) Turn unit back on.
 - 4) Check damper operation by adjusting outside air thermostat to higher than outside air temperature.
 - 5) Check pump operation.
 - 6) Check flush operation by adjusting flush cycle frequency setting.
 - 7) Turn system to automatic operation at thermostat.
 - 8) Turn thermostat to system calls for heat and verify operation of heat cycle.
 - 9) Put time clock in automatic mode.
 - h. If items are found satisfactory, unit is turned into 5-day test same as outlined in Package Unit Startup item (f).



- i. If system satisfies above requirements, system is deemed satisfactory.
- F. Where equipment and components are interlocked into a system, test and verify proper operation as a complete system.

PART 2 PRODUCTS

2.1 GENERAL

- A. Products and materials shall be as described in pertinent sections of Division 23.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Before commencing work, verify that systems are complete and operable. Ensure the following:
 - 1. Equipment is operable and in safe and normal condition.
 - 2. Control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fan rotation is correct.
 - 7. Fire and volume dampers are in place and open.
 - 8. Coil fins have been cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage has been minimized.
 - 12. Pump rotation is correct.
 - 13. Proper strainer baskets are clean and in place.
 - 14. Service and balance valves are open.
 - 15. Air vents are installed and operating properly.
- B. Report any defects or deficiencies noted during performance of services to Owner's Representative.
- C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
- D. If, for design reasons, system cannot be properly balanced, report as soon as observed.
- E. Commencement of work indicates acceptance of existing conditions.

3.2 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner's Representative to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.



3.3 ADJUSTING

- A. Adjust work under provisions of Division 1.
- B. Recorded data shall represent actually measured, or observed condition.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. Air System Procedure
 - 1. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
 - 2. Make air quantity measurements in ducts by Pilot tube traverse of entire cross sectional area of duct.
 - 3. Measure air quantities at air inlets and outlets.
 - 4. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
 - 5. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
 - 6. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
 - 7. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
 - 8. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
 - 9. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions. Set minimum position for outside air dampers to achieve indicated minimum outside air CFM's.
 - 10. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
 - 11. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
 - 12. Take sound level reading at two diffusers per zone at approximately 5 feet above floor. Readings shall be between 43 and 41 db.

3.4 CONTROL COORDINATION

- A. Cooperate with control system installer and equipment installer in making adjustments to equipment as required to accomplish indicated performance.



- B. Assist in the testing of the chemical agent mode controls in Housing Buildings, to verify that all required fans and dampers position automatically and properly in response to system commands.

END OF SECTION 23 05 93



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SECTION 23 07 00 - HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Acceptable Manufacturers.
 - 2. Piping Insulation and Jacketing Materials.
 - 3. Insulation Materials.
 - 4. Equipment Insulation Materials.

1.2 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this Project.
- C. Flame/smoke ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.
 - 1. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.
- D. Insulation on pipes, ducts, and plenums in building spaces shall not breed or promote microbial growth.
- E. Insulation products shall be formaldehyde-free.
- F. K Values: Thermal conductivity in BTU-in/hr. sq.ft. deg.F.
- G. Density: In pound/cu.ft. (pcf).
- H. Vapor Permeability, in perms: (0.02 perms = 0.02 grains/hr x sq. ft x inch Hg.)

1.3 SUBMITTALS

- A. Product data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Maintenance data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.



1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from Project site.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
 - 1. Armacell.
 - 2. CertainTeed Corp.
 - 3. Johns Manville Corp.
 - 4. Owens-Corning Corp.

2.2 PIPING INSULATION MATERIALS

- A. Fiberglass piping insulation: Preformed, one piece, with all service jacket/self sealing lap; K value of 0.23 at 75°F (33.1 at 24°C mean temperature) mean temperature.
 - 1. Vapor Barrier Jacket: With integral, factory-applied, paintable, white reinforced kraft outer surface bonded to aluminum foil with self-sealing lap. Maximum vapor permeance of 0.02 perms, and minimum beach puncture of 50 units.
- B. Elastomeric Foam Piping Insulation: Closed cell. K-value of 0.27 or less at 75°F (39 or less at 24°C) mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame / 50 smoke rating for thicknesses up to 1.5 inch. Insulation shall be CFC free.
 - 1. Pipe sizes up to 6": Preformed, one-piece insulation. Armacell AP/Armaflex, Rubatex Insul-Tube 180, or approved equal.
- C. Jackets:
 - 1. Interior Applications:
 - a. Vapor Barrier Jackets: Kraft, reinforced foil vapor barrier with self-sealing adhesive joints.
 - b. PVC Jackets: One piece, premolded type.
 - c. Canvas Jackets: UL listed treated cotton fabric, 6oz/sq. yd.
 - 2. Exterior Applications:
 - a. Aluminum Jackets: ASTM B209, 20 mils thick; with 2 joint longitudinal seams, and factory supplied butt straps.
- D. Fittings and Valves: Manville Zeston, Speed-Line. Premolded PVC fitting covers over pre-cut insulation of same thickness as adjacent piping. Do not use for engine exhaust piping.
- E. Bands, wires, and cement: As recommended by insulation manufacturer for applications indicated.



- F. Adhesives, sealers, and protective finishes: As recommended by insulation manufacturer for applications indicated.

2.3 DUCTWORK INSULATION MATERIALS

- A. Duct Wrap with Vapor Barrier: 1.5 inch thick fiberglass; 0.75 lb/cu. ft.. R-value of 5.2 at 75°F mean temperature (0.92 at 24°C mean temperature); installed R-value of 4.2. With factory-applied FSK (foil scrim kraft) facing with maximum vapor permeance of 0.02 perms. Formaldehyde free.
- B. Elastomeric Foam Duct Insulation: Closed Cell. K-value of 0.27 or less at 75°F (39 or Less at 24°C) mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame / 50 smoke rating for thickness up to 1.5 inch. Insulation shall be CFC free.
1. Sheet and Roll: Armacell AP, Rubatex Insul-Sheet 1800.
- C. Fire Wrap Duct Insulation: 2 inch thick. Thermal Ceramics Firemaster, 3M Firemaster, or Certainteed Flamecheck.
- D. Ductwork insulation accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
- E. Ductwork insulation compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.
- F. Internal Duct Liner: Insulation inside the ductwork shall not be used on HVAC systems utilizing evaporative cooling.

2.4 EQUIPMENT INSULATION MATERIALS

- A. Rigid fiberglass equipment insulation: 6 lb./cu.ft. insulation board; All Service Jacket; K value of 0.22 at 75 degrees F mean temperature mean temperature.
- B. Flexible equipment insulation:
1. Johns Manville Micro-Flex APT Jacket. K value of 0.24 at 75 degrees F mean temperature.
2. Elastomeric Foam: Closed cell sheet and roll. K-value of 0.27 or less at 75 degrees F mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame/50 smoke rating for thicknesses up to 1 inch. Armacell AP/Armaflex, Rubatex Insul-Sheet 1800.
- C. Jacketing material for equipment insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.
- D. Equipment insulation compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- E. Equipment insulation accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.



PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with Work of this Section until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PIPING SYSTEM INSULATION

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems after acceptance of pressure testing.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Insulate valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Factory molded, precut or job fabricated units may be used in accordance with manufacturer's published recommendations. Cover with premolded PVC fitting covers for fiberglass insulation.
- F. Maintain integrity of vapor-barrier jackets on cold pipe insulation, including at valves and fittings. Protect vapor barrier to prevent puncture or other damage. Do not use staples. Follow recommendations of insulation manufacturer for applications indicated.
- G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- H. Insulation shall be butted against insulated pipe supports, as specified in Section 23 05 29. For hot pipes, apply 3 inches wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3 inches wide vapor barrier tape or band.
- I. If grooved piping system is employed where piping insulation is specified, insulate all mechanical joints as specified for pipe fittings. Maintain thermal expansion capability of grooved piping system intact.
- J. Elastomeric Foam insulation:
 - 1. Install per manufacturer's published recommendations.
 - 2. Cut custom pieces from insulation sheets for use at elbows, valves, Victaulic fittings, strainers, and other irregular surfaces. Follow manufacturer's published recommendations. Obtain manufacturer's cutting templates.
 - 3. Seal all joints completely with proper adhesive such as Armacell 520 or Rubatex Contact Adhesive. Apply adhesive to both sides of all joints.



- K. For insulated piping installed in locations exposed to weather, provide sealants, etc. for aluminum jacketing to result in watertight finished installation.
- L. For insulated valves installed out-of-doors, provide removable weatherproof stainless steel box at each valve to completely enclose and protect the insulation and (if applicable) the piping freeze protection heater strips.
- M. Provide fiberglass piping insulation for all applications unless indicated otherwise:
 - 1. Refrigerant: Provide closed cell elastomeric foam insulation. If required insulation thickness is greater than 1.5 inch, provide fiberglass insulation.
 - 2. Indoor Cooling Coil Condensate Drain Lines: Provide elastomeric foam insulation.
- N. Minimum pipe insulation thickness:
 - 1. Insulation thicknesses (inch / mm) for system type and pipe diameters per following table based on specified K factor. Comply with California Title 24 as a minimum, unless a more stringent requirement is specified.

Insulation Thickness Schedule						
Piping System	Runouts up to 2"	3/4" to 1"	1-1/2" to 2"	2-1/2" to 4"	5" to 6"	8" and greater
Refrigerant	1"	1"	1-1/2"	1-1/2"	1-1/2"	1-1/2"

3.3 DUCTWORK SYSTEM INSULATION

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation materials with smooth and even surfaces.
- C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
- E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except at fire dampers, fire/smoke dampers, or where otherwise indicated.
- F. Insulate all ductwork except for the following, unless otherwise indicated:
 - 1. Exhaust ductwork, unless within 25 feet of fan.
 - 2. Factory insulated or lined items such as terminal units, air supply chambers, etc.
 - 3. Conditioned air supply duct exposed in conditioned area served by that duct.
 - 4. 10 feet downstream of humidifiers.
 - 5. When code prohibits.
- G. Application requirements:
 - 1. Ductwork Installed within Buildings: Insulate with minimum 1-1/2 inches thick (installed thickness 1 inch), fiberglass duct wrap insulation with vapor barrier, unless otherwise specified.



2. Ductwork Installed out-of-doors (Including Ductwork within Architectural Screen or Enclosure):
 - a. Insulate with 2-inch thick elastomeric foam insulation.
 - b. Install per manufacturer's published recommendations.
 - c. Cut custom pieces from insulation sheets.
 - d. Seal all joints completely with proper adhesive such as Armacell 520 or Rubatex Contact Adhesive. Apply adhesive to both sides of all joints.
 - e. Enclose within 0.016 inch aluminum jacket with Z-joint seams and butt straps. Provide sealants, etc. to result in watertight finished installation.
- 3.4 EQUIPMENT INSULATION
- A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
 - B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
 - C. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
 - D. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.
 - E. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2 inches. Apply over vapor barrier where applicable.
 - F. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.

END OF SECTION 23 07 00



SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Refrigerant piping used for air-conditioning applications.

1.2 REFERENCES

- A. ANSI/ASHRAE 15-2018 - Safety Standard for Refrigeration Systems.
- B. ANSI/ASHRAE 34-2018 - Designation and Safety Classification of Refrigerants.
- C. ANSI/ASME B16.22-2018 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- D. ANSI/ASME B31.5-2016 - Refrigeration Piping and Heat Transfer Components.
- E. ASTM B32-2014 - Solder Metal.
- F. ASTM B280-2016 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- G. ASTM B828-2016 - Making Capillary Joints by Soldering of Copper and Copper-Alloy Tube and Fittings.
- H. AWS A5.8/A5.8M-201 - Filler Metals for Brazing and Braze Welding.
- I. ANSI/ARI 49-1999 (R2008) - Refrigerant Liquid Receivers.
- J. ARI 730-2001 (R2014) - Flowcapacity Rating and Application of Suctionline Filters and Filterdriers.
- K. ARI 750-2001 - Thermostatic Refrigerant Expansion Valves.
- L. ARI 760-2001 - Solenoid Valves for Use With Volatile Refrigerants.
- M. UL 429 (Ed. 5) - Electrically Operated Valves.

1.3 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include Pressure drop based on manufacturer's test data.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.



1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
 - C. Field quality-control test reports.
 - D. Operation and maintenance data.
- 1.4 QUALITY ASSURANCE
- A. Comply with ASHRAE 15, Safety Code for Refrigeration Systems.
 - B. Comply with ASME B31.5, Refrigeration Piping and Heat Transfer Components.
- 1.5 PRODUCT STORAGE AND HANDLING
- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 2. End Connections: Socket ends.
 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch long assembly.
 4. Pressure Rating: Factory test at minimum 500 psig.
 5. Maximum Operating Temperature: 250 degrees F.

2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.



3. Operator: Rising stem and hand wheel.
 4. Seat: Nylon.
 5. End Connections: Socket, union, or flanged.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 275 degrees F.
- B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
 2. Packing: Molded stem, back seating, and replaceable under pressure.
 3. Operator: Rising stem.
 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
 5. Seal Cap: Forged-brass or valox hex cap.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Working Pressure Rating: 500 psig.
 8. Maximum Operating Temperature: 275 degrees F.
- C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 3. Piston: Removable polytetrafluoroethylene seat.
 4. Closing Spring: Stainless steel.
 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Maximum Opening Pressure: 0.50 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 275 degrees F.
- D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig.
- E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 115-V ac coil.
 6. Working Pressure Rating: 400 psig.
 7. Maximum Operating Temperature: 240 degrees F.
 8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by and NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.



5. Working Pressure Rating: 400 psig.
 6. Maximum Operating Temperature: 240 degrees F.
- G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 degrees F.
 6. Superheat: Nonadjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 450 psig.
- H. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig.
 5. Maximum Operating Temperature: 275 degrees F.
- I. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig.
 6. Maximum Operating Temperature: 275 degrees F.
- J. Moisture/Liquid Indicators:
1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60-ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 240 degrees F.
- K. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurements.
 7. Maximum Pressure Loss: 2 psig.



8. Rated Flow: 5-tons.
 9. Working Pressure Rating: 500 psig.
 10. Maximum Operating Temperature: 240 degrees F.
- L. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Rated Flow: 5-tons.
 9. Working Pressure Rating: 500 psig.
 10. Maximum Operating Temperature: 240 degrees F.
- M. Liquid Accumulators: Comply with ARI 495.
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig.
 4. Maximum Operating Temperature: 275 degrees F.

2.3 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arkema Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- C. ASHRAE 34, R-22: Monochlorodifluoromethane.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

- A. Suction Lines NPS 1½ and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.
- B. Suction Lines NPS 4 and Smaller MPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.



- C. Hot-Gas and Liquid Lines and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.
- D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
- E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:
 - 1. NPS 1½ and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.
 - 2. NPS 1½ and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
 - 3. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 4. NPS 4: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
- F. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
- G. Safety-Relief-Valve Discharge Piping:
 - 1. NPS 1½ and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.
 - 2. NPS 1½ and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 3. NPS 2 to 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
 - 4. NPS 4: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at strainers if they are not an integral part of strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalize liners are required, make connection where it will reflect suction line pressure at bulb location.



- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 - 1. Solenoid valves.
 - 2. Thermostatic expansion valves.
 - 3. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install Refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to buildings walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.



- L. Install refrigerant piping in protective conduit where installed below ground.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- Q. Seal penetrations through fire and smoke barriers according to Section 07 84 00, Firestopping.
- R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- T. Seal pipe penetrations through exterior walls according to Section 07 90 00, Joint Protection for materials and methods.
- U. Identify refrigerant piping and valves according to Section 23 05 53, Identification for HVAC Piping and Equipment.

3.4 PIPE JOINT CONSTRUCTION

- A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20-feet long.
 - 2. Roller hangers and spring hangers for individual runs 20-feet or longer.



3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20-feet or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 60-inches; minimum rod size, 1/4-inch.
 2. NPS 5/8: Maximum span, 60-inches; minimum rod size, 1/4-inch.
 3. NPS 1: Maximum span, 72-inches; minimum rod size, 1/4-inch.
 4. NPS 1-1/4: Maximum span, 96-inches, minimum rod size, 3/8-inch.
 5. NPS 1-1/2: Maximum span, 96-inches, minimum rod size, 3/8-inch.
 6. NPS 2: Maximum span, 96-inches; minimum rod size, 3/8-inch.
 7. NPS 2-1/2: Maximum span, 108-inches; minimum rod size, 3/8-inch.
 8. NPS 3: Maximum span, 10-feet; minimum rod size, 3/8-inch.
 9. NPS 4: Maximum span, 12-feet; minimum rod size, 1/2-inch.
- D. Support multifloor vertical runs at least at each floor.
- 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Line Test Pressure for Refrigerant R-22:
- a. Suction Lines for Air-Conditioning Applications: 185 psig.
 - b. Suction Lines for Heat-Pump Applications: 325 psig.
 - c. Hot-Gas and Liquid Lines: 325 psig.
4. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in No. 3 above.
- a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 4. Charge system with a new filter-dryer core in charging line.



3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00



SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Duct Materials.
2. Ductwork - General.
3. Round Ductwork.
4. Flexible Ductwork.
5. Plenums.
6. Kitchen Hood Exhaust Ductwork.
7. Shower Exhaust Ductwork.
8. Chemical Fume Hood Ductwork.

B. Related Work Specified in Other Sections

1. Duct smoke detectors are furnished and connected under Fire Alarm Work, and installed as Work of this Section.
2. Duct temperature sensors, automatic dampers, and airflow measuring units are furnished and connected under Section 23 09 23, Control Systems, and installed as Work of this Section.
3. Wiring and conduit to fire/smoke dampers is specified under Electrical Work.

1.2 REFERENCES

- A. ASHRAE - Handbook Fundamentals; Duct Design.
- B. ASHRAE - Handbook Equipment; Duct Construction.
- C. ASTM A90/A90M-2018 - Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- D. ASTM A167-99 (R2009) - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- E. ASTM A653/A653M-2016 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ASTM B209-2016 - Aluminum and Aluminum Alloy Sheet and Plate.
- G. NFPA 90A-2016 - Installation of Air Conditioning and Ventilation Systems.
- H. NFPA 90B-2018 - Installation of Warm Air Heating and Air-Conditioning Systems.
- I. SMACNA - HVAC Duct Construction Standards.
- J. UL 181-2013 - Factory-Made Air Ducts and Air Connectors.



1.3 DEFINITIONS

- A. Duct Sizes: Outside clear dimensions.
- B. Pressure Classifications:
 - 1. SMACNA 2-inch Standard with Seal Class A:
 - a. Ductwork and plenums installed outdoors.
 - b. Housing Building supply ductwork and plenums between air handling unit and points where ducts enter chases.
 - 2. SMACNA 1-inch Standard with Seal Class C:
 - a. Other ductwork and plenums other than listed above, unless indicated otherwise.
- C. Seam: Locks or weld applied longitudinally to close section of duct, e.g., longitudinal seam, spiral seam.
- D. Joint: Abutting connection between duct sections for continuity of air passage, e.g., cross joint, transverse joint, coupling.
- E. Reinforcement: Hardware applied to strengthen duct, e.g., girth angles, tie rods, fasteners (not connectors), etc.
- F. Stiffening: Folding, bending, beading, crossbreaking or corrugating of sheets to achieve strength through shape, e.g., pocket lock secures joint and is transverse stiffener, with girth angle and/or fasteners applied (not connectors), joint or stiffener.

1.4 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by the Owner's Representative. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.5 REGULATORY REQUIREMENTS

- A. Construct ductwork to California Mechanical Code..

1.6 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data:
 - 1. Provide make and model, gages for each duct size, material data sheets, and information for fittings.
- C. Shop Drawings: CAD-generated and drawn to 1/4-inch equals 1-foot scale. Show fabrication and installation details for metal ducts.
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes and pressure classes.
 - 3. Elevations of top and bottom of ducts.



4. Dimensions of main duct runs from building to grid lines.
 5. Fittings.
 6. Reinforcement and spacing.
 7. Seam and joint construction.
 8. Penetrations through fire-rated and other partitions.
 9. Equipment installation based on equipment being used on Project.
 10. Duct accessories, including access doors and panels.
 11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
- D. Quality Control Submittals:
1. Coordination Drawings: reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.
 - a. Ceiling suspension assembly members.
 - b. Other systems installed in same space as ducts.
 - c. Ceiling and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
 - d. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 2. Welding certificates.
 3. Field quality-control test reports.
- E. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for kitchen hood exhaust systems.
- F. Security Details: Submit drawings to clearly identify installation details of all security-related HVAC items. Details shall be based on actual Project conditions and shall indicate means of access to dampers and damper actuators.
1. Security air outlet at wall.
 2. Duct penetration of wall with security barrier.
 3. Duct fire damper at wall with security barrier.
 4. Duct fire/smoke damper at wall with security barrier.
 5. Air outlet and fire/smoke damper at wall with security barrier.
- 1.7 QUALITY ASSURANCE
- A. Welding: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code - Steel, for hangers and supports and AWS D9.1, Sheet Metal Welding Code, for duct joint and seam welding.
- B. NFPA Compliance:
1. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
 2. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Protect ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.



PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Spiral Round Ducts:
 - 1. United McGill.
- B. Flexible Connections:
 - 1. Ventfabrics, Inc.
 - 2. Duro Dyne.
- C. Flexible Ducts:
 - 1. Thermaflex.
 - 2. United McGill.
 - 3. Automatic Industries, Inc.
- D. Spring Fasteners:
 - 1. Dzus.
 - 2. Simmons "Quick-Lock".
- E. Duct Protective Coatings:
 - 1. Varni-lite Corporation of America.
- F. Duct Sealants:
 - 1. Minnesota Mining and Manufacturing Company (3M).
 - 2. Benjamin Foster Company.
 - 3. United McGill Corporation.
 - 4. Harcast Corporation Inc.
 - 5. Miracle Adhesive Corporation.
- G. Spin-in Fittings:
 - 1. Modular Metals.
 - 2. R & J Manufacturing.

2.2 DUCT MATERIALS

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- B. Steel Ducts: ASTM A653 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25-ounce per square foot for each side in conformance with ASTM A90.
- C. Aluminum Ducts: ANSI/ASTM B209; aluminum sheet, alloy 3003-H14. Mill finish. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- D. Stainless Steel Ducts: ASTM A167, Type 304 18-8. Concealed: Finish 2B or 3. Exposed: Finish 3 or 4.
- E. Fasteners: Rivets, bolts, or sheet metal screws.
 - 1. Screws and Rivets:
 - a. Same material as sheet, except as noted.



- b. On aluminum sheets, provide cadmium plated or stainless steel.
 - c. Zinc or cadmium plated, permitted on galvanized sheets.
 - d. Minimum Screw Size: No. 1C.
 - e. Minimum Rivet Size: 4-lb.
- F. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. Gaskets: Continuous, reinforced, inert self-conforming type. 1/8-inch thick. Width, to match angle connection.
- G. Hard-Setting Joint Tape:
 - 1. Two-part Tape:
 - a. Mineral impregnated woven fiber tape.
 - b. Impregnated with activator/adhesive of polyvinyl acetate type.
 - 2. UL Listed:
 - a. Flame Spread: 10.
 - b. Smoke Contributed: 0.
- H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- I. Spring Fasteners:
 - 1. Oval head stud and receptacle.
 - 2. Screwdriver slot.
 - 3. Self-ejecting.
 - 4. Similar to Dzus.
- J. Angles, tie rod and shapes for reinforcing ducts in accordance with SMACNA Duct Construction Standards, except as noted.
- K. Duct Lining: Not allowed.

2.3 DUCTWORK - GENERAL

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Only where absolutely unavoidable, divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.



- E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10-percent duct area, split into two ducts maintaining original duct area.

2.4 ROUND DUCTWORK

A. General:

1. Flow low pressure.
2. Prefabricated spiral lockseam duct.
3. Prefabricated fittings.
 - a. Same manufacturer as duct and as detailed.
 - b. Continuity welded seams.
 - c. Die-stamped elbows for 8-inches or smaller.
 - d. Mitered elbows larger than 8-inches.
 - 1) 2 Gores: less than 35 degrees.
 - 2) 3 Gores: 36 degrees through 71 degrees.
 - 3) 5 Gores: over 71 degrees.
4. Not Acceptable:
 - a. Corrugated or flexible metal duct.
 - b. Shop fabricated circular duct, except above maximum factory-fabricated size.
 - c. Fiberglass ductwork.
5. Provide ducts with gauges meeting CMC and NFPA 90A, whichever is more strict.

B. Round Duct and Fittings:

1. Duct Construction:

Duct Diameter (in)	Spiral Duct Gage	Fitting Gage
3-14	26	20
15-26	24	20
27-36	22	20
37-50	20	18
51-60	18	16

2. Similar to United Sheet Metal “Uniseal” with “Uniform” fittings.

C. Accessories: Factory fabricated.

1. Couplings.
2. Volume dampers.
3. Bellmouth fittings.
4. End caps.
5. Fire damper access section.
6. Angle rings.
7. Insulation Ends: Connections of double to single wall ducts.

2.5 FLEXIBLE DUCTS

A. General:

1. Use only where specified or indicated.
2. UL 181, Class I Air Duct.
3. Labeled for compliance with CMC.



- B. Low Pressure:
 - 1. Insulated Flexible Duct:
 - a. Minimum working pressure 1.5-inches w.g.
 - b. Nominal 1-inch insulation with vapor barrier.
 - c. Maximum thermal conductivity 0.27-Btuh/sq. ft. degrees f/inch at 75 degrees F.
 - 2. Use At Following Locations:
 - a. Connection to ceiling air outlets in non-secure areas.
 - b. As indicated.

2.6 PLENUMS

- A. Fabricate plenums in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.
- B. Mount floor mounted plenums on 4-inch high concrete curbs. At floor, rivet panels on 8-inch centers to angles. Where floors are acoustically insulated, provide liner of 18-gauge galvanized expanded metal mesh supported at 12-inch centers, turned up 12-inches at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 6 by 6-inch.
- D. Fabricate acoustic plenums with reinforcing turned inward. Provide 16-gauge back facing and 22-gauge perforated front facing with 3/32-inch diameter holes on 5/32-inch centers. Construct panels 3-inches thick packed with 4.5-lb/cu ft minimum glass fiber media, on inverted channels of 16-gauge.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Construct with gauges, joints, bracing, reinforcing, and other details per CMC, ASHRAE, SMACNA, or NFPA standard unless specified otherwise.
 - a. Comply with most stringent.
 - b. Provide ducts with NFPA 90A gauges when traversing smoke zones.
 - 2. Install ductwork of sizes, runs and connections as shown on the drawings.
 - 3. Verify all dimensions at the site, making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Make allowances for beams, pipes or other obstructions in building construction and for work of other trades. Check plans showing work of other trades and consult with Owner's Representative in the event of any interference.
 - 4. Fabricate ductwork in workmanlike manner with airtight joints, presenting smooth surfaces on inside, neatly finished on outside, construct with curves, bends, turning vanes to aid in easy flow of air. Make internal ends of slip joints in direction of airflow.
 - 5. Construct, brace and support ducts and air plenums to prevent sagging and to minimize vibration when fans are operating.
 - 6. Maintain rectangular cross section of ductwork unless otherwise shown.



7. Blow out all dirt and foreign matter from ductwork, and clean diffusers, registers and grilles before fans are started.
8. Unless otherwise noted, construct ductwork as specified for low pressure ductwork.
9. All angle irons required for ductwork construction and support shall be galvanized.
10. Construct of galvanized sheet metal, except where otherwise indicated.
11. Diagonally crossbrace all panels on metal rectangular ducts over 18-inches in either direction. Beading for reinforcing is acceptable.
12. Duct dimensions indicated are net, outside, clear dimensions.
13. Alter duct sizes on basis of equal friction where required to facilitate installation.
14. Penetrations of ducts are forbidden without approval from the Owner's Representative. Provide airtight rubber grommets at unavoidable penetrations of hanger rods.
15. At exposed duct penetrations of walls, floors and ceilings, provide sheet metal angle type escutcheons.
16. At supply diffusers, grilles and/or registers extend branch duct 1-foot beyond air outlet.
17. Install exposed ducts to maintain not less than 7-feet head clearance, unless indicated otherwise.
18. Tapers: Pitch sides of duct in "diverging" or "converging" airflow maximum of 1 to 4 taper.
19. Duct Opening:
 - a. Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc. Insert through airtight rubber grommets.
 - b. Provide Pitot tube openings where required for testing of systems:
 - 1) Complete with metal cap with spring device or screw to ensure against air leakage.
 - 2) For Pitot tube test install test holes.
 - c. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
 - d. At fire dampers and fire/smoke dampers, allow adequate length of duct to install duct access door.
20. Tapers:
 - a. Pitch sides of duct in a "diverging" airflow maximum of 20 degrees.
 - b. Pitch sides of duct in a "converging" airflow maximum of 30 degrees.
 - c. Design elbows for minimum friction with inside radius not less than width of duct. Use square elbows with hollow double radius type duct turns where radius is less than duct width. Attach duct turns to duct securely with spot weld, screws, or rivets. Friction type attachment not acceptable.
21. Branch Duct Connections: Make branch duct connections to other ducts or plenums in such a manner that it provides a smooth airflow with minimum turbulence and minimum air pressure drops at the connections. Use parallel flow connections or 45-degree clinch collars or bell mouth, and provide air volume control dampers. Straight tap connections are not acceptable unless specifically shown.
22. Flashing Ducts Through Roof: Install flashing to cover top and sides of curb and fit closely around duct. Cover top edge of base flashing with collar soldered to duct and turned down over base flashing. Fabricate flashing from 24-gauge galvanized steel. See HVAC details on plans for further information.
23. Test Holes: Drill instrument test holes into ductwork for Pitot tube tests. Install hole covers attached to ductwork by sheet metal screws. Locate test holes at intake and discharge from each air handling unit and as shown.



24. Remove all debris and oily residue from ductwork and plenums after manufacturing and prior to installation.
 25. Cover and seal all openings in ductwork during transportation and storage; remove just prior to installation. Prevent dirt and moisture from entering ductwork after installation. Cover and seal openings at the end of each work day.
- B. Elbows and Transitions:
1. Construct radius elbows with inside radius not less than duct width.
 2. Use square turns in rectangular ductwork, unless indicated otherwise, at following locations:
 - a. Immediately upstream from supply air outlets.
 - b. Where required to facilitate installation.
 3. Provide turning vanes in miter elbows in round and rectangular ducts.
 4. Where indicated, provide turning vanes of special size and shape.
 5. Tow-way Splits:
 - a. Supply, return and exhaust.
 - b. Two Elbows:
 - 1) Proportionally sized per SMACNA Duct Standards.
 - 2) Radius or square.
 - c. Single fitting acceptable with turning vanes. Duct opening sized as above.
- C. Rectangular Duct Joints:
1. Standing seams, except where flush drive slip seam called for.
 2. Use flush, drive-slip, for:
 - a. Exposed ducts.
 - b. Where required for clearance.
 - c. In ducts no wider than 60-inches.
- D. Joint Sealing:
1. Seal transverse and longitudinal joints of sheet metal ducts, including angle iron connections, by one of following methods:
 - a. Six ounce canvas strip, six inches wide. Adhere with lagging adhesive.
 - b. Applications as recommended by manufacturer.
 2. Seal punched holes and corner cracks.
 3. After installation and balancing reseal joints found to be leaking.
- E. Ducts Outdoors:
1. Make ducts watertight.
 2. Use double corner or Pittsburgh seams for longitudinal seams.
 3. Use capped flanges for transverse joints.
 4. "Ductmate" system joints may be used in lieu of capped flanges for transverse joints.
 - a. In ducts no wider than 60-inches.
 - b. Installation as recommended by manufacturer.
 - c. Ductmate angle to be fastened to the duct section with spot welds.
 - d. Install cleat full length in one-piece on the top of the joint to prevent water from collection on the gasket.
 5. Construct as follows to assure water runoff:
 - a. Arrange flanges to not act as dams.
 - b. Longitudinal seams at top of duct.
 - c. Slope entire top of duct down toward side.



- d. Vertical struts within duct to bow top panels of duct into convex shape.
 - e. Mastic within sheet metal joints.
- F. Aluminum Ductwork:
- 1. Aluminum Sheets: One gauge heavier than galvanized steel as tabulated.
 - 2. Joints and seams made watertight by soldering, aluminum welding.
 - 3. Grilles on aluminum ductwork: aluminum.
 - 4. Separate aluminum ducts, casings, plenums, housing and louvers from direct contact with concrete by resilient gasketing or caulking compound.
 - 5. Pitch down to 1/8-inch to 1/4-inch per foot toward air intake opening.
- G. Stainless Steel Ductwork Material Thickness and Construction Details: As specified for low pressure ductwork except as noted otherwise. Pitch down to 1/8-inch to 1/4-inch per foot toward air intake opening.
- H. When exposed ducts are located within ten feet of the floor or ground in an inmate accessible area:
- 1. Ducts shall be welded rectangular ducts; minimum 14-gauge. Sections shall be welded or screwed together with security type screws; slip joints are not allowed.
 - 2. Mount tight against ceiling or deck above with supports made from minimum 14-gauge material. Fasten mounting with security type screws.
 - 3. Cover cracks exceeding 1/32-inch wide between duct and ceiling or deck with 1/4-inch thick steel angle, minimum 1 by 1-inch size, spot welded to the duct and bolted to the ceiling or deck with security type screws.
- ### 3.2 ROUND DUCTWORK
- A. Fittings: Factory fabricated with radius of elbows and angles minimum of 1½-times diameter of duct. Where tee fittings of conical type change in shape from round to rectangular, utilize a transformation joint with a taper ratio of 1 to 7.
- B. Joints Between Ducts:
- 1. Made with beaded sleeve joints as scheduled.
 - 2. Duct sealer applied to male end.
 - 3. Mechanically fastened with sheet metal screws or pop rivets.
 - 4. Over joint and screw or rivet heads, apply coating of duct sealer.
 - 5. Cover entire joint with duct tape.
- C. Joints, Duct and Fitting:
- 1. Slip projecting collar of fittings into duct. Insertion length 2-inches minimum.
 - 2. Apply duct sealer. Seal and tape as specified above.
 - 3. Mechanically fasten per following Fastening Schedule:
- | No. of Rivets | Diameter | Slip Joint |
|---------------|----------------------|------------|
| 4 | 8-inches | 3/4-inch |
| 6 | 9 to 16-inches | 1-inch |
| 7 | 17-inches and larger | 1 1/4-inch |
- D. Junctions Between Ducts: Branch takeoff conical 90 degrees.



- E. Horizontal Supports:
 - 1. One or two-piece clamp band strap.
 - 2. Minimum: One per section.
 - 3. Support fittings to prevent sagging.
- F. Vertical Support: One of the following:
 - 1. Clamp bands with extended ends supported by floor.
 - 2. Clamp bands with knee bracing.
 - 3. Pedestal at base of vertical.

3.3 FLEXIBLE DUCTWORK

- A. Provide insulated flexible ducts continuous, single pieces not over seven feet in length, adequately supported, and have a minimum inside bending radius of two-thirds the internal diameter, but not installed with a radius of bend less than two duct diameters.
- B. Provide 4-inches wide sheet metal protection saddles under ductwork at each hanger.
- C. Where flexible ducts join other ductwork and air terminals, apply duct sealer to outside surface of collar. Secure duct to collar with sheet metal screws and clamps, and seal joint with three wraps of pressure sensitive vapor seal adhesive tape.
- D. Use only on supply air application.
 - 1. At non-security ceiling air outlets.
- E. Install flexible ducts in as straight a manner as possible. Cut ducts to lengths required, maximum 7-feet, rather than create bends to take up excess lengths. Terminate flexible duct perpendicular to the connection.
- F. Connect flexible ducts to metal ducts with draw bands.
- G. Use crimp joints with or without bead for joining round duct sizes 8-inch and smaller with crimp in direction of air flow.
- H. Use double nuts and lock washers on threaded rod supports.

3.4 DUCT HANGERS AND SUPPORTS

- A. General:
 - 1. Attachment to structure, as specified in Section 23 05 09 - Hangers and Supports for HVAC Piping and Equipment.
 - 2. Seismic restraints shall be as specified in Section 23 05 08 - Vibration Isolation and Seismic Control.
- B. Horizontal Duct Supports:
 - 1. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA HVAC Duct Construction Standards.
 - 2. Install hangers at each change in direction of duct.
 - 3. Strap Hangers:
 - a. Extend strap down both sides of ducts.
 - b. Turn under bottom one inch minimum.



- c. Metal screw hangers to bottom of duct, upper and lower sides of ducts, and not more than 12-inches on center.
- 4. Angle Hangers:
 - a. Provide angle hangers formed by extended vertical bracing angles.
 - b. Or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule.
- 5. Support horizontal ducts on the roof with supports of size and spacing as indicated on the drawings.
- 6. Vertical Duct Supports: Support vertical ducts at every floor.
 - a. Use angles or channels riveted to ducts.
 - b. Set angles or channels on floor slab or structural steel members placed in opening, unless otherwise noted.

3.5 MISCELLANEOUS INSTALLATIONS

- A. Install following equipment and materials in accordance with manufacturers printed instructions.
 - 1. Filters.
- B. Duct Drains:
 - 1. At low points for moisture collection.
 - 2. 1 inch drain, galvanized steel.
 - 3. S-trap (or P-trap) for water seal. Minimum depth of trap 1¼ times maximum static pressure differential in duct section.
 - 4. Run drain to nearest plumbing drain. Terminate with one inch minimum air gap.
 - 5. Provide tee connection in drain.
 - a. Between duct and trap.
 - b. Connection from trap primer under Section 22 11 16 - Domestic Water Piping.

3.6 SLEEVES

- A. Sleeves are specified in Section 23 05 00 - Common Work Results for HVAC.

3.7 LEAKAGE

- A. General:
 - 1. Leakage of ductwork and plenums shall not exceed 3-percent of design cfm. The 3-percent leakage limit applies to each duct system as a whole.
 - 2. Leakage shall be determined by summation of all supply outlet cfm's on any one system subtracted from the total cfm developed by the unit serving that system.
 - 3. Balancer to inform Owner's Representative of any system that exceeds the 3-percent leakage allowance.
 - 4. Contractor to inspect the systems that exceed the 3-percent leakage allowance and reseal leaking ductwork at no additional cost to the owner until the leakage rate is within the 3-percent allowance.

3.8 DUCT CLEANING

- A. Force air at high velocity through duct to remove accumulated dust.
- B. Clean half system at time.



- C. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. When closures are removed, avoid spilling dust in room.
- D. Insulation inside the duct shall not be used on any HVAC systems.

3.9 FIRE DAMPERS

- A. Demonstrate ability to reset fire dampers.

3.10 FIRE/SMOKE DAMPERS AND SMOKE DAMPERS

- A. Demonstrate ability to achieve access to actuator and to visibly see damper blades.

END OF SECTION 23 31 00



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SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Volume control dampers.
 - 2. Fire dampers.
 - 3. Combination fire and smoke dampers.
 - 4. Backdraft dampers.
 - 5. Air turning devices.
 - 6. Flexible duct connections.
 - 7. Duct access doors.
 - 8. Duct test holes.

1.2 REFERENCES

- A. ASHRAE - Handbook, Fundamentals, Duct Design.
- B. ASHRAE - Handbook, Equipment, Duct Construction.
- C. NFPA 90A-2018 - Installation of Air Conditioning and Ventilating Systems.
- D. SMACNA - HVAC Duct Construction Standards.
- E. UL 555-2006 - Safety for Fire Dampers.
- F. UL555C-2006 - Ceiling Dampers.
- G. UL 33-2015 - Heat Responsive Links for Fire-Protection Service.
- H. UL 555S-2014 - Safety for Smoke Dampers.

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: For the Following:
 - 1. Backdraft dampers.
 - 2. Volume dampers.
 - 3. Motorized control dampers.
 - 4. Fire dampers.
 - 5. Ceiling fire dampers.
 - 6. Smoke dampers.
 - 7. Combination fire and smoke dampers.
 - 8. Duct silencers.
 - 9. Turning vanes.
 - 10. Duct-mounting access doors.
 - 11. Flexible connectors.



- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Special fittings.
 - 2. Manual-volume damper installations.
 - 3. Motorized-control damper installations.
 - 4. Fire-damper, smoke-damper, and combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.
 - 5. Wiring Diagrams: Power, signal and control wiring.
 - D. Quality Control Submittals.
 - 1. Manufacturer's Installation Instructions for fire dampers and combination fire and smoke dampers.
 - 2. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.
- 1.4 QUALITY ASSURANCE
- A. Comply with NFPA 90A, Installation of Air Conditioning and Ventilating Systems, and NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
- 1.5 MAINTENANCE
- A. Extra Materials
 - 1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Fusible Links: Furnish quantity equal to 10-percent of amount installed.

PART 2 PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
- A. Multiblade Volume Dampers:
 - 1. Ruskin Manufacturing Company.
 - 2. Air Balance Inc.
 - 3. American Warming and Ventilating Inc.
 - B. Fire Dampers:
 - 1. Ruskin Manufacturing Company.
 - 2. Air Balance Inc.
 - 3. American Warming and Ventilation Company.
 - 4. Phillips-Aire Division of Reed National Corporation.
 - 5. Pottorff Company, Inc.
 - 6. United McGill Corporation.
 - C. Backdraft Dampers:
 - 1. Air Balance, Inc.
 - 2. American Warming and Ventilating Inc.



3. Ruskin Manufacturing Company.
 - D. Fire/Smoke Dampers
 1. Ruskin Manufacturing Company.
 2. SafeAir.
 3. Air Balance, Inc.
 4. Greenheck.
 5. Pottorff Company, Inc.
 - E. Damper Hardware:
 1. Ventfabrics, Inc.
 2. Duro Dyne Corporation.
 3. Young Regulator Company.
 - F. Access Doors, Ducts:
 1. Ventfabrics, Inc.
 2. Dura Dyne Corporation.
 3. Ruskin Manufacturing Company.
 - G. Access Doors, Plenum:
 1. Ventfabrics, Inc.
 2. Duro Dyne Corporation.
 - H. Acceptable Manufacturers - Air Turning Devices
 1. Titus.
 2. Kruger.
 3. Price.
 - I. Acceptable Manufacturers - Flexible Duct Connections
 1. Vent Fabrics Inc. Ventglas or Ventlon.
 2. Duro Dyne Corporation; Super Metal Fab DDFDC-483.
 - J. Acceptable Manufacturers - Duct Access Doors
 1. Milcor.
 2. Karp.
 3. Bilco.
- 2.2 VOLUME CONTROL DAMPERS.
- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.
 - B. Fabricate splitter dampers of material same gage as duct to 24-inches size in either direction, and two gages heavier for sizes over 24-inches.
 - C. Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum ¼-inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
 - D. Fabricate single blade dampers for duct sizes to 12 x 48-inch.



- E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 by 72-inch (300 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- F. Except in round ductwork 12-inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30-inches (750 mm) provide regulator at both ends.
- H. Single Blade Dampers:
 - 1. Galvanized Steel Ductwork: 16-gauge galvanized steel, except as noted.
 - 2. Low Pressure Systems: SMACNA HVAC Duct Construction Standards, except as noted.
 - a. Bearing at one end of damper rod: Similar to Ventlok No. 60 or Ruskin.
 - b. Accessible quadrant at other end of damper rod:
 - 1) With lever and lock screw, similar to Ventlok No. 635. or Ruskin.
 - 2) Insulated Ducts: Quadrants mounted on bracket to clear insulation; similar to Ventlok Nos. 637, 638, or 639. Selection based on insulation thickness.
 - c. For Inaccessible Dampers in Ceiling Spaces: Provide metered gear assembly with concealed ceiling regulator at other end of damper rod.
 - 1) With end bearing at the other end of damper rod, similar to Ventlock No. 607.
 - 2) With metered gears, similar to Ventlock No. 680 or Ruskin.
 - 3) With concealed damper regulator, similar to Ventlock No. 677 or Ruskin. One with 2-5/8-inch diameter paintable coverplate provided with an additional set of security screws.
 - 4) Required interconnecting hardware and set of regulator wrenches.
 - d. Self-locking Splitter Damper Assembly with Accessible Quadrant: With a damper blade bracket, a double lead threaded rod, a universal joint, a lever and lock screw, similar to Ventlock No. 690 or Ruskin.
 - e. Abbreviated Self-locking Splitter Damper Assembly for Inaccessible Ceiling:
 - 1) With damper blade bracket, a double lead threaded rod and an extended shaft universal joint, similar to Ventlock No. 691 or Ruskin.
 - 2) Provide required hardware as specified under For Inaccessible Damper above.
- I. Multiblade Dampers for Low Pressure Systems:
 - 1. Opposed blade damper. Maximum 8-inches wide for ducts over 14-inches.
 - 2. Rated at 10 cfm per sq. foot at 4-inches differential pressure.
 - 3. Similar to Ruskin Model CD454.
- J. Extraction Damper:
 - 1. Turning vanes and companion volume damper.
 - 2. Similar to Titus AG-45 with No. 2 operator or Ruskin.

2.3 FIRE DAMPERS

- A. Fire dampers shall be approved by California State Fire Marshal and shall be UL-555 labeled.
- B. Fabricate in accordance with NFPA 90A and ASTM E84, and as required by State Fire Marshal.



- C. Multi-bladed with blade housing 100-percent out of air stream, 1-1/2-hour rated, equipped with fusible link:
 - 1. Horizontal Ducts: Gravity drop type.
 - 2. Vertical Ducts: Spring loaded type.
- D. Stainless Steel Construction: Type 304 where installed in stainless steel ductwork.
- E. Fusible Link:
 - 1. UL listed.
 - 2. Temperature rating not greater than 50-degrees F above highest air temperature in duct.
- F. Provide as noted and in ducts and openings in following:
 - 1. Shafts.
 - 2. Floors.
 - 3. Fire Walls.
 - 4. Fire Rated Ceilings.
- G. Provide access door in duct adjacent to each fire damper.
- H. Rectangular Type: Similar to Ruskin Model IBD, Pottorff Model VFD-10, SafeAir, Model 150-A.
- I. Circular Type: Similar to Ruskin Model FDR25, Pottorff Model VFD-10, SafeAir Model 410A.
- J. Ceiling Fire Dampers: Similar to Ruskin Model CFD-5.

2.4 COMBINATION FIRE AND SMOKE DAMPERS

- A. Dampers shall be approved by California State Fire Marshal and shall be UL-555 and UL-555S labeled.
- B. Fabricate in accordance with NFPA 90A and ASTM E84, and as required by the State Fire Marshal.
- C. Provide factory sleeve for each damper. Install damper operator on exterior of sleeve and link to damper operating shaft.
- D. Multiblade damper classified as:
 - 1. 1-1/2 hour UL fire damper.
 - 2. Leakage rated smoke damper under ASTM E84.
 - 3. Minimum pressure rating of 4-inch and minimum velocity rating of 3000 fpm.
- E. Operating Shafts: 90 degrees operating range between open and shut.
- F. Damper Actuator:
 - 1. Electric Type Spring Return: 120 volts AC, 60 Hz.
 - 2. UL listed and labeled as fire damper operator.
 - 3. Fail-safe type. Close dampers on failure of power.
 - 4. Factory installed per UL555S.
 - 5. Electric type, 120 Volt ac.



6. Shall produce no audible noise when in either open or closed position.
7. No special cycling required during long-term holding.
8. Provide two sets of end switches for damper blades, to indicate full open and full closed, with contacts for connection under Fire Alarm System Work.
9. Controlled closure rate of between 7 and 15 seconds. Instantaneous close-type actuators are not acceptable.
10. Actuator shall close damper upon detection of heat (212-degrees F / 100-degrees C release temperature) or upon external signal based on smoke. Without fusible link.
11. Provide with Ruskin TS 150 "Firestat" system, with high limit temperature sensor, end switches, and remote override ability. Capable of remote actuation (closing, opening, and re-opening) based on remote signal, unless high limit temperature (approximately 300-degrees F/150-degrees C) sensor is activated, in which case damper re-opening requires manual reset.

G. Rectangular Type: Similar to Ruskin Model FSD 60, SafeAir Model 661.

H. Circular Type: Similar to Ruskin Model FSD60, SafeAir Model 661, AirBalance Model FA2.

2.5 BACKDRAFT DAMPERS

A. Description:

1. Extruded aluminum construction.
2. Vinyl blade edge seals.
3. Blade ends overlapping frame.
4. Similar to Air Balance Inc., Series 700 or Ruskin.

2.6 AIR TURNING DEVICES

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps; Model TV manufactured by Titus.
- B. Vane length not to exceed 36-inches. Provide separate equal size sections for greater lengths.

2.7 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.
- B. With metal collar frames at each end.
- C. 2-inch slack in fabric.
- D. Install to allow minimum movement of 1-inch.
- E. Length of Fabric Connections
 1. Minimum: 4-inches.
 2. Maximum: 10-inches.
- F. Coated Glass Fabric:
 1. Indoors - Neoprene.
 2. Outdoors - Hypalon, weather-resistant.



3. Flame Spread Rating: 25.
 4. Smoke Development Rating: 50.
 5. 30-oz. per sq. yd.
 6. Sewed and cemented seams.
- 2.8 DUCT ACCESS DOORS
- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
 - B. Review locations prior to fabrication.
 - C. Access Doors: Construct of galvanized sheet metal of same gauge (minimum) as duct, with frame, galvanized steel hinges, handles, clamping devices, gasketed for airtight fit.
 - D. In Ductwork:
 1. Insulated or noninsulated, same as duct.
 2. Hinged, except where sliding or removable type required. Latch, similar to Ventlok No. 100.
 3. Size:
 - a. 20-inches x 14-inches.
 - b. Ducts Less Than 16-Inches: One dimension 20-inches, other dimension 2-inch less than duct width.
 - c. Larger sizes where required for access.
 - E. In Casings and Plenums:
 1. Insulated Casings and Plenums: Insulated doors.
 2. Size 24-inch x 60-inch:
 - a. 18-inch x 45-inch permitted where necessary.
 - b. Larger size where required for maintenance, such as filter removal.
 - c. Latches: Similar to Ventlok No. 310 or Ruskin.
- 2.9 DUCT TEST HOLES
- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
 - B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions. Manufacturers' installation instructions shall be made available to the Owner's Representative and inspecting authorities.
- B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems at the following locations:
 1. In all duct splits and branches of supply, return and exhaust systems.



2. In duct serving single outlets.
 3. At open return duct above ceilings.
 4. At duct splits above 36-inches deep.
 5. In duct connected to common plenum.
 6. Where shown on drawings.
 7. Install balancing dampers at the split or branch take-off.
 8. Dampers at air outlets and inlets cannot be used in lieu of balancing dampers.
- C. Fire Dampers and Fire/Smoke Dampers:
1. Provide fire dampers, combination fire and smoke dampers and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction.
 2. Install in same manner as tested for UL-listing.
 3. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
 4. Provide duct access door and ceiling access panel (unless accessible ceiling), at each damper and fire/smoke damper, suitably sized and located for inspection and resetting. Provide permanent label per requirements of Section 23 05 53.
 5. All required access doors shall be installed prior to "rough" sign-off. Access doors shall comply with CMC.
 6. Contractor shall provide ladder or other approved means of access for inspection.
 7. Where detail on Drawings includes a fire damper or fire/smoke damper, it is intended to show relative location of damper to other items. The detail is for information only and does not supercede the installation requirements given above.
 8. Coordinate with Section Fire Alarm System Work for:
 - a. Low voltage wiring to fire/smoke dampers.
 - b. Control of fire/smoke dampers.
 - c. Remote status indication of fire/smoke damper status (open or closed).
 9. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's Representative.
 10. Fire/Smoke Dampers: Demonstrate ability to achieve sufficient access to damper actuator. Demonstrate ability to open duct access door and visually verify position of damper blades.
- D. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- E. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Attach tightly, and allow at least 1-inch slack.
- F. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, main balancing dampers, smoke detection heads, at fire and smoke dampers, and elsewhere as indicated. Make completely accessible. The access opening shall be large enough to permit maintenance and resetting of the damper. (Minimum 24-inch x 24-inch size access doors in non-accessible ceilings).
- G. Provide duct test holes where indicated and required for testing and balancing purposes.
- H. The construction and installations for damper openings in wall and ceilings shall conform to Chapter C, CBC, and the manufacturer's approved installation instructions.



END OF SECTION 23 33 00



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SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Ceiling Diffusers.
 - 2. Grilles and Registers.
 - 3. Transfer Grilles.
 - 4. Roof Hoods and Goosenecks.
- B. Related Sections
 - 1. Section 07 90 00 - Joint Protection
 - 2. Section 08 91 19 - Fixed Louvers.
 - 3. Section 09 91 23 - Interior Painting
 - 4. Section 23 05 00 - Common Work Results for HVAC.
 - 5. Section 23 31 00 - HVAC Ducts and Casings.

1.2 REFERENCES

- A. ADC 1062: GRD-84 - Test Code for Grilles, Registers, and Diffusers.
- B. ANSI/ASHRAE 70 – 2006 (RA 2011) - Method of Testing the Performance of Air Outlets and Air Inlets.
- C. SMACNA - HVAC Duct Construction Standard.

1.3 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Coordination Drawings: Reflected ceiling plans, drawing to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
- C. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.



- D. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

1.4 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with:
1. AMCA 500.
- C. Acoustical Criteria:
1. Air Distribution System Equipment: Maximum permissible sound-power levels in octave bands of airborne transmissions through combination of grilles, registers and diffusers when operated in installed condition per plans and specifications:
- D. Maximum PWL re 10 to the minus 12 Watts

Octave Bands	NC-30	NC-35	NC-40	NC-45	NC-50
1	60	62	66	68	7
2	53	56	63	66	68
3	45	49	54	58	62
4	41	46	51	56	61
5	38	43	48	53	58
6	37	42	47	52	57
7	36	41	46	51	56
8	37	42	47	52	57

- E. Except as noted, maximum permissible NC levels shall be as follows:
1. NC-30: Private offices, conference rooms.
 2. NC-35: Classrooms, libraries, small offices.
 3. NC-40: Open office areas.
 4. NC-45: Dining areas, waiting areas, corridors.
 5. NC-50: Kitchens, toilets, storage rooms.

1.5 REGULATORY REQUIREMENTS

- A. Conform to California Mechanical Code.

1.6 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product data, for each product indicated, include the following:
1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.



- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
- D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.
- E. Manufacturer's Installation Instructions.
- F. Provide seismic fastening clips and install per factory and code requirements.

PART 2 PRODUCTS

2.1 AIR OUTLETS AND INLETS

- A. Manufacturers
 - 1. Titus.
 - 2. Price.
 - 3. Metal-Aire.
- B. General:
 - 1. Manufacturer shall examine application of each outlet and guarantee that each will provide comfort space conditions without drafts at noted capacity.
 - 2. Noise level at noted capacities: Not to exceed criteria specified in Part 1.
 - 3. Suitable for operation at 10-percent excess and 25-percent less than noted capacity.
 - 4. Ceiling diffusers and registers shall be supplied with volume damper adjustable from face except as noted. May be omitted when a single outlet is installed on branch with volume damper.
 - 5. Finish matching color sample as selected by the Owner's Representative.
 - a. Other special materials and finishes as indicated in schedule on drawings.
 - b. Other outlets, standard finish for field painting.
 - 6. Provide gaskets at supply outlet flanges.

2.2 CEILING DIFFUSERS

- A. Supply Air Diffusers: With air-equalizing deflectors.
- B. Diffusers In Same Room: Same size and type, except as otherwise indicated.
- C. Diffuser with removable core, installed in plaster: Supply plaster frames for setting under other sections.
- D. Diffuser without removable cores, installed in plaster: supply plaster frames for setting under other sections.



- E. Diffusers suitable for ceiling construction in which installed.
- F. Provide blanking for proper coverage and blow without producing objectionable noise or air motion at occupied level. Blank-Offs: Sheet metal panels with black color exactly matching color of other exposed elements within air outlets and ceiling slots.
- G. Drop collar as indicated.
- H. Outside may be steel or aluminum unless indicated otherwise.
- I. Types:
 - 1. Type CD: Square modular core face. Frame style to match ceiling in which installed. Similar to Titus Model MCD.

2.3 GRILLES AND REGISTERS

- A. Registers:
 - 1. Type CR: Perforated ceiling register. Frame style to match ceiling in which installed. With backplate with collar for ducted applications. Similar to Titus Model PAR.
 - 2. Types RR and EG: Sidewall type grille with fixed parallel blades. Frame style to match surface in which installed. Blade spacing and blade angle as scheduled on drawings. Steel construction, except provide in stainless steel or aluminum construction where indicated. Similar to Titus Model 350/355.
- B. Grilles:
 - 1. Material: Steel
 - 2. Finish: Baked enamel, white, Baked enamel, color selected by the Owner's Representative where called out by drawings.
 - 3. Face Blade Arrangement: Adjustable horizontal. Spaced 3/4-inches apart.
 - 4. Rear Blade Arrangement: Adjustable horizontal. Spaced 3/4-inches apart.
 - 5. Frame: 1-inch wide.
 - 6. Mounting Frame: See air distribution schedule.
 - 7. Mounting: Countersunk screw.
 - 8. Damper Type: Adjustable opposed-blade assembly.

2.4 ROOF HOODS AND GOOSENECKS

- A. Manufacturers:
 - 1. Greenheck.
 - 2. Cook.
 - 3. Penn.
- B. Roof Hoods:
 - 1. Fabricate air inlet or exhaust hoods in accordance with SMACNA Low Pressure Duct Construction Standards.
 - 2. Fabricate of galvanized steel, minimum 16-gauge base and 20-gauge hood, or aluminum, minimum 16-gauge base and 18-gauge hood; suitably reinforced; with removable hood; birdscreen with 1/2-inch square mesh for exhaust and 3/4-inch for intake, and factory prime coat finish.
 - 3. Mount unit on minimum 12-inch high curb base with insulation between duct and curb.
 - 4. Make hood outlet area minimum of twice throat area.



- C. Goosenecks:
 - 1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards of minimum 18-gauge galvanized steel.
 - 2. Mount on minimum 12-inch high curb base where size exceeds 9 by 9-inch.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install items in accordance with manufacturers' instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Refer to Section 09 90 00.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Return and Exhaust Registers: Install with blades oriented to prevent sight through outlets.
- F. Refer to reflected ceiling plans for exact location of ceiling air outlets.
- G. Install inclined blade return and exhaust grilles and registers so that blades obstruct vision by inclining blades as follows:
 - 1. Ceiling Outlets: Incline toward nearest wall.
 - 2. Wall Outlets Near Ceiling: Incline toward ceiling.
- H. On grilles utilizing a plenum box, provide box fabricated of 0.034-inch/22-gauge (0.864-mm) thick, galvanized steel with internal surface internally lined with minimum ½-inch (12-mm) thick duct liner as specified in this Section.
- I. Blank-Offs: Where blank-offs are indicated for un-used portions of air outlets or ceiling slots, provide sheet metal panels with black color exactly matching color of other exposed elements within air outlets and ceiling slots.
- J. Provide stainless steel air outlets in shower areas, kitchen, and other wet areas.

END OF SECTION 23 37 13



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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic Electrical Requirements, materials and methods common to multiple electrical systems, specifically applicable to all Sections in Division 26.
- B. Related Sections:
 - 1. Section 26 08 13 - Acceptance Testing.

1.2 REFERENCES

- A. CEC - California Electrical Code, Part 3, CCR Title 24 and 2019 California Fire Code, Part 9, CCR Title 24, National Electric Code (NFPA 70) as revised and adopted within the most recent edition.
- B. NEMA ICS-6 - Industrial Control and Systems: Enclosures.

1.3 DEFINITIONS

- A. The meaning of words must be as defined in the CEC Article 100, Definitions, unless defined otherwise in an individual section.
- B. The following specification development organizations are referenced throughout the various specification sections of Division 26:
 - 1. AASHTO - American Association of State Highway and Transportation Officials.
 - 2. ADAAG - Americans with Disabilities Act Accessibility Guidelines
 - 3. Air Pollution Control District, Air Quality Management District
 - 4. ANSI - American National Standards Institute
 - 5. AQMD - Air Quality Management District
 - 6. APCD - Air Pollution Control District
 - 7. ASME - American Society of Mechanical Engineers
 - 8. ASTM - American Society for Testing and Materials
 - 9. CBC - California Building Code
 - 10. CCR - California Code of Regulations Title 24. State Chapters.
 - 11. CEC - California Electrical Code
 - 12. CFC - California Fire Code
 - 13. CMC - California Mechanical Code
 - 14. CSA - Canadian Standards Association
 - 15. EIA - Electronic Industries Association
 - 16. FCC - Federal Communications Commission.
 - 17. FM - Factory Mutual.
 - 18. FS - Federal Specifications
 - 19. ICEA - Insulated Cable Engineers Association
 - 20. IEC - International Electrotechnical Commission
 - 21. IEEE - Institute of Electrical and Electronic Engineers



22. IETA - International Electrical Testing Association
23. ISA - Instrument Society of America
24. ISO - International Organization for Standardization
25. MIL - Military Specifications
26. NACE - National Association of Corrosion Engineers
27. NECA - National Electrical Contractor's Association
28. NEMA - National Electrical Manufacturing Association
29. NETA - National Electrical Testing Association
30. NFPA - National Fire Protection Association
31. NIST - National Institute of Standards and Technology
32. OSHA - Occupational Safety and Health Administration
33. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc.
34. UL - Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. Performance Requirements

1. Furnish and install all materials to provide functioning systems in compliance with performance requirements specified, and any modifications required by reviewed shop drawings and field coordinated drawings.

1.5 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data

1. Submit product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
2. Quantity of Submittals Required
 - a. Submittals shall be in electronic PDF format.

C. Shop Drawings

1. Submit shop drawings grouped to include complete submittals of related systems, products, and accessories in a single submittal.
2. Quantity of Submittals Required:
 - a. Submittals shall be in electronic PDF format.
3. Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with requirements of the drawings and specifications. Shop drawing checked by the Engineer is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for:
 - a. Confirming and correlating all quantities and dimensions.
 - b. Selecting fabrication processes and techniques of construction.
 - c. Coordinating his work with all other trades.
 - d. Performing his work in a safe and satisfactory manner.
 - e. Provide equipment that can be installed in the available space with all code clearances. This must be coordinated prior to ordering any equipment.

D. Samples

1. Submit as directed by the architect and as required in each specification section.



E. Quality Control/Control Submittals

1. Submit material control record procedures for approval. Submit records during the project upon request by the Owner's Representative. Submit at the end of the project for record.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements

1. Conform to CEC as revised and adopted within the most recent edition.
2. Conform to NFPA 70E Standard for Electrical Safety in the Workplace as revised and adopted within the most recent edition.
3. Furnish products listed and classified by UL or other independent laboratory acceptable to Owner's Representative as suitable for purpose specified and shown when a listing is available for the type of product.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle and protect products under provisions.
- B. Maintain material control records for all products for traceability to manufacturer and order number. Have records available for inspection by Owner's Representative.
- C. Store material and equipment in an environment similar to the final installation environment.
- D. Store and handle material and equipment in accordance with manufacturers' recommendations.

1.8 PROJECT CONDITIONS

- A. Electrical plan drawings show only general locations of equipment, devices, and raceway, unless specifically dimensioned.
- B. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- C. Prepare and submit drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner's Representative before proceeding.

1.9 SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

- A. Provide a short circuit and arc flash study to the Engineer for review and approval. Provide all short circuit characteristic information on new electrical equipment. Obtain short circuit values from Utility if necessary to complete the study.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Weather Proof Equipment

1. Where weatherproof (WP) equipment is indicated, use NEMA 3R or NEMA 4 stainless steel.



PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment to permit easy access for normal operation and maintenance to switches, motors, drives, pull boxes and receptacles in accordance with CEC Article 110, Requirements for Electrical Installation as revised and adopted within the most recent edition.
- B. Coordinate electrical work with Owner's Representative and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the campus during construction.
- C. Check and coordinate the approximate locations of electrical stub-ins, light fixtures, electrical outlets, equipment, and other electrical system components shown on Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify the Owner's Representative in writing, email is acceptable. The Owner's Representative's decision must govern. Make modifications and changes required to correct conflicts.

3.2 SITE TESTS

- A. Test under provisions of Section 26 08 13.
 - 1. At completion of installation, test for operation.

3.3 ADJUSTING

- A. Adjust work under provisions of Section 26 08 13.
- B. Inspect all equipment and put in good working order.

3.4 CLEANING

- A. Clean work under provisions of Division 01.
- B. Clean all items.

3.5 PROTECTION

- A. Protect finished installation under provisions of Section 01 35 43.
- B. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.
- C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the Owner's



Representative. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

3.6 FINAL CONNECTION

- A. Make final connection to the power distribution system at the building service point.

3.7 PUTTING SYSTEMS IN OPERATION - START UP

- A. Operate all systems in good working order prior to inspection.

END OF SECTION 26 05 00



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SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600V AND BELOW)

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conductors (600V and below).
2. Wiring connectors and connections.
3. Communications data cable.
4. Pulling lubricant.

B. Related Sections:

1. Section 26 05 00 - Common Work Results for Electrical.
2. Section 26 05 53 - Identification for Electrical Systems.

1.2 REFERENCES

A. UL 486A-486B - Wire Connectors.

B. UL 510 - Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Certify compliance with CEC Article 110 - Requirements for Electrical Installation.

C. Quality Assurance/Control Submittals

1. Test Reports
 - a. Submit certified megger test results.

1.4 QUALITY ASSURANCE

A. QUALIFICATIONS

1. Manufacturer: Company specialized in manufacturing products specified in the Section with a minimum of 5 years experience.

1.5 PROJECT CONDITIONS

A. Existing Conditions

1. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
2. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

B. Field Measurements

1. Verify that field measurements are as shown on Drawings.



PART 2 PRODUCTS

2.1 CONDUCTORS (600V AND BELOW)

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Conductor Identification: Color code all conductors in accordance with CEC Article 310 - Conductors for General Wiring comply with temperature requirements of CEC 110-14(c).
 - 1. Color code all feeders and branch circuits with the following colors.
 - 2. Use the following colors in lighting and power wiring:

	<u>120/208 VOLT</u>	<u>277/480 VOLT</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutrals	White	Gray/White
Ground	Green or Bare	Green or Bare

- 3. Wire marker sleeves permanently marked with wire/circuit designation may be used in lieu of color coding for control wiring.
- E. Insulation:
 - 1. Type THHN/THWN or XHHW insulation for feeders and branch circuits larger than 4 AWG;
 - 2. Type THHN/THWN insulation for feeders and branch circuits 6 AWG and smaller.
- F. Equipment Grounding Conductors:
 - 1. Stranded copper conductors, size as required by CEC.
 - 2. Comply with CEC Articles 210 - Branch Circuits, 215 - Feeders, and 250 - Grounding.

2.2 WIRING CONNECTORS

- A. Spring Wire Connectors:
 - 1. Burndy.
 - 2. Elastimold.
 - 3. Thomas & Betts.
- B. Compression Connectors:
 - 1. Type with prestressed insulation to equal insulation of wire being installed.
 - 2. Conform to UL 486A-486B.
- C. Power Conductors Splicers:
 - 1. Burndy "Hylug".
 - 2. Ilsco.
 - 3. O.Z. Gedney.
- D. Insulating Tape.



1. Conform to UL 510.
- E. Cable Ties.
1. Scotchflex #760.
 2. Thomas & Betts "Tyrap".

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verifications of Conditions
1. Verify that interior of building has been protected from weather.
 2. Verify that mechanical work likely to damage wire has been completed.
 3. Verify conduit and raceway systems are completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Application;
1. Use conductor not smaller than 12 AWG for power and lighting circuits.
 2. Use conductor not smaller than 14 AWG for control circuits, unless otherwise indicated.
 3. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet Use same size wire for entire circuit, except for taps.
 4. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 150 feet. Use same size wire for entire circuit, except for taps.
 5. Install all wiring in raceway. Lighting and receptacle home runs indicated are for identification purposes only.
 6. Two or three branch circuits may be carried on one neutral leg as permitted by CEC.
 7. Run panelboard and motor feeders in individual conduits.
- C. Pulling wire;
1. Verify conduit is clean before pulling cable.
 2. Utilize pull rope for pulling in cable.
 3. Pull all conductors into raceway at same time.
 4. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
 5. Install feeder cables in one continuous length.
 6. Control wiring must be numbered at both ends with wiremarkers, per Section 26 05 53.
 7. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii.
 8. Utilize pull boxes and junction boxes for pulling cable.
- D. Connections;
1. Neatly train and lace wiring inside boxes, equipment, and panelboards.
 2. Clean conductor surfaces before installing lugs and connectors.



3. Make splices, taps, and terminations to carry full capacity of conductors with no perceptible temperature rise.
4. Use copper split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
5. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
6. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
7. Tighten screws to the value recommended by the manufacturer.
 - a. In the absence of manufacturer's recommendations for torque settings, tighten screws to the values shown in UL 486A-486B.
8. Provide and use terminals for control wiring terminations.

3.4 INTERFACE WITH OTHER WORK

- A. Identify wire and cable under provisions of Section 26 05 53.
- B. Identify each conductor with its circuit number or other designation indicated in Contract Documents.
- C. Mark properly torqued connections with a line, black ink.

3.5 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- C. Verify continuity of each branch circuit conductor.
- D. Megger test and record all feeder conductors.
 1. Replace conductors failing test.
 2. Test replaced conductors in same manner.

END OF SECTION 26 05 19



SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Materials and methods for grounding systems and equipment.
 - 2. Grounding electrodes and conductors.
 - 3. Equipment grounding conductors.
 - 4. Bonding.
- B. Related Sections:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 08 13 - Acceptance Testing.

1.2 REFERENCES

- A. National Fire Protection Association (NFPA): NFPA 70 E – Standard for Electrical Safety in the Workplace.

1.3 SYSTEM DESCRIPTION

- A. The following must be acceptable grounding electrodes:
 - 1. Concrete-encased electrode.
 - 2. Ground ring.
 - 3. Rod electrode.
 - 4. Metal Underground Pipe.
 - 5. Metal Frame of Building.

1.4 SYSTEM DESCRIPTION

1.5 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance:
 - 1. Building grounding electrode: 10 ohms.
 - 2. Separately Derived Sources grounding electrode: 10 ohms.
 - 3. Non-Current carrying metal parts: 25 ohms.
 - 4. Grounds not covered above: 25 ohms.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Certify compliance with CEC Article 110 - Requirements for Electrical Installations.
- C. Quality Assurance/Control Submittals:
 - 1. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
 - 2. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.



D. Closeout Submittals:

1. Project Record Documents: Accurately record actual locations of grounding electrodes.

PART 2 PRODUCTS

2.1 MECHANICAL CONNECTORS

A. Acceptable Manufacturers, as listed below and meeting the criteria and requirements specified herein, will be acceptable:

1. Burndy.
2. Thomas & Betts.
3. For manufacturers not listed, comply with substitution requirements in Section 01 25 00.

B. Material: Bronze.

2.2 EXOTHERMIC CONNECTIONS

A. Acceptable Manufacturers, as listed below and meeting the criteria and requirements specified herein, will be acceptable:

1. Burndy.
2. Cadweld Division, Erico Products.
3. For manufacturers not listed, comply with substitution requirements in Section 01 25 00.

2.3 WIRE

A. Material: Stranded bare copper.

B. Grounding Electrode Conductor: as indicated or per CEC Article 250, whichever is larger.

2.4 GROUNDING CLAMPS

A. Acceptable Manufacturers, as listed below and meeting the criteria and requirements specified herein, will be acceptable:

1. Burndy.
2. For manufacturers not listed, comply with substitution requirements in Section 01 25 00.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturers' instructions.

B. Grounding Electrode Conductor:

1. Install grounding electrode conductor from each separately derived system in the building to the ground bar (grounding electrode system).
 - a. Install grounding electrode conductor in steel conduit and bond grounding conductor to conduit at entrance and exit.
 - b. Connect to the ground bar (grounding electrode system) with exothermic weld.
 - c. Unless otherwise indicated, install main ground unspliced.
 - d. Make connections easily accessible for inspection in ground bar cabinet.



2. Grounding electrode conductor must be of the same type and quality as other conductors in the building.
- C. Bonding:
1. Provide bonding to meet requirements of CEC.
 2. Bond together metal siding not attached to grounded structure; bond to ground.
 3. Bond pre-fabricated metal building to grounding electrode system at a minimum of one location.
 4. Bond together all metallic conduit, boxes, cabinets and enclosures.
- D. Grounding Conductors:
1. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder circuit raceway and within each motor feeder raceway. Terminate each end on suitable lug, bus, or bushing.
 2. Provide separate grounding conductor for circuits installed in flexible steel conduit. Terminate each end on a suitable lug, bus or bushing.
 3. Ground all conduit systems, cabinets, equipment, motor frames, etc., in accordance with CEC and applicable codes.
- E. Grounding Connections:
1. Bond neutrals of transformers within buildings to the system ground network, and to additional indicated grounding electrodes.
 2. Unless shown otherwise, make connections of grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection point below finished grade.
 3. Grounding pad plates must be cast into the slab with the surface flush with the finished floor.

3.2 FIELD QUALITY CONTROL

- A. Site Tests:
1. Test under provisions of Section 26 08 13.
 2. Notify Owner's Representative five days before inspection and testing.
 3. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.
 4. Remove main bonding jumper at main service switchboard and at each separately derived system and test for infinite resistance between neutral and ground systems. Reconnect bonding jumper(s).
 5. Record test results in accordance with 26 05 00 and submit.
- B. Inspection:
1. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION 26 05 26



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SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment supports.
 - 2. Raceway supports.
 - 3. Anchors and fasteners.
- B. Related Sections:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1.2 REFERENCES

- A. ASTM A36/A36M - Carbon Structural Steel.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Hangers and supports must have minimum safety factor of five (5), based on ultimate tensile or compressive strength, as applicable, of material used.
 - 2. Anchors must be applied in accordance with the ANCHOR CAPACITY TABLE following paragraph 3.2.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Design Data
 - 1. Indicate hanger and support framing and attachment methods.
 - 2. Submit seismic and structural calculations in accordance with Section 26 05 48.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide corrosion resistance that provides as a minimum the same protection as the products being supported.
- B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire equal to full capacity of raceway in calculations for supports.
- C. Anchors and Fasteners.
 - 1. Sheet Metal Screws: Steel.
 - 2. Machine Screws, Bolts, Nuts, and Washers: Steel.



3. Precast Inserts: Suitable for the purpose.
 4. Anchor bolts, expansion type (stainless steel).
 - a. Phillips Red-Head.
 - b. Hilti Kwik-Bolt.
 - c. WEJ-IT
 5. Cast-in-Place Anchors: Suitable for the purpose (hot-dip galvanized except cadmium plated in dry locations).
 6. Beam Clamps: Steel.
- D. Raceway Supports
1. Conduit Straps Used with Rigid Steel Conduit: One hole malleable iron, cadmium plated.
 2. Conduit Straps Used with Other Than Rigid Steel Conduit: One or two hole steel, cadmium plated.
 3. Clamp Backs: Steel, cadmium plated.
- E. Channels
1. Acceptable Manufacturers
 - a. Unistrut.
 - b. Powerstrut.
 - c. B-line.
 2. Material
 - a. 12 gauge steel, 1-5/8 inches by 1-5/8 inches when not attached to building surface.
 - b. 14 gauge steel, 1-5/8 inches wide by 13/16 inches deep when connected directly to building surface.
 - c. Hot-dip galvanized except cadmium plated in dry locations.
 3. Fittings: By channel manufacturer.
- F. Hanger Rods:
1. Material: 1/4 inch minimum hot-dip galvanized after fabrication.
- G. Structural Steel:
1. Material: ASTM A36/A36C.
 2. Finish:
 - a. Dry Locations: Shop coat of rust inhibiting primer.
 - b. Otherwise hot-dipped galvanized after fabrication.
- H. Pipe/Conduit Hangers: Hot dipped galvanized steel or malleable iron.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General
1. Install products in accordance with manufacturer's instructions.
 2. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.
 3. Do not drill or cut structural members without approval of Owner's Representative.
- B. Anchors
1. Concrete - Precast inserts, cast-in-place anchors or expansion type anchor bolts.



- a. When installing drilled-in anchors in non-prestressed reinforced concrete, avoid the reinforcing bars.
 - b. When installing drilled-in anchors into prestressed concrete (pre- or post-tensioned), locate tendons by using a non-destructive method prior to installation. Maintain a minimum clearance of one-inch between the reinforcement and the drilled-in anchor.
 2. Sheet Metal - Sheet metal screws or machine bolts, nuts and washers.
 3. Structural Steel Members - Beam clamps, machine screws, bolts, nuts and washers.
- C. Supports
1. Fabricate supports from structural steel or steel channel. Rigidly weld or bolt members to present a neat appearance with adequate strength and rigidity.
 2. Vertical adjustment on threaded rods must be with 2 nuts on each end for positioning and locking.
- D. Conduit
1. In damp or wet locations, space conduit support directly from concrete or metal structure out at least 1/4 inch using straps with spacers or, if three (3) or more conduits are located in a parallel run, they must be spaced out from the wall approximately 5/8 inch to 1 inch by means of channel.
 2. Runs of individual conduit suspended from the floor or ceiling must be supported with pipe hangers. Where three (3) or more conduits are suspended from the floor/ceiling, suitable racks must be constructed from channel material with suitable fittings.
 3. Space supporting points no greater than required by CEC.
- E. Raceway Other Than Conduit
1. Support from structure in accordance with manufacturers' instructions.
- F. Equipment
1. Install surface-mounted cabinets and panelboards with a minimum of four anchors.
 2. In wet and damp locations use steel channel supports to stand cabinets and panelboards 13/16 inch minimum off wall.
 3. Use sheet metal channels to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
 4. Support equipment in accordance with manufacturer's instructions.
 5. Verify that equipment will fit support layouts indicated.
 - a. Where substitute equipment is used, revise indicated supports to fit at no additional cost.
 6. Arrange for necessary openings to allow entry of equipment.
 - a. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves or other devices to allow later installation.
- G. Sleeves
1. Set sleeves in position in formwork. Provide reinforcing around sleeves.
 2. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves full depth and provide floor plate.
 3. Where raceway penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal.



3.2 FIELD QUALITY CONTROL

- A. All expansion anchors must have 50 percent of the bolts (alternate bolts in any group arrangement) proof tested in tension and certified by a recognized testing agency at the values indicated in the following table, except where shown otherwise in the Contract Documents. If there are any failures, the immediately adjacent bolts must then also be tested. Anchor capacities must not exceed 80 percent of the values in the published ICBO report.

ANCHOR CAPACITY (3,000 PSI MINIMUM STONE AGGREGATE CONCRETE)							
	1/2 inch	5/8 inch	3/4 inch	7/8 inch	1 inch	1-1/4 inches	UNITS
IN TENSION	680	960	1,360	1,900	2,700	3,600	LBS
IN SHEAR	1,170	1,680	2,420	3,500	5,020	6,700	LBS
TYPE OF TEST:							
DIRECT PULL- TENSION, LBS.	1,360	1,920	2,720	3,800	5,400	7,200	LBS
MINIMUM EMBEDMENT	3	3-3/4	4-1/2	5-1/4	6	7-1/2	INCHES

END OF SECTION 26 05 29



SECTION 26 05 34 - OUTLET AND JUNCTION BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Outlet boxes.
 - 2. Floor boxes.
 - 3. Pull and junction boxes.
- B. Related Sections:
 - 1. Section 07 84 00 - Firestopping.
 - 2. Section 08 31 13 - Access Doors and Frames.
 - 3. Section 26 27 16 - Electrical Cabinets and Enclosures.

1.2 REFERENCES

- A. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. UL 514A - Metallic Outlet Boxes.
- D. UL 886 -Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Closeout Submittals
 - 1. Project Record Documents: Accurately record actual locations and mounting heights of all boxes.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Furnish products listed and classified by UL as suitable for purpose specified and shown.
 - 2. Compliance with CEC with particular attention to Article 110.

1.5 PROJECT CONDITIONS

- A. Field Measurements
 - 1. Verify field measurements are as shown on the Drawings.
 - 2. Boxes are indicated in approximate locations unless dimensioned. Verify locations prior to rough-in.
 - 3. Coordinate mounting heights and locations of boxes mounted above, below, in, or on counters, benches and backslashes.
 - 4. Coordinate cutting of masonry to achieve neat installation.
 - 5. In framed ceilings, coordinate locations and sizes of required access doors.



PART 2 PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal: NEMA OS 1, galvanized steel.
 - 1. Manufacturers:
 - a. Appleton.
 - b. Bowers.
 - c. Racor.
 - d. Steel City.
 - 2. Concrete/Masonry Boxes: Concrete/Masonry Type.
 - 3. Minimum Size: 4 inches square; 2-1/2 inches deep at ceilings; 3-1/2 inches deep at concrete or masonry walls; 2-1/8 inches deep with a raised 1-inch device cover at metal stud walls.
 - a. Use of 2-1/2-inch deep single gang boxes must be permitted when there is only one conduit entry into the box.
- B. Cast Boxes
 - 1. Manufacturers:
 - a. Crouse Hinds, FS or FD Series.
 - b. Non-hazardous rating: UL 514A, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
 - c. Boxes in Hazardous Locations: UL 886.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface-Mounted: NEMA 250, Type 4; flat-flanged.
 - 1. Material: Galvanized cast iron or steel.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General
 - 1. Provide boxes as indicated, and as required by the CEC.
 - 2. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
 - 3. Install boxes to preserve fire resistance rating of partitions and other elements using materials and methods per Section 07 84 00.
 - 4. Do not install flush mounting boxes back-to-back in walls.
 - a. Provide minimum 24 inches separation between boxes in acoustic and fire-rated walls and 6 inch separation between boxes in other locations.
 - b. Install flush mounting box without damaging wall insulating or reducing its effectiveness.
 - 5. At access panel in ceilings, install boxes not more than 6 inches horizontally from panel opening or from removable recessed luminaires.



6. At masonry walls and partitions, locate flush mounting box at corner of block to reduce cutting.
- B. Outlet Boxes
1. Minimum Size: 4 inches square; 2-1/2 inches deep at ceilings; 3-1/2 inches deep at walls.
 - a. Exception: 2-1/2 inches deep box allowed if allowed if rebar or other obstructions prevents the use of deeper boxes.
 2. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
- 3.2 APPLICATION
- A. Exterior
1. In-ground: Provide in-ground cast box with cover.
 2. Above-ground: Provide cast box.
- B. Interior
1. Finished Areas: Provide flush-mounted boxes.
 2. Interior Unfinished Areas: Provide flush or surface-mounted boxes, except that exposed surface-mounted boxes will not be acceptable in accessible areas.
- C. Pull Boxes Larger than 100 Cubic Inches in Volume or 12 Inches in Any Dimension:
1. At stud walls and partitions, install box and plaster ring allowing for thickness of surface finish. Provide boxes for luminaires and electrical connections to equipment shown on Drawings.
 2. For 1-gang outlets in non-masonry walls, use four-inch square box with four-inch square plaster ring with 1-gang opening. Boxes smaller than four-inches square not permitted.
 3. For 2-gang outlets, use four-inch square box with four-inch square plaster ring with 2-gang opening.
 4. Dry Locations: Provide hinged enclosure.
- D. Use gang box where more than one device is mounted together. Do not use sectional box. Provide box with interior barrier for devices on normal and emergency power which are mounted together. In addition, provide barriers where the voltage between adjacent switches exceeds that which is allowed by the CEC.

END OF SECTION 26 05 34



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SECTION 26 05 35 - RACEWAY FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rigid metal conduit.
2. Intermediate metal conduit.
3. Flexible metal conduit.
4. Liquid tight flexible metal conduit.
5. Electrical metallic tubing.
6. Fittings.
7. Cable/conduit locator.

B. Related Documents and Sections:

1. Section 07 84 00 - Firestopping.
2. Section 26 05 00 - Common Work Results for Electrical.
3. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
4. Section 26 05 29 - Hangers and Supports for Electrical Systems.
5. Section 26 05 34 - Outlet and Junction Boxes for Electrical Systems.
6. Section 26 05 63 - Identification for Electrical Systems.

1.2 REFERENCES

- A. ANSI C80.1 - Electrical Rigid Steel Conduit (ERSC).
- B. ANSI C80.3 - Steel Electrical Metallic Tubing (EMT).
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
- D. UL 1 - Flexible Metal Conduit.
- E. UL 6 - Electrical Rigid Metal Conduit - Steel.
- F. UL 360 - Liquid-tight Flexible Steel Conduit.
- G. UL 514B - Conduit, Tubing, and Cable Fittings.
- H. UL 797 - Electrical Metallic Tubing - Steel.
- I. UL 1242 - Electrical Intermediate Metal Conduit - Steel.
- J. FS-A-A-55810 - Conduit, Metal, Flexible.
- K. FS-A-A-50552 - Fittings, For Cable, Power, Electrical and Conduit, Metal, Flexible.
- L. FS-A-A-50553A - Fittings for Conduit, Metal Rigid (Thick-wall and Thin-wall).



1.3 DESIGN REQUIREMENTS

- A. Conduit Size: As indicated. When not indicated or when equipment has been substituted, size per CEC except no smaller than 3/4-inch.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Certify compliance with CEC Article 110 - Requirements for Electrical Installation.

1.5 AS-BUILT DOCUMENTS

- A. Accurately record actual routing of conduits larger than 2 inches in diameter.

1.6 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.1 RIGID METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1, UL 6.
 - 1. Stamp each length with manufacturer's name or trademark and U/L label.

2.2 INTERMEDIATE METAL CONDUIT

- A. Material: Rigid steel; hot-dip galvanized.
 - 1. UL 1242 and UL 514B.

2.3 FLEXIBLE METAL CONDUIT

- A. Interlocked Steel Construction: UL 1, FS-A-A-55810.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Interlocked steel construction with PVC jacket: UL 1 and UL 360.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Galvanized Steel Tubing: ANSI C80.3, UL 797 and UL 797.

2.6 FITTINGS

- A. Acceptable Manufacturer
 - 1. Thomas and Betts, (T&B).



- a. For reference, Thomas & Betts series numbers are listed below.
 2. Appleton.
 3. Crouse-Hinds.
 4. O.Z. Gedney.
- B. Standards
1. Metallic: NEMA FB1 and UL 514B ferrous.
 - a. Flexible: FS-A-A-50553A.
 2. Non-metallic: NEMA TC3.
- C. Locknuts:
1. Hardened Steel or malleable iron construction, electro zinc plated, capable of insuring positive bond to enclosure.
 - a. Non-bonding: T & B Series 142.
 - b. Bonding: T & B Series 107.
 - c. Crouse-Hinds.
 - d. Appleton.
- D. Bushings:
1. Insulated: T & B Series 223.
 2. Insulated Metallic Bushing: T & B Series 1223.
 3. Insulated Grounding and Bonding Bushing: T & B Series 3871.
 4. Crouse-Hinds.
 5. Appleton.
- E. Couplings:
1. Non-metallic Conduit Coupling: By non-metallic conduit manufacturer for the purpose.
 2. Threaded Rigid Metal Conduit Couplings: By conduit manufacturer for the purpose.
 3. Threadless Coupling: "Erickson" Type; T & B Series 676.
 4. EMT Coupling, Raintight: T & B Series 5220.
 5. Expansion Type: permit 3/4 inch movement any direction.
 - a. Exposed: Weatherproof with external bonding jumper.
 - b. Embedded: Watertight with internal bonding jumper.
 6. Crouse-Hinds.
 7. Appleton.
- F. Connectors:
1. Non-Metallic Conduit Connector: By conduit manufacturer for the purpose.
 2. Threaded Hubs: Electro zinc coated with nylon insulated throat and oil/moisture resistant recessed sealing ring, raintight.
 - a. Non-bonding: T & B series 371.
 - b. Bonding: T & B Series 371 with 107 series bonding locknut.
 3. EMT Connectors, Raintight: T & B Series 5223.
 4. EMT to Rigid Metal Conduit Connector: Raintight - T & B Series 531.
 5. Flexible metal conduit connector - Insulated throat, suitable as grounding means. T & B Series 3115.
 6. Liquid-tight flexible metal conduit connector FS-A-A-50552, electro zinc plated inside and outside, with nylon insulating throat and taper threaded hub.
 - a. Non-External Bonding - T & B Series 5333.
 - b. External Bonding - T & B Series 5333GR.



7. Crouse-Hinds.
8. Appleton.

G. Nipple: "Chase" Type, Insulated; T & B Series 1943.

H. Sealing Gaskets: Oil and moisture resistant rubber bonded to metallic retainer.

1. With rigid conduit - T & B Series 5303.
2. With liquid tight flexible conduit - T & B Series 5263.
3. Fittings not specifically listed but required must be of similar style and quality.

2.7 CONDUIT BODIES

A. Standards - NEMA FB-1 and FS-A-A-50553A.

B. Ferrous with threaded hubs and gasketed cover.

2.8 SEALANT

A. Internal to fittings.

1. Approved by manufacturer for application.
2. Manufacturer:
 - a. Crouse Hinds Chico A-P and Chico X Fiber.
 - b. O.Z. Gedney.

2.9 WARNING TAPE

A. Tape: Heavy-gauge, yellow plastic; minimum 6inch width for use in trenches containing electric circuits; material resistant to corrosive soil and containing a metallic tracer wire for use with cable locators; printed warning that electric circuit is located below the tape.

1. Manufacturers and Types:
 - a. 3M.
 - b. Calpico.
 - c. Plymouth, Vinyl Tape.
 - d. Griffolyn Co, Terra Tape.
 - e. ITT Blackburn, Type YT or RT.

2.10 CABLE/CONDUIT LOCATOR

A. Locator: Hand-held, self contained, cable/conduit locator capable of inducing a signal on a cable and detecting a 60 Hz power signal.

2.11 MC CABLE

- A. Copper conductors with full size grounding wire.
- B. Aluminum interlocking armor.
- C. UL listed.

PART 3 EXECUTION



3.1 INSTALLATION - GENERAL

A. Installation Standards:

1. Install conduit in accordance with NECA "Standard of Installation."
2. Ground and bond conduit under provision of Section 26 05 26.
3. Identify conduit under provisions of Section 26 05 53.
4. Where conduit systems penetrate or parallel fire and/or smoke rated walls, ceilings, roofs or floors, maintain the fire rating integrity.
5. Install nonmetallic conduit in accordance with manufacturer's instructions.
6. Provide heavy nylon cord pull string in each empty conduit except sleeves and nipples. Pull line to have a minimum of 200 pound pull strength. Tag each end of string with destination. Leave a minimum of 24 inches of slack and tie-off at each end.
7. Within finished areas of building. Install all conduits concealed.
8. Exposed overhead conduit may be used in areas with exposed metal structure, Switchgear Rooms, Mechanical Equipment Rooms, Electric Closets, and Equipment Rooms only.
9. Locate boxes in accordance with Section 26 05 34 before installing conduit.
10. Do not use setscrew type couplings, bushings, elbows, nipples, or other fittings.

B. Supports:

1. Arrange supports to prevent misalignment during wiring installation.
2. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
3. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
4. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
5. Do not attach conduit to ceiling support wires.
6. Conduit Installation:
 - a. Support all conduit systems from building structure or walls with approved hangers.
 - 1) Do not support from piping, ducts or support system for piping or ducts.
 - 2) Do not install to prevent ready removal of piping, ducts or ceiling tiles.
 - 3) Do not support from ceiling or ceiling support systems.

C. Routing:

1. Arrange conduit to maintain headroom and present neat appearance.
2. Route conduit in and under slab from point-to-point.
3. Route other conduit parallel and perpendicular to walls.
4. Maintain adequate clearance between conduit and piping.
5. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
6. In outdoor, underground, or wet locations, use watertight couplings and connections in raceways.
7. Thoroughly clean threads of oil, tailings and paint threads of galvanized conduits that are installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound before assembling.
8. Do not notch or penetrate structural members for passage of raceways except with prior approval of the Owner's Representative.
9. Do not run raceways in equipment foundation pads.



10. Install concealed, embedded, and buried raceways so that they emerge at right angles to the surface and have none of the curved portion of the bend exposed.

D. Fitting:

1. Cut conduit square using saw or pipe cutter; de-burr cut ends.
2. Bring conduit to shoulder of fittings; fasten securely.
3. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
4. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
5. Install no more than equivalent of four 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2 inch size.
6. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
7. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic control and expansion joints.
8. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
9. Make joints in threaded conduit watertight with white nonlead compound applied to male threads only.
 - a. Cut square, ream smooth, and properly thread filed joints to receive couplings.
 - b. Do not use running threads. Fit all conduit ends at switch and outlet boxes with approved lock nuts and bushing forming approved tight bond with box when screwed tightly in place.
10. Remove moisture and debris from conduit before wire is drawn into place. Tightly plug ends of conduit with plastic inserts until wire is pulled.
11. Neatly seal openings around conduits, etc., where they pass through fire rated construction or exterior walls or roof in accordance with Section 07 84 13.
12. Install conduit to roof exhaust fans through fan housing with no conduit exposed.
13. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified under Section 07 60 00.
14. Provide escutcheon plates at exposed wall, ceiling and floor conduit penetrations.

E. Bends:

1. Make changes in direction of runs with symmetrical bends or cast metal fittings. Make bends and offsets of the longest practical radius. Avoid field-made bends and offsets where possible, but where necessary, make with an acceptable hickey or conduit bending machine. Do not heat metal raceways to facilitate bending.
2. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Factory elbows may be used in parallel or banked raceways if there is a change in the plane of the run and the raceways are of the same size. Otherwise, make field bends in parallel runs.
3. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduit's flexibility.

F. Bushing and Insulating Sleeves:



1. Where metallic conduit enters metal equipment enclosures through conduit openings, install a bonding bushing on the end of each conduit. Install a bonding jumper from the bushing to any equipment ground bus or ground pad.
2. If neither exists, connect the jumper to a lag-bolt connection to the metallic enclosure.
3. Use manufacturer's standard insulating sleeves in all metallic conduits terminating at an enclosure.

G. Penetrations:

1. Seal the interior of all raceways entering structures including manholes, handholes, and pullboxes at the first box or outlet with oakum or suitable plastic expandable compound to prevent the entrance into the structure of gases, liquids, or rodents.
2. Dry pack with nonshrink grout around raceways that penetrate concrete walls, manholes, handholes, pullboxes, or floors, or use one of the methods specified for underground penetrations. The seal must prevent water seepage around the raceways.
3. Where raceways penetrate fire-rated walls, floors, or ceilings, fire stop openings around electrical penetrations to maintain the fire-resistance rating.

3.2 PRODUCT APPLICATION - RACEWAY - GENERAL LOCATIONS

A. Outdoors, Above Grade:

1. Liquid-tight Flexible Conduit:
 - a. Other locations where protected from physical damage.
 - b. Maximum 3 foot lengths.
2. Electrical Metallic Tubing:
 - a. Where protected from weather and physical damage.
3. Rigid Metallic Conduit:
 - a. Other locations not otherwise indicated.

B. Dry Locations - Concealed:

1. Rigid metal conduit.
2. Flexible metal conduit.
3. Liquidtight flexible metal conduit.
4. Electrical metallic tubing.
5. Connections and Fittings:
 - a. Above lay-in tile ceilings, make connections to lay-in type fixtures with 1/2-inch flexible metal conduit.
 - 1) Include No. 12 branch and grounding conductors.
 - 2) Arrange conduit and box systems for easy removal of lay-in ceiling.
6. MC cable – within existing walls.

C. Dry Locations - Exposed.

1. Rigid metal conduit.
2. Flexible metal conduit - 6 feet maximum length.
3. Liquidtight flexible metal conduit - 6 feet maximum length.
4. Electrical metallic tubing.

3.3 PRODUCT APPLICATION - RACEWAY - SPECIAL LOCATIONS

A. The following requirements modify the general location requirements listed above.

B. Motor Connections:



1. Make motor and equipment connections with flexible metal conduit not exceeding 24 inches in length.
 - a. Use liquidtight metal conduit in damp and wet locations.
 - b. Damp locations include but are not limited to: Dietary production, dishwashing, decontamination sterilizers and pumps.

3.4 PRODUCT APPLICATIONS - CONNECTIONS

A. Rigid Metal Conduit:

1. At building expansion joints, use expansion type fittings.
2. Where an expansion type fitting is not required, use a threaded rigid metal conduit coupling or "Erickson" type coupling as appropriate.
3. Make connections to NEMA 12 boxes with a threaded hub.
4. Make connections to a threadless opening with locknuts on the inside and outside of the box. The conduit end must be fitted with an insulating bushing. In wet locations, a sealing gasket must be provided between the outside locknut and the box.
5. Bonding type locknuts must be used where the raceway and associated fittings are part of the equipment grounding system.
6. Insulated grounding and bonding bushings must be used to terminate service conduits, rigid metal conduit used as the grounding electrode conductor enclosure, where assurance of electrical continuity between isolated sections of raceways is required in accordance with CEC and where a bonding jumper around unpunched knockouts is required in accordance with CEC.
7. Terminate in sealing type fittings when leaving refrigerator and freezer boxes and when leaving hazardous areas.
8. Repair any marred galvanized finish to maintain the same level of corrosion protection.

B. Flexible Metal Conduit:

1. Terminate with a flexible metal conduit connector. Use a locknut in unthreaded boxes.

C. Liquidtight Flexible Metal Conduit:

1. Terminate with a liquidtight flexible metal conduit connector. Use external bonding type with equipment bonding jumper in hazardous locations (where allowed). Fasten bonding jumper to conduit with cable ties every foot.
2. In wet locations, use a sealing gasket.

D. Electrical Metallic Tubing:

1. At building expansion joints, use expansion type fittings.
2. Where an expansion type fitting is not required, use an EMT coupling to connect EMT sections.
3. Make connections with EMT connectors.

E. Rigid non-metallic conduit:

1. Make connections in accordance with the manufacturers published instructions.

F. System-to-System Connections:

1. Make EMT to rigid metal conduit connections with an EMT to rigid metal conduit connector.
2. Make a box-to-box connection with a "chase" type nipple and locknut.

3.5 PREPARATION FOR PULLING IN CONDUCTORS



- A. Do not install crushed or deformed raceways. Avoid traps in raceways where possible. Take care to prevent the lodging of plaster, concrete, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Make raceways entirely free of obstructions. Raceways that are not usable because of being crushed or obstructions must be replaced. Ream all raceways, remove burrs, and clean raceway interior before introducing conductors or pull wires.
- B. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals until the time for pulling in conductors. Provide a permanent removable cap over each end of each empty raceway.

3.6 EMPTY RACEWAYS

- A. Certain raceways will have no conductors pulled in as part of this Contract. Identify with tags at each end the origin and destination of each such empty raceway. Provide a permanent cap over each end of each empty raceway. Provide a nylon pull wire in each empty raceway, tie-off at both ends.

3.7 TESTING & INSPECTION

- A. Do not cover up conduit work until inspected. Notify Owner's representative at least 3 days before inspection is desired.

END OF SECTION 26 05 35



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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Wire markers.
 - 3. Conduit and electrical markers.

1.2 REFERENCES

- A. Refer to Requirements of Section 26 05 00.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Furnish products listed and classified by UL as suitable for purpose specified and shown.
 - 2. Compliance with the CEC and in particular, Article 110.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description
 - 1. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
 - 2. Letter Size:
 - a. Use 1/8-inch letters for identifying individual equipment and loads.
 - b. Use 1/4-inch letters for identifying grouped equipment and loads.

2.2 WIRE MARKERS

- A. Manufacturers:
 - 1. Brady.
 - 2. E-Z Code by T&B.
 - 3. Pan-Code by Panduit.
 - 4. Plymark by Plymouth and Bishop.
 - 5. ScotchCode by 3M.
 - 6. Ideal.
- B. Description:
 - 1. Vinyl cloth, self laminating vinyl, heat shrink sleeving, or tube type markers.
 - 2. Legend:
 - a. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.
 - b. Control Circuits: Control wire number indicated on shop drawings.

2.3 CONDUIT AND ELECTRICAL MARKERS



- A. Manufacturers:
 - 1. E-Z Code by T&B.
 - 2. Pan-Code by Panduit.
 - 3. Ideal.
- B. Description: Tape, 2 inches wide.
- C. Legend and Color:
 - 1. Black Lettering on Orange Background.
 - a. All voltages.
 - 2. White Lettering on red background.
 - a. Fire Alarm System: "FIRE"
 - 3. White Lettering on Blue Background.
 - a. Telephone system: "TELE"
 - b. Spare communications, "SPARE."

PART 3 EXECUTION

3.1 PREPARATION

- A. Surface Preparation
 - 1. Degrease and clean surfaces to receive nameplates, wire markers, conduit and electrical markers.

3.2 APPLICATION

- A. Nameplates
 - 1. Provide nameplates for electrical equipment, such as distribution panels, sub panels, transformers, and disconnects.
 - 2. Recessed Panelboards: Install nameplate with metal screws to inside surface of door.
- B. Wire Markers.
 - 1. Provide for each conductor at panelboard, gutter, pull box, junction box, convenience outlet, cabinet, and each load connection.
 - 2. For feeder and branch circuits, use circuit numbers indicated on the Drawings. For control circuits, use circuit numbers indicated on the shop drawings.
- C. Above Grade Conduit
 - 1. Provide conduit/electrical markers for all exposed conduits, longer than 20 feet, which pass through a room or any open area without terminating.
 - a. Mark conduit every 20 feet.
 - 2. Interior or exterior located mechanical equipment: Provide conduit/electrical markers to distinguish voltage differences when fed by two or more conduits.

END OF SECTION 26 05 53



SECTION 26 08 13 - ACCEPTANCE TESTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Quality assurance.
 - 2. Field quality control.
- B. Related Sections:
 - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 2. Section 26 24 00 - Panel boards.

1.2 REFERENCES

- A. Refer to requirements of Section 26 05 00.
- B. International Electrical Testing Association (NETA)
 - 1. ATS - Acceptance Testing Associations for Electrical Power Distribution Equipment and Systems.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements
 - 1. Inspections and tests must be performed in accordance with applicable codes and standards including CEC, ANSI, IEEE, NFPA, and NEMA as referenced in the related Sections.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Quality Assurance/Control Submittals
 - 1. Test Reports: Certified test reports must be submitted at the completion of the project. The final report must be signed and include the following information:
 - a. Summary of the project.
 - b. Description of the equipment tested.
 - c. Visual inspection report.
 - d. Description of the tests.
 - e. Test results.
 - f. Conclusions and recommendations.
 - g. Appendix including appropriate test forms.
 - h. Identification of the test equipment used.
 - i. Name of Company & individual conducting tests.
 - 2. After the evaluation of the system and equipment has been made, the testing organization must submit for approval an acceptance test procedure for each item of electrical distribution equipment to be tested on this project. Test procedures must



include the proposed system function test. No testing must be performed unless the test procedures have been approved.

- C. Qualification Statements: The qualifications of the testing organization and field engineer responsible for the testing must be submitted for approval prior to the start of the testing.

1.5 QUALITY ASSURANCE

A. Qualifications

1. The Contractor must engage the services of a qualified testing organization to provide final inspection, testing, calibration and adjusting on the electrical system as defined in this Contract. The testing organization must have been engaged in full practice for a minimum of five years.
2. The testing organization must have a calibration program with accuracy traceable every six months, and in an unbroken chain, the National Institute of Standards and Technology (N.I.S.T.).
3. Testing, inspection and calibration must be performed by an Engineering Technician, certified by a national organization with a minimum of 5 years experience inspecting, testing and calibrating electrical distribution equipment, systems and devices. Information substantiating the qualifications of the Certified Engineering Technician must be submitted for approval prior to the start of work.
4. The Contractor must supply to the testing organization complete sets of approved shop drawings, coordination study, settings of all adjustable devices and other information necessary for an accurate inspection and evaluation of the system prior to the performance of any tests.
5. Membership in the International Electrical Testing Association or equivalent organization.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide materials and equipment necessary to perform the inspection and tests.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Site Tests

1. Test under provisions of Division 01.
2. Perform tests in accordance with the latest edition of ATS.
3. Field Acceptance Testing must be accomplished on each item of electrical equipment installed or connected to a part of this Contract. This must include:
 - a. Grounding System: Perform inspection and testing as required in Section 26 05 26 and ATS.
 - b. Over Current Protective Device: Perform primary injection test to prove circuit breakers rated 400-amps and above.
 - c. AC Motors: Perform inspection and testing as required in ATS for all motors rated 10 HP and higher.



- d. Motor Control: Perform inspection and testing as described in the Motor Control, Low Voltage section of ATS.
 4. All interlocks, safety devices, fail-safe functions, and design functions must be tested.
 5. Each system covered by this Section must be function tested to ensure total system operation.
 6. Upon satisfactory completion of equipment acceptance tests, the system functional tests must be performed. Prove proper interaction of sensing, processing and action devices to effect the designed end product and results.
 7. System must be energized or otherwise placed in service only after completion of all required tests and an evaluation of the test results has been completed.
- B. Inspection
1. Visual inspection of installed equipment must be performed by the testing organization to verify that the equipment installed and to be tested is the equipment denoted on the approved shop drawings. The inspection must check the equipment designations, device characteristics, special installation requirements, applicable codes and standards.
 2. After completion of the visual inspection, a report must be developed stating any discrepancies that may have been found. Discrepancies must be corrected before proceeding further with testing unless allowed in writing by the Owner's representative.
- 3.2 ADJUSTING
- A. Adjust work under provisions of Division 01.
- B. Deficiencies found must be rectified, and work affected by such deficiencies must be completely retested. Final acceptance of the electrical power system is contingent upon satisfactory completion of the acceptance and system function tests.

END OF SECTION 26 08 13



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SECTION 26 09 43 – DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Distributed Digital Lighting Control System: System includes
 - 1. Digital Lighting Controls

1.2 RELATED SECTIONS

- A. Section 26 50 00 - Lighting.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.
- B. NEMA - National Electrical Manufacturers Association
- C. FCC emission standards
- D. UL - Underwriters Laboratories, Inc. Listings
- E. UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products Installed in Air-Handling Spaces.
- F. UL 20 - General Use Switches, Plug Load Controls
- G. UL 924 - Standard for Emergency Lighting and Power Equipment
- H. ULC - Underwriter Laboratories of Canada Listings

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Digital Lighting Management System shall accommodate the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories that suit the required lighting and electrical system parameters.
- B. System shall conform to requirements of NFPA 70.
- C. System shall comply with FCC emission standards specified in part 15, sub-part J for commercial and residential application.
- D. System shall be listed under UL sections 916 and/or 508.

1.5 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:



1. Catalog sheets and specifications.
 2. Ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 3. Storage and handling requirements and recommendations.
 4. Installation instructions.
- C. Shop Drawings: Wiring diagrams a for the various components of the System specified including:
1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
 2. Show location of all devices, including at minimum sensors, load controllers, and switches/dimmers for each area on reflected ceiling plans.
 3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
 4. Network riser diagram including floor and building level details. Include network cable specification. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Closeout Submittals:
1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
 2. Operation and Maintenance Manual:
 - a. Include approved Shop Drawings and Product Data.
 - b. Include Sequence of Operation, identifying operation for each room or space.
 - c. Include manufacturer's maintenance information.
 - d. Operation and Maintenance Data: Include detailed information on device programming and setup.
 - e. Include startup and test reports.
- F. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in Part 3 of this specification under "COMMISSIONING".

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing of centralized and distributed lighting control systems with a minimum of 10 years documented experience.
- B. Installer Qualifications: Company certified by the manufacturer and specializing in installation of networked lighting control products with minimum three years documented experience.
- C. System Components: Demonstrate that individual components have undergone quality control and testing prior to shipping.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation



1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
 - 1. Ambient temperature: 32 to 104 degrees F (0 to 40 degrees C).
 - 2. Relative humidity: Maximum 90 percent, non-condensing.

1.9 WARRANTY

- A. Products Warranty: Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: WattStopper, which is located at: 2700 Zanker Rd., Suite 168; San Jose, CA 95134; Tel: 408.988.5331; Fax: 408.988.5373; Email: [request info \(\)](mailto:requestinfo@legrand.com); Web: <https://www.legrand.us/wattstopper.aspx>
- B. Requests for substitutions will be considered in accordance with provisions of Section 01.

2.2 DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

- A. Equipment Required: Lighting Control and Automation system as defined under this section covers the following equipment.
 - 1. Digital Lighting Management (DLM) local network: Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
 - 2. Digital Room Controllers: Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
 - 3. Digital Occupancy Sensors: Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
 - 4. Digital Switches: Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
 - 5. Configuration Tools: Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away.
 - 6. Programming and Configuration Software: Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.
- B. Local Network LMRJ-Series: DLM local network is a free topology lighting control



physical connection and communication protocol designed to control a small area of a building.

1. Features of the DLM local network include:
 - a. Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
 - b. Simple replacement of any device in the local DLM network with a standard off the shelf unit without requiring significant commissioning, configuration or setup.
 - c. Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
 - d. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.
2. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.
3. If manufacturer's pre-terminated Cat5e cables are not used for the installation each cable must be individually tested and observed by authorized service representative following installation.

2.3 DIGITAL LOAD CONTROLLERS (ROOM AND FIXTURE CONTROLLERS)

- A. Digital Load Controllers: Digital controllers for lighting zones, fixtures and/or plug loads automatically bind room loads to the connected control devices in the space without commissioning or the use of any tools. Provide controllers to match the room lighting and plug load control requirements. Controllers are simple to install, and do not have dip switches/potentiometers, or require special configuration for standard Plug n' Go applications. Control units include the following features
 1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
 2. Simple replacement using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf device.
 3. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so that individual load numbers are assigned starting with load 1 to a maximum of 64, assigned based on each controller's device ID's from highest to lowest.
 4. Device Status LEDs to indicate:
 - a. Data transmission
 - b. Device has power
 - c. Status for each load
 - d. Configuration status
 5. Quick installation features including:
 - a. Standard junction box mounting
 - b. Quick low voltage connections using standard RJ-45 patch cable
 6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:



- a. Turn on to 100 percent
 - b. Turn off
 - c. Turn on to last level
7. Each load be configurable to operate in the following sequences based on occupancy:
 - a. Auto-on/Auto-off (Follow on and off)
 - b. Manual-on/Auto-off (Follow off only)
8. Polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
9. BACnet object information shall be available for the following objects:
 - a. Load status
 - b. Schedule state, normal or after-hours
 - c. Demand Response enable and disable
 - d. Room occupancy status
 - e. Total room lighting and plug loads watts
 - f. Electrical current
 - g. Total watts per controller
 - h. Total room watts/sq ft.
 - i. Force on/off all loads
10. UL 2043 plenum rated
11. Manual override and LED indication for each load
12. Zero cross circuitry for each load
13. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
14. Dimming Room Controllers shall share the following features:
 - a. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.
 - b. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
 - c. The following dimming attributes may be changed or selected using a wireless configuration tool:
 - 1) Establish preset level for each load from 0-100 percent
 - 2) Set high and low trim for each load
 - 3) Initiate lamp burn in for each load of either 0, 12 or 100 hours
 - d. Override button for each load provides the following functions:
 - 1) Press and release for on/off control
 - 2) Press and hold for dimming control
 - e. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver. LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
 - f. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100 percent dimming range defined by the minimum and maximum calibration trim.
 - g. Calibration and trim levels must be set per output channel. Devices that set calibration or trim levels per controller (as opposed to per load) are not



- acceptable.
- h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

2.4 DIGITAL WALL SWITCHES

- A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
 - 1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
 - 2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
 - 3. Configuration LED on each switch that blinks to indicate data transmission.
 - 4. Load/Scene Status LED on each switch button with the following characteristics:
 - a. Bi-level LED
 - b. Dim locator level indicates power to switch
 - c. Bright status level indicates that load or scene is active
 - d. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
 - 5. Programmable control functionality including:
 - a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
 - b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
 - 6. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.
- B. BACnet object information shall be available for the following objects:
 - 1. Button state
 - 2. Switch lock control
 - 3. Switch lock status
- C. Two RJ-45 ports for connection to DLM local network.
- D. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.
- E. Load and Scene button function may be reconfigured for individual buttons from Load to Scene, and vice versa.
 - 1. Individual button function may be configured to Toggle, On only or Off only.
 - 2. Individual scenes may be locked to prevent unauthorized change.
 - 3. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
 - 4. Ramp rate may be adjusted for each dimmer switch.
 - 5. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.
 - 6. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104,



LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

2.5 HANDHELD CONFIGURATION TOOLS

- A. Provide a wireless configuration tool to facilitate customization of DLM local networks using two-way infrared communications, and/or PC software that connects to each local network via a USB interface.
- B. Features and functionality of the wireless configuration tool shall include but not be limited to:
 - 1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
 - 2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
 - 3. Must be able to read and modify parameters for load controllers and relay panels, occupancy sensors, wall switches, daylighting sensors, network bridges, and identify DLM devices by type and serial number.
 - 4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
 - 5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
 - 6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
 - 7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
 - 8. Verify status of building level network devices.
- C. WattStopper Product Numbers: Handheld LMCT-100

PART 3 EXECUTION

3.1 PREPARATION

- A. Do not begin installation until measurements have been verified and work areas have been properly prepared.
- B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.
- B. Install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors.
 - 1. If pre-terminated cable is not used for room/area wiring, each field-terminated cable shall be tested following installation and testing results submitted to the Manufacturer's Representative for approval prior to proceeding with the Work.
 - 2. If fixtures have internal DLM Control Modules, ensure that they are also connected



- with Cat 5e cable.
- 3. Install all room to room network devices using manufacturer-supplied LM-MSTP network wire or wireless devices. Network wire substitution is not permitted and may result in loss of product warranty.
- 4. Low voltage wiring topology must comply with manufacturer's specifications.
- 5. Route network wiring as indicated on the Drawings as closely as possible. Document final wiring location, routing and topology on as built drawings.
- C. All line voltage connections shall be tagged to indicate circuit and switched legs.
- D. Test all devices to ensure proper communication.
- E. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.
- F. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
 - 1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
 - 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
 - 3. Load Parameters (e.g. blink warning, etc.)
- G. Post start-up tuning - Adjust sensor time delays and sensitivities to meet the Owner's requirements 30 days from beneficial occupancy. Provide a detailed report to the Architect / Owner of post start-up activity.
- H. Tighten all panel Class I conductors from both circuit breaker and to loads to torque ratings as marked on enclosure UL label.
- I. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.
- J. Run separate neutrals for any phase dimmed branch load circuit. Different types of dimming loads shall have separate neutral.
- K. Verify all non-panel-based lighting loads to be free from short circuits prior to connection to room controllers.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Notify Architect and Manufacturer in writing a minimum of 3 weeks prior to system start-up and testing.
- B. Tests and Inspections: Manufacturer's service representative shall perform the following inspections and prepare reports.
 - 1. Verify Class I and II wiring connections are terminated properly by validating system performance.
 - 2. Set IP addresses and other network settings of system front end hardware per facilities IT instructions.
 - 3. Verify / complete task programming for all switches, dimmers, time clocks, and



sensors.

4. Verify that the control of each space complies with the Sequence of Operation.
5. Correct any system issues and retest.

- C. Provide a report in table format with drawings, or using a software file that can be opened in the manufacturer's system software including each room or space that has lighting control installed. Indicate the following:
1. Date of test or inspection.
 2. Loads per space, or Fixture Address identification.
 3. Quantity and Type of each device installed
 4. Reports providing each device's settings.

3.4 COMMISSIONING ASSISTANCE

- A. Title 24 Acceptance Testing Service; Include additional costs for Lighting Control Manufacturer to provide a technician for one additional day while the CLCATT performs lighting control acceptance testing in accordance with CAL TITLE 24 P6 including submission of required documentation.

3.5 DEMONSTRATION AND TRAINING

- A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:
1. Confirmation of entire system operation and communication to each device.
 2. Confirmation of operation of individual relays, switches, and sensors.
 3. Confirmation of system Programming, photocell settings, override settings, etc.
 4. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.

3.6 PRODUCT SUPPORT AND SERVICE

- A. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION 26 09 43



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SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall switches.
 - 2. Occupancy sensors.
 - 3. Receptacles.
 - 4. Device plates and decorative box covers.
- B. Related Sections:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 05 33 - Raceway for Electrical Systems.
 - 3. Section 26 08 13 - Acceptance Testing.

1.2 REFERENCES

- A. NEMA WD 1 - General Color Requirements for Wiring Devices.
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Certify compliance with CEC Article 110 - Requirements for Electrical Installations.
- C. Product Data
 - 1. Provide manufacturer's catalog information showing dimensions, colors and configurations.
- D. Quality Assurance/Control Submittals
 - 1. Manufacturer's Instructions
 - a. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory requirements contained in Section 26 05 00.
 - b. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

1.4 MAINTENANCE

- A. Extra Materials
 - 1. Provide two of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.1 WALL SWITCHES



- A. Manufacturers:
 - 1. Hubbell.
 - 2. Bryant.
 - 3. Pass and Seymour.
 - 4. Arrow-Hart.
 - 5. Sylvania.
 - 6. Leviton.
- B. Description: NEMA WD 1, heavy-duty, AC only general-use snap switch, specification grade.
- C. Device Body: Ivory plastic with toggle handle; unless otherwise indicated in the Contract Documents.
- D. Voltage Rating: 120-277 VAC.
- E. Current Rating: 20 amperes.
- F. Ratings: Match branch circuit and load characteristics.
- G. Typical Switches:
 - 1. Single-pole: Hubbell 1221-I, Bryant #4901-GI, Pass & Seymour #20AC1-I.
 - 2. Three-way: Hubbell 1223-I, Bryant #4903-GI, Pass & Seymour #20AC3-I.
- H. Weatherproof Switches: Where switches are indicated on Drawings as “WP”, the switches must be of the types specified above, mounted in cast metal box with gasketed weatherproof device plate.

2.2 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Arrow-Hart.
 - 3. Pass & Seymour.
 - 4. General Electric.
 - 5. Slater.
 - 6. Bryant.
 - 7. Kenall
 - 8. Sylvania.
 - 9. Leviton Spec-Master series (with nylon face).
- B. Description: NEMA WD 1; heavy-duty general-use receptacle.
- C. Device Body: Ivory, unless otherwise indicated, plastic.
- D. Refer to symbol legend, Hubbell Nos. listed unless otherwise noted.
- E. Receptacle Outlet; Duplex: 20A, 125V, 2 pole, 3 wire grounding, NEMA 5-20R; ivory (5362-I), red (5362-R).



- F. Weatherproof GFCI Receptacle Outlet: 20A, 125V, 3 wire grounding, duplex. While-in-use cover. UV-resistance polycarbonate. Crouse-Hinds #TP or equal.
- G. GFCI Type Duplex Receptacle Outlet: Built-in ground-fault circuit interruption, 5-mA sensitivity, with indicator and reset button; UL listed; standard model for ground-fault protection at individual location; feed-through model for ground fault protection of “downstream” conventional receptacles.
 - 1. 20A, 125V, 3 wire duplex: NEMA 5-20R ivory (Arrow Hart GF5242-I), red Arrow Hart GF5242-R).

2.3 DEVICE PLATES

- A. Device plates for concealed wiring: Same manufacturer as wiring devices, to suit device covered, single or ganged, in one piece with beveled edges that match faces of plates.
 - 1. Device Plate: Type 302/304 stainless steel flush, satin finish, approximately 20 gauge.
 - 2. Cast Metal Plates for Surface Type Boxes: Corrosion resistant cast ferrous metal, designed for application.
 - 3. Plastic Device Plates: Not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions
 - 1. Verify conditions under provisions of Division 1.
 - 2. Verify outlet boxes are installed at proper height.
 - 3. Verify wall openings are neatly cut and will be completely covered by wall plates.
 - 4. Verify floor boxes are adjusted properly.
 - 5. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
 - 6. Verify openings in access floor are in proper locations.
 - 7. Beginning installation means installer accepts existing conditions.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install products in accordance with manufacturers’ instructions.
- B. Install products in accordance with CEC.
- C. Install devices plumb and level.
- D. Install switches with OFF position down.
- E. Install receptacles with grounding pole on bottom.



- F. Connect wiring devices by wrapping conductor around screw terminal.
- G. Use jumbo size plates for outlets installed in masonry walls.
- H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- I. Center outlets with regard to paneling, furring, trim, etc.
- J. Where several outlets occur in a room, symmetrically arrange them.
- K. Set outlets plumb or horizontal and extending to finished surface of wall, ceiling or floor as case may be without projecting beyond same.
- L. Where GFCI receptacles are indicated, install GFCI receptacles at each location. Use of a GFCI receptacle to protect downstream receptacles is not permitted unless otherwise indicated. Do not use GFCI circuit breakers unless specifically indicated.

3.4 CONSTRUCTION

- A. Interface with Other Work
 - 1. Coordinate locations of outlet boxes provided under Section 26 05 33 to obtain mounting heights specified unless otherwise indicated on Drawings. All dimensions are to the center of the item.
 - 2. Install convenience receptacle 4 inches above backsplash of counter or 4 inches above counter if no backsplash, not to exceed allowable code requirements.
 - 3. Install Electric Water Cooler outlet boxes centered behind unit, behind Electric Water Cooler cover.

3.5 FIELD QUALITY CONTROL

- A. Site Tests
 - 1. Operate each wall switch with circuit energized and verify proper operation.
 - 2. Verify that each receptacle device is energized.
 - 3. Test each receptacle device for proper polarity.
 - 4. Test each GFCI receptacle device for proper operation.
- B. Inspection
 - 1. Inspect under provisions of Section 26 08 13.
 - 2. Inspect each wiring device for defects.

3.6 ADJUSTING

- A. Adjust work under provisions of Section 26 08 13.
- B. Adjust devices and wall plates to be flush and level.

END OF SECTION 26 27 26



SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Disconnect switches.
- B. Related Sections:
 - 1. Section 26 05 00 - Common Work Results for Electrical.
 - 2. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1.2 REFERENCES

- A. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. UL 98 - Enclosed and Dead-Front Switches.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data
 - 1. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.
- C. Quality Assurance/Control Submittals
 - 1. Manufacturer's Instructions
 - a. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- D. Closeout Submittals
 - 1. Operating and Maintenance Data: See Division 01.

1.4 MAINTENANCE

- A. Extra Materials
 - 1. Spare fuses, 10 percent or minimum of 3 of each type and rating of installed fuses.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

- A. General Electric.
- B. Siemens.



- C. Square D.
- D. Cutler-Hammer.

2.2 MOTOR DISCONNECT SWITCHES

- A. Provide disconnect for motors as indicated. Disconnects must be horsepower rated, padlockable, heavy duty; Square D type, Heavy duty; or approved equal, fused or nonfused as indicated, NEMA 1 indoors; NEMA 3R outdoors conforming to UL 98.
 - 1. Provide fuses in accordance with Section 26 05 74.
 - 2. Size fuses per motor manufacturer's recommendations.
- B. Disconnects for small single-phase motors must be a horsepower rated, padlockable, manual starter, with overloads, Square D, Class 2510, NEMA 1 indoors or NEMA 3R outdoors conforming to UL 98.

2.3 IDENTIFICATION OF DISCONNECT MEANS

- A. Comply with CEC 110-22.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated in the Contract Documents.
- B. Install fuses in fusible disconnect switches.
- C. Install in accordance with manufacturer's instructions.

END OF SECTION 26 28 16



SECTION 26 50 00 - LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior luminaires and accessories.
2. Building mounted exterior luminaires.
3. Exit signs.
4. Ballasts.
5. Lamps.
6. Luminaire accessories.

B. Related Documents and Sections:

1. Section 26 05 00 - Common Work Results for Electrical.
2. Section 26 05 34 - Outlet and Junction Boxes for Electrical Systems.
3. Section 26 05 35 - Raceway for Electrical Systems.

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C78.379 - Electric Lamps - Classification of the Beam Patterns of Reflector Lamps.
2. UL 924 – Emergency Lighting and Power Equipment.

B. American National Standards Institute/National Fire Protection Association (ANSI/NFPA):

1. ANSI/NFPA 70 – National Electrical Code.
2. ANSI/NFPA 101 - Life Safety Code.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data:

1. Provide manufacturer dimensions, ratings, and performance data. Identify fixtures by luminaire schedule number. Show all required features and options.
2. Submit lighting level performance data where indicated as required or where an approval of a listed fixture is requested. Provide all assumptions. Indicate whether calculated or measured.

C. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

D. Quality Assurance/Control Submittals:

1. Manufacturers' Instructions:
 - a. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.



- b. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
 - E. Closeout Submittals:
 - 1. Operation and Maintenance Data:
 - a. Submit under provisions of Division 01.
 - b. Include replacement parts list.
- 1.4 QUALITY ASSURANCE
 - A. Regulatory Requirements:
 - 1. Conform to requirements of CEC.
 - 2. Conform to requirements of CBC.
 - 3. Furnish products listed and classified by UL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
- 1.5 WARRANTY
 - A. Warranty for parts and labor for malfunctions resulting from defects in materials and workmanship. The warranty period shall be no less than 5 years. Warranty shall begin upon acceptance of the owner.

PART 2 PRODUCTS

- 2.1 LUMINAIRES
 - 1. GENERAL: Lighting fixtures as hereinafter specified are identified by type as noted on drawings. Fixture specifications are based on construction and performance. Manufacturer's catalogue numbers are of general nature and indicate level of quality required, but do not necessarily reflect complete options as specified. Approval must be based on description and specification of fixture as well as catalogue number indicated. See specifications for fixture, lens, lamp and ballast requirements. Verify ballast voltage requirements with circuitry indicated on drawings.
 - B. Substitutions: Submit performance calculations for proposed substitutions.
 - C. Install ballasts, and specified accessories at factory.
 - D. Luminaires shall be fully accessible from below ceiling plate for changing drivers, power supplies and arrays.
 - E. Architectural Coordination:
 - 1. Consult Architectural Drawings for details of ceiling construction, finish, reflected ceiling plans and other applicable details and provide lighting fixtures suitable for the particular type of ceiling at each location.
 - 2. Where fixtures are surface or suspended to match the length of walls or other architectural elements, the Contractor shall verify all lengths in the field prior to releasing fixture order.
 - F. Coordinate fixture types with ceiling construction.



- G. Provide pendant fixtures with swivel hangers which will allow fixture to swing in any direction but will not permit stem to rotate.
 - 1. Provide hangers with enclosure rating (NEMA 1, 4, or 7) equal to enclosure requirements of area in which they are installed.
 - 2. Swivel hangers for fixtures in mechanical equipment areas: Shock absorbing type.

2.2 LIGHT EMITTING DIODES(LED):

- A. Refer to Fixture Schedule for size and type of LED lamps required.
- B. All diodes shall be tested.
- C. Minimum CRI: 80
- D. Diodes shall have a minimum life of 50,000 hours and maintain at least 70% of initial lumens throughout this period.
- E. LED fixture components shall be free of all toxic materials to include lead, cadmium and mercury, and shall be RoHS compliant.
- F. LED light source shall be fully dimmable with the use of compatible dimmers.

2.3 LED DRIVERS:

- A. LED drivers shall be integral to the fixture housing.
- B. Typical LED drives shall be electronic, 0-10v dimming.
- C. Drivers shall be solid state.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Examine substrate and supporting grids for luminaires.
 - 2. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION - GENERAL

- A. Install in accordance with manufacturers' instructions.
- B. Mount lighting fixtures at heights indicated. Where not indicated mount:
 - 1. Exit lights - 90 inches above floor. Center in space over door frame where applicable.
 - 2. Bracket light above lavatory - 80 inches minimum above floor.
- C. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- D. Support luminaires larger than 2 foot x 4 foot size independent of ceiling framing.



- E. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- F. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- G. Install recessed luminaires to permit removal from below.
- H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Install clips to secure recessed grid-supported luminaires in place.
- J. Install wall mounted luminaires and exit signs at height as indicated on Drawings.
- K. Install accessories furnished with each luminaire.
- L. Connect luminaires, and exit signs to branch circuit outlets provided under Section 26 05 33 using flexible conduit as indicated.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- N. Bond products and metal accessories to branch circuit equipment grounding conductor.
- O. Install specified lamps in each luminaire, emergency lighting unit and exit sign.
- P. Maintain fire rating of ceiling where luminaire are installed.
- Q. Where a switched fixture with battery backup is used, connect an unswitched lead to the emergency ballast.

3.3 FIELD QUALITY CONTROL

- A. Site Tests:
 - 1. Test under provision of Division 01.
 - a. Operate each luminaire after installation and connection.
- B. Inspection
 - 1. Inspect for proper connection and operation.

3.4 ADJUSTING

- A. Adjust Work under provisions of Division 01.
- B. Aim and adjust luminaires as indicated on Drawings as directed.
- C. Adjust exit sign directional arrows as indicated.
- D. Relamp luminaires that have failed lamps at Project Completion.



3.5 CLEANING

- A. Clean Work under provisions of Division 01.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.6 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 01.
- B. Provide minimum of two hours demonstration of luminaire operation.

3.7 LUMINAIRE SCHEDULE

- A. See drawings for fixture schedule.

END OF SECTION 26 50 00



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SECTION 27 10 00 - STRUCTURED CABLING SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. The extent of telephone/data system, Structured Cabling System (SCS) work is indicated and is hereby defined to include, but not be limited to cable, cable supports, raceway, connectors, racks, cabinets, panels, wire management, device plates, patch cords, backboard, grounding, firestop and miscellaneous items required for a complete, tested and operational system.
- B. Provide, install and test the complete cable and outlet system as indicated and described herein. Work includes procurement, project management, installation, labeling, termination, testing and cleanup of all cables installed under this project.
- C. Provide system testing, as-builts (redlines) of installed cables and numbering plan, Operations & Maintenance Manuals (O&M's), and processing of warranty registration with Manufacturer.
- D. Project coordination with General Contractor, Owner, Owners Representative, and other trades before, during and upon completion of project as necessary for a well-executed project.
- E. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
- F. Horizontal copper cabling system consists of four twisted pairs of solid annealed copper. Each four-pair cable is terminated onto 8 position 8 conductor ("RJ45", or 8P8C) outlet connectors ("Jacks") using Insulation Displacement Conductors (IDCs). Color-coded connectors are placed into NEMA rated faceplates at the work area and placed into corresponding rack-mounted patch panels in the equipment / networking rooms. The jacks use state-of-the-art techniques to effectively eliminate Alien Crosstalk.
- G. Bridged taps and/or splices will not be installed in the horizontal cabling.
- H. Communications cables shall be rated CMR (riser) or CMP (plenum). CMP cable ratings are required for cables passing through or contained within plenum air handling spaces, such as above drop ceilings and return or supply air shafts. The contractor is responsible for installing the correct cable type in the appropriate environment, and any failures to do so according to the Owner or the Authority Having Jurisdiction (AHJ) will result in the contractor removing the unsuitable cable and installing the correct cable, at their own expense.
- I. The maximum allowable horizontal cable length installed in the permanent link (jack



to jack) is 295 feet (90 m). This maximum allowable length does not include an allowance for patch cords, maximum length of 16 feet (5 m) to the workstation equipment and of 16 feet (5 m) in the horizontal cross-connect.

1.2 DIVISION OF RESPONSIBILITY

- A. Owner
 - 1. All Local Area Network (LAN) hub equipment
 - 2. All active electronics required at the telecom room.
 - 3. Server Room Cabinets
- B. Contractor:
 - 1. As indicated on plans and specifications.
 - 2. Testing.

1.3 SUBMITTALS AND SUBSTITUTIONS

- A. Acceptable manufacturers solutions:
 - 1. Panduit
 - 2. General Cable
 - 3. Owner pre-approved equal
- B. Owner has standardized on a unified, end-to-end copper and optical fiber cabling system design based on Panduit jacks, patch panels, patch cords, (Panduit / General) fiber cords, (Panduit / General) fiber connectors, trunk cables, (Panduit / General) fiber enclosures and modules, as well as General Cable field-terminable copper and (Panduit / General) fiber cables. The Owner is satisfied that the products specified herein are qualified for the purpose intended, and has performed due diligence in establishing a consistent set of standards based on performance and feature set.
- C. Prior to ordering any material, provide a complete submittal, in electronic format to include copies of brochure information on all products for installation on this project. All product data and specification sheets shall be organized in the same manner as the products portion of the specifications. If more than one product is listed on the same page of the brochure or specification sheet submitted, the intended product or part number shall be clearly indicated or highlighted by the Contractor
- D. Contractor shall submit along with the materials submittal all Proposed Test Procedures and a sample of the printout or test result form as well as a list of all Test Equipment to be used for cable testing. Within two (2) weeks of completion of testing all cabling systems, Contractor shall submit an electronic copy of the test results as directed in the Testing portion of the Specifications.
- E. Products which are proposed in the bid response which are of an alternative solution are to be prequalified as "equal or better" by the Designer and Owner, in writing, prior to bid acceptance. If substitutions are allowed, they are at the discretion of the Owner and based on performance, suitability, quality, administrative requirements, warranty and other factors deemed important to the Owner. Written acceptance of substitutions from Owner must be included in bid package to avoid disqualification of bid.



- F. Submit manufacturer's data and installation details for all devices, plates, cable, terminal blocks, patch cords, racks, wire management, labels and similar equipment which are not in accordance with Owner standards.
- G. Submit a copy of 3rd party testing and certification documents which prove they meet or exceed the requirements as set forth in this document, for any product or system not specified herein or proposed as an "equal" substitute for Owner-approved products. All products must have independent test data published prior to bid.
- H. Any substitutions must be approved by Designer, Owner and/or Owner's Representative in writing prior to acceptance of bid.
- I. Company Certification: The Proposer must be certified by the manufacturer of the submitted system. If different manufacturers will be used there must be a company certification for each, and its use to be approved and authorized by County Telecommunications Staff. The Proposer must provide evidence of this certification as part of the submittal process.

1.4 REFERENCE STANDARDS

- A. Strictly adhere to all Building Industry Consulting Service International (BICSI), and Telecommunications Industry Association (TIA) recommended installation, best practices, codes, and standards when installing The Structured Cabling System.
- B. Material and work specified herein shall comply with the applicable requirements from the following Codes and Standards.
 - 1. AAAC-B – Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers
 - 2. ANSI/TIA-492.AAAD – Detail Specification for 850-nm Laser- Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber
 - 3. ANSI/TIA-492.CAAB – Detail Specification for Class IVa Dispersion-Unshifted Single- Mode Optical Fibers with Low Water Peak. Current Edition
 - 4. ANSI/TIA-568.0-D – Generic Communications Cabling for Customer Premises
 - 5. ANSI/TIA-568.1-D – Commercial Building Communications Cabling Standard
 - 6. ANSI/TIA-568-C.2-1 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards
 - 7. ANSI/TIA-568.3-D – Optical Fiber Cabling and Components Standard
 - 8. ANSI/TIA-569-D – Telecommunications Pathways and Spaces
 - 9. ANSI/TIA-606-B.1 – Administration Standard for the Commercial Telecommunications Infrastructure.
 - 10. ANSI/TIA-607-C – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
 - 11. ANSI/TIA-862-B – Structured Cabling Infrastructure Standard for Intelligent Building Systems
 - 12. ANSI/TIA-942-A – Telecommunications Infrastructure Standard for Data Centers
 - 13. NFPA 70 – National Electrical Code (NEC).
 - 14. BICSI – TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM)



- C. Fire stopping shall be in accordance with ASTM E 814, ASTM E 136, and UL 1479 as well as Section 300-21 of the National Electric Code.
- D. Other applicable standards. ANSI C2-2010 National Electric Safety Code. UL 497 Electrical Grounding and Bonding Equipment.
 - 1. IEEE 802.3 Carrier Sense Multiple Access with Collision Detection.
 - 2. FCC Rules and Regulations, Part 68.
 - 3. Basic, Uniform, and Standard Building Codes (BOCA, ICBO, SSBC).
 - 4. REA Cable Designations - PE Series Specifications
 - 5. NFPA 101 - Life Safety Code
- E. Conditions: Materials and equipment provided must be new products of manufacturers regularly engaged in the production of such products.
- F. UL Listing: Products must be UL listed where a UL test procedure is applicable.
- G. Communications system materials and equipment shall be FCC Type-accepted and certified as such by supplier.

1.5 ADMINISTRATION REQUIREMENTS

- A. The Electrical Code referred to in these specifications is the National Electrical Code as currently adopted by the State of California. All work will be provided in strict compliance with the Electrical Code and all regulations that may apply.
- B. Where standards exist, for a category, products used on this project will be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL), and be approved or listed for the intended service and application.
- C. These specifications do not undertake to repeat the requirements of codes, regulations or NRTL listing or labeling instructions. The Specifications or Drawings may require items or work beyond the requirements of applicable codes or regulations. The stricter, higher quality, greater quantity or higher cost will be allowed, and accommodations must be approved by Owner/Designer prior to procurement or installation. It is incumbent on the Installer, material and equipment suppliers to meet these specifications, applicable codes, regulations, and NRTL listing agency restrictions.
- D. The word "Manufacturer" will include the Manufacturer, the Manufacturer's Representative, the Distributor, the Fabricator, and the Supplier of the particular classification of equipment, system, product, and material.
- E. All work, equipment, and systems will be manufactured, provided, repaired, installed, and tested in accordance with the latest edition and all current amendments of the applicable publications and standards of the organizations listed below as of the date of the Contract Documents.
- F. When the Specification requirements exceed the requirements of these publications and standards the Specifications will govern:
 - 1. State Building Code (SBC)
 - 2. Building Department Inspectional Services
 - 3. American Society for Testing and Materials (ASTM)



4. Underwriter's Laboratories, Inc. (UL)
 5. Insulated Cable Engineers Association (ICEA)
 6. National Electrical Manufacturers Association (NEMA)
 7. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
 8. American National Standards Institute, Inc. (ANSI)
 9. National Fire Protection Association (NFPA)
 10. Local Electric Code
 11. Department of Public Safety (DPS)
 12. Building Officials and Code Administrators International, Inc. (BOCA)
 13. Department of Labor USA. Safety and Health Regulations for Construction (OSHA)
 14. Energy Codes
 15. National Electrical Contractors Association (NECA)
 16. National Bureau of Standards (NBS)
 17. Federal Communications Commission (FCC)
 18. Utilities Serving Project.
 19. Fire Department.
 20. Americans with Disabilities Act Applications Guidelines (ADAAG).
 21. Accessibility Guidelines for Buildings and Facilities.
 22. Any and all Federal, State and Local Standards, Codes and Authorities having Jurisdiction (AHJ).
- G. In addition, all phases of the Structured Cabling System installation will adhere to applicable Local Area Network (LAN) Specifications of the IEEE, Electronics Industry Association/Telecommunications Industry Association (TIA/EIA), and Building Industry Consulting Service International (BICSI). The entire system and all components will be Nationally Recognized Testing Laboratory (NRTL) certified to appropriate TIA/EIA performance rating Category, Latest ANSI/TIA/EIA Standards 455-A, 492, 568, 569-A, 570, 606, 607 and 758 (latest revisions), and ANSI/TIA TSB 67, TSB 72, TSB 75, TSB 95 plus other standards as applicable.
- H. The above requirements will not in any way limit responsibility or requirements to comply with all other codes, standards and laws.
- I. Material, equipment, enclosures, and systems will be designed for use as required to suit the conditions, exterior or interior operation, dust tight, water tight, explosion-proof, or other special types.
- J. All materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.
- 1.6 QUALIFICATIONS
- A. The Structured Cabling System (SCS) required for this project shall be the following: The Contractor must have current Panduit Partner ONE Certified Installer Certificate and be qualified to offer a Panduit Certification PLUS 25-year A PanGen system performance warranty.
- B. A PanGen™ System Warranty shall provide a complete system warranty to guarantee end-to-end high-performance cabling systems that meet application requirements. The guarantee



- shall include cable and connectivity components and have one point of contact for all cabling system issues. The system shall be warranted for a period of at least 25 years.
- C. In order for the structured cabling system or additional links to be eligible for warranty coverage, an installation company trained and certified by PANDUIT ® and General Cable must install them. The contractor shall have completed standards based product and installation training. A copy of the PCI Certificate or PanGen Installer Certificate shall be submitted in the proposal.
 - D. All PANDUIT ® Pan-Net ® non-consumable products have a 20-year guarantee. When installed per TIA or ISO/IEC standards, the Cabling System will operate the application(s) for which the system was designed to support.
 - E. In order to qualify for the guarantee, the structured cabling system must be installed per the following:
 - 1. Meet all TIA/EIA commercial building wiring standards.
 - 2. PANDUIT ® categorized product must be used in conjunction with an equivalent or higher Category UL or ETL verified cable.
 - 3. PANDUIT ® Products must be installed per PANDUIT ® instruction sheets.
 - 4. Categorized copper product shall be used in conjunction with General Cable of equivalent or higher Category cable as verified by ETL, UL or PANDUIT ® engineering
 - F. The company must have a minimum of three (3) years' experience in low voltage installations for voice, data, and fiber optic cabling systems.
 - G. The Panduit Partner ONE Certified Installer Certificate must be in place 45 days prior to bid. All personnel performing work on this project must have gone through the Panduit Partner ONE Certified Installer Certificate training program as required by Panduit prior to performance of work.
 - H. Warranty: All repair, including labor and material, shall be made at no cost to the owner during the warranty period. All warranties shall be provided in writing to Owner prior to acceptance of the cabling system.
 - 1. The contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data and voice systems. The Contractor shall at a minimum possess the following qualifications:
 - a. Provide references of the type of installation provide in this specification.
 - 2. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
 - 3. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
 - 4. Be in the Low Voltage or Telecommunications Installation business for a minimum of three (3) years. If project is in California, contractor must possess a current California C7 or C10 license. Projects in other states must be supported by the appropriate minimum level contractor's license required for the work involved.
 - 5. Maintain a certified RCDD on staff and utilize manufacturer trained, or BICSI certified Installers for this project.
 - 6. Contractor must be less than 100 miles from project location.



- I. Be an approved Member in good standing of the Certified Installer network associated with the products listed in this Specification and authorized for use in this Project. Contractor must be a member of this installer program before, during, and through completion of the system installation. Supporting documentation will be required as part of the submittal.
- J. Product manufacturer and cabling solution hardware are specified for performance, applications requirements, and warranty purposes. Contractor may provide an, "or equal cabling solution" if the contractor is an authorized installer certified to provide full manufacturer warranties.
- K. All structured cabling products shall be installed according to any applicable instructions.
- L. All networks and other applications shall be installed per applicable standards and manufacturers' guidelines and transmitted over the appropriate minimum Category copper cable or fiber cable for which it was intended to operate on
- M. All applicable local, state, national, and federal electrical and fire safety standards shall be adhered to during and after installation.

1.7 WARRANTY

- A. Panduit Certification PLUS 25-year system performance warranty covering all components (cable, jacks, panels, patch cords, equipment, workmanship, etc.) shall be provided to the Owner, submitted in writing with system documentation. The warranty period shall begin on the system's first use by the owner.
 - 1. Horizontal channels shall be completed with Panduit/General factory-terminated copper and/or fiber optic patch cords in order to be eligible for the applicable Warranty with channel performance guarantees.
 - 2. Approved product shall be listed on the most recent version of the applicable Manufacturer's data sheets for each listed solution.
 - 3. The Contractor must pre-register the project with the Manufacturer before installation has begun. Following project completion, contractor is responsible for completing all warranty registration procedures on behalf of the Owner.
 - 4. Should the cabling system fail to perform its expected operation within this warranty period due to inferior or faulty material and/or workmanship, the contractor shall promptly make all required corrections without cost to the owner.
- B. Certified Installer shall provide labor, materials, and documentation in accordance with Manufacturer requirements necessary to ensure that the Owner will be furnished with the maximum available Manufacturer's Warranty in force at the time of this project.
- C. The installed structured cabling system shall provide a warranty guaranteeing the specified performance in the installed channel performance above the ANSI/TIA-568 requirements for Augmented Category 6 (CAT 6A) cabling systems or ISO 11801 requirements for Class E and Class EA, respectively.
 - 1. Standards-compliant channel or permanent link performance tests shall be performed in the field with a Manufacturer-approved certification tester in the appropriate channel or permanent link test configuration.
- D. Necessary documentation for warranty registration shall be provided to the manufacturer by the installer (within 10 days) following 100 percent testing of cables.



1. Installation Contractor shall submit test results to Manufacturer in the certification tester's original software files.
 2. Installation Contractor shall ensure that the warranty registration is properly submitted, with all required documentation within 10 days of project completion.
 3. Certified Contractor/Integrator must adhere to the terms and conditions of the respective manufacturer's warranty programs.
- E. Manufacturer shall ensure that the Owner receives the project warranty certificate within 60 calendar days of warranty registration.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials in manufacturer's standard protective packaging.
- B. Do not remove protective packaging until ready for installation.
- C. Follow manufacturer's instructions for storage & handling.
- D. Protection: Contractor shall take all necessary precautions to protect materials from the following:
 1. Theft
 2. Vandalism/Tampering
 3. Dents
 4. Scratches
 5. Dust
 6. Temperature
 7. Weather
 8. Cutting
 9. Paint
 10. Other Hazardous Conditions
- E. Replacement: Contractor shall replace any damaged or lost material as required by Owner or Consultant.
- F. Installed Materials: Installed materials remain the responsibility of the Contractor until Acceptance. Contractor shall take necessary precautions to ensure the safety and security of installed materials.

1.9 CONTRACT DRAWINGS AND SPECIFICATIONS

- A. The intent of the drawings and specifications is to establish the type of system and functions, but not to set forth each item essential to the functioning of the system. The drawings are generally diagrammatic and show approximate location and extent of work. In case of doubt of work intended, it is the responsibility of the Contractor to request instructions from the Engineer or Owner prior to bid. The Contractor shall be responsible for installing a complete functioning system.
- B. Contractor shall review all drawings and specifications before starting the work. Where discrepancies occur, Contractor shall immediately notify Engineer for clarification.



PART 2 PRODUCTS

2.1 GENERAL

- A. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the specified system. Where a material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be a part of these specifications, as if completely contained herein in every detail. Each material, device or piece of equipment provided hereunder shall comply with all the manufacturer's published specifications for that item.
- B. Quantity: Provide quantity as shown on Contract Drawings, or as otherwise defined herein.
- C. Preference: Where more than one manufacturer is listed herein as acceptable or equivalent, preference is intended and implied by the order of listing.
- D. Substitutions: Comply with provisions of Division 01. Burden of proof of equivalence is on the Contractor.
- E. Provide Complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section as if specified in full herein.
- F. Provide New: All materials provided under the Work of this Section shall be new, shall be the manufacturer's latest design/model, and shall be permanently labeled with the manufacturer's name, model number and serial number.
- G. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.
- H. Safety Agency Listing: All devices provided under the Work of this Section which are connected to the Project electrical system shall be listed by Underwriters Laboratories (UL), and shall be so labeled.

2.2 TELECOMMUNICATIONS HORIZONTAL CABLING SYSTEM

- A. Category cable (data circle).
 - 1. Category 6a (cat6a) unshielded twisted-pair (UTP) cable
 - a. 100-Ohm, 23 AWG, Category 6A 4-pair balanced unshielded twisted pair solid annealed copper
 - b. Cable shall be characterized to 750 MHz and UL/ETL Listed by the Manufacturer printed on the cable jacket and package, as well as Intertek (ETL) Verified to TIA-568 Category 6A and ISO/IEC 11801 Class EA requirements for channel, link and component performance to support IEEE 10GBASE-T (802.3an) networks
 - c. Maximum Cable Outer Diameter: 0.250".
 - d. Documentation available from an independent third-party testing agency that verifies through random sampling that cable components perform at or above the levels contained on their product specifications, not simply at or above the standard.
 - e. Guaranteed cable balance improves overall performance and reduces emissions which results in error-free performance up to 10 Gigabit Ethernet with full duplex transmission



- f. The unshielded twisted pair conductors are surrounded by a non-conductive aluminum/polyester tape and jacketed with flame-retardant polymer alloy to reduce alien crosstalk, reduce cable diameter and improve performance.
- g. Provided on spools or reels-in-box to reduce risk of kinking cable upon deployment
- h. Cable shall be Plenum-rated (CMP) for any location where plenum cable is required.
- i. Category 6A cables shall have the following cable jacket (Yellow) for all outlets.
- j. Be made by an ISO 9001 and 14001 Certified Manufacturer.
- k. Guaranteed to meet or exceed Channel margin guarantees as stated above under System Performance
- l. Approved products:
 - 1) Panduit: Yellow, PUP6AM04YL-UG / Plenum rated
 - 2) Panduit: Yellow, PUR6AM04YL-UG / Riser rated
 - 3) Category 6A General cable: Yellow, 7141822 / Plenum rated
 - 4) Category 6A General cable: Yellow, 7143822 / Riser rated
 - 5) Other colors as required

B. Category -Rated Data Connectors (Rj45 Insert Jacks)

- 1. Category 6A Mini-Com® TX6A™ 10Gig™ UTP Jack Modules shall be Category 6A performance featuring Split Foil MaTriX Technology. These Category 6A (CAT6A) connectors shall be individual snap-in style, and exceed compliance with TIA/EIA-568-C.2 specifications. The connectors shall comply with the following:
 - a. The eight position modules shall terminate unshielded twisted 4 pair, 22 - 26 AWG, 100-ohm cable.
 - b. Comply with FCC Part 68; UL listed and CSA Certified. Verified to exceed all channel performance requirements in TIA-568-B.2-10 from 1 MHz to 500MHz to support the IEEE 802.3an standard for 10 Gigabit Ethernet over UTP Cable.
 - c. Jack module shall use Enhanced Giga-TX™ Technology with forward motion termination to optimize performance by maintaining cable pair geometry and eliminating conductor untwist.
 - d. The Mini-Com® TX6A™ Jack Modules include Split Foil MaTriX Technology on the external portion of the jack module, which assists in suppressing alien crosstalk. Connector shall have Pair Separation Towers on IDC to facilitate quick, easy terminations without a complete untwist of each pair of conductors.
 - e. The jack modules shall be universal in design, including complying with the intermateability standard IEC 60603-7 for backward compatibility.
 - f. The connector shall provide a ledge directly adjacent to the 110-style termination against which the wires can be directly terminated and cut in one action by the installation craftsperson.
 - g. Connector wiring label shall provide installation color codes for T568B wiring schemes on separate labels.
 - h. The Mini-Com® TX6A™ 10Gig™ Jack Module must be installed as part of a complete Copper Cabling System in order to achieve 10GBASE-T certified performance.
 - i. All Category 6A jack modules shall be UL and CSA approved and RoHS compliant.
 - 1) CJ6X88TG**.
 - 2) 2) Where ** = one of 12 colors. See drawings or check with Owner for application.(OR)=Orange



- j. The RJ11 type modules shall be available in six position/three pair USOC coded version and in 11 standard colors. They shall snap into all Mini-Com® outlets and patch panels. The module shall include a white base to signify Category 3.

1) CJ66U**

2) 2) Where ** = one of 12 colors. See drawings or check with Owner for application.

2. Additional Copper Cabling Connectors

- a. Additional Mini-Com® Modules for copper shall include the following:

1) 50 and 75 Ohm BNC coax coupler modules, male-male

2) F-Type coax coupler module, male-male threaded

3) The connectors shall snap into all Mini-Com® outlets and patch panels.

a)	<u>Part Number</u>	<u>Style</u>	<u>Medium</u>	<u>Termination</u>	<u>Style</u>
	CMFBA**	F-Type	Copper	Coupler	5
	CMFSR**	F-Type	Copper	Coupler	5
	CMB**	Blank	-	-	5

C. Faceplates, Frames and Inserts

1. Faceplates (wall plates) secure information outlets to the work area. Contractor shall provide and install single gang faceplate kits to house all jacks as required for all work area outlets, workstation base feeds, and furniture openings. Unused telecom backboxes shall receive a solid blank faceplate.

2. CLASSIC SERIES WITH LABEL AND LABEL COVER Frames shall be vertical, single and double gang frames with combination head screws, screw covers, labels, and a curved designer appearance.

3. The faceplates shall mount onto standard U.S. NEMA boxes and adapters with screw-to-screw dimensions of 3.28" (83.3mm).

4. Each faceplate frame shall accept flat, sloped, sloped shuttered, sloped recessed and blank 1/2 and 1/3 size module inserts that can be individually inserted and removed as required from the front of the frame without removing the frame.

5. Telecommunications faceplates shall:

- a. Utilize a ("QuickPort") footprint to match the approved connectivity manufacturer, and be made by the same manufacturer as the connectors.

- b. Precisely match colors and materials of the power wiring device plates.

- c. Support any connectivity media type, including fiber, AV and copper applications.

- d. Have write-on or printable designation labels for circuit identification together with a clear plastic cover.

- e. Be available in single-gang and double-gang configurations.

- f. Have surface-mount boxes and standoff rings available for both single and double gang faceplates.

- g. Have single-port blank inserts to match faceplate color, available in packs of 10.

- h. Color shall match nearby electrical devices exactly. Off-color ivories or whites will not be accepted.

- i. Furniture faceplates shall fit existing knockouts for telecom receptacles, and snap in without screw mounts.

- j. Decora® inserts shall hold from 1 to 6 jacks per device plate.

1) Classic Series: CFP1**

2) Classic Series: CFP2**

3) Classic Series: CFP4**

4) Where ** = one of 12 colors. See drawings or check with Owner for application.



- a) (IW)=Off White
- b) (AW)=Artic White
- c) (EI)=Electric Ivory
- d) (YL)=Yellow
- e) (OR)=Orange
- f) (BU)=Blue
- g) (VL)=Violet
- h) (WH)=White
- i) (RD)=Dark Red
- j) (GR)=Green
- k) (IG)=International Grey
- l) (BL)=Black

D. Surface-Mount Blocks (SMB)

1. Surface-Mount Blocks (SMBs) are used to protect terminated CAT6A cables at the endpoints where they are not contained within walls or furniture. Example locations may be Wireless Access Points (WAPs), Group Work Areas fed by conduits run down columns, security cameras, or other network-enabled device locations.
2. Ceiling, WAP, Camera and other non-wall mount locations will use a 2-port plastic SMB.
3. Small Surface-Mount Boxes shall exhibit the following characteristics:
 - a. Outlet housings for WAPs and other devices shall be a high-density, low profile design with (1) to (12) field-configurable ports, snap-lock cover, and cable knockouts on back.
 - b. Housing cover shall have raceway knockouts for top and bottom entry. Base shall include Tie-wrap anchor points at all cable entrances.
 - c. The housing shall be mountable with screws, tape or a single magnet.
 - d. The cover shall provide the option of securing it to the base with a screw that is hidden under the outlet identification window.
 - e. Shall be constructed of high-impact self-extinguishing plastic rated UL 94V-0, and be UL Listed and compliant with FCC Part 68 and TIA-568 specifications.
 - f. 1- and 2-port housings are suitable for installation in air-handling spaces (plenum)
 - g. Approved products:
 - 1) CBX1**-A (1 port)
 - 2) CBX2**-AY (2 port)
 - 3) CBXJ2**-A (2 port, low profile)
 - 4) Where ** = one of 12 colors. See drawings or check with Owner for application.
 - a) (IW)=Off White
 - b) (AW)=Artic White
 - c) (EI)=Electric Ivory
 - d) (YL)=Yellow
 - e) (OR)=Orange
 - f) (BU)=Blue
 - g) (VL)=Violet
 - h) (WH)=White
 - i) (RD)=Dark Red
 - j) (GR)=Green
 - k) (IG)=International Grey
 - l) (BL)=Black



E. Modular Furniture Faceplates

1. Modular Furniture Faceplates shall be four-port flat or angled and two port angled faceplates that snap directly into TIA/EIA standard furniture openings.
2. The two port, angled faceplate shall provide a 45° slope to the side, in-line with the cable running through the furniture channel. If required, an extender shall be used with the four- port flat faceplate to provide 12.7mm (0.5”) additional depth.
3. Each faceplate shall accept Mini-Com modules that can be individually inserted and removed as required.
 - a. UICFFP4** (snaps into standard knockouts)
 - b. CFFP4** (flat with (4) modules)
 - c. CFFPA2** (slopped with (2) modules)
 - d. CFFPL4** (flat with label (4) modules)
 - e. CFFPLA4** (slopped with label (4) modules)
 - f. Where ** = one of 12 colors. See drawings or check with Owner for application.
 - 1) (IW)=Off White
 - 2) (AW)=Artic White
 - 3) (EI)=Electric Ivory
 - 4) (YL)=Yellow
 - 5) (OR)=Orange
 - 6) (BU)=Blue
 - 7) (VL)=Violet
 - 8) (WH)=White
 - 9) (RD)=Dark Red
 - 10) (GR)=Green
 - 11) (IG)=International Grey
 - 12) (BL)=Black

F. Modular Patch Panels

1. Telecommunications Room Patch Panels shall be manufactured with empty ports, which allow for the insertion of appropriately-graded and colored jacks.
 - a. Available in either 24- or 48-port 2RU versions.
 - b. Independently tested and verified by Intertek (ETL) to meet or exceed all TIA component, permanent link, and channel requirements of TIA-568 for Cat 6A, FCC part 68, and IEC 60603-7.
 - c. An appropriate cable management bar shall be included with standard density flat panels.
 - d. Shall be sized to fit a TIA standard, 19-inch relay rack and hole pattern.
 - e. There shall be pre-printed numbers above each port for easy identification and white write on areas for port and/or panel identification on the 24 and 48 port version.
 - f. The panel shall have vertical and horizontal cord organizers available as to improve patch cord management.
 - g. Verify angled or flat panel use per design documentation or verification with Owner's Representative.
 - h. Approved Products:
 - 1) Mini-Com Flush Mount Modular Angled Patch Panel, 24 Port, CPPA24FMWBLY
 - 2) Mini-Com Flush Mount Modular Angled Patch Panel, 48 Port, CPPA48FMWBLY



G. Copper patch cords

1. Category 6a patch cords

- a. TX6A™ 10Gig™ Patch Cords shall be constructed with Category 6A 23 / 26-AWG stranded cable featuring MaTriX Technology. Patch Cords shall be factory terminated with modular plugs featuring a one-piece, tangle-free latch design and black strain-relief boots to support easy moves, adds and changes. TX6A™ 10Gig™ Patch Cords have incorporated MaTriX Technology and a barrier tape into the patch cable design to help suppress alien crosstalk and improve internal electrical performance. Patch cords shall be wired to be compatible with both T568A wiring schemes.
- b. The patch cords shall be ETL verified ANSI/TIA-568-C.2 Category 6A and IEC/ISO 11801 Class EA channel performance. Each patch cord shall be 100% performance tested at the factory in a channel test to the ANSI/TIA-568-C.2 and IEC/ISO standards. The TX6A™ 10Gig™ Patch Cords must be installed as part of a complete TX6A™ 10Gig™ UTP Copper Cabling System in order to achieve 10GBASE-T certified performance.
- c. Patch Cords shall be Contractor furnished/Owner Installed (CFOI)
 - 1) Part numbers:
 - a) UTP6ASD5**
 - b) UTP6ASD10**
 - 2) Where ** = one of 10 colors. See drawings or check with Owner for application.
 - a) (YL)=Yellow
- d. Provide Category 6A data patch cords, Panduit or approved equal for 50% of all data connections.
- e. Provide 10', Panduit UTP6ASD*** yellow for workstation use and 5' lengths, Panduit UTP6ASD***yellow for closet use.

H. Multimode Optical Fiber Cable

1. Multimode fiber optical cables shall meet all of the requirements delineated within the specification of ANSI/TIA-568 and ANSI/TIA-492.CAAB (OM4). Must be a minimum of 12 strands, of Laser-Optimized 50 micron Armored optical fiber. Cable jacketing must be appropriate for the environment in which it is installed (indoor, indoor/outdoor, outside plant, OFNO or OFNR).
2. Fiber optic cables will utilize an interlocking armor outer cover around an integrated Tight-Buffered (indoor only) cable construction and fiber strands with a 900-micron protecting sheath.
3. See plans and scope of work for total strand count between locations.
4. Approved Products:
 - a. Fiber Optic Pigtail: FZTSR17NNSNM001
 - b. Furnish 12-fiber, 24" fan-out Kit: FO6CB and/or FO12CB
 - c. 12-Strand – BLO121PNU
 - d. 12-Strand – BLO121PNR
 - e. Grounding Kit
 - f. Or other strand counts as specified.

I. Fiber Connections

1. Pro-polished fiber optic connectors shall be the primary means of field-terminating individual fiber strands at the enclosure or faceplate location.



2. Shall meet or exceed the requirements described in TIA-568 and ANSI/TIA-604-10 (LC) Connector Impermeability Standards.
3. Shall be pre-polished and field installable to eliminate the need for hand polishing, bonding or epoxy in the field.
4. Shall utilize a precision zirconia ceramic ferrule and be re-terminable up to three times during testing without loss of performance.
5. Shall require the use of a cleaver with a guaranteed maximum cleaving angle of two degrees for multimode and 1 degree for single-mode fibers.
6. Shall be provided in LC, single-mode or multimode (laser optimized) configurations, terminated on 250 or 900 buffered fiber and slash or 2MM or 3MM jacketed fiber.
7. Maximum connector insertion loss shall be no greater than 0.5 dB, with an average of 0.1 dB (MM) or 0.2 dB (SM). Typical connector return loss shall be 35 dB (multimode) and 56 dB (single-mode). All versions shall allow continuity to be verified by use of a visual fault locator (VFL).
 - a. Panduit LC Opti-Cam Pre-Polished Fiber Optic Connectors OM4 Multimode\10 Gig 50/125um (laser optimized) simplex P/N: FLCSMCXAQY.
 - b. Panduit LC Opti-Cam Pre-Polished Fiber Optic Connectors OS2 Single-mode\10 Gig 9-125um (laser optimized) simplex P/N: FLCSSCBUY.

2.3 GROUNDING AND BONDING

A. Wall-Mount Busbars

B. Telecommunications Main Grounding Busbar (TMGB)

1. Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
2. Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
3. The busbar shall be 4" (100 mm) high and 20" (510 mm) long and shall have 30 attachment points (two rows of 15 each) for two-hole grounding lugs.
4. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 27 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.
5. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
6. The busbar shall be UL Listed as grounding and bonding equipment.
7. Design Make shall be:
8. Chatsworth Products, Inc. (CPI),
9. Telecommunications Main Grounding Busbar:
10. Part Number 40153-020, 20" x 4" (510 mm x 100 mm) Telecommunications Main Grounding Busbar, UL Listed.

C. Telecommunications Grounding Busbar (TGB)

1. Telecommunications Grounding Busbar (TGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
2. The busbar shall be 2" (50 mm) high and 12" (300 mm) long and shall have 9 attachment points (one row) for two-hole grounding lugs.
3. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 6 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.



4. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
 5. The busbar shall be UL Listed as grounding and bonding equipment.
 6. Design Make shall be:
 7. Chatsworth Products, Inc. (CPI),
 8. Telecommunications Grounding Busbar:
 9. Part Number 13622-012, 12" x 2" (300 mm x 50 mm) Telecommunications Grounding Busbar, UL Listed.
- D. Grounding Conductors
1. Bare stranded copper ground conductors shall be provided and installed by the Contractor as shown on the project drawings to provide a grounding system consistent with the National Electric Code as well as TIA 607B.
 2. Ground conductors shall be minimum 6 AWG between MDF/IDF Closets, and the Building Service Ground point and minimum 6 AWG green jacketed cable between hardware components located within the MDF/IDF closets.

2.4 BACKBONE CABLING SYSTEMS

- A. Interbuilding Backbone Copper Cable
1. Conductors – Solid, annealed copper, 24 AWG.
 2. Insulation – Solid, high density polyethylene, color coded in accordance with telephone industry standards.
 3. Twisted Pairs – Insulated conductors are twisted into pairs with varying lay lengths to minimize crosstalk.
 4. Core Assembly - 25 pairs and less: pairs are assembling together in a single group. More than 25 pairs are arranged in groups or binders, each binder having a color-coded unit binder.
 5. Filling Compound - The entire core assembly is filled with ETPR compound, filling the intersects between the pairs and under the court tape.
 6. Core Wrap Non-hygroscopic dielectric tape applied longitudinally with an overlap.
 7. Aluminum Sheath - Corrugated copolymer coated 0.0008" aluminum tape applied over longitudinally with an overlap. The sheath interfaces are flooded with an adhesive water blocking compound.
 8. Jacket - Black, low density polythene.
 - a. Other multiples of 25 acceptable (50, 100, 200, 300 pr as required or applicable.)
 9. Acceptable Manufacturer: General Cable.

2.5 CABLE SUPPORT HARDWARE AND MISCELLANEOUS MOUNTING EQUIPMENT

- A. Miscellaneous Equipment: shall be provided and installed by the Contractor as described below and on the drawings. Mounting hardware and accessories typically required to provide a complete and working installation but not listed in these specifications shall be provided and installed by the Contractor.
- B. Backboard Cable Management: shall be provided and placed by Contractor on all telecommunications backboards to provide effective routing of all telecommunications cabling. Contractor shall utilize D-rings, wire distribution spools, and cable clamps as required for a neat and organized installation.



- C. Wall Termination Devices: 110 blocks and primary protection blocks will be provided at all wall termination fields. Primary protector blocks will be provided on both ends of all copper outside plant cables. 110 blocks will be installed with appropriate standoffs and brackets for a complete installation.
- D. J-Hook assemblies:
 - 1. All cable shall be supported above ceiling on dedicated cable support hardware.
 - 2. Contractor is responsible for maintaining the maximum fill guidelines and spacing requirements as shown on the accompanying project plans. Contractor shall provide and install additional J-hook assemblies as required to meet these requirements.
 - 3. J-hook horizontal cable supporting hardware shall be UL listed. The J-hook(s) shall provide a broad base for proper cable support, thereby reducing stress and bending of cabling.
 - a. Contractor shall attach appropriate J-hook fasteners for wall, stud, beam, or flange mounting to the supporting structure. Fasteners shall be spaced a maximum of 5' apart, and no more than 4' from the final outlet destination or turn point as shown on the accompanying project drawings.
 - b. Cable saddles and J-hooks shall be used where cable tray or wire basket is not available. These must be supported on their own ceiling wires, threaded rod, or affixed to building structure by use of beam clamps (on metal beams) or wood screws (on wood beams). Affixing communication cable supports to existing ceiling support wires is not allowed.
 - c. Acceptable product:
 - 1) Caddy CableCat Clips
 - 2) Erico
 - 3) B-Line
 - 4) Panduit
 - 5) Required supporting hardware, or approved equivalent.

2.6 FIRESTOPPING

- A. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur. Such devices shall:
 - 1. Meet the hourly rating of the floor or wall penetrated.
 - 2. Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.
 - 3. Permit multiple devices to be ganged together to increase overall cable capacity.
 - 4. Allow for retrofit to install around existing cables.
 - 5. Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes
 - 6. Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:
 - a. Opening or closing of doors.
 - b. Twisting an inner liner.
 - c. Removal or replacement of any material such as sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.
 - 7. Where single cables (up to 0.27 in. (7 mm) diameter) penetrate gypsum board/stud wall assemblies, a fire-rated cable grommet may be substituted. Acceptable products shall be molded from plenum-grade polymer and conform to the outer diameter of the cable



forming a tight seal for fire and smoke. Additionally, acceptable products shall lock into the barrier to secure cable penetration.

8. Where non-mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.
 - a. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.
 - b. Utilize an EMT sleeve as a stub through a rated wall
 - c. Surround annular space between EMT sleeve and wall material with a hardening intumescent caulk.
 - d. Utilize re-enterable, non-hardening putty around cables inside a metal sleeve. Do not exceed 40% fill capacity of sleeve and follow all rated assembly requirements per Manufacturer, local codes, and AHJ.
9. Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.
10. Clean surfaces to be in contact with fire stopping materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting or the required fire resistance.
11. Install fire stopping materials as indicated, in accordance with manufacturer's instructions.
12. Seal all holes or voids made by penetrations to ensure an effective smoke barrier.
13. Unless protected from possible loading or traffic, install fire stopping materials in floors having void openings of 4 square inches or more to support the same floor load requirements.
14. A small amount of hydrogen gas is released as foam cures. Use forced air ventilation when installing if areas of installation have less than 2 cubic feet of free air for each pound of liquid mixture being foamed.
15. Examine fire stopped areas to ensure proper installation prior to concealing or enclosing fire stopped areas.
16. Approved products
 - a. Specified Technologies, Inc. EZ-PATH series 22, 33 and 44+ fire-rated pathway devices
 - b. Specified Technologies, Inc. EZ-PATH GROMMET
 - c. Specified Technologies, Inc. SSS Intumescent Caulk
 - d. Specified Technologies, Inc. SSP Intumescent Putty

2.7 LABELING

- A. All labeling shall be in accordance with and strictly adhered to TIA-568, TIA-606 (Class 2 Administration) and BICSI Standards.
- B. Provide machine-generated labels appropriate for all components supplied and installed. Under no circumstances shall hand written labels be used.
- C. The labeling scheme shall not include duplicates of any new or existing cable identification across the entire cable plant.



- D. The labeling scheme will be provided at all locations within the cable infrastructure.
- E. All cables shall be labeled, using the owners cable identification standard.
- F. Intrabuilding Cable: All Intrabuilding cables will be labeled. Provide legible and indelible marking on all cables as indicated in the Drawings. Contractor shall ensure labeling of the cables during installation.
- G. Interbuilding Cable: All Interbuilding cables will be labeled. Provide legible and indelible marking on all cables as indicated in the Drawings. Contractor shall ensure labeling of the cables during installation.
- H. Each faceplate, cable, or data outlet (drop) will be numbered with a unique identifier clearly indicating the voice and data jacks by floor number, station, and outlet identification. This labeling scheme will be independent of any assigned telephone numbers.
- I. Cables
 - 1. Horizontal and backbone cables shall be labeled at each end according to Owner labeling standards (see below). The cable or its label shall be marked with its identifier.
 - 2. Cable labels shall be machine-generated wrap-around labels with multiple cable ID's printed such that it can be viewable in place without turning the cable.
 - 3. Label cables within 6" of termination point at both ends.
- J. Faceplates
 - 1. A unique location identifier shall be marked on each faceplate to identify its location in the cable plant.
 - 2. Each port in the faceplate shall be labeled with its own unique identifier.
- K. Racks, Panels, Blocks
 - 1. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
 - 2. Each port on the connecting hardware shall be labeled with its own identifier to match the other end of the cable.

2.8 FLOOR MOUNT EQUIPMENT RACKS

- A. Two-Post Equipment Standard Relay Rack, Chatsworth Products, Inc. (CPI)
 - 1. Racks shall be rectangular in shape, manufactured from steel, welded construction with two pairs of removable (bolt-on) equipment mounting rails.
 - 2. The top of the rack shall be pre-punched with attachment holes for cable runway and a top-mount cable management jumper tray. The sides of the rack shall be pre-punched with attachment points for power strips, Snap-On cable guides and vertical cable managers. The bottom of the rack shall be pre-punched with attachment points for a junction box and attachment to the floor.
 - 3. Equipment mounting rails shall be L-shaped, set 6" (150 mm) or 3" (80 mm) apart and punched on the front flange with the EIA-310-D Universal hole pattern to provide 44 rack-mount spaces for equipment. Each mounting space shall be marked and numbered on the mounting rails. Mounting rails shall be removable and reversible so that RMU numbering can start at the bottom or top of the rack.
 - 4. Equipment-mounting rails shall be horizontally spaced to allow attachment of 19" EIA or 23" rack-mount equipment. Attachment points shall be threaded with 12-24 threads.



5. The rack shall have two masked ground connection points located near the top and bottom of the frame and will include a ground terminal lug to attach ground conductors from the Telecommunications Grounding Busbar. Equipment mounting rails will bond to the rack through assembly hardware.
6. The rack shall measure 7' (2.1 m) high, 24" (610 mm) wide and 15" (380 mm) deep at the base. The sides of the rack frame shall be 9.6" (294 mm) deep.
7. The rack shall be rated for 1,000 lb. (453.6 kg) of equipment in seismic areas and meet Telcordia Technologies GR-63-CORE Network Equipment Building Systems (NEBS) Zone 4 requirements.
8. Finish shall be epoxy-polyester hybrid powder coat in the color as specified below. Mounting rails will be painted to match or zinc-plated.
9. Part Number 55053-703, Standard Rack, 7'H (2.1 m) x 20.3" W (515.9 mm) x 15" D (381.0 mm), 45U x 19" EIA, Black, UL Listed.
10. Each rack must have one (1) 6' long 125V 15A multiple-outlet power strips each with twenty three-prong outlets and no switch, Chatsworth 12848-701. These power strips, with standoff mounting legs, must be installed vertically at the rear of the rack, with the bottoms of the power strips about 6" off the floor. The power strips must be UL-listed. All power strips must be furnished with a 15' three prong plug/cord, NEMA 5-15P.

2.9 EQUIPMENT ROOM CABLE MANEGEMENT

A. Horizontal Cable Management System

1. Product Description: Panduit, NetManager P/N: NM2, or approved equal, 3"x3" front, 2"x 5" back, mountable in an EIA standard 19" rack.
2. Provide 3 per new installed rack
3. Provide to ITD / Telecommunications for installation.
4. Note: Do Not utilize Horizontal wire management between angle patch panels.

B. Vertical Cable Management System

1. Product Description: Panduit, PR2VD06, or approved equal, 7' Vertical Wire Manager, side mount with covers.
2. Location: Both sides of Floor Mount Equipment Racks and in-between racks.

C. Distribution Rings/Jumper Troughs

1. Product Description: Panduit P110JTW-X or approved equal.
2. Location: On all backboards as required for routing of voice cables in a neat fashion.

2.10 LADDER RACKING

A. Cable Ladder Sections and Components

1. General: Except as otherwise indicated, provide metal cable ladders, of types, classes and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
 - a. Materials and Finish: Material and finish specifications for each cable ladder type are as follows:
 - b. 1.5" Tubular Steel: Straight section and fitting side rails and rungs shall be extruded from ASTM A513 steel tube. All fabricated parts shall be finished with a black powder coat.



B. Type of Cable Ladder System

1. Ladder type cable ladders shall consist of two longitudinal members (stringers) with transverse members (rungs) welded to the stringers. Rungs shall be spaced 9" inches on center. Rung spacing in radius fittings shall be 9 inches and measured at the center of the cable ladder's width. Rungs shall have a minimum cable bearing surface of 1" with radius edges. No portion of the rungs shall protrude below the bottom plane of the side rails.
2. Straight cable ladder sections shall have side rails fabricated as tubular steel channels. All straight sections shall be supplied in standard 10'-foot lengths, except where shorter lengths are permitted to facilitate cable ladder assembly lengths as shown on drawings.
3. Cable ladder widths shall be 12" inches as indicated on drawings.
4. Splice plates shall be the bolted type made as indicated below for each cable ladder type. The resistance of fixed splice connections between an adjacent section of cable ladder shall not exceed .00033 ohm. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing the cable ladder rated loading capacity.
5. All splice materials shall be made of ASTM A570 structural steel using carriage bolts and serrated flange locknuts. Hardware shall be Yellow Zinc Dichromate. Chatsworth # 16299-001 or approved equal.
6. Cable ladder Supports: Shall be placed so that the support spans do not exceed a maximum span of 5' feet. Supports shall be constructed from formed shape channel members 1 5/8" x 1 5/8" with necessary hardware such as trapeze support kits, ceiling support kits, triangular support brackets, or wall angle support kits as manufactured by Chatsworth Products or engineer approved equal.
7. Trapeze hangers shall be supported by 3/8" (minimum) diameter all thread rods.
8. Accessories - special accessories shall be furnished as required to protect, support, and install a cable ladder system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially-designed ladder drop-outs, barriers, etc.

C. Acceptable manufacturers

1. Manufacturer: Subject to compliance with these specifications, cable ladder and cable channel systems to be installed shall be as manufactured by Chatsworth, Inc. or engineer approved equal.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Furnish and install materials necessary for a complete and working system.
- B. Contractor must be a Certified Installer for selected manufacturer prior to, during, and through completion of the system installation, and must be able to provide the manufacturer's extended warranty.
- C. Perform work in a neat and workmanlike manner.
- D. Determine requirements for plenum rated cable and devices. When doubt exists, seek prior determination in writing by AHJ.



- E. Install cable after interior of building has been physically protected from the weather and mechanical work likely to damage cabling has been completed.
- F. Contractor shall give notice to all agencies requiring advance notification and comply with all regulations specified by all governing agencies having jurisdiction (AHJ) over the performance of the work.
- G. Before installing cabling, ensure cable pathways are completely and thoroughly cleaned:
 - 1. Inspect conduit, wireway, cable trays, and innerduct systems prior to installation.
 - 2. Swab any additional enclosed raceway and innerduct systems.
- H. Contractor shall coordinate with and abide by the construction schedule and sequencing as dictated by the General Contractor on the project. Storage and staging areas within the construction site shall be as dictated by the General Contractor.
- I. Provide protection for exposed cables where subject to damage. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal.
- J. The contractor shall provide and pay all permits.
- K. The contractor shall provide all labor, materials, equipment, tools, utilities and services necessary for the proper execution and completion of the telecommunications cabling system.
- L. Proper cable handling is critical to maintaining the design integrity of high-performance cabling. Cable handling recommendations include:
 - 1. Cable must be conditioned above 32 degrees F for 48 hours prior to installation.
 - 2. Do not use excessive force when pulling cable. The maximum pull-force guideline for a 4- pair horizontal UTP should not exceed 110N (25lbf). Meeting this guideline avoids stretching conductors during installation and the associated transmission degradation.
 - 3. The minimum bend radius for UTP should not exceed 4 times the cable outside diameter (O.D.) The O.D. of Cat 6A 100 ohm, balanced UTP cable is .30 in. ($4 \times .3 = 1.2$ in. bend radius).
 - 4. The minimum bend radius for fiber should not exceed 10x the cable outside diameter.
 - 5. Traditional combing and dressing (bundling) of Category 6A cabling for a combed appearance is required in all exposed locations.
 - 6. In TR, use appropriate horizontal cable management for patch cords on front of patch panels. Also, use appropriate cable management bar(s) for support of terminated horizontal cable.
 - 7. Do not use vinyl or plastic cable ties due to the potential for over-cinching of cable bundles which can alter the cable geometry and degrade the system cabling performance. Use only hook and loop ("Velcro") fasteners for bundling of horizontal cables.
 - 8. Install cable ties and other cable management clamps via hand so that it fits snugly. Do not over tighten or use mechanical tools which could compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted- pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices.
 - 9. Store cable slack in an extended loop configuration to alleviate cable stress. Excessive cable slack in bundled loops or traditional 'service loops' to provide additional cable length in TR has been shown to degrade cabling performance and are not recommended.



3.2 INSTALLATION METHODS

- A. Contractor is required to adhere to the following parameters whether or not Contractor and/or others have placed existing equipment. Contractor will notify the owner of any of the following requirements that cannot be met prior to bid or ordering of materials.
- B. General: Install an infrastructure cabling system as detailed by the contract drawings, details, and specifications.
- C. The maximum length of horizontal cabling from nearest closet to an outlet shall not exceed 295 feet as per TIA 568 standards. Contractor will notify the owner prior to commencement of any installation not meeting the 295-foot maximum distance limitation.
- D. Contractor will place all station cables in the ceiling area on Contractor supplied and installed wire hangers or in floor spaces and raceways. Contractor also will assess whether or not the ceiling space is a plenum air return, which shall dictate the use of the listed plenum type, or PVC type cable required in the materials specification section. The cables will be routed to the MDF/IDF locations, utilizing cable tray. Station cables must be strapped every 5 feet with tie straps in J-Hooks provided by the Contractor; strapping to any other wires (e.g., lighting, ceiling grid, etc.) is not permitted. Cable splicing at any point of a station cable is unacceptable. When cables are routed in non-ceiling spaces, such as below raised flooring, the Contractor will still assess whether or not the space is a plenum air return and pull the appropriate cable type.
- E. In hard wall (wallboard) or V wall type construction where accessible, Contractor will install a wall board adapter or equivalent, which will support mounting of the faceplate necessary for the jacks. This will eliminate the need for an electrical box (in-wall junction box) to accommodate the communications outlet.
- F. Cables will be run vertically in dedicated EMT conduit inside the wall and into the ceiling space. Once in the ceiling space, the cable will be routed to the closest cable tray. Cables shall be routed to their closest MDF/IDF utilizing the shortest path possible, while still following TIA standard guidelines. Station cables outside of cable tray must be strapped to tie wires with J- Hooks every 5 feet provided by Contractor; strapping to any other wires (e.g., lighting, ceiling grid, etc.) is not permitted.
- G. In areas where modular furniture is installed or in areas where office furniture is in an open office space, telecommunications cabling access will either be through the floor or from the ceiling.
- H. Where the cable access is from a duct under the floor, the Contractor will provide and install mounting hardware inside the floor box that will support the outlets.
- I. The Contractor will provide and install a plastic spiral wrap device or metal flexible conduit to the cable channel in the furniture or to a surface mount box located at each work station. The Contractor shall coordinate with the owner, the exact location of each cable termination and jack location.
- J. UTP cabling must conform to a 6-foot separation requirement from main power panels, switch gear and/or starter motors.



- K. All power feeds crossing the path of the UTP cables at right angles must be a minimum of 6 inches in distance from the UTP cables.
- L. Cables shall be run cable tray in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
- M. The cables shall be placed at a minimum of 6 inches above the ceiling.
- N. The cables are to be run so as to maximize accessibility. Contractor will notify the owner in the event this requirement cannot be met.
- O. Debris, boxes, leftover cables, and trash must be removed from construction sites upon completion of work. No debris or work material may be left in areas that have student access unless the affected area is marked with cones, tape, or temporary fencing.
- P. Contractor shall pull conductors together where more than one is being installed in a raceway. Cable bundles in raceways, in suspension systems, or on wallboards must be tie wrapped every 5 feet. There must be an independent system supporting the cable system. Cable bundles tied to the lighting-ceiling grid will not be permitted. Station wire cannot be attached to electrical conduit, gas or sprinkler piping, or other code-restricted items.
- Q. No cabling is allowed to rest on any ceiling tile or suspension system. Cable shall be kept 30 inches away from any heat source; i.e., steam valves, etc.
- R. Cables shall be pulled free of sharp bends or kinks, twists, or impact damage to the sheath.
- S. Cables shall not be pulled across sharp edges. Cables shall not be forced or jammed between metal parts, assemblies, etc.
- T. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
- U. Cables shall be protected from paint and any other chemicals during installation. Any paint or chemicals that adhere to the installed cable shall be cleaned from the cable per manufacturers requirements. The cable manufacturer and the design consultant shall be notified.
- V. Insulation shall be removed to expose shielding and conductors to the exact length required by manufacturer for proper termination of plugs and pins. Plugs and pins, upon termination, shall not be damaged in any way.
- W. All communications racks must be properly anchored to walls and floors and grounded to building ground grid (not to water pipes, etc.).
- X. Cable splicing will not be permitted in any horizontal cable run.
- Y. Contractor shall install system using tools and equipment specifically designed for the installation tasks. Use installation practices that ensure the highest quality installation. Perform all cutting, splicing, pulling and termination of cables using equipment specifically designed for each purpose.



- Z. Install tie wraps using a tension controlling cutting device. Tension shall not exceed that which is specified by the manufacturer of the cable. Tie wraps and other securing hardware shall be rated as required for the installation environment.
 - AA. Where multiple conduits are being used, fill one conduit to its maximum fill ratio before going onto the next conduit. Wherever possible, leave as many spare conduits available as possible.
 - BB. All cables requiring lubrication for installation in conduits shall be continuously lubricated during the pulling-in process. Maximum pulling tensions specified by the cable manufacturer shall not be exceeded. Monitor cable-pulling tension with a mechanical tension-indicator.
 - CC. All new conduit will not exceed a 40% fill rate. All spare conduits or conduits filled with less than the maximum allowed fill ratio shall have a pull string installed and left for future installation of cable. Clearly label as "pulling line" indicating To/From.
 - DD. Support cables running overhead that are not installed in raceways by bridle rings or J-Hooks spaced every 5 feet.
 - EE. Install the telecommunication cabling system as detailed in the contract drawings in the exact location and layout shown in the details.
 - FF. Openings around electrical raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
 - GG. Label all cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. An acceptable labeling product is a self-laminating cable marker, such as Brady #DAT-9-292-series. All cable labeling shall include numeric designation, source, destination, and cable type.
 - HH. All outlet plates shall be installed neatly and square with floor and walls.
 - II. Category 6A installations shall conform strictly with EIA/TIA 568B and TSB-40B to insure a quality system that meets the transmission rate criteria.
 - JJ. Install cable above fire-sprinkler systems and ensure that the cable does not attach to the system or any ancillary equipment or hardware. Install cable system and support hardware such that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
 - KK. Do not attach cables to ceiling grid or lighting fixture wires. Where support for cable is required, install appropriate carriers to support the cabling.
 - LL. Any cable damaged or exceeding recommended installation parameters during installation will be replaced by the contractor prior to final acceptance at no cost to the Owner.
- 3.3 SEPERATION OF DATA AND POWER CABLING
- A. Design cable pathways to avoid potential sources of EMI. Avoid installing cable near sources of EMI (X-ray equipment, large motors/generators, electrical power cabling and transformers, Radio frequency (RF) sources and transmitters, lighting, copiers, etc.).



- B. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less.
1. Open or Nonmetal Communications Pathways:
 - a. 12-inches from electric motors, fluorescent light fixtures, and unshielded power lines carrying up to 3 kVA.
 - b. 36-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - c. 48-inches from large electrical motors or transformers.
 2. Grounded Metal Conduit Communications Pathways:
 - a. 2 1/2-inches from electrical equipment and unshielded power lines carrying up to 2 kVA.
 - b. 6-inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.
 - c. 12-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - d. 3-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
 - e. 6-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.
- C. Physically separate power & data cabling according to relevant code and standard requirements when run in a common pathway.
1. Never run data and Class 1 power cabling in parallel closer than 2".
 2. Avoid crossing cables if possible. If necessary, always cross cables at 90 degrees.
 3. Maintain a minimum of 5 in. separation between data cable and all ballast controlled lighting.
- D. Minimum separation distances of telecommunications cabling from potential sources of EMI exceeding 5kVA:
1. 24" away from Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways
 2. 12" away from Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway
 3. 6" away from Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway 48" away from Electrical motors and transformers

3.4 FURNITURE CABLING

- A. The contractor will pull all data cables in advance of the installation of the modular furniture workstations, and coil at basefeed or above ceiling for power pole feeds. Upon furniture arrival, the contractor will feed the cables through power poles or base feed/wall connected data/telecom conduit, and terminate as specified on the floor plans.
- B. Contractor to coordinate with Owner's furniture vendor for timing of the installation of systems furniture, and installation of electrical and voice/data cabling.



3.5 TERMINAL BLOCKS AND PATCH PANELS

- A. Arrange all terminal blocks in a manner that allows natural wiring progression and minimizes crossing of wires.
- B. Dress and comb all incoming cable bundles in groups of 24 cables each. Eliminate crossed cables and “divers”.

3.6 TELECOMMUNICATION ROOMS

- A. The Data and Telco Rooms are a transition point between the backbone and horizontal distribution pathways. The rooms shall be able to contain data or telecommunications’ equipment, cable terminations and associated cross-connection wiring. Closet spaces are not to be shared with electrical installations, other than those directly for telecommunications, video, security and information systems equipment. The rooms are not to be shared with other unrelated building service, for example plumbing. Any conflicts with these specifications require the approval of the Owner’s project manager.
- B. Contractor shall submit a drawing of the Telco room showing layout of all components including necessary and required electrical outlets, conduits, environmental requirements and wire termination fields prior to start of the job. Any jack densities noted in these specifications are estimates only. The drawing will designate the most effective, scalable, jack termination cabling design to facilitate data/telecom outlets shown on the lease exhibits. Owner’s Project Managers must approve drawings prior to installation.
- C. All racks, panels, and equipment finished shall be anchored to meet local seismic zone requirements and industry standards. The equipment racks are to be anchored to the concrete floors via “Unistrut or equal metal framing strut systems”, drop in anchors only for all floor mount racks, concrete anchors, bolts and washers.
- D. The overhead cable ladder system will provide a route for the Category 6A, and other communication cables while providing stability to the equipment racks.
- E. The vendor is responsible to provide and install the specified count of 19” EIA rack-mount 7’ (45U) 2- post racks, Black, as required in the new Telco Room. The vendor is responsible for submitting Telco room layout drawings to Owner for approval prior to installation.
- F. The contractor shall provide high capacity horizontal and vertical cable manager channels are required in all data and equipment racks, and the racks will contain sufficient vertical and horizontal cable managers to facilitate the patch panel density and placement installed by the contractor.
- G. Contractor will install raceways, boxes, managers, and enclosures as indicated according to manufacturer’s written instructions. Securely fasten each component to the surface to which it is mounted and remove burs and sharp edges from all cable tray.
- H. A 12” ladder rack system is required and will be provided by the contractor and installed in the IDF to provide cable support to the rack system. This includes all of the required ladder rack support items such as rack to runway kits, wall angle brackets, ceiling supports, splices (junction and butt), radius drops and j-bolts. The final ladder rack layout will be included in the IDF layout drawing described above.



- I. Provide and install as needed in the Telco room 4' x 8" x 3/4" fire-rated plywood board and labeled with fire rating stamp facing into the room to accommodate rack ladder support, cabling support, grounding platform, data and voice equipment. Paint backboard white (leave stamp visible) to match existing backboard in room, if appropriate. Location of installation is to be determined with approval by Owner.
- J. No more than four (4) data patch panels will be mounted to a 7' equipment rack.
- K. If you need more than four (4) data patch panels to complete the job contractor will need to install an additional 7' rack.
- L. Patch panels for special circuits (fax, T1,) can be mounted to a rack that already has four (4) data patch panels mounted in it.

3.7 UNSHIELDED TWISTED PAIR TEMINATION

- A. Check plans and symbology for final determination of faceplate constitution or consult with Owner prior to bid.
- B. Install additional cables at drop locations and in quantities indicated on the drawings.
- C. Do not exceed manufacturers' recommendations for maximum allowable pulling tension, side wall pressure or minimum bending radius. Use pulling compound as recommended by cabling manufacturer.
- D. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.
- E. The combined length of jumpers, or patch cords and equipment cables in the telecommunications room/closet and the work area shall not exceed 10m (33 ft.).
- F. No run of UTP cable between horizontal portions of the cross-connect in the telecommunication closet and the information outlet shall contain splices.
- G. In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling. Minimum 6" is preferred.
- H. J-hooks shall be provided for all suspended cable, at a semi-irregular spacing not to exceed 5 feet between supports. Cables shall be supported by dedicated low-voltage cable support hardware. Support of cables or hanging hardware by means of supports or surfaces related to other trades or applications is not allowed.
- I. Provide a full-size service loop (at least once around the inside edge of the box) in each J-box in the communications system.
- J. Install all cable in plenum spaces with J-hooks of at least 1" in width to disperse the weight on the bottom cables. Homerun all cable to nearest TR Cabinet.
- K. Comply with ANSI/TIA-569 for conduit and splice box sizing.



- L. Install modular jacks at all outlets shown; one data jack for each data cable at each faceplate or termination point. Install additional cables and modular jacks as indicated on the drawings. Do not “split pairs” between different jacks.
- M. Terminate cables at each jack location and at termination board or patch panel. Follow industry guidelines and manufacturers’ recommendations and procedures as required. All termination hardware shall be rated to exceed their associated Category rating as specified above.
- N. Field-installable RJ45 plugs are not to be used.
- O. For enclosed ceiling WAP locations, install and terminate CAT6A cables to approximate location as shown on plans. For open-ceiling environments, secure cables and surface-mount boxes to nearest appropriate support structure.
- P. For in-ceiling WAP locations, secure jacks inside a surface-mount block mounted to in-ceiling metal assembly, and provide a 5’ patch cord or longer, as needed, to connect device to its final determined location in ceiling.
- Q. For wall-mounted device locations, utilize an in-wall bracket in lieu of faceplate as described above. Secure mounting bracket and device hardware directly over backbox. Connect device with 1’ CAT6A cord (Security, AV, or WAP), or 1’ high-flex CAT6 patch cord for other CAT6- based devices. Coil patch cord inside backbox.
- R. Label and identify each outlet and cable for data circuits. Label at outlet end and at termination board or patch panel with matching designations.
- S. Provide data outlets in surface raceway at 26” on center unless otherwise indicated.
- T. Extreme care must be taken not to nick any of the copper conductors when removing jacket. Use rip cord to expose pairs for termination onto Insulation Displacement Contacts. You can also use a precision stripper that allows the technician to set the depth of the blade.
- U. Maintain twists as close as possible to the point of termination. Untwisting of copper pairs should not exceed ¼” to the termination point.
- V. Manage the cable bundles in a symmetrical orientation. For example, in a 48-port patch panel, distribute 24 cables through the vertical cable management on the left rear side of the rack and 24 cables through the vertical cable management on the right rear side of the rack.
- W. Do not dress cables in bundles larger than 24 cables. Multiple 24-cable bundles may be run in parallel with evenly-spaced Velcro cable ties in an orderly sequence.
- X. For cable management on rear of patch panel, cable shall sweep into termination points and be supported by appropriate rear cable management.
- Y. Horizontal patch cord management is required on all installations which do not use angled patch panels.
- Z. Maintain cable bend radius 4X outer diameter (UTP only) when mounting faceplate onto EMT backbox, box-eliminators or furniture knock-outs.



- AA. Faceplates and SMBs shall be fully installed and labeled prior to testing.
- BB. Loosely coil and store excess slack in the ceiling above each termination location when there is not enough space present to store slack cable.
- CC. Install cable in accordance with manufacturer's recommendations and best industry practices.
- DD. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.1 document, manufacturer's recommendations and best industry practices.
- EE. Terminate 4 pair cables on the jack and patch panels using T568B wiring scheme. FF.
- FF. Maintain the cable jacket within 1-inch of the termination point.
- GG. Do not exceed 0.5-inch of pair untwist at the termination point.
- HH. Do not exceed 4 times the outside diameter of the cable in the termination area for bend radiance compliance.
- II. Neatly bundle and dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- JJ. Horizontal station cabling must have no less than 10' service loop at station end and 5' at patch panel ends. These loops should be dressed in an orderly fashion above T-bar.

3.8 FIBER OPTIC CABLE SYSTEM

- A. The fiber optic Raceway system must be continuous between pull boxes and junction boxes. The Raceway system must enter and be secured to enclosures.
- B. All fiber supplied to the campus must be tested with an OTDR, Microtest Certifiber or equal prior to installation, while still on the shipping reel, using an optical time domain reflectometer (OTDR) or a 850/1300/1510 nm power meter and stabilized light source. The test results may be compared to the manufacturer's test results. A discrepancy of more than one dB on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier.
- C. All fiber must be tested after installation according to the procedures and acceptability criteria described in EIA/TIA 455A (August 1991) and all applicable addenda after installation and termination using an OTDR in one direction and then 850/1300 nm power meter in stabilized light source in both directions and in both optical windows. The results of these tests (printed OTDR results and tabular loss results) must be provided by the installer as documentation of the quality of installation and as a baseline for future troubleshooting. The results must be compared to the pre-installation test results for significant changes.
- D. All optical test equipment must have current traceable calibration certification.
- E. All spare optical ports and connectors should have a dust cap in place to protect the cable from the environment.



- F. Manufacturer's specification for pulling stress and minimum bend radius must not be exceeded on any fiber cable.
- G. Installation contractor must develop an review conduit installation plan with the owner before beginning installation.
- H. Installation contractor must verify all device locations with the owner before installation.
- I. Installation contractor must review cable numbering and labeling scheme with the Owner prior to installation.
- J. Installation contractor must review drawing notes and drawing back annotations (red line) on site plans with the owner prior to installation.
- K. Fiber Optics Cable Labeling: Fiber termination locations must be labeled to corresponding fiber strand pairs at the Main Distribution Frame (MDF), and Intermediate Distribution Frame (IDF), using embossed labels. The Contractor is expected to provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure overtime period handwritten labels are not acceptable.
- L. All outside fiber cable will be installed through 1.25 inch innerduct from point of origin and destination.
- M. Securely fasten the fiber optics raceway to the cable tray, or walls when routed inside buildings, using clamps and clips designed for this purpose.
- N. Provided nylon or polyethylene pulling line in all fiber optic raceways. Clearly label as "pulling line", indicating source and destination.
- O. Openings around fiber optic raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
- P. All fiber optic cables are to be run as efficiently as possible, minimizing the amount of cable required .
- Q. All fiber optic cables shall be continuously lubricated during the pulling-in process. The maximum pulling tension specified by the cable manufacturers shall not be exceeded. Monitor cable pulling tension with a mechanical tension meter.
- R. The fiber optic cables passing through pull boxes and manholes shall be neatly arranged and secured to cable jacks on the interior walls. Cables will not be accepted when diving through the manhole or pull box.
- S. As fiber optic cables emerge from intermediate point pull boxes, coil the cable in a figure eight pattern with loops not less than two feet in diameter.
- T. Label all fiber optic cables at both ends. The label shall be permanent. Labels shall be typed, not handwritten. Individual number strips are unacceptable. All cable labeling shall include numeric designation, source, destination, and cable type.
- U. Fiber optic raceways shall be clearly marked at each pull box indicating type and number of cables within.



- V. If connectors have been factory installed on fiber optic cables, protect the connector during the pulling-in by wrapping with a thin layer of foam and insert in a stiff plastic sleeve for protection.

3.9 GROUNDING

- A. All grounding (earthing) and bonding shall be done to applicable codes, standards and regulations.
- B. Grounding shall be accomplished by common single-point termination of all ground conductors.
- C. All metallic components of the infrastructure system shall be solidly grounded by the shortest possible route.
- D. Manhole Splices and Splice Cases - the Contractor will connect the splice case to the manhole ground as per GTE practice 605-100-201 using a #6 AWG solid copper wire.
- E. NEMA Enclosure splices and Splice Cases - the splice case must be grounded to the provided ground lug in the existing NEMA box with a minimum #6 AWG wire.
- F. MDF/IDF Splices and Splice Cases - the splice case must be grounded to the provided ground bar in the Voice/Data Equipment Room with a minimum #6 AWG wire.
- G. MDF/IDF Electrical Protection Splices - the Contractor must bond the cable's metallic sheath/shield to the metallic splice case with the bonding bar assembly provided with the splice case.
- H. Labeling: The splice case and all cables must be labeled using a stamped metal plate or indelible plastic plate, that the owner has approved, which details exact pair counts and destinations. Each 25-pair binder group, of each cable entering the splice case, must be labeled with a Panduit PAN-TY PLF1M-0 Flag with appropriate cable pair counts.
- I. Conduit Sealing: The Contractor will supply and install all necessary components to effectively seal all conduits. The Contractor will use Semco part #PR-851 conduit sealing kit. The PR-851 compound is a two-part polyurethane foam, which, when mixed for fifteen seconds, expands approximately fifteen times in volume. It forms a dense, tough foam with a density of three to four pounds per cubic foot. The expanding nature of the compound allows it to fill cracks and voids in conduit walls, and imperfections in the cable sheath. This effectively seals the conduit against the passages of gases and water. For additional information, refer to GTE Practice 628-020-203.
- J. Shielded cabling channels shall include appropriate method of bonding shield to approved ground for proper EMI/RFI mitigation.
- K. Shield Continuity Testing shall be Enabled when shielded cabling channels are installed.
- L. All shielded and armored cables shall be bonded to a telecom grounding system via shielded patch panels at the rack locations. Shielded Category-rated connectors must be properly installed to maintain electrical ground conductivity along entire length of cable and at both ends of the cable. UTP connectors shall not be used on shielded cables at either end.



- M. Shielded Patch cords shall be provided for use and employed at each workstation location utilizing shielded cable. Shielded patch cords can be identified by their gray color and metallic RJ45 plug.
- N. Telecom Contractor shall bond and ground all telecom room metals. Telecom Contractor shall provide and install TIA-rated Telecommunications Grounding Busbar (TGB) at all Telcom Room locations, and an in-cabinet grounding busbar at each remote wall-mounted cabinet or telecom enclosure. All ground lugs shall be 2-hole make-up and be compression style. Screw lug type will not be accepted.
- O. Electrician will provide connection between TGB and building ground; Telecom contractor (if separate, otherwise electrician) will provide a busbar and ground all equipment and telecom metals to the busbar.
- P. Telecom installer will ground and bond all armored and/or shielded cables, racks, cabinets, cable tray, ladder racking, and shielded panels to telecom grounding busbar.

3.10 WIRELESS ACCESS DEVICE INSTALLATIONS

- A. Above-ceiling and wall-mounted wireless access points and devices.
 - 1. All WAP locations shall receive (2) Category 6A cables from the nearest TE or TR (IDF). Multimedia, security and other video devices shall receive CAT6A cables as shown on drawings, documents and details.
 - 2. Clock/Speakers and other low-bandwidth mounted devices shall receive (1) CAT6A cable.
 - 3. WAP, IP Camera and other communications cables shall terminate on patch panels in the TE/TR (IDF).
 - 4. WAP cables shall terminate on Category 6A information outlets and shall be supported by an in-ceiling termination bracket. Affixing of a 2-port SMB to the bracket is recommended.
 - 5. SMB, jacks, and patch cords used in plenum spaces shall be plenum-rated.
 - 6. SMB shall be mounted in the ceiling on a specially-designed clip attached to a cable support ceiling wire or threaded rod support per cable management section in Part 2. SMB shall not be tie wrapped to supports, or left on ceiling tiles or other equipment located above the ceiling.
 - 7. Wall-mounted devices not requiring faceplates will be mounted directly to the backbox. Jacks will be secured inside backbox on a specially-designed in-wall bracket clip per cable management section in Part 2.
 - 8. Contractor shall mount Access Point (AP) electronics to the drop-ceiling suspended T-grid system. (AP and mounting hardware provided by Owner). Contractor to provide and install (2) white Cat 6A patch cords from the overhead WAP outlets to the AP. Contractor shall neatly cut holes into the ceiling tile and finish the holes with grommets or other industry-standard finishing piece for a professional look.

3.11 PATHWAYS AND TOPOLOGY

- A. Utilize “thin film” lubricants only! It has been shown that cable-pilling lubricants will affect your testing as the cable needs several weeks to dry before attenuation levels recover. Use of incorrect cable lubricants will erode cable jacket and void cable warranty.



- B. All cable and wire shall be concealed in conduits, floor ducts, paneling, ceiling or similar areas except at mutually agreed upon areas.
- C. Fill capacity in conduit, modular furniture and other horizontal pathways should not exceed 40%. A maximum of 60 % pathway fill is allowed to accommodate unplanned additions after initial installation. The Cat 6A cable is a larger O.D. 0.250. The increased diameter of Cat 6A cable will require appropriate design considerations when sizing conduit and other pathways. In most installations, conduit sizes will have to be increased in order to accommodate all of the cables being installed. This will impact the design and material selection of the project. To calculate the fill ratio, divide the sum of the cross-sectional area of all cables, by the most restricted cross-sectional area of the pathway.
- D. Fill ratios for Augmented CAT6 cable (CAT6A) requires 1" EMT for 4 cables and sized larger for additional cables as required to maintain a 60% fill ratio.
- E. Flat-rung and/or solid bottom cable tray shall be utilized for large, high-density installations. J- hooks and other specific cable support hardware shall be used at all locations outside of cable tray.
- F. Pathway design should not exceed (2) 90-degree bends between pull points or pull boxes (PB). If more than (2) 90-degree bends are required, install a pull box between bends.
- G. Provide NEC-sized pull boxes for any run greater than 100 feet, or with more than two ninety- degree bends.
- H. J-hooks should be randomly spaced 60" or less. Do not exceed J-hook capacity for size and weight limitations.
- I. Land wireless access cabling above ceiling, secured onto in-ceiling bracket. Utilize varying-length patch cords when installing wireless access point devices for flexibility in length.
- J. Crimp-on plugs at wireless access points are not allowed. Terminate all WAP cabling onto jacks and ceiling-mount brackets and test all cables as appropriate.
- K. Mixing of various Category cables in the same pathway is allowed as long as the applications are appropriate for each category of cable used.
- L. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.
- M. Maintain a distance of at least 12 inches from all power conduits and cables, and 6 inches from all fluorescent lighting fixtures. Do not install power feeders 100 amps or greater above or within 5 feet of telecommunications backboard. Do not install telecommunications conduits above power panels or switchboards.
- N. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.



- O. The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications room/closets (TCs or IDFs) and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications room/closets and the main or intermediate cross-connect in a long single story building.
- P. Unless otherwise recommended by the Owner, all fiber cables will be encased in interlocking armor. All fibers will be terminated in the Telecom Rooms or Cabinets in rack-mounted enclosures equipped with sufficient ports to allow for growth, slack storage space and splice trays if required to terminate and secure all fibers.
- Q. Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all Telecommunications rooms/closets, such that no drilling of additional sleeves/slots is necessary. Sleeves may need to be provided and installed under the scope of this Project.
- R. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications room/closet. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect.
- S. For voice or data applications, 4 pair UTP or fiber optic cables shall be run using a star topology from the telecommunications room/closet serving that floor to every individual information outlet.
- T. Backbone and Horizontal pathways shall be installed or selected such that the minimum bend radius is maintained both during and after installation.
- U. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.
- V. Install $\frac{3}{4}$ " x 4' x 8' fire-rated plywood across all walls in telecom rooms, from 6" AFF to 8'-6" AFF. Coat with 2 coats of white paint. Do not paint over fire rating stamp.
- W. Contractor shall firestop all used pathways which enter or leave the telecom rooms via conduit, cable tray or slot. Contractor is responsible for installing sleeves at each wall or partition penetration, and firestopping all fire-rated penetrations. Intumescent caulk shall be applied around the outside of each sleeve, and intumescent putty inside the sleeve or conduits around the cables. Appropriate fill ratios must be followed when penetrating fire-rated walls.
- X. Do not run fiber cables in conduits which are less than 2" in diameter.
- Y. Abandoned cable shall be removed from pathways (i.e., from tunnels, manholes, plenum spaces, and conduit) under scope of this project. Previously unknown or unidentified cable which is apparently abandoned prior to work shall be brought to the attention of the Owner for authorization prior to removal.

3.12 SYSTEM TESTING

- A. The Contractor shall be responsible for separately testing and documenting the cables and termination throughout the entire cabling system. Ensure that the cable and equipment being installed in the system is without flaw and that no potential damage to the cable or equipment occurred in shipment, handling, or installation. The owner representative shall observe the testing of the installed cabling and terminations at any time during the testing process.



- B. Test cables and termination hardware for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.
- C. Verify pairs of each installed cable prior to system acceptance. Repair or replace any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks in order to ensure 100 percent useable conductors in cables installed.
- C. Testing of all installed unshielded twisted pair telecommunications cabling shall be performed by the Contractor. Interim testing of the cabling system during and after installation is encouraged to ensure that the testing and acceptance criteria are met.
- D. Acceptance of the Telecommunications Cabling System shall be based on the quality of Contractor performance by analysis/inspection of the testing program documentation and the conformance of the system operation with the criteria described herein. Contractor shall make available all drawings and documentation prior to acceptance testing.
- E. Contractor shall provide all necessary testing equipment for performing the required acceptance test. Contractor shall verify the authenticity and display appropriate calibration data to include the expiration date of the correct calibration.
- F. Testing methods are provided herein as reference for the Contractor. Test equipment, methods, and criteria shall comply with the guidelines set forth in TIA TSB - 67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems where applicable.
- G. Copper Cable Testing:
 - 1. TEST TWISTED-PAIR copper cable links for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Test cabling using a Level IV test unit for Category 6 performance compliance as specified in ANSI/TIA/EIA-568-C.
 - 2. CONTINUITY - Test each pair of each installed cable using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Test shielded/screened cables with a device that verifies shield continuity in addition to the above stated tests. Record the test as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Correct or repair any faults in the wiring and re-test the cable prior to final acceptance.
 - 3. LENGTH - Test each installed cable link for installed length using a TDR type device. Test the cables from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length will conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C standard. Record cable lengths, referencing the cable identification number and circuit or pair number. For multi-pair cables, record the shortest pair length as the length for the cable.
 - 4. Test all equipment and each outlet, horizontal cable, termination block, patch cords, etc. to verify compliance with requirements. Testing shall consist of attenuation and NEXT across all splices and devices installed in the field and shall meet latest requirements of EIA/TIA. Re-terminate any cable or connection found to be defective.
- H. Provide test results in electronic format, with the following minimum information per cable Tester is to be a Level IV device or better, and configured with the specific cable installed,



- and the Permanent Link test will be performed according to the Category's standard methodology.
1. All parameters must exhibit a PASS test result prior to project completion. PASS*, FAIL* or FAIL test results will not be accepted. Test Results for PASS test shall include the following:
 - a. Project Name
 - b. Date and Time of test (daily recording)
 - c. Circuit I.D. number with corresponding jack identifier
 - d. Applicable room number of jack location (per contract documents)
 - e. Applicable telecommunications room number
 - f. Test result, "Pass" or "Fail"
 - g. Wire Map – shall include the following:
 - 1) Continuity to the remote end
 - 2) Shorts between any two or more conductors
 - 3) Crossed pairs
 - 4) Reversed pairs
 - 5) Split pairs
 - 6) Any other mis-wiring
 - h. Length
 - i. Insertion Loss
 - j. Near-end Crosstalk (NEXT) Loss
 - k. PS-NEXT (Power Sum Near End Cross Talk)
 - l. FEXT (Far End Crosstalk)
 - m. ELFEXT (Equal Level Far End Cross Talk)
 - n. PS-ELFEXT (Power Sum Equal Level Far End Cross Talk)
 - o. Propagation Delay
 - p. Delay Skew
 - q. Return loss
 - r. PSFEXT (Power Sum Far End Crosstalk)
 - I. Category 6A
 1. Only a permanent link test for Category 6A will be required.
 2. All systems must pass Category 6A specifications and be accepted by the owner before the work will be considered complete.
 3. Inter- and Intra-building tie cables: all tie cables will be tested for pass-fail connectivity ground continuity.
 - a. Testing of Category 6A cable shall meet TIA 568A Requirements.
 - b. The vendor must utilize a check-off list for reference by the owner during tests.
 - c. The result of the measurements outlined shall be recorded and submitted to the owner as final proof of system performance. Electronic results will be supplied in Fluke or equivalent format. If the owner requires specific software to view the results, the contractor will supply a copy of software to the owner.
 4. Test Results for CAT6A shall include all of the above (3.12, H), plus the following:
 - a. AACRF (Alien Attenuation to Crosstalk Ratio, Far End)
 - b. AFEXT (Alien Far End Crosstalk)
 - c. ANEXT (Alien Near End Crosstalk)
 - d. PSANEXT (Power Sum Alien Near End Crosstalk)
 - e. PSAACRF (Power Sum Alien Attenuation to Crosstalk Ratio, Far End)
 5. Approved tester products:
 - a. Softing WireXpert series tester



- b. Fluke DTX or later platform Cable Certification testers
- c. Linkware Record Management Software
- d. All optical test equipment must have current, traceable calibration certification.

J. Fiber Test Documentation:

1. Provide electronic CD disc and hard copy test reports from ANSI/TIA/EIA-526-14a Method B Standards. Calculate a "Loss Budget" for each cable length based on cable length and connectors. Provide as a minimum OTDR test results in the form of a printed waveform and text table for both 850 nm and 1300 nm for multimode fiber, and 1350 nm and 1510 nm for single-mode fiber. Test fibers and connector systems for an end-to-end attenuation. Provide a power meter test on a fiber optic strand at both wavelengths A to B, B to A and OSPL (OSPL is as defined as $L_a + L_b$). Include the results of unsatisfactory tests with an explanation how the problem was corrected. Clearly label connector and fiber loss on test waveforms.
2. Each pre-terminated fiber strand shall be tested for continuity and attenuation with an Optical Power Meter and a light source for actual length and splice/connector loss. Each field terminated fiber strand, if any, shall be tested for attenuation with an Optical Power Meter and light source and with an Optical Time Domain Reflectometer (OTDR) for actual length and splice/connector loss.
3. Cable length shall be verified using sheath markings. The guidelines and procedures established for Tier 1 testing in TIA/TSB-140 shall apply.
4. All fiber optic cable shall be tested from the site's MDF to each fiber terminal located in the IDF.
5. The Contractor shall conduct a bi-directional power meter (loss) test of each fiber optic station and riser cable at both wavelengths, 850/1300 nm for MM, and 1310/1550 nm for SM.
6. No individual station or riser fiber link segment (including connector) shall measure more than 2.0 dB loss for LC, and 1.5 dB loss for MTP. LC link shall be tested with LC jumpers to the tester. MTP link shall be tested with either an MTP tester and array cord, or with an MTP-LC breakout harness and an LC duplex fiber tester.
7. Tests shall be conducted using an ANSI/TIA-526-14A, Method B. Test results evaluation for the panel to panel (backbone) shall be based on the value set forth and ANSI/TIA-568.
8. The Contractor shall provide an electronic printout for each strand tested with the Power Meter and the OTDR.
9. Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of test.
10. The Contractor shall perform all tests and adjustments, and shall furnish all test equipment necessary, and perform all work required to determine or modify performance of the system in accordance with these specifications. The Contractor will submit to the Owner a complete test plan for Station Wiring/Information outlet (Voice, Data and Network), and the Riser Cable to be used for this contract. At a minimum, the plan should show test configurations, calibration procedures, impedances, and measurement equipment. This plan must be approved by the Owner prior to the start of testing. The test plan is a one-time requirement and will remain in effect for the duration



of this contract, unless specifications change requiring a resubmittal. The scope of this work includes, but is not limited to the following:

- a. Test all fiber with an OTDR, Microtest Certifiber or equal, prior to installation while fiber is still on the shipping reel, using an optical time domain reflectometer (OTDR) or an 850/1300/1510 nm power meter and stabilized light source. Compare test results to the manufacturer's tests. A discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier. Contractor shall keep test results on file for future reference.
- b. Test all fiber after installation according to procedures and criteria described in TIA 455A and all applicable addenda after installation and termination using an OTDR in one direction and then 850/1300/1510 nm power meter and stabilized light source in both directions and in both optical windows.
- c. All optical test equipment must have current, traceable calibration certification.

3.13 DELIVERABLES

- A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (4) manuals shall be delivered to the Owner. Manuals shall include all service, installation, and programming information.
- B. Four (4) copies of the general Copper, Category 6A, and Fiber ODTR results shall be submitted in a tabular, typewritten format at the completion of system testing. The test results must also be provided in an electronic file for future reference.
- C. Cable test results shall be submitted in hard copy and magnetic format along with viewing software from the tester manufacturer. Hard copy to be bound within loose leaf binder and organized by serving MDF or IDF, room number of outlet location, and station identifier.
- D. Contractor to provide all warranty information to APPROVED MANUFACTUER for processing. MANUFACTURE will send warranty document direct to Owner.

3.14 RECORD DRAWINGS

- A. All drawings shall be submitted in hard copy with all field changes and contractor labeling indicated in red line updates. Upon completion of the project, Contractor shall deliver to Owner documentation of the project to include.
- B. As-built telecommunications floor plans of the facility with cable, outlet placement and full labels clearly depicted.
- C. As-built elevations of all termination fields describing cable and outlet location labeling scheme, and any changes to the wall elevations and conduit placements in the IT rooms will be recorded on as-built drawings
- D. As-built logical riser diagram describing connectivity and cable sizes, for copper, fiber and grounding cabling systems. Diagram shall include as-built labeling of all OSP and rise cables.
- E. Provide a full set of "as-built" (redline) drawings in AutoCAD DWG and PDF format. Drawings to depict final location and drop/cable identification numbers and labels which



match the test reports. Include (1) hard copy paper format of all as-builts in a laminated 30"x42" size or equivalent, posted in each telecom room involved in the project.

END OF SECTION 27 10 00



SECTION 28 31 11 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Fire alarm initiation and signal devices.
- B. Conduit and wiring for fire alarm system.

1.2 SUBMITTALS

- A. Provide submittals for the following items:
 - 1. Fire alarm initiation devices.
 - 2. Interface devices and accessory components.
- B. Provide a complete deferred approval fire alarm system submittal package to the AHJ. The package shall include, but not be limited to, layout plan drawings, riser diagram, wiring diagrams, battery calculations, voltage drop calculations, sound level calculations, bill of materials, device and equipment catalog cut sheets, and California State Fire Marshal (CSFM) listing sheets.
- C. Prepare complete drawings of the entire fire alarm system. The design drawings shall include a point-by-point wiring diagram identifying initiation and notification signal zones conductor colors. Identify devices according to the manufacturer's catalog numbers and indicate their locations on the drawings.
- D. In addition to an approved copy of the fire alarm system submittal, provide a set of comprehensive operating instructions; programming documentation; and system maintenance, testing and alarm documentation to the Owner.
- E. At project completion the factory authorized technician shall provide all on-site software modifications and provide a written report attesting to the proper operations of the completed system.

PART 2 – PRODUCTS

2.1 EXISTING FIRE DETECTION AND ALARM SYSTEM

- A. Manufacturer
 - 1. SILENT KNIGHT 5820XL– All new devices and equipment provided for this project shall be compatible with the existing system. Fire alarm system and components shall operate as an extension of the existing system.

2.2 ADDRESSABLE INITIATION DEVICES



- A. Smoke detectors shall be intelligent photoelectric detectors with thermal element that provides digital communications to the FACP. Detectors shall be listed for use as open area protective coverage, in duct installation and duct sampling assembly installation and shall be insensitive to air velocity changes. Detectors shall be programmable as application specific, selected in software for a minimum of eleven environmental fire profiles unique to the installed location. These fire profiles shall eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber. The detector shall support the use of a relay, or LED remote indicator. The detector shall not exceed 2.5 inches of extension below the finish ceiling. Detector wiring shall not require any special cable.
- B. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box. Detectors located in concealed locations (above ceiling, etc.) shall have a remote visible indicator lamps. Bases shall be supplied with the following features as required for performance to this specification. Select the bases based on manufacturer's requirements for the devices specified.
- C. Intelligent interface modules shall be supplied for the monitoring of contact type initiation devices and for the control of electrical devices as required by project conditions. Modules shall be intelligent analog signaling circuit interface modules as follows:
1. A single circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory or status contact type devices.
 2. The single circuit interface shall also be available as a freestanding shrink-wrapped unit with pigtail wire leads for direct mounting with contact devices.
 3. A single circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory security or status contact type devices with form C software programmable control contacts for the management of specified electrical loads as required by this specification.
 4. Dual circuit intelligent signaling circuit interface module for monitoring alarm, trouble, supervisory security or status contact type devices.
- D. Addressable Duct Smoke Detectors
1. UL 268A listed, operating at 24-V dc, nominal.
 2. Integral Addressable Module: arranged to communicate detector status and sensitivity (normal, alarm, or trouble) to the FACP.
 3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
 - a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.
 4. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conduits where applied.
 5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.
 6. Addressable analog or 2 wire type utilizing addressable component by other manufactures must be approved by the DGS "Representative, DGS Alarm Shop and CSFM".



7. The devices shall include necessary sampling tube extensions.
8. Install remote indicating light where indicated on the Drawings and where detector indicating lights are not readily visible.
 - a. Mount remote indicator lights adjacent to the unit, 4 to 6 feet above finished floor, the location must not obstruct area served.
 - b. Device shall be flush or semi-flush mounted with identifying nameplate.
 - c. Integral Visual- Indicating Light: LED type. Indicating detector has operated and power-on status.

2.3 CONDUIT, WIRE, & CABLE

- A. Conduit: Conduit and fittings shall comply with UL 6, UL 1242 and UL 797.
- B. Wiring: Wiring for 120-volt ac power shall be No. 12 AWG minimum. Wiring for low voltage dc circuits shall be No. 14 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. All wiring shall conform to CEC. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color-coded. Conductors used for the same functions shall be similarly color-coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited. T-tapping using screw terminal blocks are allowed for addressable systems.
- C. Special Tools and Spare Parts: Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LED's of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

2.4 MANUAL STATIONS

- A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
 1. Single action mechanism, pull lever type. With integral addressable module arranged to communicate status (normal, alarm, or trouble) to the FACP.
 2. Reset shall be accomplished with lock and key.
 3. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting access to initiate an alarm.

2.5 NOTIFICATION APPLIANCES

- A. Description: Equipped for mounting as indicated on the Drawings and with screw terminals for system connections.
- B. Bells: Electric vibrating, 1200V under-dome type with provision for housing the operating mechanism behind the bell. Bells shall produce a sound-pressure level of 90 dBA, measured 10 feet from the bell. 10-Inch size, unless otherwise indicated. Bells are weatherproof where indicated.



- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn in a three pulse temporal pattern. System Sensor, Wheelock, Gentex, or equal.
- D. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word FIRE is engraved in minimum 1-inch-high letters on the lens. System Sensor, Wheelock, Gentex or Equal.
 - 1. Strobe Leads: Factory connected to screw terminals.
- E. Combined Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
 - 1. Speaker/strobes color shall be as approved by DGS's Representative and have sealed back, metal grill, with multiple wattage taps including $\frac{1}{4}$, $\frac{1}{2}$, 1 watt, and 2 watts, and multiple candela taps 15, 30, 75, or 110.
 - 2. Install a speakers at the $\frac{1}{2}$ watt setting unless indicated otherwise in the Drawings and with the candela setting as indicated on the Drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed. Smoke detectors shall not be installed until the building has been thoroughly cleaned.
- B. Boxes: All devices and appliances shall be mounted to or in an approved electrical box. Boxes shall be installed plumb and firmly in position. Extension rings with blank covers shall be installed on junction boxes where required. Junction boxes served by concealed conduit shall be flush mounted.
- C. Wiring: All system wiring shall be installed in conduit. Conduit size for wiring shall be in accordance with CEC. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made boxes. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors. The use of wire nut type connectors are prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts. The equipment manufacturer's representative shall be present for the connection of wiring to the control panel.
- D. Marking: Each conductor shall be identified as shown on the drawings with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible. A consistent color code for fire alarm system conductors throughout the installation. "Fire alarm system" decal or indicator shall be applied to all junction box covers and visible conduits in each room or space.



- E. Auxiliary Equipment: Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.
- F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.
- G. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

3.2 FIELD QUALITY CONTROL AND PRELIMINARY TESTING

- A. Complete testing and certification shall be performed by a certified technician or manufacturer representative.
- B. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional.
- C. The Contractor shall notify the Owner's Representative 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.
- D. Preliminary Testing Procedure
 - 1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
 - 2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
 - 3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
 - 4. All test equipment, the installing contractor shall make instruments, tools and labor required to conduct the system tests available. The following equipment shall be a minimum for conducting the preliminary and acceptance tests:
 - a. Ladders and scaffolds as required to access all installed equipment.
 - b. Multi-meter for reading voltage, current and resistance.
 - c. Two way radios, and flashlights.



- d. A manufacturer recommended device for measuring airflow through air duct smoke detector sampling assemblies.
- e. Decibel meter.
- f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.3 ACCEPTANCE TESTING

- A. Acceptance testing shall be in accordance with NFPA 72 and this specification. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The contractor shall be responsible for the performance of the acceptance testing, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.
- B. Conduct the acceptance testing procedure (ATP) in the presence of the Owner's Representative and the AHJ.
- C. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
 - 1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, shorted and grounded signal line circuits.
 - b. Open, shorted and grounded notification circuits.
 - c. Primary power or battery disconnected.
 - 2. System notification appliances shall be demonstrated as follows:
 - a. All alarm notification appliances actuate as programmed
 - b. Audibility and visibility at required levels.
 - 3. System indications shall be demonstrated as follows:
 - a. Correct message display for each alarm input at the control display.
 - b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
 - c. Correct history logging for all system activity.
 - 4. System off-site reporting functions shall be demonstrated as follows:
 - a. Correct point transmitted for each alarm input b. Trouble signals received for disconnect
 - 5. Secondary power capabilities shall be demonstrated as follows:
 - a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
 - c. System battery voltages and charging currents shall be checked at the fire alarm control panel.



- D. Complete and submit to the Owner's Representative the signed "Certificate of Completion" as per NFPA 72 Section 7.5.2 following the successful completion of the witnessed acceptance testing procedure.

3.4 DOCUMENTATION

- A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
1. System record drawings and wiring details including one set of reproducible masters and drawings on a CD ROM in a DXF format suitable for use in a CAD drafting program. Original drawings must be provided by the systems engineering firm.
 2. System operation, installation and maintenance manuals.
 3. System matrix showing interaction of all input signals with output commands.
 4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
 5. System program showing system functions, controls and labeling of equipment and devices.

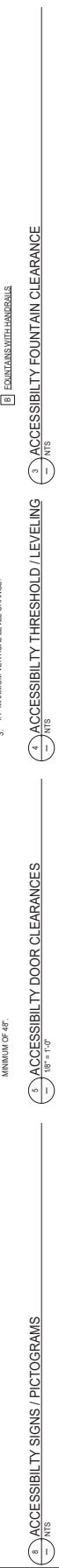
3.5 SERVICES

- A. The contractor shall warrant the entire system against mechanical and electrical defects for a period described in the contract general conditions. This period, shall begin upon completed certification and test of the system or upon first beneficial use of the system, determined by the Engineer, whichever is earlier.
- B. The contractor performing the contract services shall be qualified and listed to maintain ongoing certification of the completed system to the UL for specific installed system listing.

END OF SECTION 28 31 11



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YOLO COUNTY GENERAL SERVICES
 100 W. COURT STREET, WOODLAND, CA, 95695

SECOND FLOOR TENANT IMPROVEMENT

PROJECT STATUS:
 PERMIT APPLICATION
 BUILDINGS

SHEET TITLE:
 CODE SUMMARY AND
 EXITING PLAN

REVISIONS

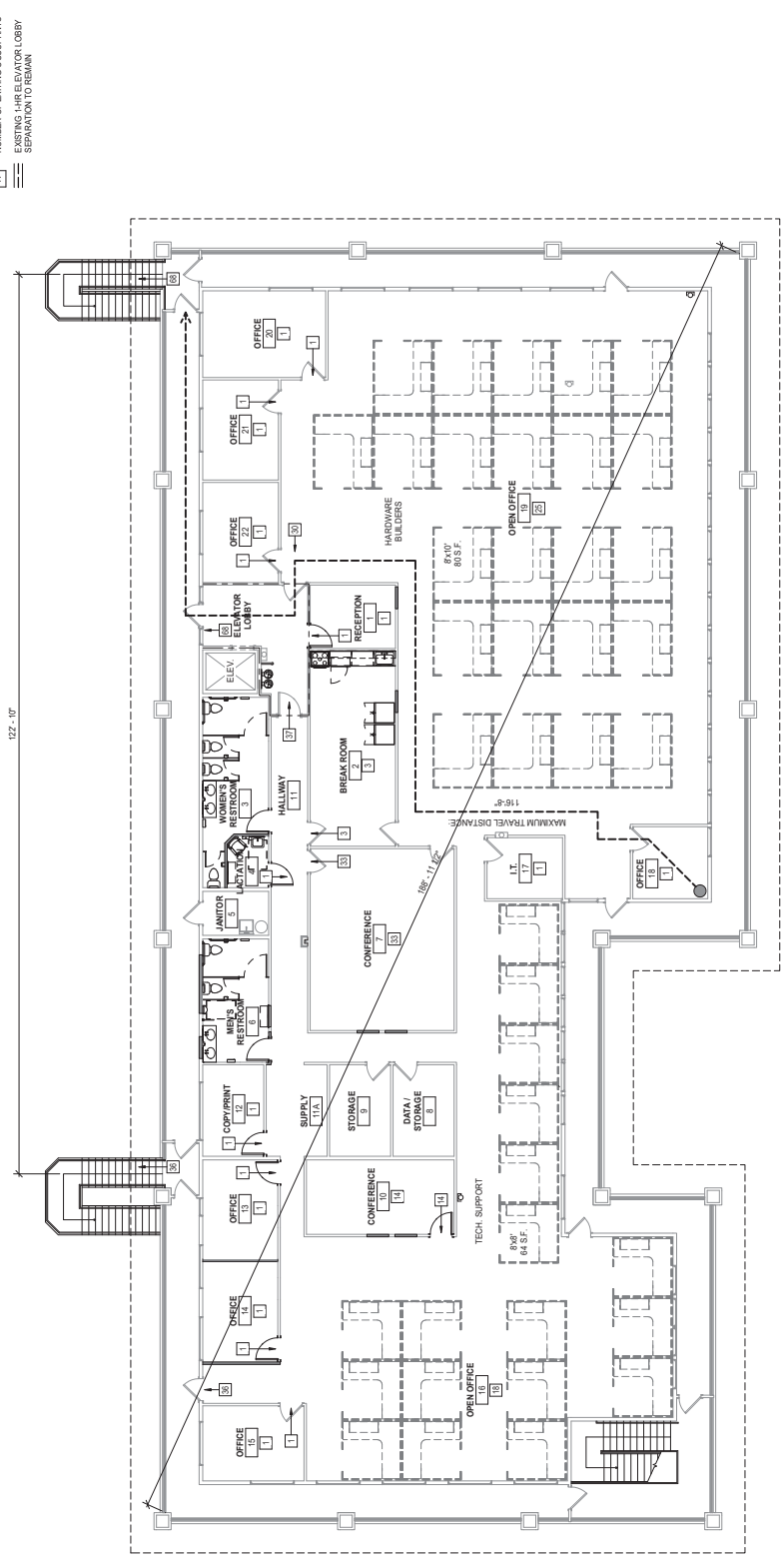
NO.	DATE	DESCRIPTION

JOB NO.	SHEET
6721A3	A002
DATE	08/29/2021

CLIPPING DOCUMENTATION: SEE CLIPPING L1, DRAWING

2450

LEGEND
 OFFICE ROOM NAME
 X NUMBER OF OCCUPANTS
 X NUMBER OF EXITING OCCUPANTS
 EXITING 1-HR ELEVATOR LOBBY
 SEPARATION TO NEUMAN



1. IMPROVEMENT EXITING FLOOR PLAN - LEVEL 2
 1/8" = 1'-0"

ROOM NO.	ROOM NAME	FUNCTION	AREA	OCC. LOAD	TOTAL EXITING
1	RECEPTION	BUSINESS	131	150	3
2	RECEPTION	BUSINESS	131	150	3
3	WOMEN'S RESTROOM	BUSINESS	131	150	3
4	WOMEN'S RESTROOM	BUSINESS	131	150	3
5	JANITOR	BUSINESS	131	150	3
6	MEN'S RESTROOM	BUSINESS	131	150	3
7	MEN'S RESTROOM	BUSINESS	131	150	3
8	DATA STORAGE	ASSISTANT	488	15	38
9	DATA STORAGE	ASSISTANT	488	15	38
10	CONFERENCE	ASSISTANT	205	15	14
11	HALLWAY	ASSISTANT	205	15	14
12	CONFERENCE	BUSINESS	96	150	1
13	OFFICE	BUSINESS	150	150	1
14	OFFICE	BUSINESS	150	150	1
15	OFFICE	BUSINESS	150	150	1
16	OFFICE	BUSINESS	150	150	1
17	OFFICE	BUSINESS	150	150	1
18	OFFICE	BUSINESS	150	150	1
19	OFFICE	BUSINESS	150	150	1
20	OFFICE	BUSINESS	150	150	1
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98	OFFICE	BUSINESS	150	150	1
99	OFFICE	BUSINESS	150	150	1
100	OFFICE	BUSINESS	150	150	1



2) TYPICAL (E) EXTERIOR STAIR SECTION





YOLO COUNTY GENERAL SERVICES
100 W. COURT STREET, WOODLAND, CA 95695
SECOND FLOOR TENANT IMPROVEMENT

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS

SHEET TITLE:
ARCHITECTURAL
DEMOLITION FLOOR PLAN

REVISIONS

NO.	DESCRIPTION	DATE

JOB NO.	SHEET
6721A3	AD201
DATE	03/29/2021

Client: Yolo County General Services, 100 W. Court Street, Woodland, CA 95695

GENERAL NOTES

- ALL NEW CONSTRUCTION SHALL BE PROTECTED DURING DEMOLITION. ANY ITEMS TO BE DEMOLISHED OR REPAIRED TO LIKE NEW CONDITION. ALL DEMOLITION WORK WITH IMPROVEMENT WORK SHALL BE COMPLETED PRIOR TO THE START OF NEW WORK.
- ALL NEW CONSTRUCTION SHALL BE PROTECTED DURING DEMOLITION. ANY ITEMS TO BE DEMOLISHED OR REPAIRED TO LIKE NEW CONDITION. ALL DEMOLITION WORK WITH IMPROVEMENT WORK SHALL BE COMPLETED PRIOR TO THE START OF NEW WORK.

LEGEND

- (E) WALL TO REMAIN
- (E) DOOR AND FRAME TO REMAIN
- DEMOLISH WALL
- DEMOLISH DOOR AND FRAME
- DEMOLISH PLUMBING FEATURE
- DEMOLISH INTERIOR WINDOW GLAZING
- (E) FIRE EXTINGUISHER AND CABINET TO REMAIN U.L.O.
- PRE-EXTINGUISHER AND BRACKET

REMOVE GYPSUM WALL BOARD FINISH MATERIAL AT ONE SIDE OF WALL

DEMOLISH DOOR AND FRAME

DEMOLISH PLUMBING FEATURE

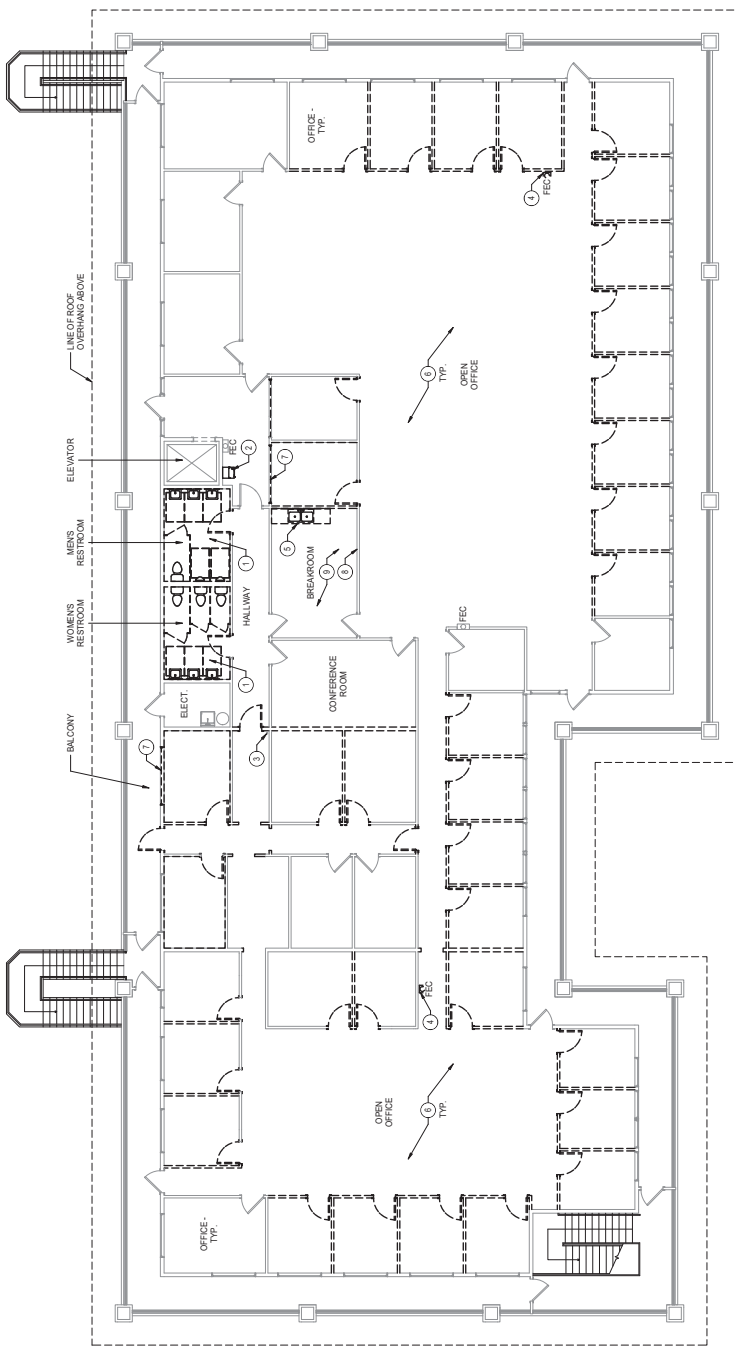
DEMOLISH INTERIOR WINDOW GLAZING

(E) FIRE EXTINGUISHER AND CABINET TO REMAIN U.L.O.

PRE-EXTINGUISHER AND BRACKET

KEYNOTES

- AT RESTROOMS REMOVE TILE FLOORING, ALL PLUMBING, EXTINGUISHERS AND INTERIOR FINISHES TO STUD. PLUMBING DRAWINGS
- REMOVE (E) WATER COOLER - SEE PLUMBING DRAWINGS
- (E) PREPARE TO REMAIN
- REMOVE (E) FIRE EXTINGUISHER BRACKET AND SALVAGE FOR RELOCATION
- REMOVE (E) BASE CABINET, EXTINGUISHER AND SALVAGE FOR WATER DRAIN STUD OUT RELOCATION
- REMOVE (E) CARPET - ENTIRE FLOOR INCLUDING ALL OFFICES AND CONFERENCE ROOMS
- REMOVE (E) WINDOW WALL BOARD - PREPARE TO MATCH ADJACENT (E) WALL
- REMOVE (E) GYPSUM WALL BOARD WHERE (N) WALL, BOX AND REFRIGERATORS - SEE PLUMBING DRAWINGS
- REMOVE CARPET AND SHEET FLOORING IN BREAKROOM

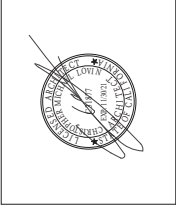


1. ARCHITECTURAL DEMOLITION FLOOR PLAN
1/8" = 1'-0"



**KITCHELL**

Capital Expenditure Managers
2450 Venture Oaks Way
Sacramento, CA 95833
(916) 846-9700



YOLO COUNTY GENERAL SERVICES

100 W. COURT STREET, WOODLAND, CA, 95695

SECOND FLOOR TENANT IMPROVEMENT

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS:

SHEET TITLE:

ARCHITECTURAL

DEMOLITION REFLECTED

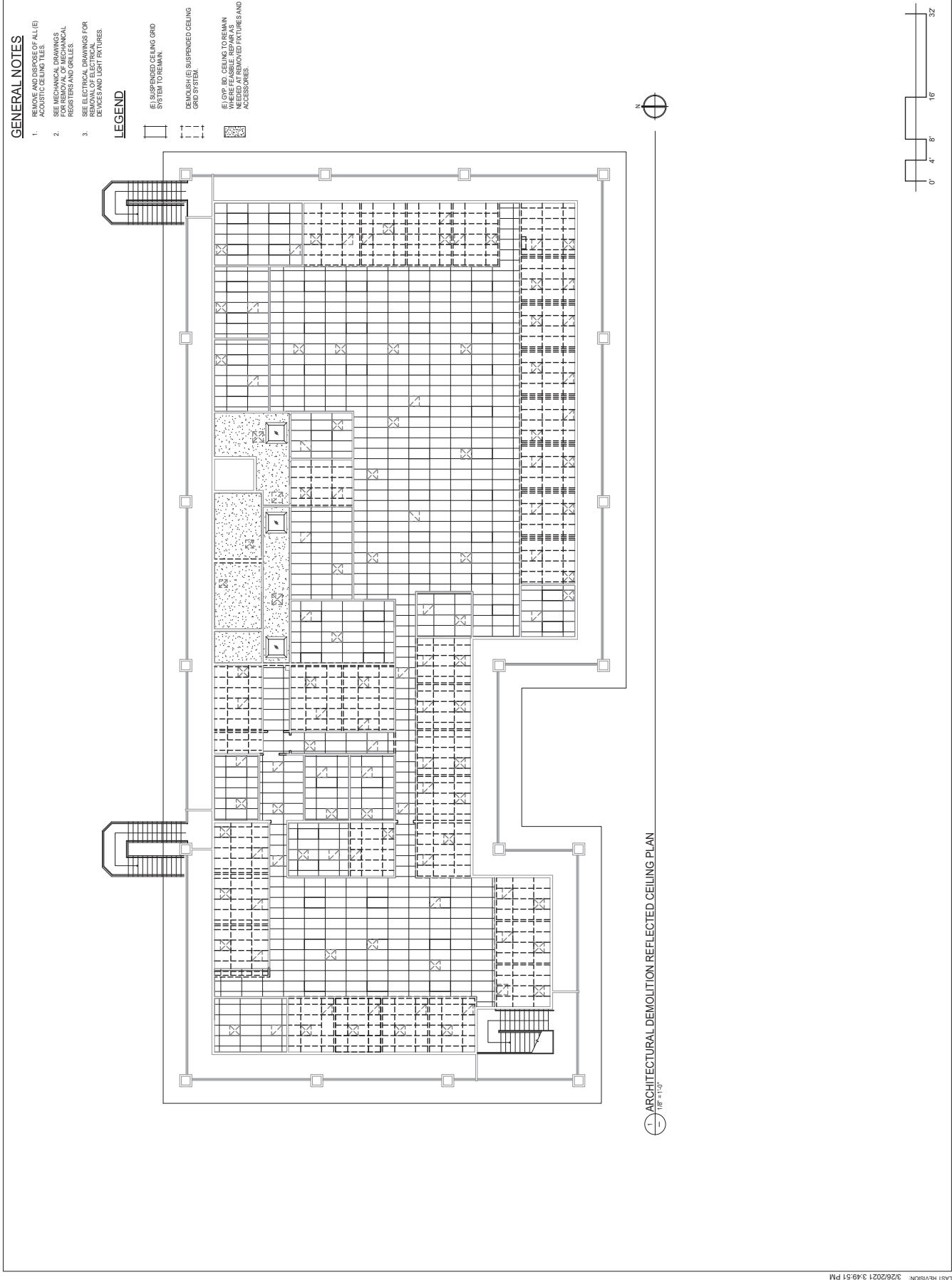
CEILING PLAN

REVISIONS	
NO.	DESCRIPTION

JOB NO.	SHEET
67213	AD221
DATE	08/29/2021

CL:\Working\67213\AD221.dwg 08/29/2021 3:49:51 PM

2450





SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS:

SHEET TITLE:
ARCHITECTURAL
IMPROVEMENT FLOOR
PLAN

REVISIONS

NO.	DATE	DESCRIPTION

JOB NO.	672133	SHEET
DATE	03/29/2021	
A202		

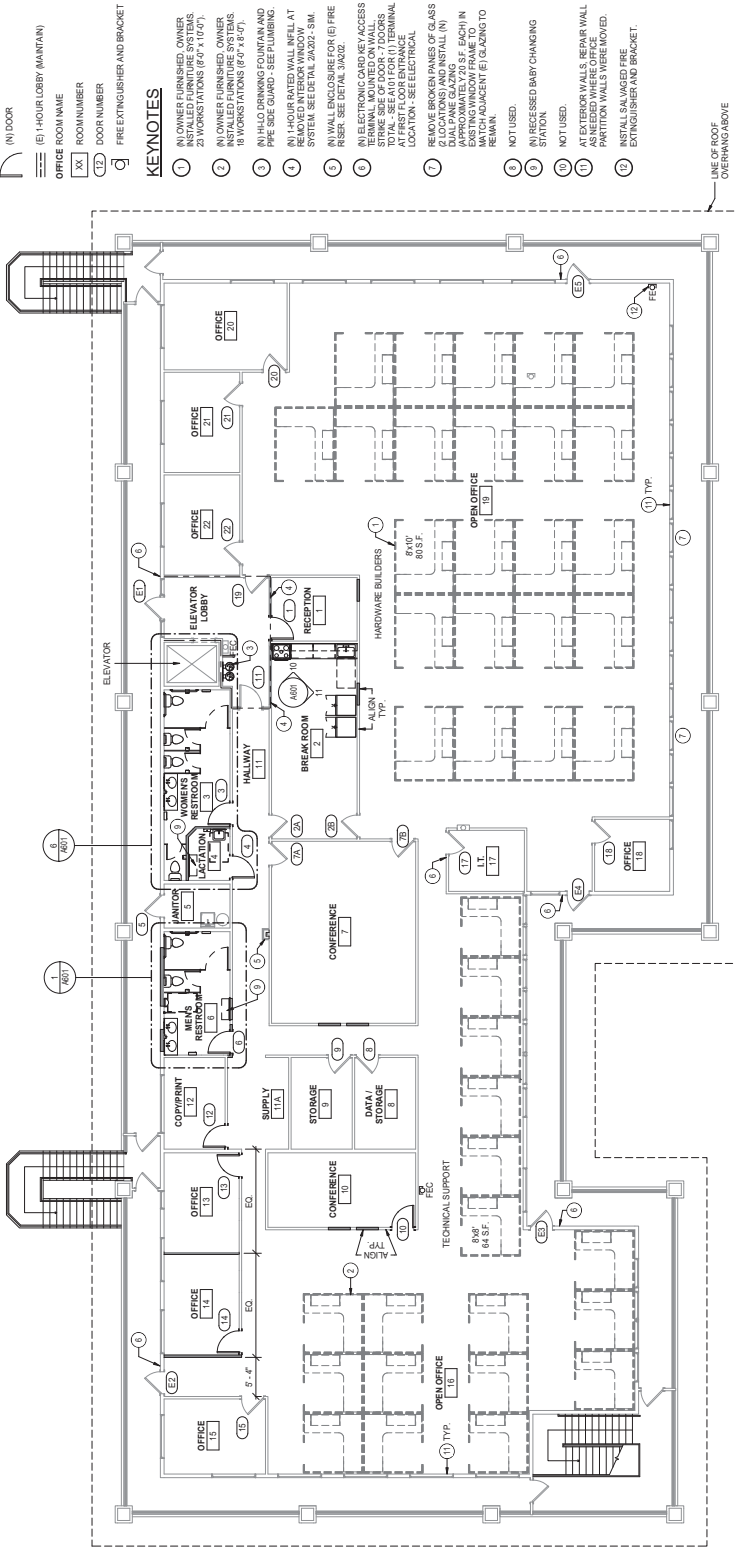
CREATED BY: MICHAEL J. KITCHELL
DATE: 03/29/2021
SCALE: AS SHOWN

LEGEND

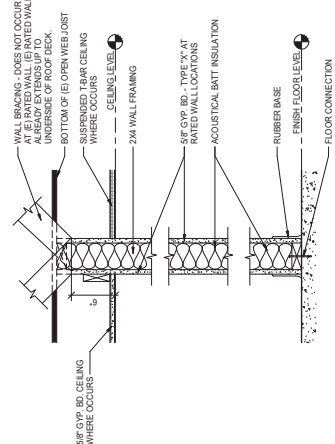
- (E) WALL TO REMAIN
- (E) DOOR TO REMAIN
- (N) WALL OR INFILL WALL
- (N) DOOR
- (E) 1-HOUR LOBBY (MANTAIN)
- OFFICE ROOM NAME
- XX ROOM NUMBER
- CE DOOR NUMBER
- FREE EXTINGUISHER AND BRACKET

KEYNOTES

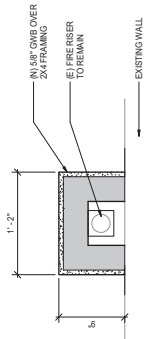
1. OWNER FURNISHED, OWNER INSTALLED FURNITURE SYSTEMS, 2 WORKSTATIONS (6'0" x 12'0").
2. OWNER FURNISHED, OWNER INSTALLED FURNITURE SYSTEMS, 14 WORKSTATIONS (6'0" x 12'0").
3. IN-HALO DRINKING FOUNTAIN AND PIPE SIZE GUARD - SEE PLUMBING.
4. IN 1-HOUR RATED WALL INFILL AT REMOVED INTERIOR WINDOW SYSTEM. SEE DETAIL 2A02 - SIM. ANSK. SEE DETAIL 3A02.
5. IN-WALL ENCLOSURE FOR (E) FIRE ALARM. SEE DETAIL 3A02.
6. IN-ELECTRONIC CARD KEY ACCESS SYSTEM. SEE DETAIL 3A02 - SIM. STRIKE SIDE OF DOOR - 7 DOORS AT FIRST FLOOR ENTRANCE LOCATION - SEE ELECTRICAL.
7. REMOVE BROKEN PANE OF GLASS (2 LOCATIONS) AND INSTALL (N) GLASS (APPROXIMATELY 20 S.F. EACH) IN APPROXIMATELY 20 S.F. EACH IN MATCH ADJACENT (E) GLAZING TO REMAIN.
8. NOT USED.
9. IN RECESSED BARRY CHANGING STATION.
10. NOT USED.
11. EXISTING WALLS, REPAIR WALL PARTITION WALLS WHERE MOVED.
12. INSTALL SALVAGED FIRE EXTINGUISHER AND BRACKET.



1. ARCHITECTURAL IMPROVEMENT FLOOR PLAN
1/8" = 1'-0"

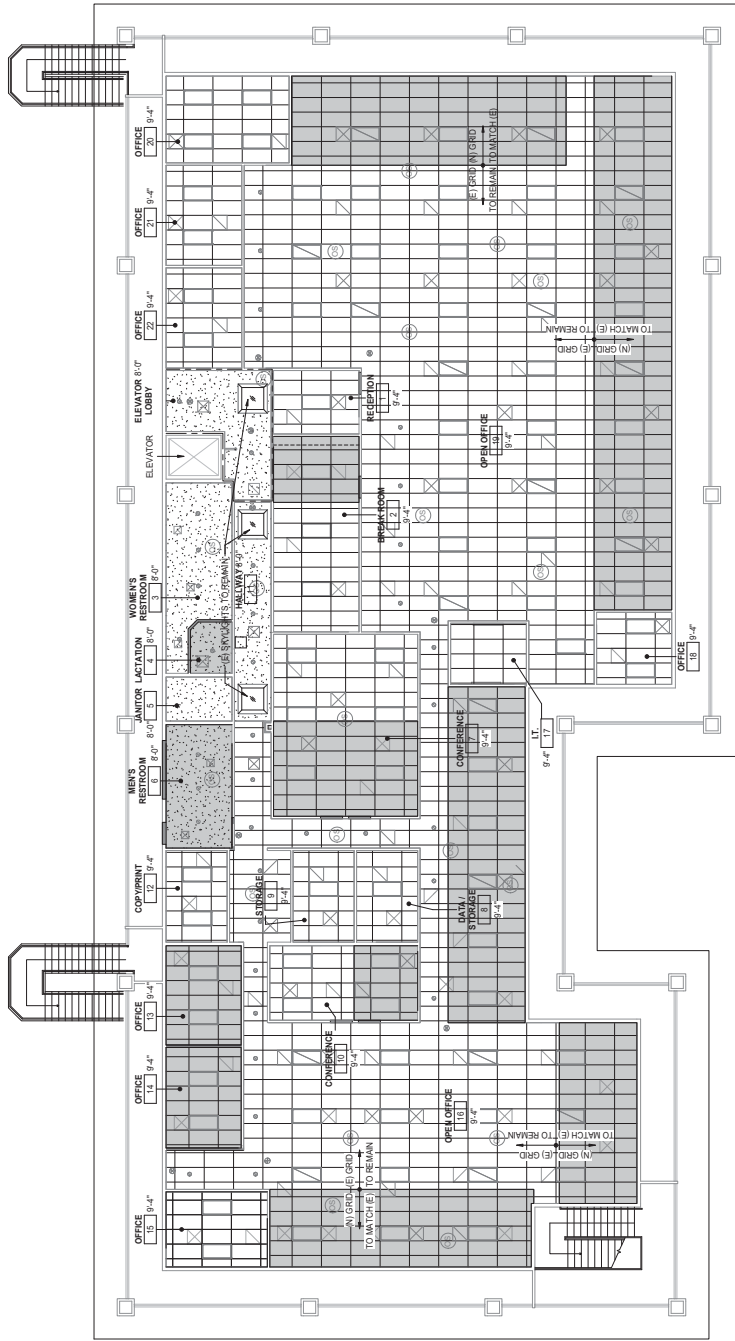


2. INTERIOR WALL 2X FRAMING
1/8" = 1'-0"

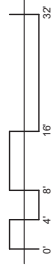


3. ENLARGED FIRE RISER ENCLOSURE DETAIL
1/8" = 1'-0"

	LOCKING LEVER THROUGHOUT CEILING FRAMES TO BE STRUCTURED ABOVE SEE SHEET AND FOR CEILING INSTALLATION NOTES.
	(N)WP, B, CEILING OVER E12, CEILING FRAMING TO MATCH CEILING FRAMING TO OVER WHERE NEEDED AT LOCATION POOR. PROVIDED IN TEXTURE AND FLOOR.
	CEILING SUPPLY VENTILATOR, SEE MECHANICAL PLANS.
	(E) AIR RETURN REGISTER, SEE MECHANICAL PLANS.
	(N) LIGHT FIXTURE SEE ELECTRICAL (N) 2'0" x 4'0" LIGHT FIXTURE SEE ELECTRICAL.
	1-HOUR LOBBY (MANTAIN)
	LOCATION OF (N) SUSPENDED CEILING GRID, TIE INTO ADJACENT (E) CEILING TIE INTO ADJACENT (E) OCCUPANCY SENSOR.
	



1 ARCHITECTURAL IMPROVEMENT REFLECTED CEILING PLAN



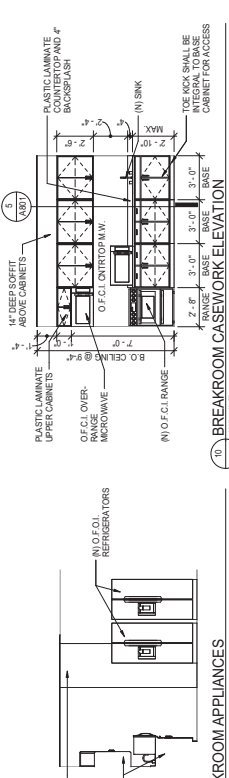
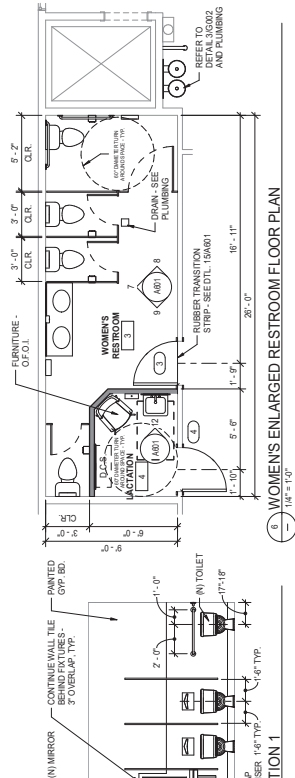
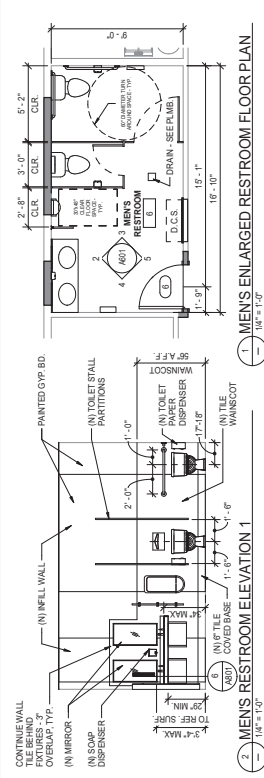


SECON FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS
SHEET TITLE:
INTERIOR ELEVATIONS

NO.	DESCRIPTION	DATE

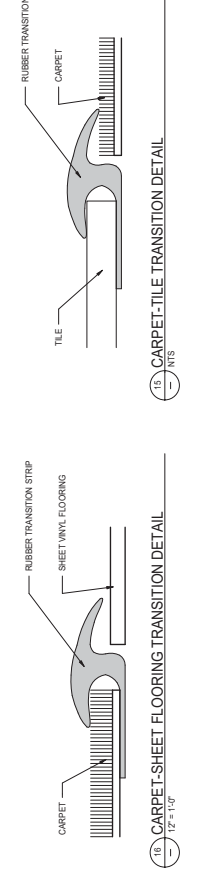
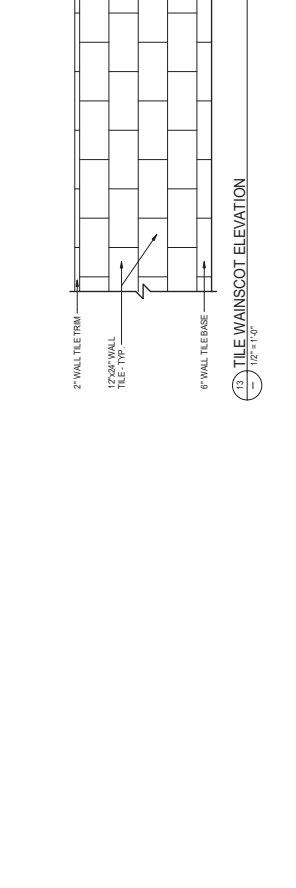
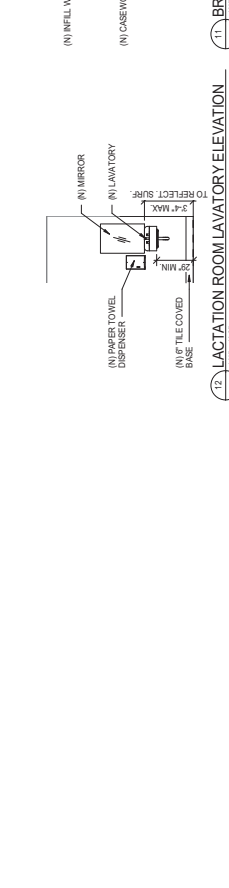
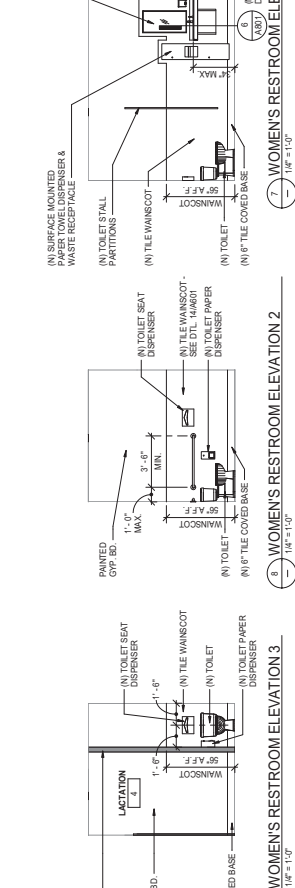
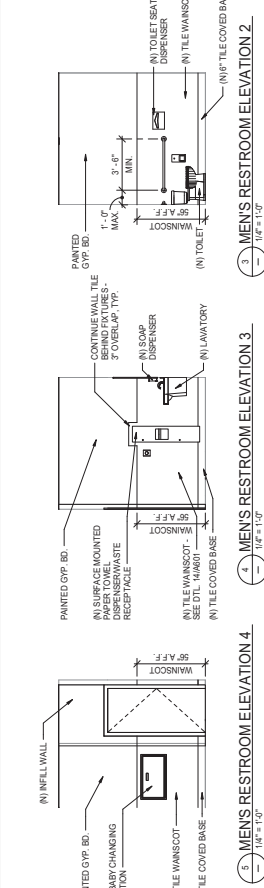
JOB NO. SHEET
6721A3
DATE
09/29/2021
A601
C:\Users\jgarcia\Documents\100 W. Court Street 11.2.dwg
JGarcia.dwg



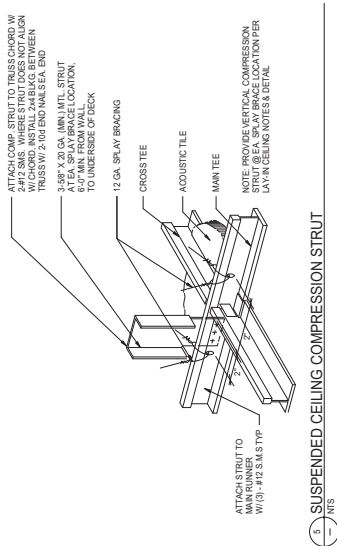
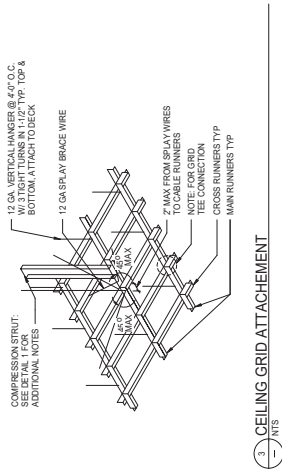
Room Number	Room Name	Floor Finish	Wall Finish	Ceiling Finish	Ceiling Ht.	Comments
1	RESTROOM	C-1	WS-1	AC-1	9'-4"	
2	RESTROOM	C-1	WS-1	AC-1	9'-4"	
3	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
4	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
5	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
6	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
7	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
8	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
9	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
10	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
11	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
12	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
13	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
14	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
15	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
16	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
17	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
18	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
19	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
20	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
21	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
22	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
23	WOMEN'S	C-1	WS-1	AC-1	9'-4"	

Room Number	Room Name	Floor Finish	Wall Finish	Ceiling Finish	Ceiling Ht.	Comments
1	RESTROOM	C-1	WS-1	AC-1	9'-4"	
2	RESTROOM	C-1	WS-1	AC-1	9'-4"	
3	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
4	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
5	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
6	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
7	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
8	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
9	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
10	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
11	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
12	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
13	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
14	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
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16	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
17	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
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19	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
20	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
21	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
22	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
23	WOMEN'S	C-1	WS-1	AC-1	9'-4"	

Room Number	Room Name	Floor Finish	Wall Finish	Ceiling Finish	Ceiling Ht.	Comments
1	RESTROOM	C-1	WS-1	AC-1	9'-4"	
2	RESTROOM	C-1	WS-1	AC-1	9'-4"	
3	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
4	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
5	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
6	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
7	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
8	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
9	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
10	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
11	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
12	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
13	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
14	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
15	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
16	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
17	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
18	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
19	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
20	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
21	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
22	WOMEN'S	C-1	WS-1	AC-1	9'-4"	
23	WOMEN'S	C-1	WS-1	AC-1	9'-4"	



12. FOR SEISMIC BRACING OF CEILING SYSTEM SEE DETAILS 3/A810 AND 5/A800.





YOLO COUNTY GENERAL SERVICES
100 W. COURT STREET, WOODLAND, CA 95695

PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS:

SHEET TITLE:
MECHANICAL
DEMOLITION PLAN -
WEST WING

REVISIONS	
NO.	DESCRIPTION

JOB NO.	6721A3	SHEET	MD202
DATE	03/29/2021		

CREATED BY: JACOBSON/CH/2021/03/29/MD202
DATE: 03/29/2021
BY: JACOBSON/CH/2021/03/29/MD202

GENERAL DEMO NOTES

1. ALL DIMENSIONS ARE APPROXIMATE. THE DRAWINGS ARE PARAMETER TO THE EXTENT THAT ALL FITTINGS, OFFSETS, ETC. MAY NOT BE SHOWN. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD FOR FABRICATION OF MECHANICAL COMPONENTS INTO COMPLETE AND OPERABLE SYSTEM.
2. ALL E-EQUIPMENT SHOWN ON THIS DRAWING TO BE DEMOLISHED SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF BY THE CONTRACTOR.
3. CONTRACTOR SHALL VERIFY ALL E-EQUIPMENT WITH THE COUNTY. THE CONTRACTOR SHALL NOTIFY THE COUNTY IN ADVANCE OF ANY NECESSARY DISTURBANCE TO THE OCCUPANTS ON THE FIRST FLOOR. IF POSSIBLE, SCHEDULE WORK TO BE DONE WHEN FIRST FLOOR TENANTS ARE NOT OCCUPYING THE BUILDING.
4. CONTRACTOR SHALL FIELD VERIFY ALL E-EQUIPMENT INCLUDING DUCT SIZES & ROUTING AND FITTING. CONTRACTOR SHALL NOTIFY THE COUNTY IMMEDIATELY WHERE DOCUMENTS VARY FROM FIELD CONDITIONS.
5. ALL EXISTING EQUIPMENT, DUCT, ACCESSORIES, FITTINGS, ETC. SHALL REMAIN UNLESS OTHERWISE NOTED. THESE ITEMS MUST BE PROTECTED IF ANY WORK WILL BE DONE IN THE AREA OF THESE ITEMS. CONTRACTOR SHALL NOTIFY THE COUNTY IMMEDIATELY WHERE CONSTRUCTION, NOTIFY THE ENGINEER OF RECORD IMMEDIATELY FOR DIRECTION.

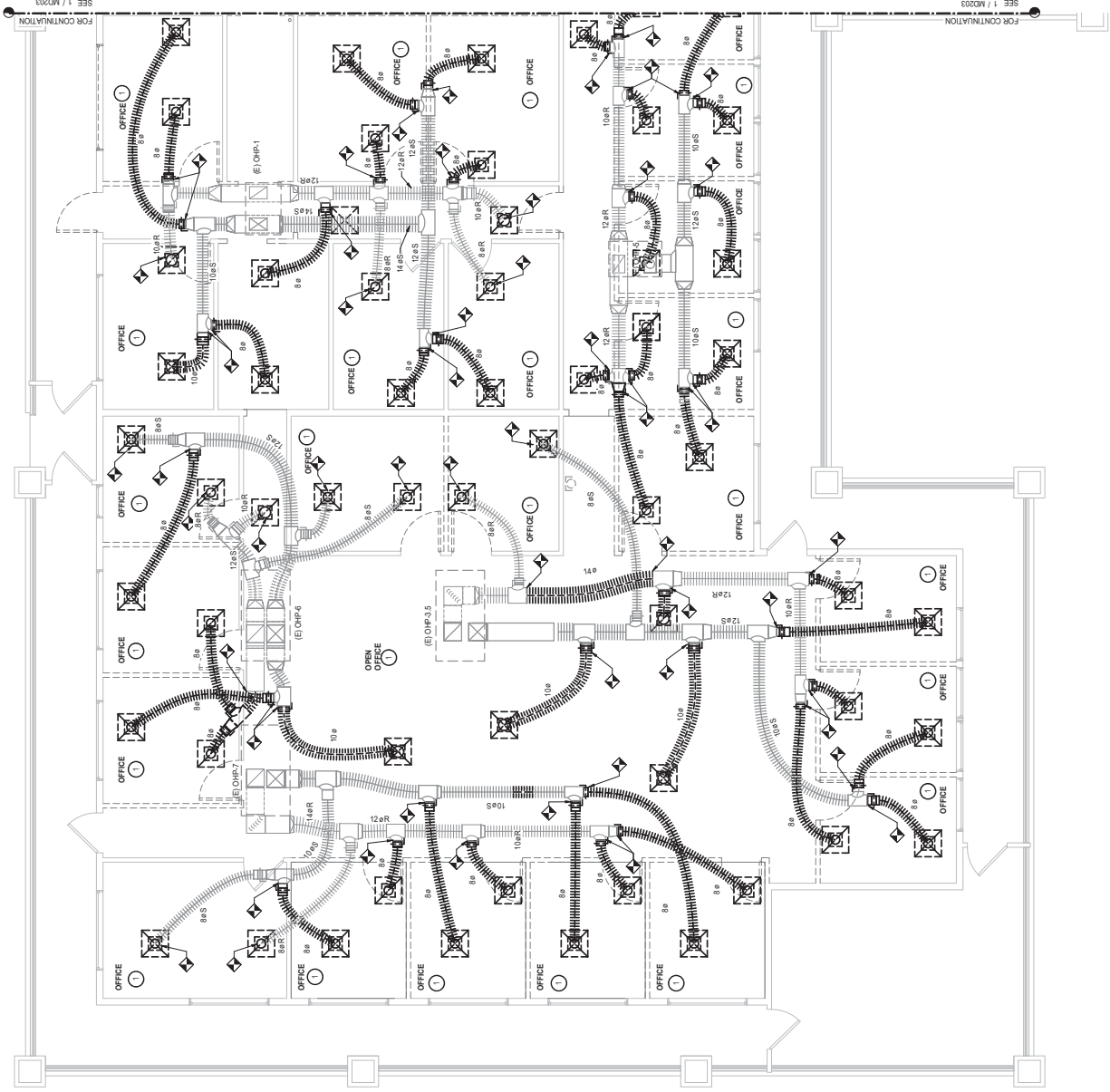
DEMO KEYNOTES

- 1. DEMO KEYNOTES: DEMOLISH ALL E-EQUIPMENT (E-EQUIPMENT) IN THIS SPACE. WHERE RELOCATED ON THIS SHEET, DEMOLISH BACK TO THE MAIN DUCT AND CAP ANY OPENINGS NOT INTENDED TO BE REUSED.

KEY PLAN



1. MECHANICAL DEMOLITION PLAN - WEST WING
1/8" = 1'-0"





SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS:

SHEET TITLE:
MECHANICAL
DEMOLITION PLAN - EAST
WING

REVISIONS	
NO.	DESCRIPTION

JOB NO.	SHEET
672143	MD203
DATE	
03/29/2021	

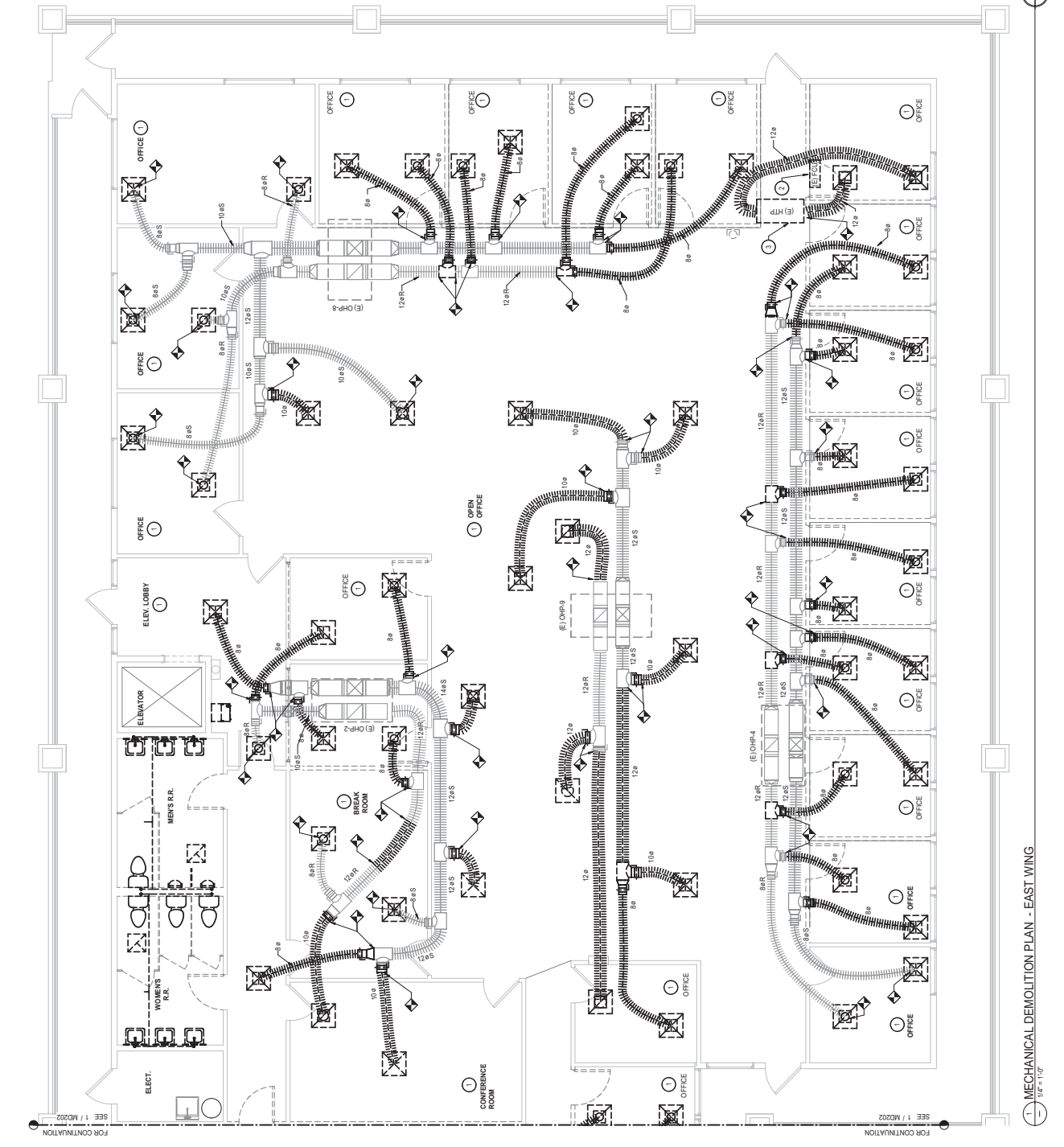
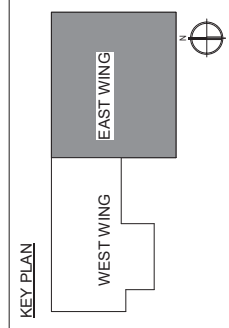
CLIENT: YOLO COUNTY GENERAL SERVICES
DESIGN: KITCHELL
DATE: 03/29/2021
SHEET: MD203

GENERAL DEMO NOTES

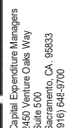
- ALL DIMENSIONS ARE APPROXIMATE. ALL DIMENSIONS ARE BASED ON THE CONTRACTOR'S FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD FOR ALL DEMOLITION WORK. ALL DIMENSIONS SHALL BE SHOWN TO THE EXTERIOR OF THE BUILDING. ALL DIMENSIONS SHALL BE SHOWN TO THE EXTERIOR OF THE BUILDING. ALL DIMENSIONS SHALL BE SHOWN TO THE EXTERIOR OF THE BUILDING.
- ALL EXISTING EQUIPMENT, DUCT, ACCESSORIES, FITTINGS, ETC. SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF BY THE CONTRACTOR.
- COORDINATE ALL SHUTDOWNS AND EQUIPMENT OPERATION WITH THE OCCUPANT. ALL SHUTDOWNS AND EQUIPMENT OPERATION SHALL BE SCHEDULED FOR THE FIRST FLOOR. IF POSSIBLE, SCHEDULE WORK TO BE DONE WHEN FIRST FLOOR TENANTS ARE NOT OCCUPYING THE BUILDING.
- CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AGENCIES.
- ALL EXISTING EQUIPMENT, DUCT, ACCESSORIES, FITTINGS, ETC. SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF BY THE CONTRACTOR. IF ANY WORK WILL BE DONE IN THE VICINITY TO ENSURE THEY ARE NOT DAMAGED. IF SUCH ITEMS ARE DAMAGED DURING DEMOLITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING THEM AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING THEM AT THE CONTRACTOR'S EXPENSE.

DEMO KEYNOTES

- REMOVE ALL EXISTING MECHANICAL EQUIPMENT, DUCT, ACCESSORIES, FITTINGS, ETC. WHERE INDICATED ON THIS SHEET. DEMOLISH BACK TO THE MAIN DUCT AND CAP ANY OPENINGS NOT INTENDED TO BE RE-USED.
- (E) WALL MOUNTED FAN COIL TO BE REMOVED AND SALVAGED FOR RE-USE. REINSTALL IN (N) IT ROOM. SEE MECHANICAL IMPROVEMENT PLAN FOR LOCATION.
- REMOVE ALL EXISTING MECHANICAL EQUIPMENT, DUCT, ACCESSORIES, FITTINGS, ETC. WHERE INDICATED ON THIS SHEET. DEMOLISH BACK TO THE MAIN DUCT AND CAP ANY OPENINGS NOT INTENDED TO BE RE-USED.



MECHANICAL DEMOLITION PLAN - EAST WING
1/8" = 1'-0"



YOLO COUNTY GENERAL SERVICES

BUILDINGS:

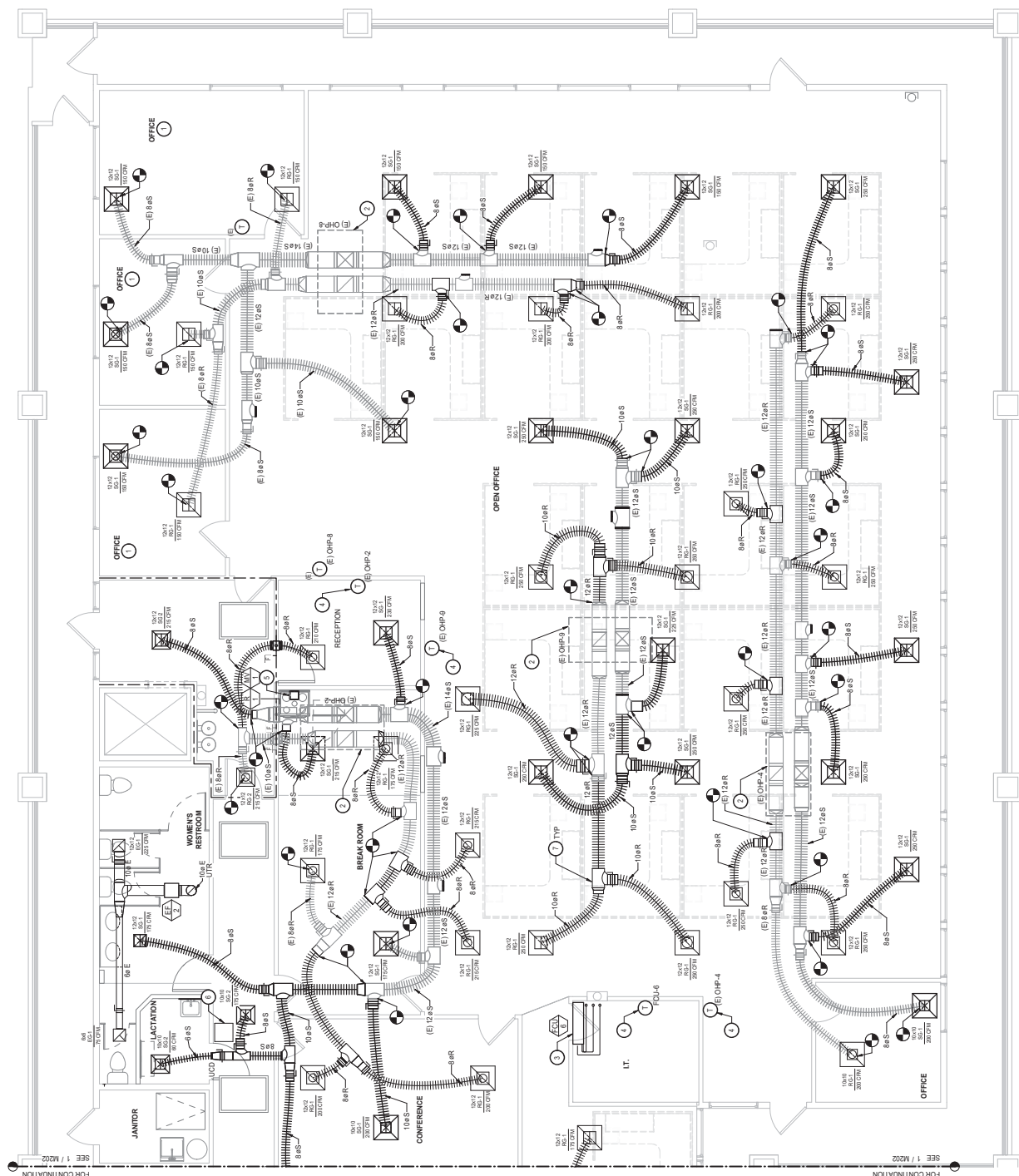
REVISIONS

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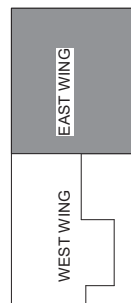
DATE	6721A3	SHEET

M203

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KEY PLAN



1 MECHANICAL IMPROVEMENT PLAN - EAST WING



SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS:

SHEET TITLE:

MECHANICAL
SCHEDULES

REVISIONS

NO.	DESCRIPTION

JOB NO.	SHEET
6721A3	M701
DATE:	03/29/2021

Client: Yolo County General Services | Job: 6721A3 | Sheet: M701 | Date: 03/29/2021

EXISTING SPLIT SYSTEM SCHEDULE (OUTDOOR UNIT)

UNIT TAG		MANUFACTURER	YEAR	EXISTING SPLIT SYSTEM SCHEDULE (OUTDOOR UNIT)														
				SERIAL NO.	MODEL NO.	LOCATION	TONNAGE	FLOOR SERVED	TOTAL TONNAGE (LBS)	EER	AIR FLOW (CFM)	INDOOR FAN (IN)	FAN MOTOR (MBH)	DX COOLING TONNAGE (LBS)	VOLTS	PHASE	MCA	MOCP
CU-HP-1	CARRIER	2016	391HE13474	21CZPA000-A	ROOF	5	1ST FLOOR	-	-	-	-	-	60	-	208V	21	30	R410A
CU-HP-2	CARRIER	2002	4402E13753	38YCO000000	ROOF	5	1ST FLOOR	-	-	-	-	-	60	-	208V	23	35	R22
CU-HP-3	CARRIER	2003	1303E30016	38YCO000000	ROOF	3	1ST FLOOR	-	-	-	-	-	36	-	208V	20	20	R22
CU-HP-4	CARRIER	2003	403E00029	38YCO04000	ROOF	4	1ST FLOOR	-	-	-	-	-	48	-	208V	17.5	25	R22
CU-HP-5	CARRIER	2017	2017E03698	214DM4000B	ROOF	3	1ST FLOOR	-	-	-	-	-	36	-	208V	20	30	R410A
CU-HP-6	CARRIER	2019	2019E28161	214DM4000A	ROOF	5	1ST FLOOR	-	-	-	-	-	60	-	208V	21.5	30	R410A
CU-HP-7	CARRIER	2004	604E200024	38YCO000000	ROOF	2.5	1ST FLOOR	-	-	-	-	-	30	-	208V	20	20	R22
CU-HP-8	CARRIER	2003	1303E30016	38YCO000000	ROOF	3	1ST FLOOR	-	-	-	-	-	36	-	208V	15.5	20	R22
CU-8	FLUITSU	2017	FRN0231942	A012400L8	ROOF	2	2ND FLOOR	1.T. ROOM	-	-	-	-	24	-	208V	17.1	20	R410A

EXISTING PACKAGED ROOFTOP HEAT PUMP SYSTEMS SCHEDULE

EXISTING PACKAGED ROOFTOP HEAT PUMP SYSTEMS SCHEDULE																					
UNIT TAG	MANUFACTURER	YEAR	SERIAL NO.	MODEL	NOMINAL TONNAGE	ORIENTATION	LOCATION	FLOOR SERVED	AIR DISTRIBUTION (WING)	TOTAL WEIGHT (LBS)	INDOOR FAN			DX COOLING		ELECTRICAL		REFRIGERANT	NOTES		
											EER	AIR FLOW (CFM)	OSHA (IN)	FAN MOTOR (HP)	ESP (IN)	VOLTS / PHASE	MCA			MOCP	
OHP-1	CARRIER	2005	2505G41291	50JL-036-501	3	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	WEST WING	-	-	1,050	210	0.5	-	36	208/3	50	60	R22	1
OHP-2	CARRIER	2005	2505G40431	50HJ0006-521	5	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	EAST WING	-	-	1,400	280	0.5	-	60	208/3	50	50	R22	1
OHP-3.5	YORK	1994	NHC1073594	B3C1048A25B	4	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	WEST WING	-	-	1,400	280	0.5	0.75	48	208/3	40	40	R22	1
OHP-4	CARRIER	2002	3702C00468	50TQ0006A11	5	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	EAST WING	-	-	1,400	280	0.5	-	60	208/3	-	-	R22	1
OHP-5	CARRIER	2005	2605G11690	50JL-030-301	2.5	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	WEST WING	-	-	900	180	0.5	-	30	208/1	90	100	R22	1
OHP-6	YORK	1994	NHC1048A25B	B3C1048A25B	4	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	WEST WING	-	-	1,750	350	0.5	0.75	48	208/3	40	40	R22	1
OHP-7	YORK	1994	NHC1073623	B3C1048A25B	4	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	WEST WING	-	-	1,225	245	0.5	0.75	48	208/3	40	40	R22	1
OHP-8	CARRIER	2005	2505G41287	50JL-36-501	3	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	EAST WING	-	-	1,750	350	0.5	-	36	208/3	-	-	R22	1
OHP-9	BRYANT	2005	3005G1243	501AP042000AAG	3.5	VERT. SUPPLY / RETURN	ROOF	2nd FLOOR	EAST WING	-	-	1,050	210	0.5	-	42	208/3	32.5	35	R22	1

NOTES

1 REBALANCE THE OUTSIDE AIR AMOUNTS TO THE AIRFLOW SHOWN IN THE OSA COLUMN OF SCHEDULE.

SYMBOL	TYPE	FACE	REGISTER	REGISTER AND GRILLE SCHEDULE	FRAME	DAMPER	FINISH	MODEL NO.	MANUFACTURER
SC-1	CEILING DIFFUSER	CEILING	DIFFUSER	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE
SC-2	CEILING RETURN GRILLE	CEILING	RETURN GRILLE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE
RG-1	CEILING RETURN GRILLE	CEILING	RETURN GRILLE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE	MODULAR CORE
EG-1	EXHAUST GRILLE	EXHAUST	GRILLE	EGGGRATE	EGGGRATE	EGGGRATE	EGGGRATE	EGGGRATE	EGGGRATE

EXHAUST FAN SCHEDULE

UNIT	LOCATION	MANUFACTURER	MODEL NO. (OR APPROVED EQUAL)	CFM	E.S.P. IN.W.G.	BHP	MOTOR RPM	VOLT-PH. GHZ	APPROX. OPER. WEIGHT (LBS)	REMARKS
EF-1	2nd FLOOR MEN'S ROOM	GREENHECK	CSP-A30A-VG	200	0.38	1.25	1099	115/1	24	1.2,3
EF-2	2nd FLOOR WOMEN'S ROOM	GREENHECK	CSP-A30A-VG	300	0.38	1.25	1099	115/1	24	1.2,3

NOTES

1. PROVIDE FACTORY MOUNTED DISCONNECT.
2. PROVIDE BACDRAFT DAMPER.
3. INTERLOCK EXHAUST FAN WITH LIGHT SWITCH SERVING THE SPACE.

MECHANICAL EQUIPMENT SCHEDULE

MECHANICAL EQUIPMENT SCHEDULE								
SYMBOL	DESCRIPTION	MANUFACTURER	MODEL	LOCATION	VOLTS	ELECTRICAL BREAKER KW	WEIGHT (LBS)	NOTES
B-1	30" FREE-STANDING ELECTRIC DOUBLE OVEN	GE	JBSK6SPS	BREAKROOM	208V	40A	11.7	204
BV-1	OVER-THE-RANGE MICROWAVE	BOSCH	HMV5053U	BREAKROOM	120V	15A	1.1	63
								1, 2

NOTES

1. MICROWAVE TO MEET UL 6031 (2013) STANDARD. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
2. MAINTAIN 30" MINIMUM CLEARANCE ABOVE RANGE TO BOTTOM OF MICROWAVE.



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100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

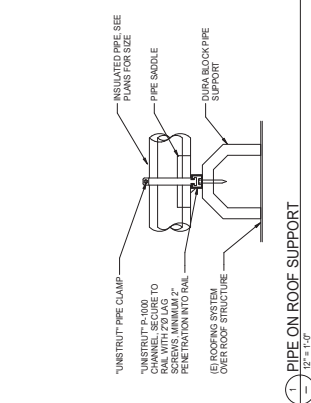
PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS

SHEET TITLE:
MECHANICAL DETAILS

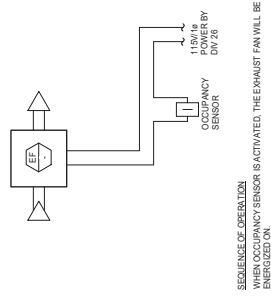
NO.	REVISIONS

JOB NO.	6721A3
DATE	03/29/2021
SHEET	M702

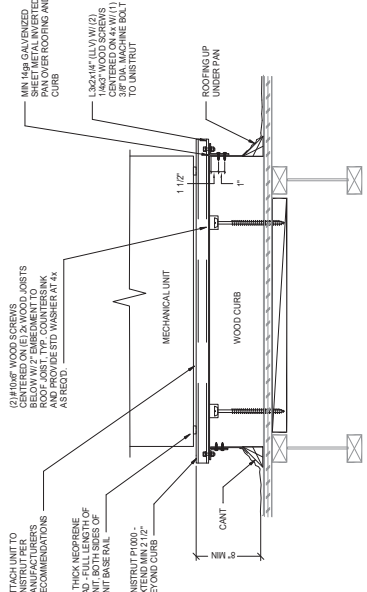
UNLESS OTHERWISE NOTED, SEE: Page No. 11, 204
Bates, Incorporated



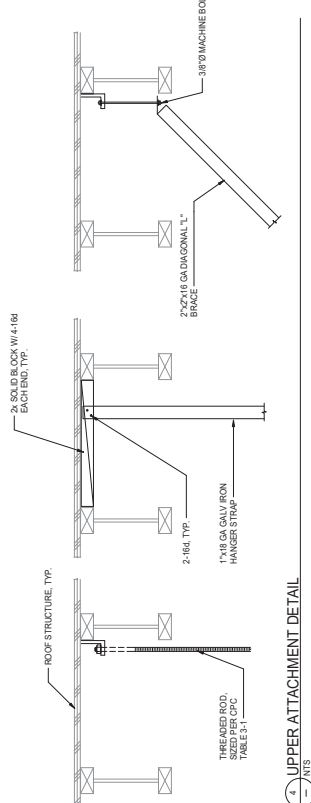
1. PIPE ON ROOF SUPPORT
1/2" x 1/4"



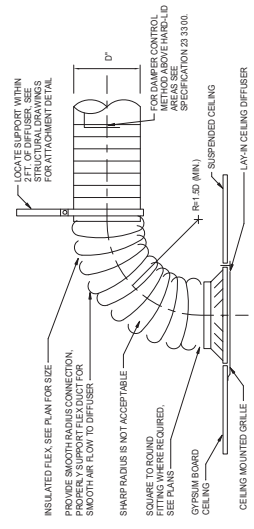
2. (N) EF CONTROL DIAGRAM
NTS



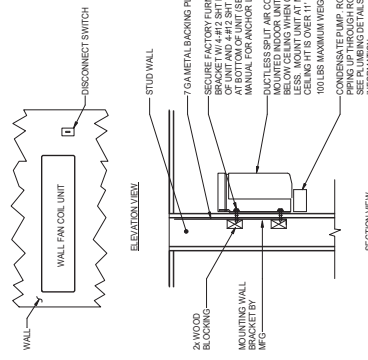
3. CONDENSING UNIT MOUNTING ON ROOF DETAIL
1 1/2" x 1/4"



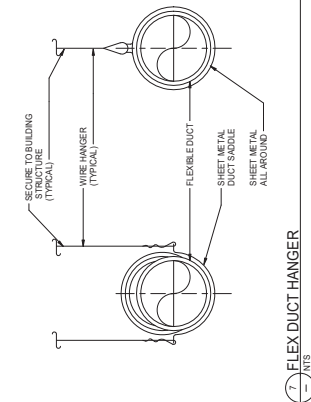
4. UPPER ATTACHMENT DETAIL
NTS



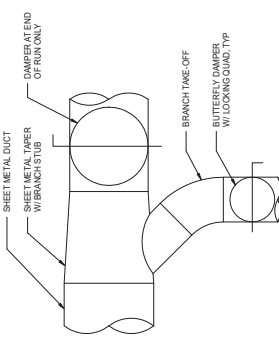
5. DIFFUSER / REGISTER MOUNTING
NTS



6. RELOCATED WALL MOUNTED FAN COIL UNIT
NTS

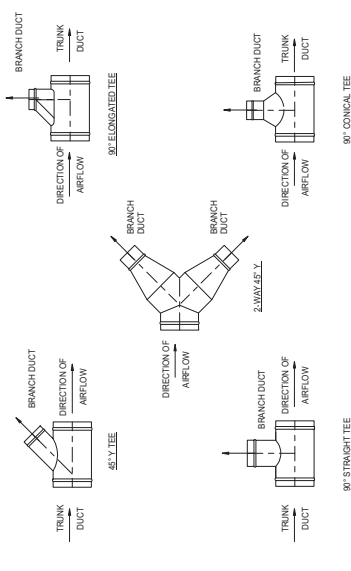


7. FLEX DUCT HANGER
NTS



8. DUCT BRANCH DAMPER
NTS

NOTES:
1. WHERE DAMPER IS ACCESSIBLE, PROVIDE YOUNG REGULATOR MODEL 270-301 CABLE KIT WITH EITHER 3/8x-CC (RECTANGULAR) OR 600-CC (ROUND) DAMPER. DAMPER MUST BE LOCATED DOWNSTREAM AT ALL SINGLE RUNOUTS.
2. 1\"/>

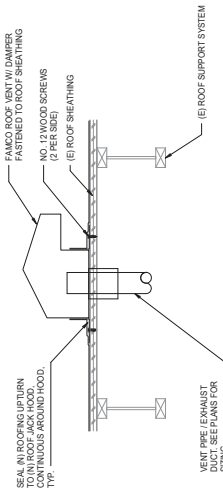


9. ROUND DUCT BRANCH TAKEOFF
NTS

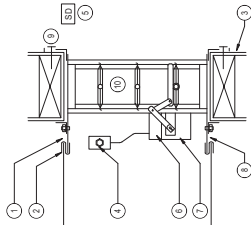
NOTE:
BRAND PIPING, CRANK TURNING, AND POWER CONNECTIONS SHALL BE REQUIRED IN STUD WALL SPACE INTO UNIT. NO EXPOSED PIPING, TUBING OR WIRING ON WALL INFORMATION.

[illegible]

JOB NO.	6721A3	M703
DATE	03/29/2021	
SHEET		



1 EXHAUST / VENT PIPE THROUGH ROOF
- 1" = 1'-0"



- [illegible]

2 FIRE SMOKE DAMPER WALL INSTALLATION

3 DRAWING SUBMITTAL NOTES

- THESE DRAWINGS HAVE BEEN DEVELOPED SOLELY FOR THE PURPOSES OF OBTAINING PRELIMINARY SYSTEM DESIGNER APPROVAL BY THE AUTHORITY-HAVING JURISDICTION (AHJ) AND FOR QUALIFIED CONTRACTOR BIDDING. THE DRAWINGS CONTAIN THE NECESSARY, APPROPRIATE AND SUFFICIENT INFORMATION TO OBTAIN A PERFORMANCE INTENT TO THE AHJ AND QUALIFIED BIDDING CONTRACTORS FOR THESE PURPOSES.
- THESE DRAWINGS ARE DIAGRAMMATIC IN THAT THE EXACT DEVICE AND PIPING LOCATIONS AND ROUTING, HANGERS, SUPPORTS, AND CONSTRUCTION DETAILS SHALL BE DEVELOPED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INVESTIGATING THE BUILDING FOR THE PURPOSES OF CONFIRMING EXISTING CONDITIONS AND IDENTIFYING ANY DISCREPANCIES TO THE OWNER'S REPRESENTATIVE.
- THE CONTRACTOR SHALL DEVELOP SHOP DRAWINGS AND CALCULATIONS IN ACCORDANCE WITH THE SUBMITTAL TO, AND APPROVAL BY, THE AHJ. INSTALLATION SHALL NOT BEGIN UNTIL AHJ APPROVAL OF THE SHOP DRAWINGS IS OBTAINED.

2 GENERAL NOTES

- IN GENERAL, WORK SHALL INCLUDE, BUT NOT BE LIMITED TO:
 - THE REMOVAL OF EXISTING SPRINKLER SYSTEMS, INCLUDING, BUT NOT LIMITED TO, THE REMOVAL OF THE COMPLETE FIRE PROTECTION SYSTEM, INCLUDING, BUT NOT LIMITED TO, DEMOLITION AND DISPOSAL OF INDICATED EXISTING FIRE SPRINKLER PIPING.
 - SYSTEMS AND DEVICE TESTING.
 - ALL NECESSARY PERMITS AND FEES.
- THE FIRE SPRINKLER SYSTEM PROTECTING THE PROJECT AREAS SHALL BE FOR GENERAL LIGHT HAZARD OCCUPANCIES (EXCEPTION: MECHANICAL STORAGE, AND STORAGE OF FLAMMABLE LIQUIDS OR GASES).
- PIPE SIZES WHERE INDICATED ON THE DRAWINGS SHALL NOT BE REDUCED.
- THE CONTRACT DRAWINGS ARE DIAGRAMMATIC ONLY. PIPE LENGTHS SHOWN ARE APPROXIMATE CENTER-TO-CENTER LENGTHS BETWEEN FITTINGS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND MAKE NECESSARY ADJUSTMENTS TO COMPLETE THE INSTALLATION AT NO CHANGE IN THE CONTRACT PRICE. THE DRAWINGS ARE NOT INTENDED TO RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF OBTAINING ALL NECESSARY PERMITS AND APPROVALS FOR INSTALLING THE NUMBER OF SPRINKLERS AND SUPPLY PIPING AS REQUIRED TO MEET THE REQUIREMENTS OF THE REFERENCED STANDARDS AND THESE SPECIFICATIONS. WRITTEN APPROVAL SHALL BE OBTAINED FROM THE OWNER'S REPRESENTATIVE PRIOR TO MAKING ANY CHANGES OR DEVIATIONS FROM THE ARRANGEMENT AND LAYOUT SHOWN ON THE DRAWINGS.
- ALL EQUIPMENT SHALL BE NEW, AND LISTED BY UNDERWRITERS' LABORATORIES OR APPROVED BY FACTORY MUTUAL.
- SYSTEM, EQUIPMENT, INSTALLATION, AND MATERIALS AND METHODS USED SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE FOLLOWING:
 - APPLICABLE REQUIREMENTS OF THE CITY OF WOODLAND FIRE DEPARTMENT.
 - NFPA 13, HANGERS, FITTINGS, AND CONNECTIONS, 2016 EDITION.
 - INSTALLATION OF SPRINKLER SYSTEMS 2016 EDITION.
 - MANUFACTURER'S RECOMMENDATIONS AND GUIDELINES.

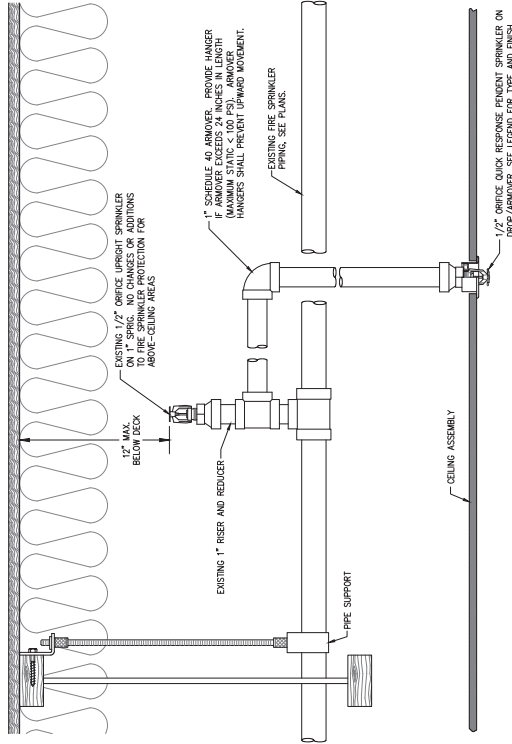
1 LEGEND

- NEW, OR EXISTING 1/2" ORifice Quick Response Excessed Pendant Sprinkler, TYCO Model TY-FBI (SN 233) OR APPROVED EQUAL, K=5.6, 155T, WHITE FINISH WITH DRIP/ARMOVER ASSEMBLY. SEE TYPICAL DETAIL.
 - NEW "HARD PIPE" ARMOVER/DRIP ASSEMBLY. SEE TYPICAL DETAIL.
 - EXISTING 1-INCH OUTLET (APPROXIMATE LOCATION)
- NEW PIPING 1/2" OR 3/4" DIAMETER AND SMALLER SHALL BE SCHEDULE 40 BLACK STEEL PIPE. PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH SPECIFICATIONS ASIN A 135 AND A 53.
 - THIN-WALLED PIPING MATERIALS (SUCH AS SCHEDULE 5, XL AND BLT THREADABLE THINWALLS, ETC.) WILL NOT BE PERMITTED.
 - ALL NEW FIRE PROTECTION SYSTEM PIPING SHALL BE PROVIDED WITH FACTORY APPLIED IDENTIFICATION MARKING, INCLUDING BUT NOT LIMITED TO, THE FOLLOWING:
 - NEW PIPING SHALL BE CLASS 125 CAST IRON, BLACK, AND IN ACCORDANCE WITH ANSI B 16.4, OR DUCTILE OR MALLEABLE IRON, 150 LB. CLASS, WITH APPROVED TYPON JOINT COMPOUND OR TAP.
 - NEW THREADED FITTINGS SHALL BE CLASS 125 CAST IRON, BLACK, AND IN ACCORDANCE WITH ANSI B 16.4, OR DUCTILE OR MALLEABLE IRON, 150 LB. CLASS, WITH APPROVED TYPON JOINT COMPOUND OR TAP.
 - NEW GROOVED COUPLINGS AND MECHANICAL FITTINGS SHALL BE UL LISTED OR FM APPROVED FOR THE PROTECTION SERVICE. FLAM-END TYPE PIPE FITTINGS AND HANGERS SHALL NOT BE USED.
 - NEW HANGERS FLEXIBLE CONNECTIONS, AND SECURE BRACING IN ACCORDANCE WITH NFPA 13.
 - SYSTEM PIPING SHALL BE INSTALLED SUCH THAT NO JOINTS, FITTINGS OR DEVICES OCCUR DIRECTLY OVER ELECTRICAL EQUIPMENT.
 - SUITABLE MEANS SHALL BE PROVIDED AT EACH HOLE OR PENETRATION TO MAINTAIN THE DESIGNED FIRE RESISTANCE RATING OF THE WALL, CEILING OR FLOOR ASSEMBLY.

4 FIRE SPRINKLER DETAIL

- NOTES:
- THE BUILDING IS CONSIDERED "UNRESTRICTED CONSTRUCTION" IN ACCORDANCE WITH NFPA 13 - 2016, SECTION 3.7.2.
 - EXISTING SPRINKLER SYSTEMS SHALL BE REMOVED AND REPLACED WITH CONSTRUCTION WITH COMBUSTIBLE MATERIALS. EXISTING ABOVE-CEILING FIRE PROTECTION IS PROVIDED, AND WILL NOT BE MOVED AS A PART OF THIS PROJECT.

TYPICAL "HARD PIPE" ARMOVER



SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS
PERMIT APPLICATION
BUILDINGS

SHEET TITLE
FIRE SPRINKLER
GENERAL NOTES,
LEGEND, DETAILS

REVISIONS

NO.	DESCRIPTION	DATE

6721A3
3/29/2021
FP0.1

KITCHELL
Capital Expenditure Managers
3450 Venture Oaks Way
Sacramento, CA 95833
(916) 645-9700

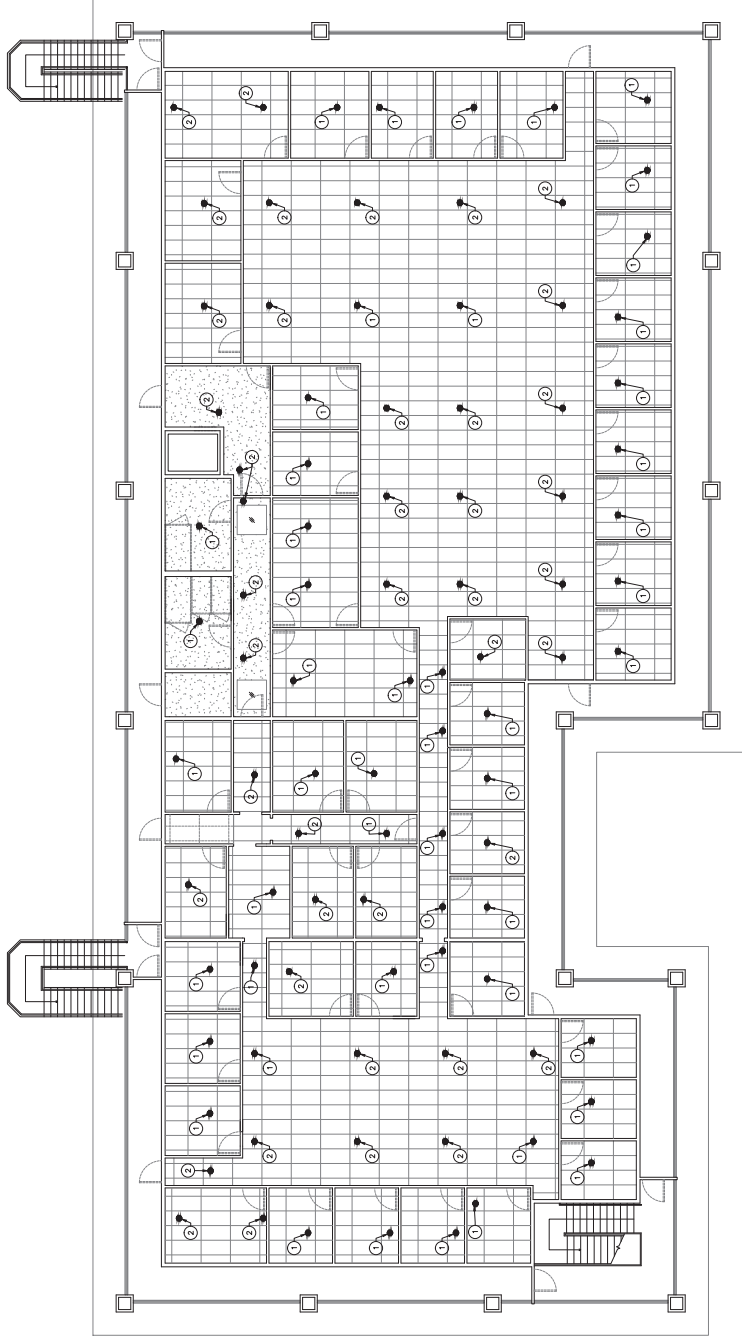
HYT Corporation
Fire Protection Engineers
and Consultants
3498 Clayton Road - Suite 101
Concord, California 94519
Phone: (925) 681-2731



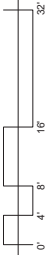
A FIRE SPRINKLER DEMOLITION KEY NOTES

- ① DEMOLISH (E) PENDANT SPRINKLER AND DROP ASSEMBLY BACK TO THE EXISTING BRANCH PIPING. PROVIDE PLUG, AS NECESSARY
- ② EXISTING FIRE SPRINKLER ASSEMBLY TO REMAIN (NO CHANGES)

NOTE: UNLESS NOTED OTHERWISE THE EXISTING FIRE SPRINKLER INSTALLATION REMAINS UNCHANGED.



1 FIRE SPRINKLER DEMOLITION PLAN
FP1.1 SCALE: 1/8"=1'-0"





KITCHELL
Capital Expenditure Managers
2450 Venture Oaks Way
Sacramento, CA 95833
(916) 645-9700



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SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS

PERMIT APPLICATION
BUILDINGS

SHEET TITLE
**FIRE SPRINKLER
DEMOLITION
PLAN**

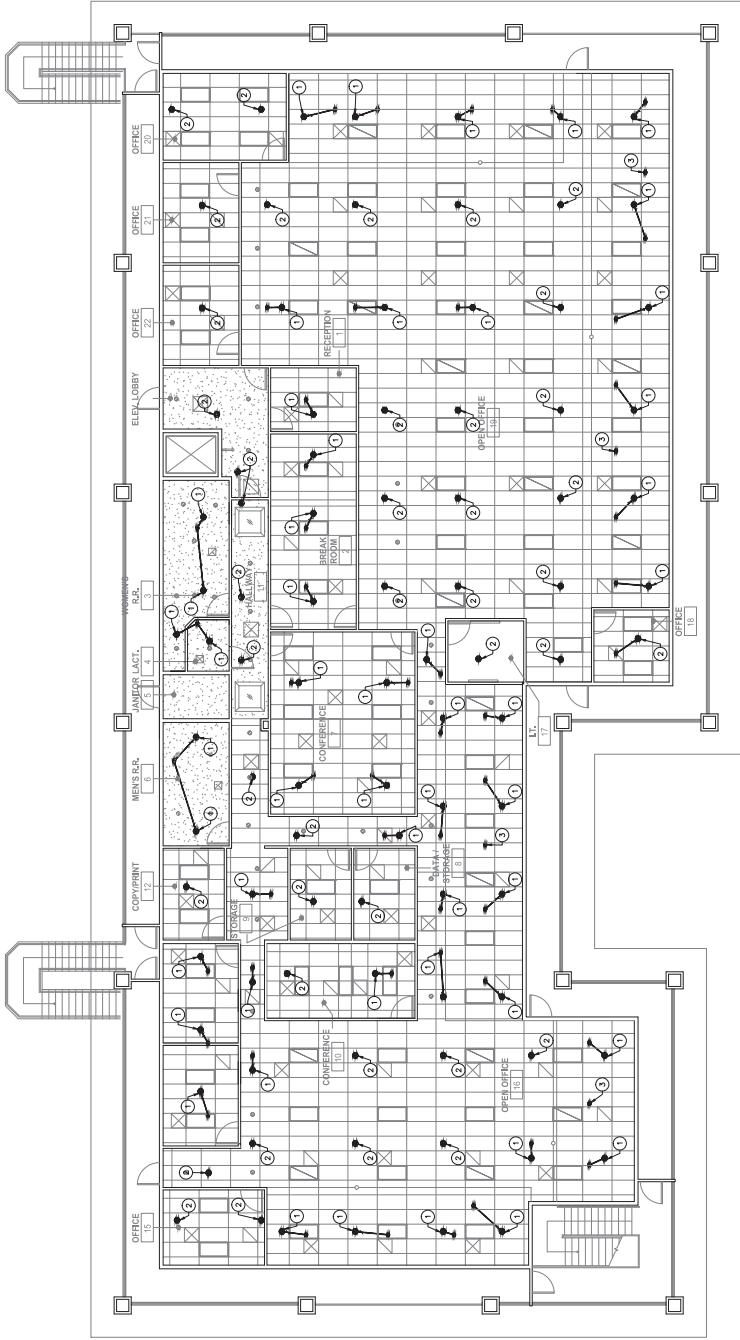
REVISIONS	
NO.	DESCRIPTION

SHEET	
6721A3	FP1.1
DATE	3/29/2021

A FIRE SPRINKLER MODIFICATION KEY NOTES

1. PROVIDE NEW "HARD PIPE" 1-INCH ROOF AND JANIKER ASSEMBLY FROM EXISTING 1-INCH OUTLET TO NEW QUICK RESPONSE RECESSED PENDENT SPRINKLER
2. EXISTING FIRE SPRINKLER ASSEMBLY TO REMAIN (NO CHANGES)
3. PROVIDE PLUG (AT EXISTING OUTLET)

NOTE: UNLESS NOTED OTHERWISE THE EXISTING FIRE SPRINKLER INSTALLATION REMAINS UNCHANGED.



1 FIRE SPRINKLER IMPROVEMENT PLAN

FP2.1 SCALE: 1/8"=1'-0"



KITCHELL
Capital Expenditure Managers
2450 Venture Oaks Way
Sacramento, CA 95833
(916) 645-9700

HYT Corporation
Fire Protection Engineers
and Consultants
3498 Clayton Road - Suite 101
Concord, California 94519
Phone: (925) 681-2731



SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND CA, 95695
YOLO COUNTY GENERAL SERVICES

PERMIT APPLICATION
PROJECT STATUS
BUILDINGS

SHEET TITLE
FIRE SPRINKLER IMPROVEMENT/ INSTALLATION

REVISIONS	
NO.	DESCRIPTION

FP2.1
SHEET
6721A3
DATE: 3/29/2021



SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA 95695
YOLO COUNTY GENERAL SERVICES

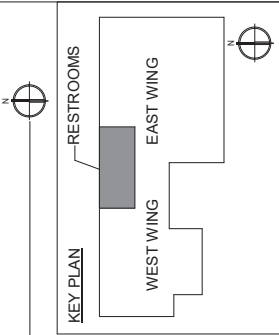
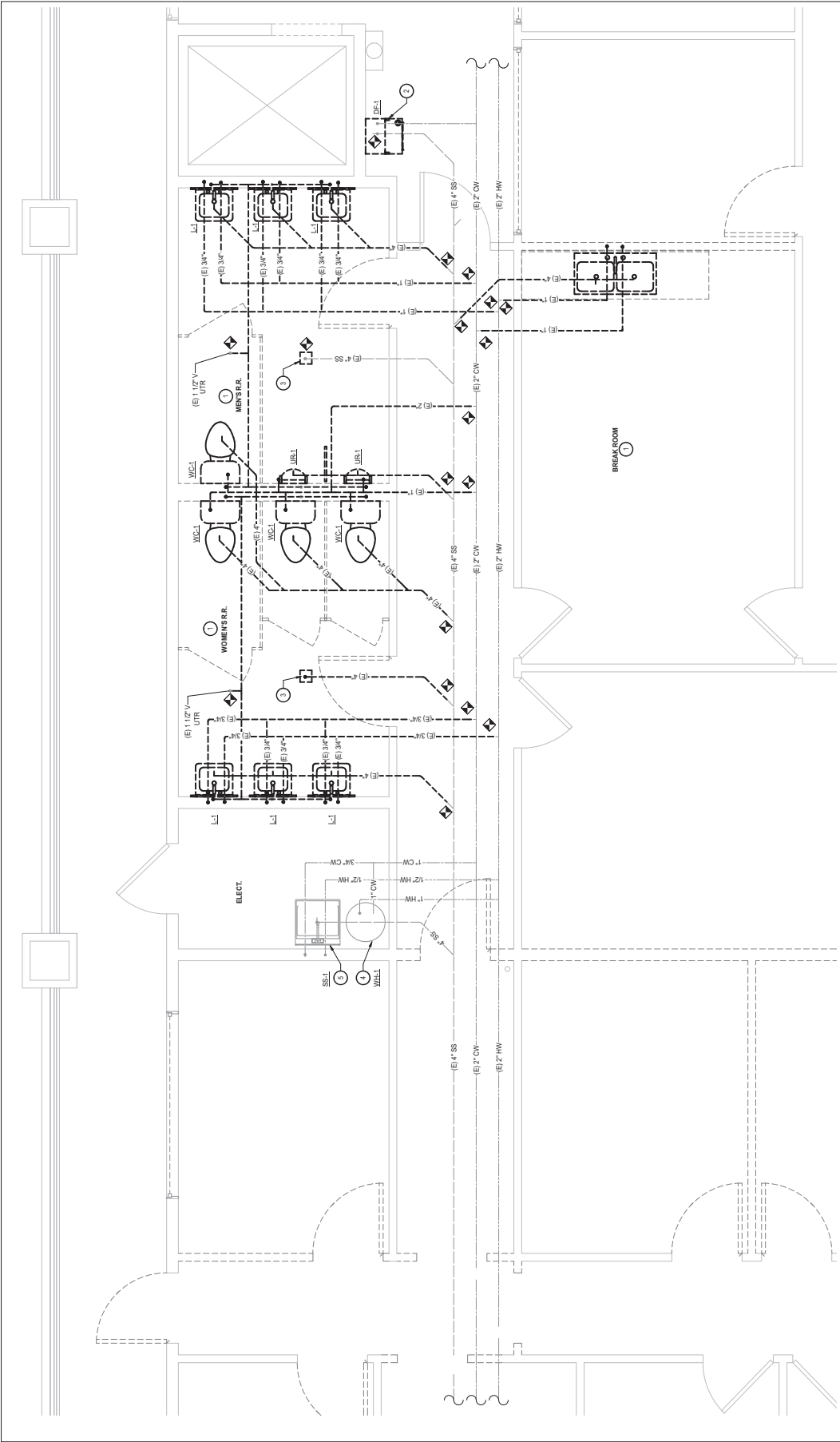
PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS:

SHEET TITLE:
ENLARGED PLUMBING
DEMOLITION PLAN

REVISIONS	
NO.	DESCRIPTION

JOB NO.	672143
DATE	03/29/2021
SHEET	PD202

UNLESS OTHERWISE NOTED, SEE: Page No. 11, 204
Notes, Appendix A



DEMO KEYNOTES

- DEMOLISH AND REMOVE THE INDICATED FIXTURES, AND ASSOCIATED ACCESSORIES AND PIPING, AS INDICATED ON CONSTRUCTION DOCUMENTS. IF PIPING IS DEMOLISHED BACK TO MAIN PIPE, CAP ANY OPENINGS NOT INTENDED TO BE RE-USED.
- DEMOLISH (E) DRINKING FOUNTAIN.
- DEMOLISH (E) FLOOR DRAIN AND PREPARE AREA AS NEEDED FOR REPLACEMENT FLOOR DRAIN. CONNECT TO (E) PIPING WHEN POSSIBLE. IF (N) SANITARY PIPING IS NEEDED, INSTALL AS NEEDED TO MEET CURRENT CODE COMPLIANCE.
- (E) WATER HEATER TO REMAIN.
- (E) SERVICE SINK TO REMAIN.

GENERAL DEMO NOTES

- ALL DIMENSIONS ARE APPROXIMATE. THE DRAWINGS ARE DIAGNOSTIC TO THE EXTENT THAT ALL FITTINGS, OFFSETS, ETC. MAY NOT BE SHOWN. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD FOR FABRICATION OF PIPING.
- MECHANICAL AND ELECTRICAL COMPONENTS INTO COMPLETE AND OPERABLE SYSTEM.
- ALL (E) EQUIPMENT OR FIXTURES SHOWN ON THIS DRAWING TO BE DEMOLISHED SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF BY THE CONTRACTOR.
- COORDINATE ALL SHUTDOWNS AND EQUIPMENT OPERATION WITH THE COUNTY. THE CONTRACTOR SHALL NOTIFY THE COUNTY OF ANY SCHEDULED WORK. SCHEDULE WORK TO BE DONE WHEN FIRST FLOOR TENANTS ARE NOT OCCUPYING THE BUILDING. IF POSSIBLE, SCHEDULE WORK TO BE DONE WHEN FIRST FLOOR TENANTS ARE NOT OCCUPYING THE BUILDING.
- CONTRACTOR SHALL FIELD VERIFY ALL (E) CONDITIONS INCLUDING PIPE SIZES, ROUTING AND INVERT ELEVATIONS PRIOR TO DEMOLITION. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY WHERE DOCUMENTS VARY FROM FIELD CONDITIONS.
- CONTRACTOR TO VERIFY THAT ALL BRANCHES BEING DEMOLISHED IN THIS SCOPE HAVE SHUT-OFF/ISOLATION VALVES IN THE SCOPE OF WORK. CONTRACTOR TO VERIFY THAT ALL BRANCHES BEING DEMOLISHED IN THIS SCOPE HAVE SHUT-OFF/ISOLATION VALVES IN THE SCOPE OF WORK.



SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS:

SHEET TITLE:
ENLARGED PLUMBING
IMPROVEMENT PLAN

REVISIONS

NO.	DESCRIPTION	DATE

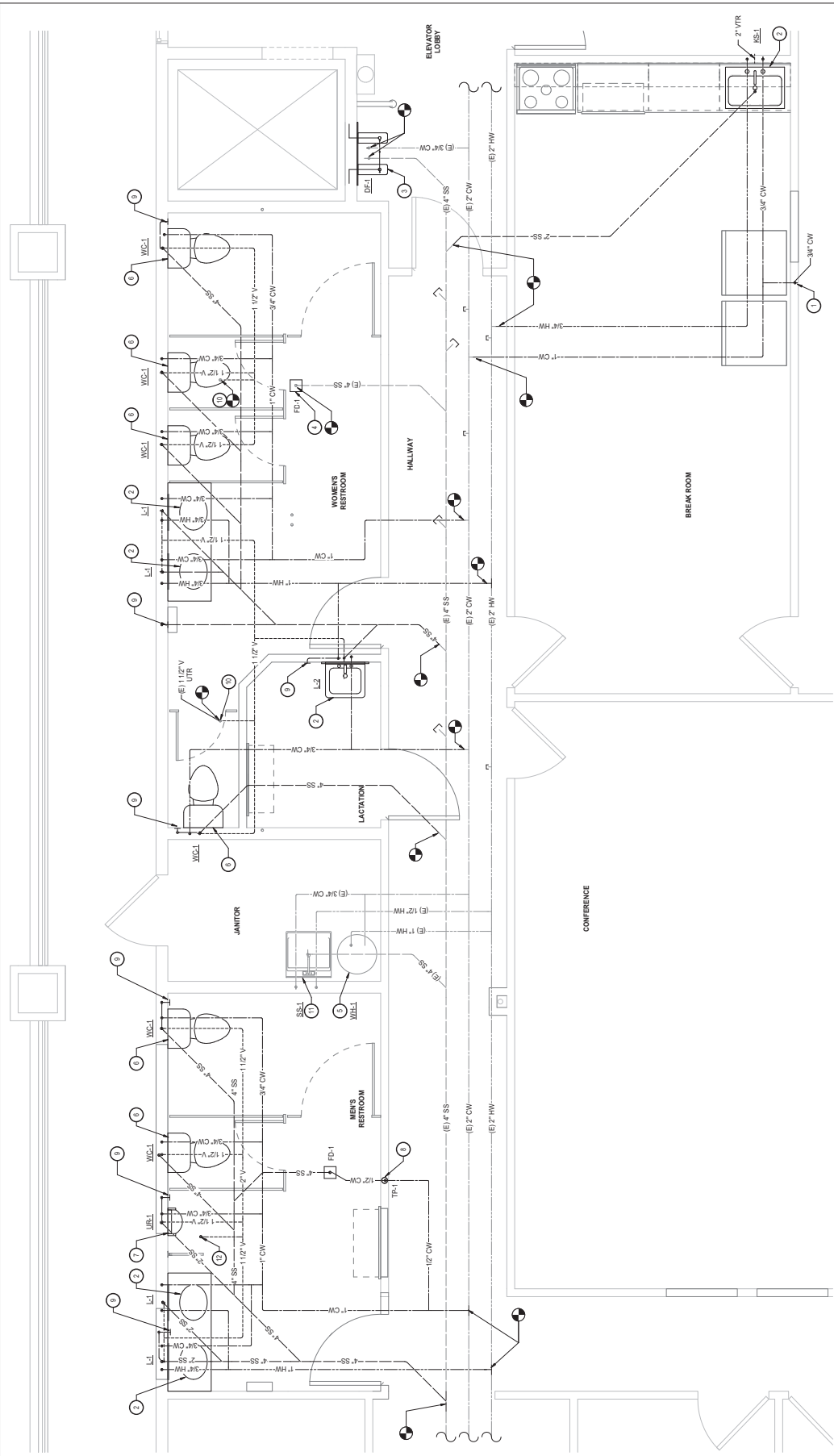
JOB NO. 6721A3

DATE 03/29/2021

SHEET

P202

CREATED BY: J. KITCHELL
CHECKED BY: J. KITCHELL
DATE: 03/29/2021



ENLARGED PLUMBING IMPROVEMENT PLAN
1/2" = 1'-0"

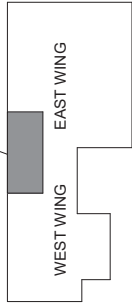
KEYNOTES

- (N) 3/4" CW LINE TO REFRIGERATOR CONNECTION PORT ON WALL. PROVIDE ISOLATION VALVE WHERE BRANCH PIPING COMES OFF MAIN PIPE.
- (N) 3/4" CW, 3/4" HW AND 2" SS PIPING TO (N) PLUMBING FIXTURE. SEE PLUMBING DETAILS SHEET FOR CONNECTION DETAILS. PROVIDE ISOLATION VALVE PRIOR TO FIXTURE TO ALLOW MAINTENANCE. LEAK THE ABILITY TO ISOLATE EACH FIXTURE.
- (N) DRINKING FOUNTAIN. ADD PIPE SEGMENTS AS NEEDED TO RECONNECT (E) PIPING TO FUTURE (N) (E) AND REPAIR WALL AS NEEDED.
- RECONNECT (E) (E) AND REPAIR WALL AS NEEDED. SEE DETAIL 5 / P201. FOR FLOOR DRAIN SECTION. SEE DETAIL 6 / P201 FOR TRAP PRIMER CONNECTION.
- (E) WATER. ELUSHY TANK UPON PROJECT COMPLETION TO MAKE SURE ANY SEGMENTS AND SCALE IS REMOVED.
- (N) 3/4" CW AND 4" SANITARY PIPING TO (N) WATER CLOSETS. PROVIDE ISOLATION VALVE FOR THE CW.
- PROVIDE (N) 3/4" CW AND 2" SANITARY PIPING TO (N) URINAL. PROVIDE ISOLATION VALVE FOR THE CW.
- INSTALL (N) TRAP PRIMER BEHIND ACCESS PANEL. CONNECT 1/2" CW LINE TO TRAP PRIMER AND 1/2" CW PIPE FROM TRAP PRIMER TO (N) FLOOR DRAIN. SEE DETAIL 4 / P201 FOR ADDITIONAL INFORMATION.
- CONNECT (E) (E) AND CONNECT TO SANITARY PIPING. SEE DETAIL 6 / P201 FOR ADDITIONAL INFORMATION.
- CONNECT (N) VENT PIPING TO (E) VTR.
- (E) SERVICE SINK.
- (N) VENT TO ROOF. SEE MECHANICAL DETAILS SHEET FOR PENETRATION DETAILS.

GENERAL NOTES

- ALL DIMENSIONS ARE APPROXIMATE. THE DRAWINGS ARE DIAGRAMMATIC TO THE EXTENT THAT DIMENSIONS IN THE FIELD FOR FABRICATION OF PIPING COMPONENTS INTO COMPLETE AND OPERABLE SYSTEM.
- COORDINATE ALL SHUTDOWNS AND EQUIPMENT OPERATION WITH THE COUNTY. THE CONTRACTOR SHALL NOTIFY THE COUNTY IN ADVANCE OF ANY NECESSARY DISTURBANCE TO THE COUNTY'S OPERATIONS. THE COUNTY SHALL BE NOTIFIED IN ADVANCE OF ANY WORK ON THE FIRST FLOOR TENANTS ARE NOT OCCUPYING THE BUILDING.
- CONTRACTOR SHALL FIELD VERIFY ALL (E) CONDITIONS INCLUDING PIPE SIZES, ROUTING AND INVERT ELEVATIONS PRIOR TO DEMOLITION. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY IF THERE ARE DISCREPANCIES WITH FIELD CONDITIONS.

KEY PLAN





SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:
PERMIT APPLICATION

SHEET TITLE:
PLUMBING DETAILS & SCHEDULES

REVISIONS

NO.	DESCRIPTION

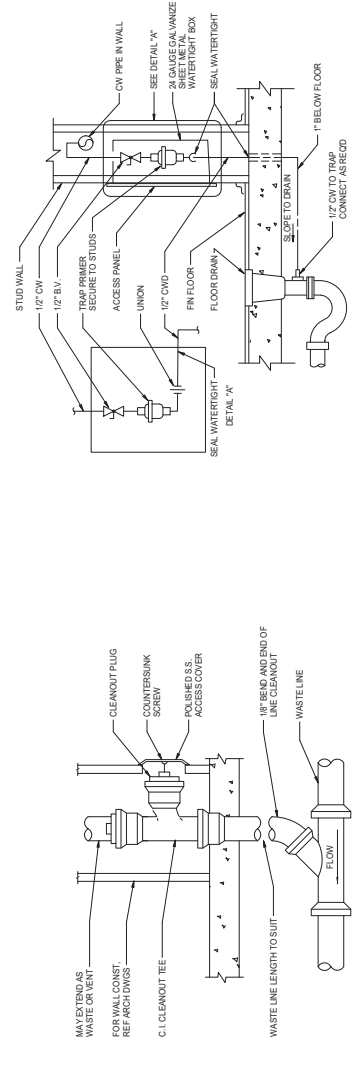
JOB NO.	SHEET
6721A3	P701
DATE	03/29/2021

CLASSIFICATION: PLUMBING DETAILS - 100% - Page 10 of 11 - 2nd Rev

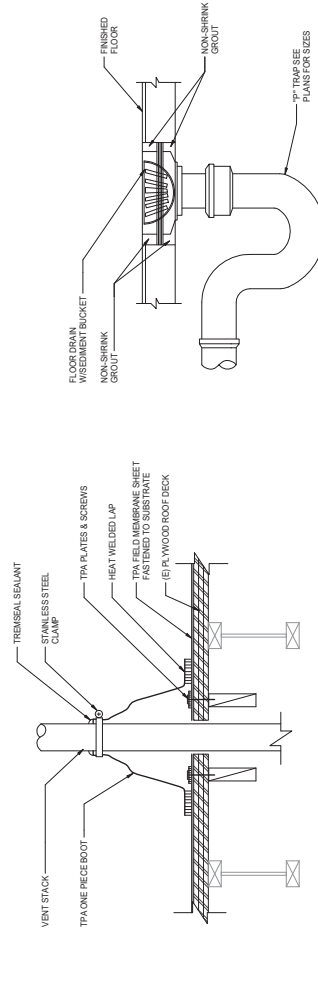
PLUMBING FIXTURE SCHEDULE				PLUMBING CONNECTION SCHEDULE			
ADA	FIXTURE ID	DESCRIPTION	FIXTURE MAKE, AND MODEL NO.	SHUT-OFF VALVE MAKE, AND MODEL NO.	TRIM MAKE, AND MODEL NO.	VENT	WASTE
	WC-1	WATER CLOSET FLOOR MOUNTED GRAYGLASS W/NO. 1000	AMERICAN STANDARD 600.0100	INTEGRAL	AMERICAN STANDARD 500.1000	Z	4"
	UR-1	URINAL WALL MOUNT FLUSH VALVE ADA	AMERICAN STANDARD 600.0101	INTEGRAL	AMERICAN STANDARD 500.1001	Z	2"
	L-1	LAVATORY WALL MOUNTED HOT AND COLD WATER ADA STANDARD HEIGHT	AMERICAN STANDARD 600.0102	INTEGRAL	AMERICAN STANDARD 500.1002	Z	2"
	L-2	LAVATORY WALL MOUNTED HOT AND COLD WATER ADA STANDARD HEIGHT	AMERICAN STANDARD 600.0103	INTEGRAL	AMERICAN STANDARD 500.1003	Z	2"
	HS-1	SINK COUNTER MOUNTED HOT AND COLD WATER ADA STANDARD HEIGHT	AMERICAN STANDARD 600.0104	INTEGRAL	AMERICAN STANDARD 500.1004	Z	2"
	DF-1	WALL HUNG TOILET	AMERICAN STANDARD 600.0105	INTEGRAL	AMERICAN STANDARD 500.1005	Z	2"

DOMESTIC COLD WATER PIPE SIZING				DOMESTIC HOT WATER PIPE SIZING			
PIPE SIZE (IN)	GPM	FIXTURE UNITS	FLUSH VALVE	PIPE SIZE (IN)	GPM	FIXTURE UNITS	FLUSH VALVE
1/2	3.4	2	2.4	1/2	3.4	2	2.4
3/4	6.4	4	4.4	3/4	6.4	4	4.4
1	13	8	8.4	1	13	8	8.4
1 1/4	23	16	16.4	1 1/4	23	16	16.4
1 1/2	37	25	25.4	1 1/2	37	25	25.4
2	71	50	50.4	2	71	50	50.4

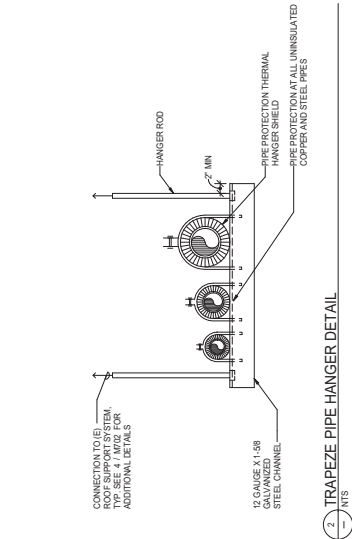
NOTE: PIPE SIZING BASED ON 4 PSI FRICTION LOSS PER 100 FT. LENGTH AND MAXIMUM VELOCITY OF 8 FT/SEC FOR COLD WATER AND 5 FT/SEC FOR HOT WATER



6 WALL CLEANOUT



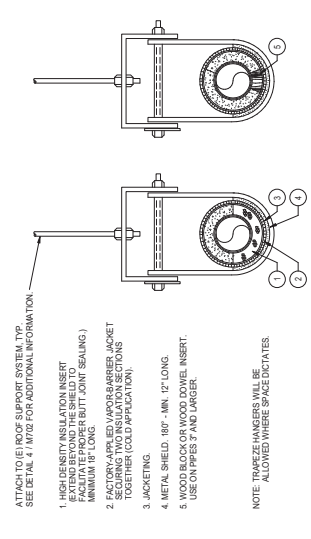
7 PIPE PENETRATION THROUGH ROOF



1 PIPE THRU WALL DETAIL



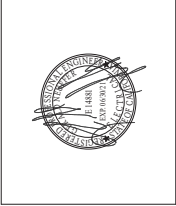
2 TRAPEZE PIPE HANGER DETAIL



3 TYPICAL PIPE HANGER DETAIL

24x36

24326



Yolo County General Services
100 W. Court Street, Woodland, CA 95695
SECOND FLOOR TENANT IMPROVEMENT

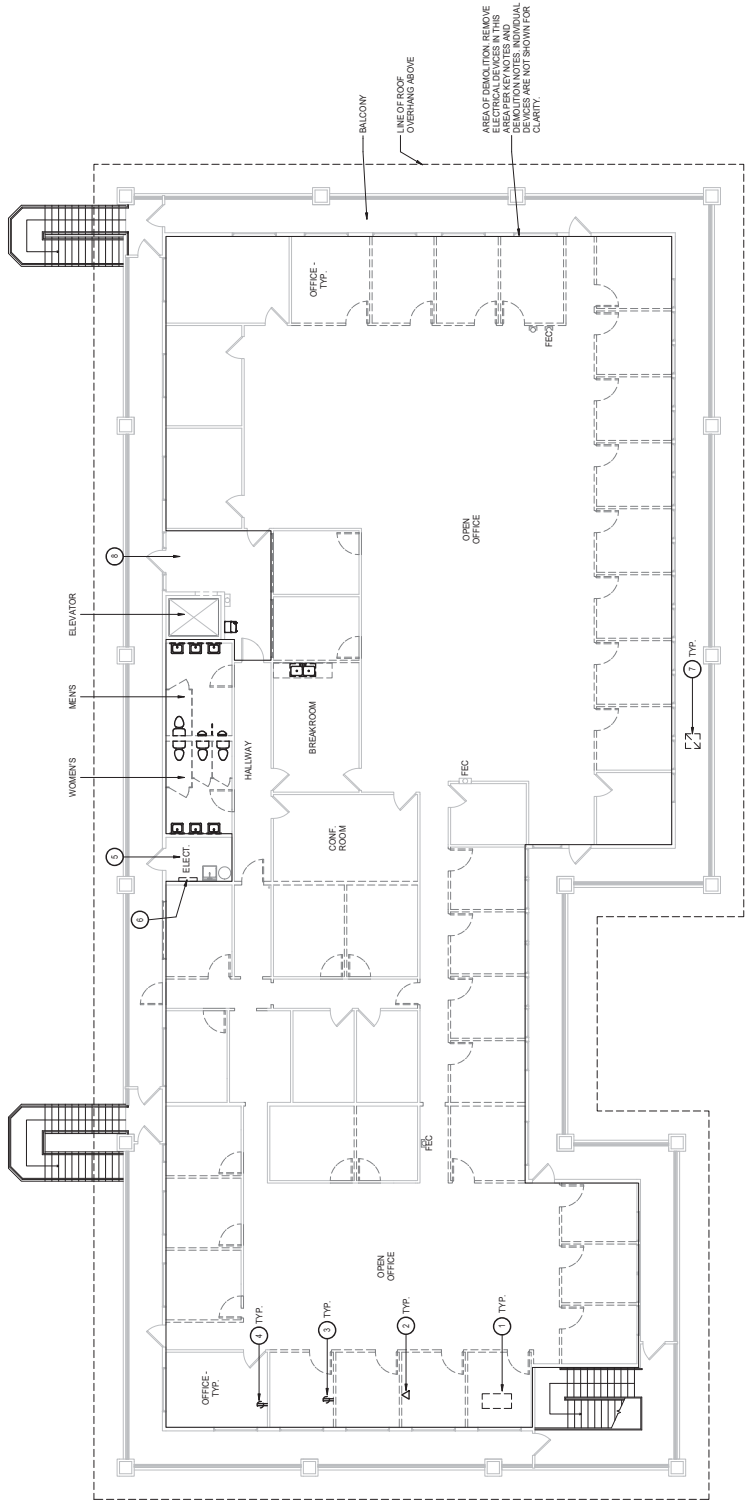
PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS

SHEET TITLE:
ELECTRICAL DEMOLITION
PLAN

REVISIONS	
NO.	DESCRIPTION

JOB NO.	SHEET
6721A3	E101
DATE	03/29/2021

Client: Yolo County General Services | 100 W. Court Street, Woodland, CA 95695



1/8" = 1'-0" ELECTRICAL DEMOLITION PLAN

KEYNOTES

- 1 DEMOLISH EXISTING LIGHTING FIXTURES, REMOVAL OF WIRING AND ASSOCIATED SWITCHING IN WALLS THAT ARE TO REMAIN. REMOVE WIRING AND PROVIDE BLANK COVER PLATE OVER REMOVED LIGHT SWITCH.
- 2 DEMOLISH INTERIOR TELECOM OUTLETS AND REMOVE OUTLET CABLE. IN WALLS THAT ARE TO REMAIN, REMOVE WIRING AND PROVIDE BLANK COVER PLATE.
- 3 IN ALL WALLS THAT ARE GOING TO BE DEMOLISHED, DEMOLISH INTERIOR RECEPTACLES, TELECOM OUTLETS, LIGHT SWITCHES, ETC., AND REMOVE CONDUIT AND WIRING BACK TO SOURCE.
- 4 DEMOLISH INTERIOR RECEPTACLES IN WALLS TO REMAIN. ABANDON CONDUIT IN WALLS AND REMOVE WIRING. PROVIDE BLANK COVER PLATE.
- 5 MAINTAIN ELECTRICAL POWER TO LIGHTING AND RECEPTACLES IN ROOM.
- 6 DEMOLISH ABANDONED TELECOM WIRING AND TELEPHONE EQUIPMENT.
- 7 EXTERIOR LIGHTING ALONG PERIMETER WALKWAY TO REMAIN.
- 8 RECEPTACLES IN ELEVATOR LOBBY TO REMAIN. MAINTAIN POWER IN THIS ROOM.



YOLO COUNTY GENERAL SERVICES
100 W. COURT STREET, WOODLAND, CA, 95695
SECOND FLOOR TENANT IMPROVEMENT

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS:

SHEET TITLE:
IMPROVEMENT
ELECTRICAL POWER AND
SIGNAL PLAN

REVISIONS

NO.	DATE	DESCRIPTION

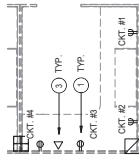
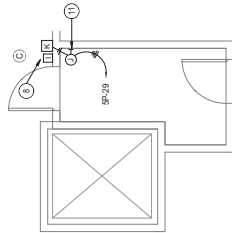
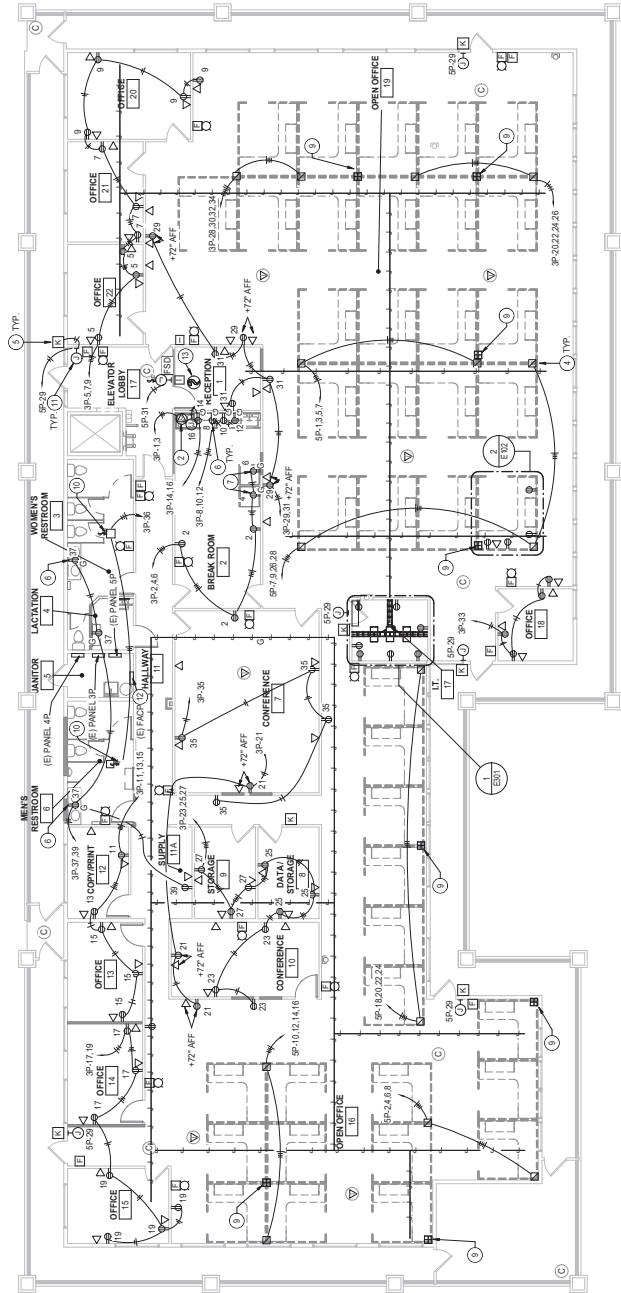
JOB NO. SHEET

6721A3
DATE
03/29/2021

E102

UNLESS OTHERWISE NOTED, SEE: Page No. 11, 20 and 21

2/24/21



1 IMPROVEMENT ELECTRICAL POWER & SIGNAL PLAN
1/8" = 1'-0"

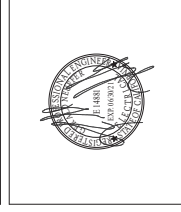
KEYNOTES

- MODULAR FURNITURE PROVIDED BY OWNER. COORDINATE ELECTRICAL INSTALLATION WITH FURNITURE SHOP DRAWINGS. FURNITURE WILL HAVE FOUR OUTLETS PER CUBICLE. PROVIDE A SEPARATE BRANCH CIRCUIT FOR EACH OUTLET LABEL. ALL OUTLETS WITHIN FURNITURE WITHIN CUBICLE NUMBERED AND CIRCLED FOR IDENTIFICATION.
- PROVIDE RECEPTACLE AS REQUIRED FOR ELECTRIC RANGE. PROVIDE 3/4" x 1/2" GND IN 3/4" C. PROVIDE DEDICATED NEUTRAL.
- TELECOM OUTLET WITHIN MODULAR FURNITURE RACKWAY. PROVIDE (4) TELECOM JACKS PER MODULAR FURNITURE WORKSTATION. UTILITY POLE FROM FURNITURE TO CEILING WITH DIVIDED POWER AND TELECOM SECTIONS. POLE IS PROVIDED WITH MODULAR FURNITURE. COORDINATE EXACT FEED POINTS WITH FURNITURE SHOP DRAWINGS AND PROVIDE ALL LABOR AND MATERIALS FOR A COMPLETE INSTALLATION.
- CARD READER. PROVIDE BACKBOX AND CONDUIT STUDIED TO CEILING. COORDINATE REQUIREMENTS WITH OWNER'S SECURITY VENDOR.
- RECEPTACLE ABOVE COUNTER. COORDINATE WITH CABINET DETAILS.
- RECEPTACLE FOR REFRIGERATOR.
- INTERCOM, KEYPAD, AND CAMERA PROVIDED BY COUNTY/VENDOR. COORDINATE WORK WITH VENDOR. PROVIDE CONDUIT PATHWAY FROM 1ST FLOOR TO 2ND FLOOR RECEPTION CEILING. PROVIDE BACKBOXES PER VENDOR REQUIREMENTS.
- UTILITY POLE TO MODULAR FURNITURE DEDICATED FOR TELECOM WIRING. COORDINATE EXACT FEED POINTS WITH FURNITURE SHOP DRAWINGS AND PROVIDE ALL LABOR AND MATERIALS FOR A COMPLETE INSTALLATION.
- PROVIDE POWER TO RES ROOM EXHAUST FAN. COORDINATE WITH MECHANICAL FAN TO BE INTERLOCKED WITH LIGHTING SEE 3E402.
- PROVIDE POWER FOR ALL LOOR CARD READERS/DOOR STRIKES. COORDINATE REQUIREMENTS WITH OWNER'S SECURITY VENDOR AND PROVIDE ALL CONNECTIONS REQUIRED. INCLUDE LOW VOLTAGE 120VAC-24V TRANSFORMERS CONCEALED ABOVE CEILING AS REQUIRED.
- APPROXIMATE LOCATION OF EXISTING TO REMAIN SILENT NIGHT 8000L FIRE ALARM CONTROL PANEL. PANEL IS LOCATED ON FIRST FLOOR NEAR THIS LOCATION. SHOWN FOR REFERENCE.
- SMOKE DETECTOR - CONTROLLER FOR THE NEW FIRE SMOKE DAMPER. CONNECT FIRE SMOKE DAMPER TO PANEL SP CIRCUIT # 31. COORDINATE WORK WITH MECHANICAL CONTRACTOR.

3 FIRST FLOOR ELEVATOR ROOM
1/4" = 1'-0"

2 TYPICAL FURNITURE SYSTEM ELECTRICAL LAYOUT
1/4" = 1'-0"

- ① EXISTING SPLIT SYSTEM CONDENSING UNIT TO BE RELOCATED. SEE MECHANICAL PLAN, SALVAGE DISCONNECT SWITCH AND EXTEND WIRING TO NEW LOCATION.
- ② RELOCATED SPLIT SYSTEM CONDENSING UNIT. PROVIDE ALL WIRING REQUIRED BETWEEN OUTDOOR CONDENSING UNITS AND INDOOR FAN COIL UNIT. SEE ARCHITECTURAL PLANS FOR ROOF PENETRATION LOCATIONS AND DETAILS.



Yolo County General Services
100 W. COURT STREET, WOODLAND, CA, 95695
SECOND FLOOR TENANT IMPROVEMENT

PROJECT STATUS:
PERMIT APPLICATION
BUILDINGS:
SHEET TITLE:
ONE LINE DIAGRAM AND
PANEL SCHEDULES

REVISIONS

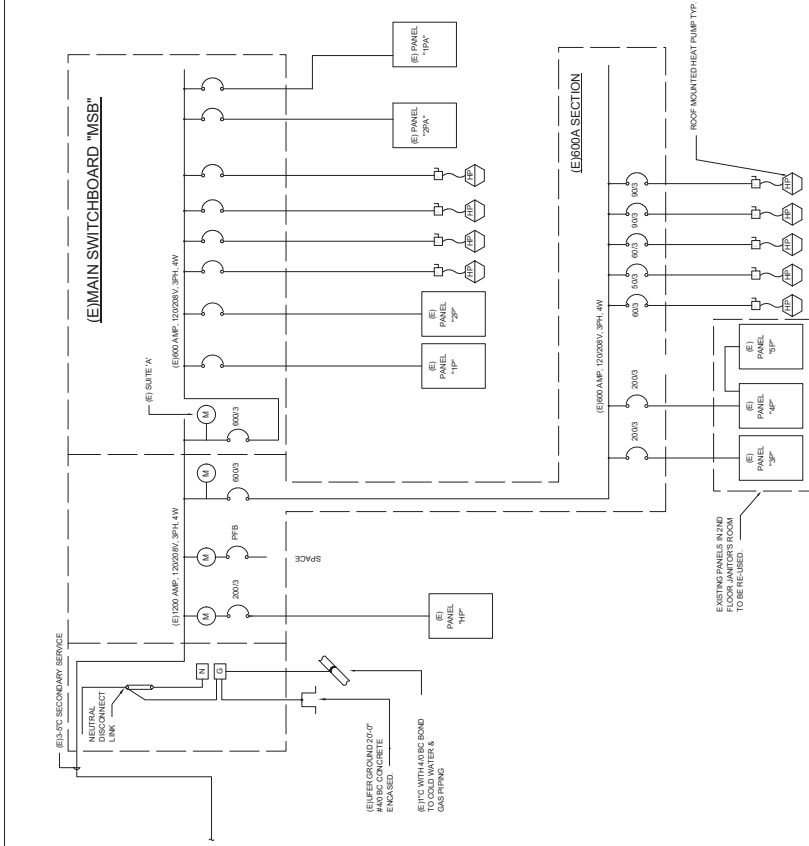
NO.	DESCRIPTION	DATE

JOB NO. 6721A3
SHEET
DATE 05/29/2021
E201

(E) PANEL 3P									
MOUNTING SURFACE									
ENCLOSURE TYPE 1									
VOLTAGE: 120/208 WYE									
PHASES: 3									
MAIN TYPE: LUGS									
MAIN RATING: 200 A									
MCB RATING: 200 A									
CRT #	LOAD	TRIP	POLES	A	B	C	POLES	TRIP	LOAD
3	RANGE (NOTE 1)	70 A	2	67.5 VA	66.7 VA	90 VA	1	20 A	REC. BREAKROOM
5	REC. OFFICE 22	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
6	REC. OFFICE 20	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
9	REC. OFFICE 19	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
11	REC. OFFICE 13	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
15	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
17	REC. OFFICE 18	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
21	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
23	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
25	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
27	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
29	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
31	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
33	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
35	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
37	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
39	REC. OFFICE 14	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	REC. C. REF. COOL.
41	SPARE	20 A	1	64.5 VA	180 VA	90 VA	1	20 A	SPARE
TOTAL LOAD: 1200 VA 1200 VA 900 VA									
TOTAL MIP: 111 A									
PANEL TOTALS									
TOTAL CONN. LOAD: 3000 VA									
TOTAL CONN. LOAD: 3000 VA									
TOTAL CONN. LOAD: 3000 VA									
TOTAL EST. DEMAND: 87 A									
TOTAL EST. DEMAND: 87 A									
TOTAL EST. DEMAND: 87 A									
NOTE: (1) MCB LOCATED AT MAIN SWITCHBOARD ON FIRST FLOOR. PANEL IS M.O.									

(E) PANEL 4P									
MOUNTING SURFACE									
ENCLOSURE TYPE 1									
VOLTAGE: 120/208 WYE									
PHASES: 3									
MAIN TYPE: LUGS									
PANEL RATING: 200 A									
MCB RATING: 200 A									
CRT #	LOAD	TRIP	POLES	A	B	C	POLES	TRIP	LOAD
3	LIGHTS - WEST OFFICE 18	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
5	LIGHTS - WEST OFFICE 18	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
7	LIGHTS - WEST OFFICE 18	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
9	LIGHTS - WEST OFFICE 18	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
11	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
13	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
15	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
17	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
21	PANEL SP	100 A	3	450 VA	1500 VA	1500 VA	2	20 A	EX. 1800 W. LIGHTS
23	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
25	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
27	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
29	SPARE	20 A	1	120 VA	90 VA	100 VA	1	20 A	EX. 1800 W. LIGHTS
TOTAL LOAD: 1800 VA 1500 VA 1500 VA									
TOTAL MIP: 100 A									
PANEL TOTALS									
TOTAL CONN. LOAD: 3000 VA									
TOTAL CONN. LOAD: 3000 VA									
TOTAL CONN. LOAD: 3000 VA									
TOTAL EST. DEMAND: 139 A									
TOTAL EST. DEMAND: 139 A									
TOTAL EST. DEMAND: 139 A									
NOTE: (1) MAIN CIRCUIT BREAKER LOCATED ON MAIN SWITCHBOARD PANEL BOARD IS M.O.									

(N) PANEL 5P									
MOUNTING SURFACE									
ENCLOSURE TYPE 1									
VOLTAGE: 120/208 WYE									
PHASES: 3									
MAIN TYPE: LUGS									
PANEL RATING: 200 A									
MCB RATING: 200 A									
CRT #	LOAD	TRIP	POLES	A	B	C	POLES	TRIP	LOAD
3	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
5	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
7	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
9	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
11	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
13	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
15	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
17	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
19	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
21	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
23	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
25	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
27	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
29	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
31	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
33	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
35	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
37	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
39	REC. FURNITURE	20 A	1	300 VA	300 VA	300 VA	1	20 A	REC. FURNITURE
41	SPARE	20 A	1	300 VA	300 VA	300 VA	1	20 A	SPARE
TOTAL LOAD: 4800 VA 4800 VA 4800 VA									
TOTAL MIP: 38 A									
PANEL TOTALS									
TOTAL CONN. LOAD: 1000 VA									
TOTAL CONN. LOAD: 1000 VA									
TOTAL CONN. LOAD: 1000 VA									
TOTAL EST. DEMAND: 139 A									
TOTAL EST. DEMAND: 139 A									
TOTAL EST. DEMAND: 139 A									
NOTE: (1) MAIN CIRCUIT BREAKER LOCATED ON PANEL 4P. PANEL BOARD IS M.O.									

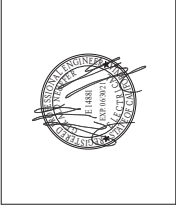


EXISTING ONE LINE DIAGRAM
NOTE: ALL ITEMS SHOWN ARE EXISTING TO REMAIN. SHOWN FOR REFERENCE ONLY.

- NOTES
- NO AS-BUILT ELECTRICAL DRAWINGS ARE AVAILABLE TO ENGINEER OR CONTRACTOR. NEW CIRCUITS FOR DEVICES ARE INTENDED TO BE RE-USED FROM PREVIOUS CIRCUITS. THE ENGINEER SHALL REVIEW THE AS-BUILT ELECTRICAL DRAWINGS AND MAKE ANY NECESSARY CORRECTIONS TO INSURE ALL CIRCUITS ARE PROPERLY IDENTIFIED. ALL NON-LABELLED CIRCUITS SHALL ALSO BE IDENTIFIED AND PROPERLY LABELED IN THE PANELS.
 - EXISTING PANEL SCHEDULES MAY NOT NECESSARILY INDICATE CORRECT CIRCUIT IDENTIFICATION. THE ENGINEER SHALL REVIEW THE AS-BUILT ELECTRICAL DRAWINGS AND MAKE ANY NECESSARY CORRECTIONS TO INSURE ALL CIRCUITS ARE PROPERLY IDENTIFIED. ALL NON-LABELLED CIRCUITS SHALL ALSO BE IDENTIFIED AND PROPERLY LABELED IN THE PANELS.



KITCHELL
 Capital Expenditure Managers
 2450 Venture Oaks Way
 Sacramento, CA 95833
 (916) 644-9700



SECOND FLOOR TENANT IMPROVEMENT
 100 W. COURT STREET, WOODLAND, CA, 95695

YOLO COUNTY GENERAL SERVICES

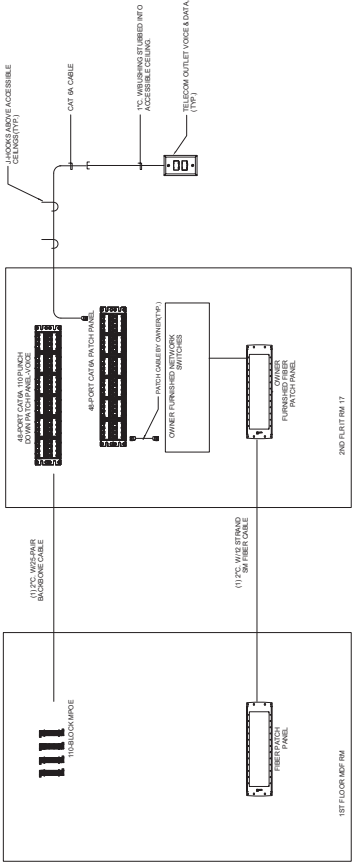
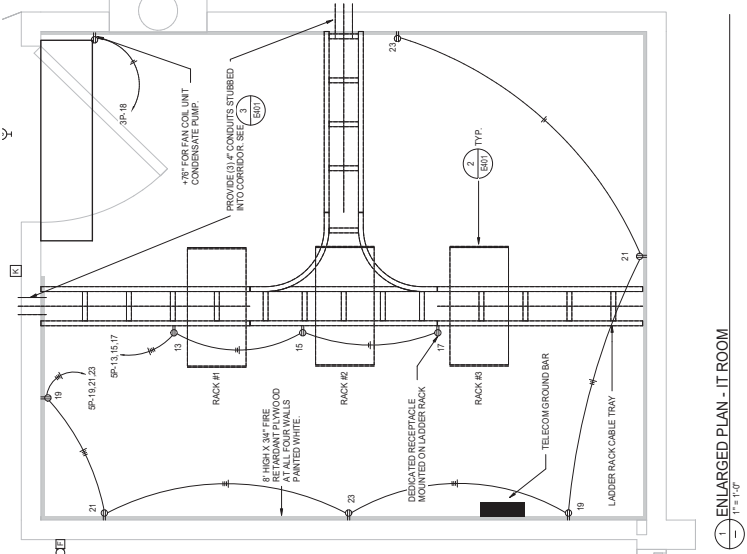
PROJECT STATUS:
 PERMIT APPLICATION
 BUILDINGS:

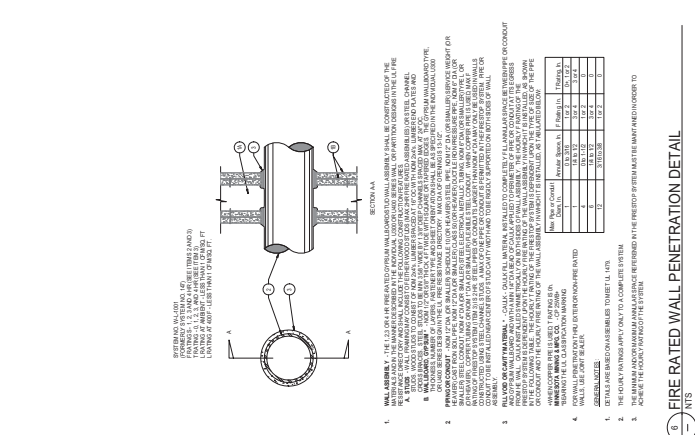
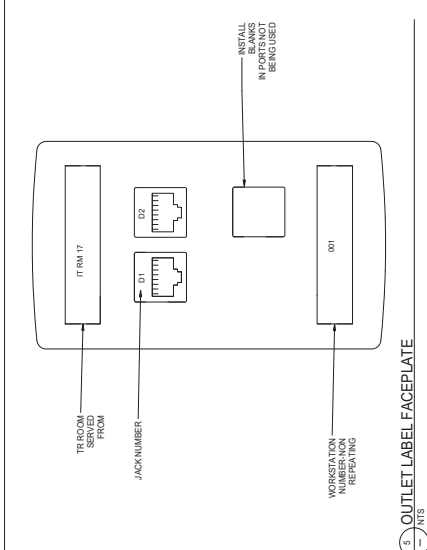
SHEET TITLE:
 ELECTRICAL ENLARGED PLANS

REVISIONS	
NO.	DESCRIPTION

JOB NO.	SHEET
6721A3	E301
DATE	05/29/2021

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SECOND FLOOR TENANT IMPROVEMENT
100 W. COURT STREET, WOODLAND, CA, 95695
YOLO COUNTY GENERAL SERVICES

PROJECT STATUS:

PERMIT APPLICATION

BUILDINGS:

SHEET TITLE:

LIGHTING CONTROL
DETAILS

REVISIONS

NO.	DESCRIPTION	DATE

JOB NO. SHEET

6721A3

DATE

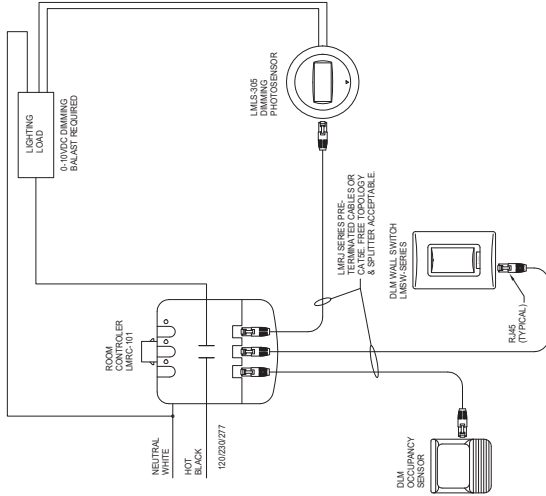
05/29/2021

E402

CLASSIFICATION: PROJECT/TYPE: NEW: Project No. 11, 2nd Floor, Woodland

NOTES

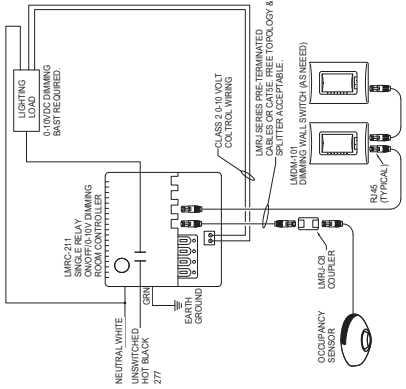
1. DIAGRAMS ARE GENERIC. REFER TO LIGHTING PLANS FOR NUMBER OF DEVICES.
2. REFER TO LIGHTING SEQUENCE OF OPERATION FOR DESCRIPTION.
3. LIGHTING CONTROL SYSTEM IS BASED ON WATTSOPPER SYSTEM AS BASIS OF DESIGN.
4. CONTRACTOR SHALL PROVIDE ALL COMPONENTS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM. PROVIDE PER MANUFACTURERS RECOMMENDATION.
5. ALL OCCUPANCY SENSORS, SWITCHES, AND PHOTOCELLS ARE CONNECTED TO THE SYSTEM VIA ETHERNET LINK AND ARE ADDRESSABLE AND PROGRAMMABLE.
6. PROVIDE INTERFACES AND WIRING REQUIRED FOR EMERGENCY LIGHTING TO RETURN TO FULL BRIGHTNESS UPON LOSS OF NORMAL POWER.



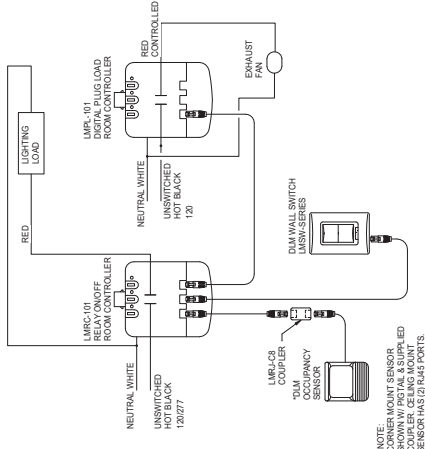
1. TYPICAL LOW VOLTAGE LIGHTING CONTROL FOR FIXTURES IN DAYLIGHT ZONES

LIGHTING CONTROL SEQUENCE OF OPERATION			
ROOM	OCCUPANCY SENSOR SETPOINT	PHOTOCELL SETPOINT	LIGHTING
OPEN OFFICES	AUTO ON/OFF IN 20 MIN.	REACT AT WORKPLACE	LIGHTING AUTO ON TO 50% WHEN OCCUPANT ENTERS SPACE. LIGHTING IN DAYLIGHT AREAS WILL CONTINUOUSLY DIM BASED ON DAYLIGHT CONTRIBUTION. LIGHTING OFF/DIM VIA MANUAL CONTROLS.
BREAKROOM	AUTO ON/OFF IN 5 MIN.	N/A	LIGHTING AUTO ON TO 50% WHEN OCCUPANT ENTERS SPACE. LIGHTING OFF/DIM VIA MANUAL CONTROLS.
REST ROOMS	AUTO ON/OFF IN 5 MIN.	N/A	LIGHTING AUTO ON WHEN OCCUPANT ENTERS SPACE. OFF VIA MANUAL CONTROLS.
INDIVIDUAL OFFICES & CONFERENCE ROOMS	AUTO ON/OFF IN 20 MIN.	N/A	LIGHTING AUTO ON TO 50% WHEN OCCUPANT ENTERS SPACE. LIGHTING OFF/DIM VIA MANUAL CONTROLS.

2. LIGHTING CONTROL SEQUENCE OF OPERATION



3. TYPICAL LOW VOLTAGE LIGHTING CONTROL FOR FIXTURES IN NON-DAYLIGHT ZONES



NOTE:
CHIMNEY MOUNT SENSOR
SHOWN IN PICTorial & SUPPLIED
SENSOR HAS 120 VAC 60 HZ
SENSOR HAS 120 VAC 60 HZ

4. TYPICAL LOW VOLTAGE LIGHTING CONTROL FOR RESTROOMS

PAYMENT BOND

BOND NO. _____

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the County of Yolo, State of California, ("Owner") has awarded to _____ ("Contractor/Principal") a contract (County Agreement No. _____, dated _____, 2021, referred to as the "Agreement") for the work described as _____. The Agreement is incorporated by this reference into this Payment Bond ("Bond"); and

WHEREAS, Contractor/Principal is required to furnish a bond in connection with the Agreement and pursuant to California Civil Code section 9550;

NOW, THEREFORE, we, _____ the undersigned Contractor/Principal, and _____, ("Surety"), a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the County of Yolo, and to any and all persons, companies, or corporations entitled by law to file stop payment notices under California Civil Code Section 9100, or any person, company, or corporation entitled to make a claim on this bond, in the sum of

_____ DOLLARS (\$ _____), which such sum being not less than one hundred percent (100%) of the total amount payable by the Owner under the terms of the Agreement, for which payment will and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if Contractor/Principal, its heirs, executors, administrators, successors, or assigns, or subcontractor, shall fail to pay any person or persons named in Civil Code section 9100; or fail to pay for any materials, provisions, or other supplies, used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code, with respect to work or labor thereon of any kind; or shall fail to deduct, withhold, and pay over to the Employment Development Department, any amounts required to be deducted, withheld, and paid over by Unemployment Insurance Code Section 13020 with respect to work and labor thereon of any kind, then Surety will pay for the same, in an amount not exceeding the amount herein above set forth, and in the event suit is brought upon this bond, also will pay such reasonable attorneys' fees as shall be fixed by the court, awarded and taxed as provided in California Civil Code Section 9550 et seq.

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, or specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described; or pertaining or relating to the furnishing of labor, materials, or equipment therefor; nor by any change or modification of any terms of payment or extension of time for payment pertaining or relating to any scheme or work of improvement herein above described; nor by any rescission or attempted rescission of the contract, agreement or bond; nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or

under the bond; nor by any fraud practiced by any person other than the claimant seeking to recover on the bond; and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given; and under no circumstances shall the Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Owner and Contractor/Principal or on the part of any obligee named in such bond; that the sole condition of recovery shall be that the claimant is a person described in California Civil Code section 9100, and who has not been paid the full amount of his or her claim; and that the Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned, including but not limited to the provisions of sections 2819 and 2845 of the California Civil Code.

Any notice to Surety may be given in the manner specified in the Agreement and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
City/State/Zip: _____
Phone: _____
Fax: _____
Email: _____

IN WITNESS WHEREOF, two identical counterparts of this Bond, each of which shall for all purposes be deemed an original thereof, have been duly executed by Contractor/Principal and Surety above named, on the ____ day of _____, 202__.

Contractor/Principal (SEAL)

By: _____
Contractor's Representative

Contractor/Principal's Address

City, State, Zip

Surety (SEAL)

By: _____
Surety's Representative

Surety's Address

City, State, Zip

Telephone Number

NOTE: Signatures of those executing for Surety must be properly acknowledged. The bond must be accompanied by a properly acknowledged Power of Attorney from the Surety authorizing its agent to bind it to this bond. A copy of such Power of Attorney must be on file with the Yolo County Clerk.

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On ____, 21__, before me, _____, Notary Public, personally
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")

appeared ____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual
- ☐ Corporate Officer
-
- Title(s)
- ☐ Partner(s) ☐ Limited
 ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:
- Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

Notary Acknowledgment

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STATE OF CALIFORNIA
COUNTY OF _____

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Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")

appeared _____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

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- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:
- Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the County of Yolo, organized and operating under the laws of the State of California, (hereinafter referred to as the "County") has awarded to _____, (hereinafter referred to as the "Contractor") an agreement for **Contract No.** _____, (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by the Contractor is more particularly set forth in the Contract for the Project dated _____, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, the Contractor is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

NOW, THEREFORE, we, _____, the undersigned Contractor and _____ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the County in the sum of _____ DOLLARS, (\$ _____), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if the Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one (1) year guarantee of all materials and workmanship; and shall indemnify and save harmless the County, its officials, officers, employees, and authorized volunteers, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees including reasonable attorney's fees, incurred by the County in enforcing such obligation.

As a condition precedent to the satisfactory completion of the Contract Documents, unless otherwise provided for in the Contract Documents, the above obligation shall hold good for a period of one (1) year after the acceptance of the work by the County, during which time if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the County from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long

as any obligation of Contractor remains. Nothing herein shall limit the County's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure Section 337.15.

Whenever Contractor shall be, and is declared by the County to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the County's option:

Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a contract between such bidder, the Surety and the County, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the County under the Contract and any modification thereto, less any amount previously paid by the County to the Contractor and any other set offs pursuant to the Contract Documents.

Permit the County to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the County under the Contract and any modification thereto, less any amount previously paid by the County to the Contractor and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the County may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the County, when declaring the Contractor in default, notifies Surety of the County's objection to Contractor's further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 21____.

(Corporate Seal)

Contractor/ Principal

By _____

Title _____

(Corporate Seal)

Surety

By _____
Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title _____

The rate of premium on this bond is _____ per thousand. The total amount of premium charges is \$ _____.
(The above must be filled in by corporate attorney.)

THIS IS A REQUIRED FORM

Any claims under this bond may be addressed to:

(Name and Address of Surety)

(Name and Address of Agent or Representative for service of process in California, if different from above)

(Telephone number of Surety and Agent or Representative for service of process in California)

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 21____, before me, _____, Notary Public, personally
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")

appeared _____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual
- ☐ Corporate Officer
-
- Title(s)
- ☐ Partner(s) ☐ Limited
 ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:
- Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

PAYMENT BOND

BOND NO. _____

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the County of Yolo, State of California, ("Owner") has awarded to _____ ("Contractor/Principal") a contract (County Agreement No. _____, dated _____, 2021, referred to as the "Agreement") for the work described as _____. The Agreement is incorporated by this reference into this Payment Bond ("Bond"); and

WHEREAS, Contractor/Principal is required to furnish a bond in connection with the Agreement and pursuant to California Civil Code section 9550;

NOW, THEREFORE, we, _____ the undersigned Contractor/Principal, and _____, ("Surety"), a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the County of Yolo, and to any and all persons, companies, or corporations entitled by law to file stop payment notices under California Civil Code Section 9100, or any person, company, or corporation entitled to make a claim on this bond, in the sum of

_____ DOLLARS (\$ _____), which such sum being not less than one hundred percent (100%) of the total amount payable by the Owner under the terms of the Agreement, for which payment will and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if Contractor/Principal, its heirs, executors, administrators, successors, or assigns, or subcontractor, shall fail to pay any person or persons named in Civil Code section 9100; or fail to pay for any materials, provisions, or other supplies, used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code, with respect to work or labor thereon of any kind; or shall fail to deduct, withhold, and pay over to the Employment Development Department, any amounts required to be deducted, withheld, and paid over by Unemployment Insurance Code Section 13020 with respect to work and labor thereon of any kind, then Surety will pay for the same, in an amount not exceeding the amount herein above set forth, and in the event suit is brought upon this bond, also will pay such reasonable attorneys' fees as shall be fixed by the court, awarded and taxed as provided in California Civil Code Section 9550 et seq.

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, or specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described; or pertaining or relating to the furnishing of labor, materials, or equipment therefor; nor by any change or modification of any terms of payment or extension of time for payment pertaining or relating to any scheme or work of improvement herein above described; nor by any rescission or attempted rescission of the contract, agreement or bond; nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or

under the bond; nor by any fraud practiced by any person other than the claimant seeking to recover on the bond; and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given; and under no circumstances shall the Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Owner and Contractor/Principal or on the part of any obligee named in such bond; that the sole condition of recovery shall be that the claimant is a person described in California Civil Code section 9100, and who has not been paid the full amount of his or her claim; and that the Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned, including but not limited to the provisions of sections 2819 and 2845 of the California Civil Code.

Any notice to Surety may be given in the manner specified in the Agreement and delivered or transmitted to Surety as follows:

Attn: _____
 Address: _____
 City/State/Zip: _____
 Phone: _____
 Fax: _____
 Email: _____

IN WITNESS WHEREOF, two identical counterparts of this Bond, each of which shall for all purposes be deemed an original thereof, have been duly executed by Contractor/Principal and Surety above named, on the ____ day of _____, 202__.

 Contractor/Principal (SEAL)

By: _____
 Contractor's Representative

 Contractor/Principal's Address

 City, State, Zip

 Surety (SEAL)

By: _____
 Surety's Representative

 Surety's Address

 City, State, Zip

 Telephone Number

NOTE: Signatures of those executing for Surety must be properly acknowledged. The bond must be accompanied by a properly acknowledged Power of Attorney from the Surety authorizing its agent to bind it to this bond. A copy of such Power of Attorney must be on file with the Yolo County Clerk.

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 21____, before me, _____, Notary Public, personally
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")

appeared _____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual
- ☐ Corporate Officer
-
- Title(s)
- ☐ Partner(s) ☐ Limited
 ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:
- Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

Notary Acknowledgment

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STATE OF CALIFORNIA
COUNTY OF _____

On _____, 21____, before me, _____, Notary Public, personally
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")

appeared _____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual
- ☐ Corporate Officer
-
- Title(s)
- ☐ Partner(s) ☐ Limited ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:
- Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the County of Yolo, organized and operating under the laws of the State of California, (hereinafter referred to as the "County") has awarded to _____, (hereinafter referred to as the "Contractor") an agreement for **Contract No.** _____, (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by the Contractor is more particularly set forth in the Contract for the Project dated _____, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, the Contractor is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

NOW, THEREFORE, we, _____, the undersigned Contractor and _____ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the County in the sum of _____ DOLLARS, (\$ _____), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if the Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one (1) year guarantee of all materials and workmanship; and shall indemnify and save harmless the County, its officials, officers, employees, and authorized volunteers, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees including reasonable attorney's fees, incurred by the County in enforcing such obligation.

As a condition precedent to the satisfactory completion of the Contract Documents, unless otherwise provided for in the Contract Documents, the above obligation shall hold good for a period of one (1) year after the acceptance of the work by the County, during which time if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the County from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long

as any obligation of Contractor remains. Nothing herein shall limit the County's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure Section 337.15.

Whenever Contractor shall be, and is declared by the County to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the County's option:

Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a contract between such bidder, the Surety and the County, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the County under the Contract and any modification thereto, less any amount previously paid by the County to the Contractor and any other set offs pursuant to the Contract Documents.

Permit the County to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the County under the Contract and any modification thereto, less any amount previously paid by the County to the Contractor and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the County may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the County, when declaring the Contractor in default, notifies Surety of the County's objection to Contractor's further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 21____.

(Corporate Seal)

Contractor/ Principal

By _____

Title _____

(Corporate Seal)

Surety

By _____

Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title _____

The rate of premium on this bond is _____ per thousand. The total amount of premium charges is \$ _____.

(The above must be filled in by corporate attorney.)

THIS IS A REQUIRED FORM

Any claims under this bond may be addressed to:

(Name and Address of Surety)

(Name and Address of Agent or Representative for service of process in California, if different from above)

(Telephone number of Surety and Agent or Representative for service of process in California)

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____

On _____, 21____, before me, _____, Notary Public, personally
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")

appeared _____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

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- Title(s)
- ☐ Partner(s) ☐ Limited
 ☐ General
- ☐ Attorney-In-Fact
- ☐ Trustee(s)
- ☐ Guardian/Conservator
- ☐ Other:
- Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above



Exhibit E

100 West Court Street
2nd Floor Tenant Improvement

PROJECT MANUAL

Volume I: Bidding and Contracting Requirements



County of Yolo
100 West Court Street
Second Floor Tenant Improvement
June 29, 2021

Bids Due before 2:00PM, Thursday, September 2, 2021 at
Yolo County Administrator's Office
625 Court Street, Room 202
Woodland, CA 95695



Permit Application

March 29, 2021

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SECTION 00 01 10

TABLE OF CONTENTS

DIVISION 0 – BIDDING AND CONTRACTING REQUIREMENTS

00 01 15	List of Bid Documents
00 12 00	Notice to Bidders
00 20 00	Instructions to Bidders
00 41 00	Bid Form with Bid Schedule
00 42 00	Bidder's Bond
00 43 00	Subcontractor List
00 44 00	Bidder Information Sheet
00 45 00	List of Successful Projects
00 45 10	Non-Collusion Affidavit
00 45 26	DAS Form 7 – Agreement to Train Apprentices
00 45 46	Certification Against Lobbying
00 51 00	Notice of Award
00 52 00	Construction Agreement
00 55 00	Notice to Proceed
00 61 00	Performance Bond
00 62 00	Payment Bond
00 62 10	Indemnification
00 70 00	General Conditions – Separated document

End Table of Contents for Volume 1



SECTION 00 01 15

LIST OF BID DOCUMENTS

BID DOCUMENTS

A. PROJECT MANUAL

1. Volume 1: Bidding and Contracting Requirements dated March 29, 2021
2. Volume 2: Project Specifications dated March 29, 2021

B. PROJECT PLANS, Kitchell CEM, dated March 29, 2021 “Bid Set”

C. SUPPLEMENTAL DOCUMENTS

1. Asbestos Renovation Survey Report, ESS Environmental, dated June 15, 2020.
2. DAS Form 7 form.
3. Yolo County Construction and Demolition Debris Diversion Plan Page 1 form.
4. Yolo County Construction and Demolition Debris Diversion Plan Page 2 form.
5. Yolo Solano Air Quality Management District - Air District Questionnaire form.
6. Yolo Solano Air Quality Management District – Asbestos Notification form.



SECTION 00 12 00

NOTICE TO BIDDERS

NOTICE IS HEREBY GIVEN that the County of Yolo will receive sealed bids in accordance with the provisions of the Public Contract Code from contractors licensed for the furnishing of all labor, materials, equipment, transportation and services for the performance of the following Work:

Second Floor Tenant Improvement, 100 West Court Street, Woodland, California



The building is an existing two-story office building in the city of Woodland, California. The extent of the work is limited to the entire second floor, comprising of 9,998 square feet of typical office space. The project scope includes the asbestos abatement, demolition and renovation of existing restroom facilities, breakroom, storage/equipment areas, and offices, including new cubicle workstations that are Owner Furnished and Owner Installed. Renovation of the mechanical and electrical systems to integrate with the renovated office layout are included.

Fire Sprinkler and Fire Alarm systems are a Deferred Submittal and shall be designed and submitted by the Contractor to the City of Woodland's Fire Department, Yolo County Building Department, Kitchell and County's General Services Department for all reviews and approvals, along with the Contractor paying all costs and fees for these permits, plan reviews and approvals.

Plans and Specifications for the work will be available as noted herein.

All questions regarding Plans and Specifications and Interpretations or Clarifications for this Initiation for Bid must be entered electronically through Bid Sync (<https://www.BidSync.com>). The County Project



Manager will respond to all Contractor questions through the Bid Sync Question and Answer section on this website.

SEALED BIDS:

Sealed bids on the above project shall be filed with Yolo County, County Administrator's Office, located at 625 Court Street, Room 202, Woodland, CA 95695, before **2:00 pm on Thursday, September 2, 2021**. All bids must be marked clearly on the envelope: **"Second Floor Tenant Improvement, 100 West Court Street"**. Said bids will be opened in public after **2:15 pm** of said day in the Atrium Training Room in the Erwin Meier Administration Building, 625 Court Street, Woodland, CA. Bids shall be submitted only on forms provided in the Bid Documents and shall be accompanied by all documents and information required to be submitted by the Instructions to Bidders and by law. No bid may be withdrawn after the time established for receiving bids or before the award and execution of the Contract, unless the award is delayed for a period exceeding ninety (90) calendar days. The low bidder, for purposes of the award, shall be the responsive bidder offering the low lump sum amount for the base bid and meeting all other bid submittal requirements. The County reserves the right to reject any or all bids.

Please note: All individuals delivering bids and Bid Opening attendees will be required to comply with the County's mandates related to Covid-19 safety including the wearing of masks and physical distancing.

CONTRACTOR'S LICENSE REQUIRED:

The Board will not consider or accept any bids from contractors who are not licensed to do business in the State of California. Contractor warrants and represents that he/she holds a valid California license pursuant to the State Contractors License Act [Business and Professions Code Section 7000, et seq.], that his/her license is in good standing and that he/she possess a Class B License as required by the categories and type of work. Copies of the Contractor's State Contractor license(s) must be provided, along with their bid.

REQUIRED LISTING OF PROPOSED SUBCONTRACTORS:

Each proposal shall have listed therein the name and address of each subcontractor to whom the Bidder proposes to subcontract portions of the Work in an amount in excess of one-half of one percent ($\frac{1}{2}$ of 1%) of his total Bid in accordance with the Subletting and Subcontracting Fair Practices Act, commencing with Section 4100, through 4113 inclusive of the Public Contract Code. The Bidder's attention is invited to other provisions of said Act related to the imposition of penalties for a failure to observe its provisions by using unauthorized subcontractors or by making unauthorized substitutions.

Notice is hereby given that the Project is a public works project within the requirements of Division 2, Part 7, Chapter 1 of the California Labor Code, and that each bidder and listed subcontractor is required to be registered pursuant to Labor Code section 1725.5 at the time of bidding. Failure of the bidder to be registered at the time of bidding shall render the bid non-responsive and unavailable for award. Bidder's listing of an unregistered subcontractor may render the bid non-responsive and unavailable for award unless such failure is the result of an inadvertent error and the provisions of Labor Code section 1771.1 apply.



Joint Apprenticeship Committee Participation Requirement

It is a Yolo County policy that, in order to be deemed a responsive bidder, the bidder must participate in a joint apprenticeship committee, if the submitted bid amount is \$750,000.00 or greater. The California Department of Industrial Relations defines a joint apprenticeship committee as a committee made up of equal number of members from labor and management. **Bidders must submit with their bid a completed California Department of Industrial Relations' DAS-7 form that documents the bidder's participation in a joint apprenticeship committee. Bids that are not accompanied by such proof of participation will be rejected.** The County will verify participation prior to the award.

BID EXAMINATION AND PREPARATION:

Construction Documents may be obtained at Bid Sync (<https://www.BidSync.com>) or at the Yolo County Website (under *Doing Business with the County*). Documents will be available beginning on Tuesday, July 27, 2021. It is the bidder's responsibility to arrange for printing services to obtain printed copies of the bid documents. The contract documents may also be examined at the following locations:

Construction Bid Board
Dodge Data & Analytics
McGraw Hill
Sacramento Regional Builders Exchange
El Dorado Builders Exchange
Placer County Contractors Association

The Bidder shall carefully examine the Bid Documents, including the Plans and Specifications and satisfy the Bidder as to their sufficiency, and shall not at any time after submission of the Bid, dispute or complain of such Plans or Specifications nor assert that there is any misunderstanding in regard to the location, extent or nature or amount of work to be performed in accordance thereto. Should a Bidder find discrepancies or omissions in the Plans and Specifications, the Bidder shall notify the Project Manager immediately. Interpretations or clarifications considered necessary by the Project Manager shall be by addenda, mailed or electronically delivered to all plan holders and acknowledged on Bid form. Questions received after 2:00 p.m. of August 20, 2021 will not be answered. The issuance and release of the final addendum is estimated to be Thursday August 26, 2021

The Bid shall have all items filled in and the signatures of all persons signing the Bid shall be in long-hand. Mistakes must be corrected, and the correction inserted and initialed in ink by the person signing the Bid. Erasures and/or correction fluid are NOT acceptable. Changes must be lined out and corrections inserted adjacent and initialed by the bidder's authorized representative. No proposal will be considered which makes exceptions, changes or reservations to the Plans and Specifications.

The bids must supply all information required by the bid documents & specifications. Bids must be full and complete. The County reserves the right in its sole discretion to reject any bid as non-responsive as a result of any omission or error in the bid.



SUBSTITUTIONS:

Bids shall be based on products and systems specified in the Bid Documents or listed by name in addenda. Contractors and materials suppliers may submit requests for substitutions up to 35 days following Notice of Award.

NON-COLLUSION AFFIDAVIT:

Bidders shall include with their bids a signed affidavit stating that their bid is not a sham or a collusive bid. The affidavit is to be signed exactly as worded; no alternate wording will be accepted. The affidavit is included with the bid.

BONDS AND INSURANCE REQUIRED:

A bid security shall be provided with each Bid. Bid security shall be in an amount of not less than ten percent (10%) of the total amount of the Bid and shall be cash, a certified check or cashier's check drawn to the order of the County of Yolo or a Bidder's Bond executed by a surety satisfactory to the County of Yolo in the form provided in the Proposal section of these Bid Documents. The Bidder to whom award is made shall provide Certificates of Insurance as required in Article 2 of the General Conditions, and shall complete and submit the Performance Bond and Payment Bond forms contained in the Contract Documents.

PREVAILING WAGE PROVISION:

- a. Pursuant to Labor Code Section 1770 et seq., 1773, 1773.1, 1773.2, 1773.6, 1773.7, and 1720 each laborer or mechanic of contractor or any subcontractor engaged in work on the project under this Contract shall be paid not less than the hourly wage rate of per diem wages set forth in the prevailing wage rate schedule published by the Director of Industrial Relations regardless of any contractual relationship which may be alleged to exist between contractor or any subcontractor and such laborers and mechanics. Interested parties may obtain the current wage information by submitting their requests to the Department of Industrial Relations, Division of Labor Statistics and Research, P.O. Box 603, San Francisco, CA 94101, or at www.dir.ca.gov/dlsr/pwd.
- b. Any laborer or mechanic employed to perform work on the project under this Contract, which work is not covered by any of the foregoing classifications, shall be paid not less than the prevailing rate of per diem wages specified herein for the classification which most nearly corresponds to the work to be performed by him/her.
- c. The foregoing specified prevailing wage rates are minimum rates only, and the contractor may pay any wage rate in excess of the applicable rates contained in this Contract.
- d. Pursuant to Labor Code Section 1775, the contractor as a penalty to the owner shall forfeit \$200.00 for each calendar day, or portion thereof for each worker paid less than the prevailing rate established by the Department of Industrial Relations for such work or craft in which such worker is employed. The



difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which the worker was paid less than the prevailing wage rate shall be paid to each worker by the contractor. NOTE: an error on the part of an awarding body does not relieve the contractor from responsibility for payment of the prevailing rate of per diem wages and penalties pursuant to Labor Code Sections 1770-1775.

- e. Prevailing wage rates are available through the following website:
<https://www.dir.ca.gov/OPRL/dprevagedetermination.htm>.
- f. All contractors and subcontractors are subject to the provisions of Sections 1810 through 1814 of the California Labor Code which provide for the maximum hours a worker is to be employed and the amount and rate of overtime compensation.

AWARD OF CONTRACT:

Bids will be considered for award by the County Administrator's Office of the County. The County of Yolo reserves the right after opening bids to reject any or all bids, or to waive any informality (non-responsiveness) in any bid, or to make award to the lowest responsive, responsible bidder and reject all other bids, as it may best serve the interests of the County.

If this Contract is to be awarded, the Notice of Award shall be issued to the lowest responsible, responsive bidder within Ninety (90) days following the bid opening.

As a condition of award, the successful Bidder will be required to submit bonds and evidence of insurance prior to execution of the Agreement by the County. Failure to meet this requirement shall constitute abandonment of the Bid by the Bidder and forfeiture of the Bid Bond. Award will then be considered to the next lowest responsible Bidder.

All bids will be compared using the Opinion of Probable Cost prepared by the AE of Record for the project. For the purposes of bonding, the OPC for the base bid work is in the range of \$1,000,000 - \$1,500,000.

PRE-BID CONFERENCE:

A mandatory pre-bid conference is scheduled for **10:00 am on Wednesday, August 11, 2021**, at the project site located at 100 West Court Street, Woodland, CA 95695. Any questions that can be answered at that time by direct reference to the Contract, Plans and Specifications, will try to be answered. Questions that cannot be so answered will be addressed, as necessary, by written addendum. Submission of a bid shall be considered an acknowledgment of familiarity with the Contract, Plans and Specifications, and conditions at the site. Oral statements made during the bidding period may not be relied upon and will not be binding or legally effective.

Please note: All Pre-Bid Conference attendees will be required to comply with the County's mandates related to Covid-19 safety including the wearing of masks and physical distancing.



PROJECT MANAGER:

All communications relative to the Contract Documents and Plans shall be posted on Bid Sync. No oral responses to any questions concerning the content of the Plans and Contract Documents will be given. Responses, if any, will be in the form of written addenda to the Contract Documents and Plans.

By order of the County Administrators Office, County of Yolo, State of California.

By:

Kevin Yarris
County of Yolo
General Services



SECTION 00 20 00

INSTRUCTIONS TO BIDDERS

1. Bids are requested for a general construction contract, or work described in general, as follows:

**Second Floor Tenant Improvement
100 West Court Street, Woodland, California**

2. The County of Yolo will receive sealed bids from Bidders as stipulated in Document 00 12 00, Notice to Bidders.
3. Apparent low Bid will be based solely on: Base Bid Price. All Bidders are required to submit Bids on all bid items.
4. Bidders must submit bids on Document 00 41 00 Bid Form. Bids not submitted on the required form shall be deemed non-responsive and shall not be considered.
5. Bidders must submit cash, a cashier's check, a certified check or a corporate surety bond of not less than ten percent (10%) of amount bid, payable to The County, with their Bids. Required form of corporate surety bond, Document 00 42 00 County of Yolo Bidder's Bond, is provided by the County. Bids submitted without necessary bid security will be deemed non-responsive and will not be considered.
6. Bidders must submit names of all subcontractors and their respective bid item sub-bids on Document 00 43 00 Subcontractors List for those subcontractors who will perform any portion of Work, including labor, rendering of service, or specially fabricating and installing a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent (0.5%) of total bid. Any violation of this provision may result in Bid being deemed non-responsive and not being considered.
7. Bidders must submit Document 00 44 00 Bidder Information Sheet with their bids. Bids submitted without the Bidder Information Sheet will be deemed non-responsive and will not be considered.
8. Bidders must submit Document 00 45 00 List of Successful Projects. Bids submitted without the affidavit will be deemed non-responsive and will not be considered.
9. Bidders must submit Document 00 45 10 Non-collusion Affidavit with their bids. Bids submitted without the affidavit will be deemed non-responsive and will not be considered.
10. Bidders must submit Document 00 45 26 DAS Form 7 – Agreement to Train Apprentices with their bids if the submitted bid total is \$750,000.00 or greater. Bids submitted without a DAS Form 7 (if applicable) will be deemed non-responsive and will not be considered.
11. Bidders must submit Document 00 45 46 Certification Against Lobbying with their bids. Bids submitted without the certification will be deemed non-responsive and will not be considered.



12. Bidders must supply all information required by Bid documents and specifications. Bids must be full and complete. The County reserves the right in its sole discretion to reject any Bid as non-responsive as a result of any error or omission in the Bid.
13. A mandatory Pre-bid Conference and Site Visit will be held as referenced in Document 00 12 00, Notice to Bidders, to clarify such matters as Bidders may request. The referenced Pre-bid Conference and Site Visit will take approximately two hours. The County will transmit to all prospective Bidders of record such Addenda as the County in its discretion considers necessary in response to questions arising at the Pre-bid Conference. The sign in sheet at the Pre-bid conference will be posted by addendum on Bid Sync following the Pre-bid conference. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda issued as a result of the Pre-bid Conference, shall constitute the sole and exclusive record and statement of the results of the Pre-bid Conference.
14. Bids shall be clearly written without erasure or deletions. The County reserves the right to reject any Bid containing erasures or deletions.
15. Bidders may not modify Bid Form or qualify their Bids.
16. Submission of Bid signifies careful examination of Contract Documents and complete understanding of the nature, extent and location of Work to be performed. Bidder must complete the tasks listed below in subsections as a condition to bidding and submission of Bid shall constitute the Bidder's express representation to The County that Bidder has fully completed the following:
 - (A) Bidder has visited the site and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, existing facility conditions for demolition and removal, Site, locality, actual conditions, existing access and facility conditions, and all local conditions and federal, state and local laws and regulations that in any manner may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;
 - (B) Bidder has given Project Manager prompt written notice of all conflicts, errors, ambiguities or discrepancies that it has discovered in or among the Contract Documents and as-built and actual conditions and the written resolution thereof by Project Manager is acceptable to Bidder.
17. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are deemed included in the bid documents.
 - (A) DIR REGISTRARION AND NOTICE: To be qualified to bid on, be listed in a bid proposal or engage in the performance of any public work contract subject to Labor Code section 1720, contractors and subcontractors must be registered with the Department of Industrial Relations. Failure to provide this information at the time of bid will result in disqualification. Please see <http://www.dir.ca.gov/Public-Works/PublicWorks.html> for more information. No contract will be entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work provided at the time of bid. If awarded a contract, the bidder and its subcontractors, at all tiers, shall maintain active



registration with the Department of Industrial Relations for the duration of the project. This Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. Each contractor and subcontractor must furnish certified payroll records to the Labor Commissioner at least monthly.

- (B) A **reminder** to General Contractors in regard to State Public Contracting and apprenticeship, there is an additional local Yolo County requirement that states; “The County requires that all bidders on public works projects in excess of seven hundred fifty thousand dollars to participate in a State of California Division of Apprenticeship Standards approved joint labor and management apprenticeship program. Proof of compliance with this instructional training requirement must be provided (**DAS 7 form**) at the time a bid is submitted.” Contractor shall be responsible to provide documentation illustrating a qualified and approved apprenticeship training program and shall include in bid documents.

18. All questions regarding Plans and Specifications and Interpretations or Clarifications for this Invitation for Bid must be entered electronically through the County’s electronic solicitation system, **Bid Sync** at <https://www.BidSync.com>. The County Project Manager will respond to all Contractor questions through the Bid Sync Question and Answer section on this website. Questions received less than seven (7) days prior to the date for opening Bids may not be answered. Only questions answered in Bonfire or by formal written Addenda posted in Bonfire will be binding. Oral and other interpretations or clarifications will be without legal effect.
19. Addenda may also be issued to modify the Bidding Documents as deemed necessary by the County and consultants.
20. Addenda shall be acknowledged on Bid Form by number and shall be part of Contract Documents. Contractor shall be responsible for obtaining all addenda published and complete listing of Addenda may be secured from the Project Manager.
21. Substitutions: Bids shall be based on products and systems specified in Contract Documents or listed by name in Addenda. Contractors and materials suppliers may submit requests for substitutions up to thirty-five (35) days following the Notice of Award.
 - (A) Requests for substitutions shall contain sufficient information to assess acceptability of product or system and impact on Project (see Specification Section 01 25 00 for criteria). Insufficient information shall be ground for rejection of substitution.
 - (B) Substitutions may be requested after Contract is signed in accordance with requirements specified in Document 00 70 00 General Conditions and Specifications Section 01 25 00.
 - (C) Substitutions may not be requested during bidding or between bid opening and issuance of the Notice of Award.
22. Bids will be received at County of Yolo, County Administrator’s Office Room 202, Woodland, CA 95695 by the County and/or Project Manager who will receive them and time/date them. Bids submitted by mail must be received prior to the opening of bids; The County will not be held responsible for the failure of delivery.



- (A) Envelopes or boxes must be sealed, and marked with name and address of the Bidder, and addressed to:

Yolo County, County Administrators Office
625 Court Street, Room 202
Woodland, CA 95695

- (B) Mark envelopes:

Second Floor Tenant Improvement, 100 West Court Street

- (C) Envelopes must be submitted by date and time shown in Document 00 12 00, Notice to Bidders.

- (D) Bids must contain the following, fully executed documents:

- 1) Document 00 41 00 Bid Form: Must be filled in and signed by Bidder.
 - 2) Cash, Cashier's Check or Certified Check, or Document 00 42 00 County of Yolo Bidder's Bond: If submitted, Document 00 42 00 is to be executed by Bidder and its surety.
 - 3) Document 00 43 00 Subcontractors List: If Bidder intends to employ sub-contractors, it is necessary to furnish information required on this form, in accordance with instructions contained herein. It is acceptable for the bidder to provide the city and state only on bid day and within 24 hours of the bid due date provide the mailing addresses & phone numbers."
 - 4) Document 00 44 00 Bidder Information Sheet
 - 5) Document 00 45 00 List of Successful Projects
 - 6) Document 00 45 10 Non-collusion Affidavit: To be subscribed and sworn before a notary public.
 - 7) Document 00 45 26 DAS Form 7 – Agreement to Train Apprentices.
 - 8) Document 00 45 46 Certification Against Lobbying
23. Envelopes will be opened in public following receipt of bids after **2:15 pm on Thursday, August 19, 2021**, in the Atrium Training Room of the Erwin Meier Administration Building, 625 Court Street, Woodland, CA.
24. The following documents are to be executed and submitted by apparent low Bidder after Bids have been opened and duly inspected. Failure to properly and timely submit these documents entitles The County to reject the bid as non-responsive.

- (A) Submit the following documents to the Project Manager by 5:00 p.m. of the TENTH business day following opening and inspection of bids.



1) Insurance Certificates and Endorsements required by Document 00 70 00
General Conditions Article 2

(B) Submit the following documents to the Project Manager by 5:00 p.m. of the TENTH business day following NOTICE OF AWARD. Award of contract depends upon approval of State Department of Finance, Insurance Certificates and Endorsements, Document 00450 Contractor Information Form, and any required safety submittals.

1) Document 00 52 00 Agreement: To be executed by successful Bidder. Submit two (2) copies, each bearing an original signature.

2) Document 00 61 00 Performance Bond: To be executed by successful Bidder and surety.

3) Document 00 62 00 Payment Bond: To be executed by successful bidder and surety.

(C) Pursuant to Section 1777.5 (d) of the California Labor Code, the Apparent Low Bidder and each of its subcontractors who employ workers in any apprenticeable craft or trade shall employ apprentices in the ratio set forth in Section 1777.5 of the California Labor Code and shall apply to any apprenticeship program in the craft or trade that can provide apprentices to the site of the Project for a certificate approving the contractor (Apparent Low Bidder) and subcontractors under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. The Apparent Low Bidder shall provide documentation of proof of compliance with this section upon request by the County. This requirement is separate from and in addition to the obligation to participate in a Joint Apprenticeship Committee as set forth in Section 00 12 00 'Notice to Bidders' in this Project Manual.

25. Any bid protest must be submitted in writing to the Project Manager, before 5 p.m. of the FIFTH business day following the posting of the **Intent to Award** on Bid Sync.

(A) The initial protest document must contain a complete statement of the basis for the protest.

(B) The protest must refer to the specific portions of all documents, which form the basis for the protest.

(C) The protest must include the name, address and telephone number of the person representing the protesting party.

(D) The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

(E) The County will issue a decision on the protest. If the County determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be



determined to be ineligible for future contract award.

- (F) The procedure and time limits set forth in this paragraph are mandatory and are the Bidder's sole and exclusive remedy in the event of bid protest and failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.

26. The County reserves the right to reject any or all Bids, including without limitation the right to reject any or all nonconforming, non-responsive, unbalanced or conditional Bids, re-bid, and to reject the Bid of any Bidder if The County believes that it would not be in the best interest of Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by The County. The County also reserves the right to waive inconsequential deviations not involving price, time or changes in the Work. For purposes of this paragraph, an "unbalanced bid" is one having nominal prices for some work items and enhanced prices for other work items.
27. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between written words and figures, or words and numerals, will be resolved in favor of the words.
28. In evaluating Bids, The County will consider the qualifications of Bidders, whether or not the Bids comply with the prescribed requirements, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award. The County may conduct such investigations as The County deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed subcontractors, suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to The County's satisfaction within the prescribed time.
29. If the contract is to be awarded, it will be awarded to the lowest responsible, responsive Bidder and Base Bid. The award of the Contract will be subject to availability of funds and approval of Department of Financing per SB863 Lease Revenue Bond Financing requirements.
30. Special attention is directed to contractors for **Covid-19** precautions and requirements during construction. Refer to Section 01 10 00 Summary of Work for description of minimum requirements.
31. Special Requirements:
- A. The Contractor's workers and equipment shall be limited to the work areas as designated by this contract. In the event the Contractor, his/her employees, or subcontractors fail to adhere to the County's security provisions, the County has the right to deny access to the work site to that employee or subcontractor without an extension of time being granted to the Contractor.
- B. No smoking shall be allowed on construction site per County's policy.



SECTION 00 41 00

BID FORM

Project: Second Floor Tenant Improvement, 100 West Court Street, Woodland, California

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the County of Yolo ("The County") in the form included in the Contract Documents, Document 00520 Contract, to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of Contract Documents.
2. Bidder accepts all of the terms and conditions of the Contract Documents and the Notice to Bidders, including without limitation, those dealing with the disposition of Bid security. Bidder will sign and submit the Agreement with Bonds and other documents required by Document 00200 Instructions to Bidders, within ten (10) calendar days after receipt of the County's Notice of Award.
3. In submitting this Bid, Bidder represents:
 - (a) Bidder has examined copies of all of the Contract Documents and of the following Addenda (receipt of all of which is hereby acknowledged).

<u>Date</u>	<u>Number</u>
_____	_____
_____	_____
_____	_____
_____	_____

- (b) Bidder has visited the site and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as built conditions, and all local conditions and federal, state and local laws and regulations that in any manner may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;
 - (c) Bidder has examined thoroughly and understood all reports, drawings and/or reports, available for Bidding purposes and accepts the determination set forth in these documents and Document 00700 General Conditions of the limited extent of the



information contained in such reports and drawings upon which the Bidder may be entitled to rely. Bidder agrees that except for the information so identified, Bidder does not and shall not rely on any other information contained in such reports and drawings.

- (d) Bidder has conducted or obtained and has understood all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in paragraph 3(c) above) which pertain to the subsurface conditions, as built conditions, Underground Facilities and all other physical conditions at or contiguous to the site or otherwise which may affect the cost, progress, performance or furnishing of Work, as Bidder considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time and in accordance with the other terms and conditions of Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by Bidder for such purposes;
 - (e) Bidder has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
 - (f) Bidder has given Project Manager prompt written notice of all conflicts, errors, ambiguities or discrepancies that it has discovered in or among the Contract Documents and as built and actual conditions and the written resolution thereof by Project Manager is acceptable to Bidder.
4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sum of money listed in the following Bid Schedule:

(continued next page)



SECTION 00 41 00

Bid Schedule

Yolo County Second Floor Tenant Improvement, 100 West Court Street Project

Contractor / Company: _____

Item No.	Description – Awarded Contractor is responsible and liable for all required and needed material quality and quantities.	Quantity Pricing	Individual Line Item Pricing
1.	General Conditions, Mobilizations, and Submittals,	LS	
2.	Disconnecting and capping the water, sewer, electrical and communications during construction so the rest of building can continue to operate during abatement, demolition and new construction.	LS	
3.	Abatement – All associated costs with removal, clearances to completion, also including submission of YSAQMD Air -District Questionnaire and Asbestos Notification forms with their payment of fees. Providing and paying for a Certified Asbestos Consultant as required for air monitoring and sample testing during on site removal and final clearances. Payment of all disposal fee costs.	LS	
4.	Demolition all costs and fees including submission of Yolo County Construction and Demolition Debris Diversion Plan.	LS	
5.	All new construction costs including electrical, plumbing, HVAC, sheetrock, ceilings, paint, carpet, etc.	LS	
6.	Finals with Building Department	LS	
7.	Site clean-up and Demobilization	LS	
<u>BASE BID TOTAL PRICE</u> -Add up Line Item Numbers 1 thru 7			\$
<u>BASE BID TOTAL PRICE</u> -Written in Words:			

***All line items on Bid Schedule form must be completed for valid bids.**



Base Bid Total Price for the Second Floor Tenant Improvement, 100 West Court Street

\$ _____

(written) _____ **Dollars**

Enclosed find Bidder's Bond, certified check or cashier's check No. _____ of the
_____ (Company/Bank), for \$ _____.

Dated this _____ day of _____, 2021

5. Subcontractors are listed on the attached document 00 43 00, Subcontractors List.
6. The undersigned understands that the County reserves the right to reject this Bid, but that this Bid shall remain open and shall not be withdrawn for a period of ninety (90) calendar days from the date prescribed for its opening (to accommodate State financing process).
7. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Award, is mailed or delivered to the Undersigned within the stipulated time after the date set for the opening of this Bid, or at any other time thereafter before it is withdrawn, the undersigned will execute and deliver the documents required by Document 00 20 00 Instructions to Bidders including, but not limited to, Document 00 52 00 Agreement, Document 00 61 00 Performance Bond, and Document 00 62 00 Payment Bond and Escrow Bid Documents, all within ten (10) calendar days after personal delivery or after receipt in the mails of the Notice of Award.
8. Notice of Award or request for additional information may be addressed to the undersigned at the address set forth below.
9. The undersigned herewith encloses a cash, cashier's check, certified check or corporate surety bond in the amount of ten percent (10%) of the total of Bid Items and made payable to: County of Yolo and is subject to all conditions imposed by law.
10. The undersigned agrees to commence work under this Contract on the date established and to complete all work within the time specified in Document 00 52 00 (Contract).
11. The undersigned agrees that, in accordance with Document 00 70 00 General Conditions liquidated damages for failure to complete all work in the contract within the time specified are as set forth in Document 00 52 00 (Agreement).
12. The undersigned herewith encloses the completed Bidder's Bond – 00 42 00.
13. The undersigned herewith encloses the completed Subcontractors List – 00 43 00.
14. The undersigned herewith encloses the completed Bidder Information Sheet – 00 44 00.
15. The undersigned herewith encloses the completed List of Successful Projects form – 00 45 00.
16. The undersigned herewith encloses the completed Non-Collusion Affidavit – 00 45 10.



17. The undersigned herewith encloses the completed DAS Form 7 – 00 45 26.
18. The undersigned herewith encloses the completed Certification Against Lobbying – 00 45 46.
19. The names of all persons interested in the foregoing Bid as principals are:

(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full).

Name of Bidder:

Legal Name of Corporation or Firm

CA Contractor's License No.

DIR Registration No.

Business Address

Email Address

Telephone Number

Date of Bid

Signature of Bidder (Authorized to sign contracts on behalf of the Corporation or Firm)

Printed Name

Title



SECTION 00 42 00

COUNTY OF YOLO BIDDER'S BOND

We, _____ as Principal, and
_____ as Surety, are bound unto THE COUNTY OF
YOLO as Owner (Obligee), in the penal sum of ten percent (10%) of the total amount of the bid of the Principal
submitted to the Obligee for the work described below, for the payment of which sum we bind ourselves, jointly
and severally,

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT:

WHEREAS, the Principal is submitting a bid to the Obligee, for the **Second Floor Tenant Improvement, 100 West Court Street** for which bids are to be opened in public in the Erwin Meier
Administration Building, 625 Court Street, Woodland, CA 95695.

NOW THEREFORE, if Principal is awarded the Contract and, within the time and manner required
under the specifications, after the prescribed forms are presented to him for signature, enters into a written
contract, in the prescribed form, in accordance with the bid, and files two bonds with the Obligee, one to
guarantee faithful performance of the contract and the other to guarantee payment for labor and materials, as
required by law, then this obligation shall be null and void; otherwise it shall remain in full force.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall
pay all costs incurred by the Obligee in such suit, including reasonable attorney's fees to be fixed by the Court.

Dated: _____

Principal

Surety

By: _____
Attorney-in-Fact

ADDRESS OF SURETY FOR SERVICE OF NOTICE:

NOTE: Signature of those executing for the Surety shall be properly acknowledged and accompanied by a
Certificate of Acknowledgement



SECTION 00 43 00

SUBCONTRACTOR LIST

Second Floor Tenant Improvement, 100 West Court Street

The General Contractor shall list below all subcontractors who will be performing categories of work in excess of one-half (1/2) of one percent (1%) of the General Contractor's total bid price. All work not covered within the following list will be performed directly by the General Contractor. Yolo County will follow Public contract Code Section 4104, where bids submitted must contain at least the Subcontractors; name, location of the place of business, CSLB No., DIR No., and type of work to be performed. The County will allow the other required information about the subcontractor to be submitted up to 24 hours after the bid submittal deadline. Copy to use additional forms as necessary.

WORK TO BE PERFORMED	NAME OF SUBCONTRACTOR	BID PRICE	DIR REGISTRATION NO.	CA LICENSE TYPE AND NO.	MAILING ADDRESS	PHONE NUMBER



SECTION 00 44 00

BIDDER INFORMATION SHEET

The Bidder must check one of the following classifications that fit its type of business organization and furnish all information required under that classification.

Please type or print your answers.

Attach a copy of license(s) upon which you intend to rely.

() BIDDER IS A CORPORATION

The full name of the corporation as it appears on the State Contractor's License is:

Corporation is incorporated in the State of:

() BIDDER IS AN INDIVIDUAL

Bidder's name as it appears on State Contractor's License is:

() BIDDER IS A PARTNERSHIP

Bidder's firm name, individual or partnership, as it appears on State Contractor's License is:

The full names of all partners as they appear on State Contractor's License are:

County in which any Certificate of Doing Business Under Fictitious Name is filed – (If none, so state):

Accompanying this proposal is _____ (NOTICE: INSERT THE WORDS "CASH (\$_____)", "CASHIER'S CHECK", "CERTIFIED CHECK", OR "BIDDER'S BOND", AS THE CASE MAY BE) in amount equal to at least ten (10) percent of the total of the Bid.

The names of all persons interested in the forgoing proposal as principals are as follows:



IMPORTANT NOTICE: If the Bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and executive officer thereof; if a partnership, state name of partnership, also names of all individual partners; if Bidder or other interested person is an individual, state first and last names in full.

Licensed in accordance with an act providing for the registration of contractors,

License No. _____ Classifications(s) _____
(A copy of the afore-referenced license must be supplied at Notice of Award.)

ADDENDA: This Proposal is submitted with respect to the changes to the Contract included in addenda number/s _____

(Fill in addenda numbers if addendas have been received and insert, in this proposal, any Engineer's Estimate sheets that were received as part of the addenda)

CERTIFICATION OF BIDDER FOR PROPOSAL:

By my signature on this Proposal I certify, under penalty of perjury under the laws of the State of California, that the foregoing questionnaire and statements of Public Contract Code are true and correct. By my signature on this proposal I further certify, under penalty of perjury under the laws of the State of California and the United States of America, that the Non-collusion Affidavit required by Public Contract Code Section 7106 and Part 24 Debarment and Suspension Certification are true and correct.

The person or persons executing this proposal on behalf of a corporation or a member of partnership, shall be prepared to demonstrate by resolution, article, or otherwise, that such person is or that such persons are appropriately authorized to act in these regards for such corporation or partnership. Such authority shall be demonstrated to the satisfaction of the County of Yolo.

If the signature is by an agent other than an officer of a corporation or a member of a partnership, a power of attorney authorizing said act by the agent on behalf of his principal shall be submitted with the bid forms, otherwise the Bid may be disregarded as irregular and unauthorized.

The Bidder's execution on the signature portion of this Proposal shall constitute an endorsement and execution of those affidavits, declarations and certifications which are of this Proposal.

Executed this _____ day of _____ at _____, California.

Sign Here: _____
by _____

Name and Title of Bidder



SECTION 00 45 00

LIST OF SUCCESSFUL PROJECTS

Bidders must have experience in demolition and grading projects and bidders must list below a minimum of five similar projects of not less than 50% of the total work scope of this project and within the last eight years.

Bidder name: _____

	Project Location	Project Description	Contract Dollar Amount	Name and Phone # of Owner's Representative
1				
2				
3				
4				
5				

SECTION 00 45 10

NON-COLLUSION AFFIDAVIT

Non-Collusion Affidavit To Be Executed By Bidder and Submitted with Bid

State of California)) ss.
County of Yolo)

_____, being first duly sworn, deposes and says that he or she is

_____ of _____ the party making the foregoing bid that the bid is not made in the interest of, or in behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in manner, directly or indirectly sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any depository, or to any member or agent thereof to effectuate a collusive or sham bid.

COMPANY NAME

COMPANY ADDRESS

SIGNATURE OF OFFICER _____

TITLE _____



SECTION 00 45 26

AGREEMENT TO TRAIN APPRENTICES

DAS Form 7

Joint Apprenticeship Committee Participation Requirement

The County adopted a policy that one of requirements to be deemed a responsive bidder is that the bidder must be participating in a joint apprenticeship committee. The California Department of Industrial Relations defines a joint apprenticeship committee as a committee made up of equal number of members from labor and management.

Bidders must complete and submit the attached California Department of Industrial Relations' DAS-7 form that documents the bidder's participation in a joint apprenticeship committee. The County will verify participation prior to the award.

***Subcontractors participating in this project are obligated to meet the requirements of Labor Code 1777.5.**

March 29, 2021

00 01



SECTION 00 51 00

NOTICE OF AWARD

Dated: xxxxxxxx, 2021

TO: xxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

COUNTY OF YOLO PROJECT:
Bid No. **01**

ADDRESS: xxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxx

PROJECT: SECOND FLOOR TENANT IMPROVEMENT
100 West Court Street
Woodland, CA 95695

COUNTY OF YOLO CONTRACT

CONTRACT FOR: **Second Floor Tenant Improvement, located in Woodland, California.**

The Contract Price of your contract is xxxxxxxxxxxxxxxxxxxxxxxxx Dollars
(\$xxxxxxxxxxxxxx).

Two copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. Three sets of the Drawings will be delivered separately or otherwise made available to you immediately.

Upon receipt of this Notice of Award, you and each of your subcontractors who employ workers in any apprenticeship craft or trade, shall apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade for a certificate approving you and your subcontractors under the apprenticeship standards for the employment and training of apprentices, pursuant to section 1777.5 of the California Labor Code.

Upon commencement of the work, you and each of your subcontractors shall certify and make available for inspection payroll records on forms provided by the Division of Labor Standards Enforcement, pursuant to section 1776 of the California Labor Code.

You must comply with the following conditions precedent within ten calendar days of the date of this Notice of Award, that is by xxxxxxxxxxxxxxxxxxxxxx, 2021.

March 29, 2021

00 01



1. You must deliver to The County two fully executed counterparts of the Contract (Document 00 52 00). Each of the Contract Documents must bear your signature on the cover page.
2. You must deliver to The County the Contract Performance Bond (Document 00 61 00) and Payment Bond (Document 00 62 00).
3. You must deliver to The County Certificates of Insurance for amounts specified.

Failure to comply with these conditions within the time specified will entitle The County to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within ten days after you comply with those conditions, The County will return to you one fully signed counterpart of the Contract with the Contract Documents attached.

The County of Yolo

BY: _____

XXXXXX
Project Manager - Capital Projects
County Administrator's Office

March 29, 2021

00 01



SECTION 00 52 00

COUNTY OF YOLO, CALIFORNIA

**CONSTRUCTION AGREEMENT FOR THE SECOND FLOOR TENANT
IMPROVEMENT**

100 West Court Way, Woodland, California

CONTRACT NO. _____

This Agreement for Construction ("Agreement") is between _____, a California Corporation ("Contractor"), and the County of Yolo ("County"), a political subdivision of the State of California.

1. SCOPE OF WORK. Contractor shall furnish all labor, services, transportation, materials, equipment, parts, and supplies necessary for **The Second Floor Tenant Improvement, 100 West Court Street, Woodland, California**, in accordance with the plans and specifications. Contractor shall complete Yolo County Second Floor Tenant Improvement Project per bid amount not to exceed \$ _____.

2. CONTRACT DOCUMENTS. The documents defined as the "Contract Documents" in Section 1.12 of the General Conditions, which are incorporated as if fully set forth herein by this reference, comprise the entire Agreement between the County and Contractor concerning the above-referenced project. The documents that describe the work to be performed are sometimes collectively referred to herein as the Plans and Specifications. In the event of any conflict between any of the provisions of this Contract Documents, the provision that requires the highest level of performance from Contractor for the County's benefit shall prevail. See Attached exhibits;

Exhibit A ~ Proposal Response, including all required forms

Exhibit B ~ Subcontractor List

Exhibit C ~ Technical Specifications and Drawings

Exhibit D ~ Performance Bond and Payment Bond

Exhibit E ~ General Provisions, General Conditions, General Requirements and Notice

Exhibit F ~ Project Plans

Exhibit F ~ Addendas

Exhibit G – Change Order Form

3. CONDUCT OF WORK, CONTRACT ADMINISTRATOR. Contractor shall perform the services described in the Contract Documents in a manner that causes the least possible inconvenience to County and the public and safeguards persons and property from any dangerous activities or conditions conducted or created by Contractor. County's Manager of Facilities

March 29, 2021

00 01



Services and Capital Programs shall administer this Agreement for County. County's Board of Supervisors may designate a different person to serve as Contract Administrator by giving advance written notice to Contractor.

(a) **Work Schedule.** Unless otherwise agreed pursuant to Section 3.01 of the General Conditions, Contractor shall begin work within ten (10) days after receiving the Contract Administrator's Notice to Proceed and shall complete the work within **150 calendar days** after receiving that notice. This work must be complete, operational, have a Temporary Occupancy Permit and be turned over to the County for its intended use for this milestone to be deemed complete. County understands the nature of weather and will allow for rain delays to the project, if applicable.

(b) **Liquidated Damages.** Contractor shall pay County **\$850.00** a day liquidated damages for each day's delay (excluding Saturdays, Sundays, and County observed holidays) in completing the work beyond the time specified for completion of work. All other aspects of the payment of such damages shall be governed by Section 3.12 of the General Conditions and other relevant provisions thereof.

4. **INDEMNIFICATION.** With the exception that this section shall in no event be construed to require indemnification by Contractor to a greater extent than permitted under the public policy of the State of California, Contractor shall indemnify, defend and hold harmless the County of Yolo, officers, agents, employees and volunteers from and against any and all claims, damages, demands, losses, defense costs, expenses (including attorney fees) and liability of any kind or nature arising out of or resulting from performance of the work, provided that any such claim, damage, demand, loss, cost, expense or liability is caused in whole or in part by any negligent or intentional act or omission of the contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Contractor and/or Subcontractor's responsibility for such defense and indemnity obligations shall survive the termination or completion of this agreement for the full period of time allowed by law. The defense and indemnification obligations of this agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained in this Agreement.

Responsibility for such defense and indemnity obligations shall survive the termination or completion of this Agreement for the full period of time allowed by law. The defense and indemnification obligations of this Agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained in this Agreement.

5. **COMPENSATION.** All matters of compensation shall be governed by the General Conditions, including but not limited to Article 25 thereof.

March 29, 2021



6. **INSURANCE.** Contractor shall maintain the following insurance while performing the services covered by this Agreement. The comprehensive general liability insurance shall include broad form property damage insurance.

(a) Minimum Coverages (as applicable) - Insurance coverage shall be with limits not less than the following:

1. **Commercial General Liability** Occurrence form Insurance policy (ISO CG 00 01 or equivalent) covering all operations by or on behalf of Contractor, including coverage for:

- a) Premises and Operations
- b) Products and completed Operations
- c) Contractual Liability insuring the obligations assumed by Contractor in this agreement or Blanket Contractual Liability Coverage
- d) Broad Form Property Damage (including Completed Operations)
- e) Explosion, Collapse, and Underground Hazards
- f) Personal Injury Liability

Limits of liability shall be not less than:

\$5,000,000 each occurrence (combined single limit for bodily injury and property damage)

\$5,000,000 for Personal Injury Liability

\$5,000,000 for Products Completed Operations

\$10,000,000 General Aggregate

If the policy does not have an endorsement providing that the General Aggregate Limit applies separately, or if defense costs are included in the aggregate limits, then the required aggregate limits shall be \$10,000,000.

2. **Automobile Liability** – Insurance policy (ISO CA 00 01) covering Bodily Injury, Property Damage and contractual Liability coverage for “Any Auto” which includes coverage for any owned, hired, borrowed and non-owned automobile, trailer, and equipment coverage, with limits no less than \$1,000,000 occurrence (per accident for bodily injury and property damage) and \$2,000,000 policy aggregate.
3. **Workers’ Compensation** – Statutory Limits/**Employers’ Liability** – No less than \$1,000,000 per accident for bodily injury or disease.

March 29, 2021

00 01



4. **Builder's Risk** – (Course of Construction) insurance utilizing an “All Risk” (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions.
5. **Contractor's Pollution Legal Liability Insurance** – Limits of no less than \$2,000,000 per occurrence or claim, and \$2,000,000 policy aggregate.

- (b) The County, its officers, agents, employees and volunteers shall be named as additional insured on all but the workers' compensation and professional liability coverages. . [NOTE: Evidence of additional insured may be needed as a separate endorsement due to wording on the certificate negating any additional writing in the description box.] It shall be a requirement under this agreement that any available insurance proceeds broader than or in excess of the specified minimum Insurance coverage requirements and/or limits shall be available to the Additional Insured. Furthermore, the requirements for coverage and limits shall be (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any Insurance policy or proceeds available to the named Insured; whichever is greater.
1. The Additional Insured coverage under the Contractor's policy shall be “primary and non-contributory” and will not seek contribution from the County's insurance or self insurance and shall be at least as broad as CG 20 01 04 13.
 2. The limits of Insurance required in this agreement may be satisfied by a combination of primary and umbrella or excess Insurance. Any umbrella or excess Insurance shall contain or be endorsed to contain a provision that such coverage shall also apply on a primary and non contributory basis for the benefit of the County of Yolo (if agreed to in a written contract or agreement) before the County's own Insurance or self insurance shall be called upon to protect it as a named insured.
 3. Said policies shall remain in force through the life of this Agreement and, with the exception of professional liability coverage, shall be payable on a “per occurrence” basis unless the County Risk Manager specifically consents in writing to a “claims made” basis. For all “claims made” coverage, in the event that the Contractor changes insurance carriers Contractor shall purchase “tail” coverage covering the term of this Agreement and not less than three years thereafter. Proof of such “tail” coverage shall be required at any time that the Contractor changes to a new carrier prior to receipt of any payments due.

March 29, 2021

00 01



4. The Contractor shall declare all aggregate limits on the coverage before commencing performance of this Agreement, and the County's Risk Manager reserves the right to require higher aggregate limits to ensure that the coverage limits required for this Agreement as set forth above are available throughout the performance of this Agreement.
 5. Any deductibles or self-insured retentions must be declared to and are subject to the approval of the County Risk Manager. All self-insured retentions (SIR) must be disclosed to Risk Management for approval and shall not reduce the limits of liability. Policies containing any SIR provision shall provide or be endorsed to provide that the SIR may be satisfied either by the named Insured or Yolo County.
 6. Each insurance policy shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the Director (ten (10) days for delinquent insurance premium payments).
 7. Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII, unless otherwise approved by the County Risk Manager.
 8. The policies shall cover all activities of Contractor, its officers, employees, agents and volunteers arising out of or in connection with this Agreement.
 9. For any claims relating to this Agreement, the Contractor's insurance coverage shall be primary, including as respects the County, its officers, agents, employees and volunteers. Any insurance maintained by the County shall apply in excess of, and not contribute with, insurance provided by Contractor's liability insurance policy.
 10. The insurer shall waive all rights of subrogation against the County, its officers, employees, agents and volunteers.
- (c) Prior to commencing services pursuant to this Agreement, Contractor shall furnish the County with original endorsements reflecting coverage required by this Agreement. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All endorsements are to be received by, and are subject to the approval of, the County Risk Manager before work commences. Upon County's request, Contractor shall provide complete, certified copies of all

March 29, 2021

00 01



required insurance policies, including endorsements reflecting the coverage required by these specifications.

- (d) During the term of this Agreement, Contractor shall furnish the County with original endorsements reflecting renewals, changes in insurance companies and any other documents reflecting the maintenance of the required coverage throughout the entire term of this Agreement. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. Upon County's request, Contractor shall provide complete, certified copies of all required insurance policies, including endorsements reflecting the coverage required by these specifications. Yolo County reserves the right to obtain a full certified copy of any Insurance policy and endorsements. Failure to exercise this right shall not constitute a waiver of right to exercise later.
- (e) Contractor agrees to include with all Subcontractors in their subcontract the same requirements and provisions of this agreement including the indemnity and Insurance requirements to the extent they apply to the scope of the Subcontractor's work. Subcontractors hired by Contractor agree to be bound to Contractor and the County of Yolo in the same manner and to the same extent as Contractor is bound to the County of Yolo under the Contract Documents. Subcontractor further agrees to include these same provisions with any Sub-subcontractor. A copy of the Owner Contract Document Indemnity and Insurance provisions will be furnished to the Subcontractor upon request. The General Contractor/**and or Contractor** shall require all Subcontractors to provide a valid certificate of insurance and the required endorsements included in the agreement prior to commencement of any work and General Contractor/**and or Contractor** will provide proof of compliance to the County of Yolo.
- (f) Contractor shall maintain insurance as required by this contract to the fullest amount allowed by law and shall maintain insurance for a minimum of five years following the completion of this project. In the event Contractor fails to obtain or maintain completed operations coverage as required by this agreement, the County at its sole discretion may purchase the coverage required and the cost will be paid by Contractor.

7. **COMPLIANCE WITH LAWS.** Contractor shall comply with all relevant federal, state, and local statutes, regulations, ordinances, rules, orders, and other laws in effect when performing the services required by this Agreement, all as set forth in the General Conditions (including but not limited to Article 20 thereof).

8. **INDEPENDENT CONTRACTOR.** While performing the services required by this

March 29, 2021

00 01



Agreement for Construction, Contractor shall act as an independent contractor, not as an employee of County, and thus shall be subject to the direction and control of County only for the final result. Contractor shall be solely responsible for paying all required employment taxes and for meeting all employment obligations related to its performance of the services, including but not limited to payment of worker's compensation, liability insurance, social security taxes (i.e., FICA), and tax withholding. Moreover, Contractor shall indemnify, defend (upon County's written request), and protect County from any liability County may incur to federal or state governments for such taxes and obligations. This Agreement does not entitle Contractor or its officers, employees, subcontractors, or agents to vacation pay, sick leave, retirement benefits, disability or unemployment insurance, or employee benefits of any kind from County.

9. INSPECTIONS. All inspections and any remedial action required in response thereto shall be governed by the General Conditions, including but not limited to Article 18 thereof.

10. PERFORMANCE BONDS. Within the time set forth in the Proposal and before performing any services pursuant to this Agreement, Contractor shall provide to County the bonds required by the General Conditions, including but not limited to Article 2 thereof. All other matters relating to bonds shall be governed by the General Conditions.

11. TERM OF AGREEMENT; EARLY TERMINATION. The term and termination of this Agreement shall be governed by the General Conditions, including but not limited to Article 27 thereof.

12. GUARANTY. Guarantees and warranties shall be governed by the General Conditions, including but not limited to Article 26 thereof.

13. AUDIT PROVISIONS. Contractor's records which shall include but not limited to accounting records, subcontract files, correspondence, change order files, and any other supporting evidence necessary to substantiate charges relating to this contract (all the foregoing hereinafter referred to as "records") shall be open to inspection and subject to audit and/or reproduction, during normal working hours, by County's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments, or claims submitted by the contractor or any of his payees pursuant to the execution of this Agreement. For the purpose of such audits, inspections, examination, and evaluations, the County's agent or authorized representative shall have access to said records from the effective date of this Agreement, for the duration of the work, and until six years after the date of final payment by County to Contractor pursuant to this Agreement.

14. MISCELLANEOUS.

(a) **Notice.** Except as provided in Section 6, all correspondence regarding this

March 29, 2021



Agreement, including invoices, payments, and notices, shall be directed to the following persons at the following addresses and phone number:

County:

Kevin Yarris
Director, General Services
120 West Main Street Suite D
Woodland, CA 95695
Telephone: (530) 406-5005

Contractor:

Telephone: _____

If written, correspondence shall be sent by personal delivery (including overnight delivery service); by U.S. Mail, postage prepaid; or by fax during business hours. Notices must be actually received to be effective.

(b) **Time of Essence.** Time is of the essence of this Agreement.

(c) **Interpretation and Jurisdiction.** This Agreement shall be interpreted and applied in accordance with California law. The plans and specifications attached as Exhibit A are part of this Agreement. If any conflict arises between Exhibit A and the terms and conditions set forth in Sections 1 through 14 of this Agreement, then Sections 1 through 14 shall govern.

(d) **Waiver.** A party's failure to insist on strict performance of this Agreement or to exercise any right or remedy upon breach of this Agreement shall not constitute a waiver of such performance, right, or remedy. No waiver is binding unless set forth in a writing signed by the waiving party.

(e) **Assignments and subcontracts.** Contractor shall not assign this Agreement. Contractor may subcontract any of the services described in Section 1 (Scope of Work) with County's prior written consent. Contractor shall require each subcontractor to agree in writing to be bound by Section 4 (Indemnification) and Section 6 (Insurance) of this

March 29, 2021

00 01



Agreement. County shall consider all subcontractors to be Contractor's employees, and Contractor shall be responsible for their work.

(f) **Dispute Resolution.** Unless the General Conditions provide otherwise, if the Contract Administrator notifies Contractor that the work or any portion of it is unacceptable, then the Contract Administrator and Contractor shall meet at the Yolo County Office of County Administrator, 625 Court Street #202, Woodland, California, within five (5) days after Contractor receives the notice (excluding Saturdays, Sundays, and County observed holidays) and shall attempt in good faith to resolve their differences. Payment shall not constitute approval or acceptance of any defective work.

(g) **Integration.** This Agreement sets forth the parties' entire understanding regarding the matters set forth in Sections 1 through 14. It supersedes all prior Agreements and representations, written and oral, and may be modified only by a written Agreement approved by County's Board of Supervisors and signed by County and Contractor.

(h) **Effective date.** This Agreement shall be effective on the last date shown below.

COUNTY OF YOLO:

CONTRACTOR:

By: _____

By: _____

Kevin Yarris
Director, General Services

(Signature)

(Print Name & Title)

(Date)

APPROVED AS TO FORM
Philip J. Pogledich, Yolo County Counsel

By _____

March 29, 2021

00 01



SECTION 00 55 00

NOTICE TO PROCEED

Dated: xxxxxxxxxxxx, 2021

TO: xxxxxxxxxxxxxxxx (Contractor)

ADDRESS: xxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxx

RE: COUNTY OF YOLO

PROJECT: Second Floor Tenant Improvement, 100 West Court Street, Woodland, California

BID NO. 01

CONTRACT FOR

Second Floor Tenant Improvement, 100 West Court Street, Woodland, California

You are notified that the Contract Time under the above contract will commence to run on xxxxxxxxxxxxxxxxxxxxxx, 2021. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Contract (Document 00 52 00), the date of final completion 150 calendar days from the date of this notice.

THE COUNTY OF YOLO

By: _____

xxxxxxx
Project Manager
County Administrators Office

March 29, 2021

00 01



SECTION 00 61 00

COUNTY OF YOLO

PERFORMANCE BOND

(To Accompany Contract)

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the County of Yolo, organized and operating under the laws of the State of California (hereinafter referred to as the "County") has awarded to _____, (hereinafter referred to as the "Contractor") an agreement for **Contract No.** _____, (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by the Contractor is more particularly set forth in the Project Plans and Specifications dated _____, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, the Contractor is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

NOW, THEREFORE, we, _____, the undersigned Contractor and _____ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the County in the sum of _____ DOLLARS, (\$ _____), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if the Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one (1) year guarantee of all materials and workmanship; and shall indemnify and save harmless the County, its officials, officers, employees, and authorized volunteers, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

March 29, 2021

00 01



As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees including reasonable attorney's fees, incurred by the County in enforcing such obligation.

As a condition precedent to the satisfactory completion of the Contract Documents, unless otherwise provided for in the Contract Documents, the above obligation shall hold good for a period of one (1) year after the acceptance of the work by the County, during which time if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the County from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the County's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure Section 337.15.

Whenever Contractor shall be, and is declared by the County to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the County's option:

Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a Contract between such bidder, the Surety and the County, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the County under the Contract and any modification thereto, less any amount previously paid by the County to the Contractor and any other set offs pursuant to the Contract Documents.

Permit the County to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the County under the Contract and any modification thereto, less any amount previously paid by the County to the Contractor and any other set offs pursuant to the Contract Documents.

March 29, 2021

00 01



Surety expressly agrees that the County may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the County, when declaring the Contractor in default, notifies Surety of the County's objection to Contractor's further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

March 29, 2021

00 01



IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 20____.
(Corporate Seal)

Contractor/ Principal

By _____

Title _____

(Corporate Seal)

Surety

By _____
Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title _____

The rate of premium on this bond is _____ per thousand. The total amount of premium charges is \$ _____.
(The above must be filled in by corporate attorney.)

THIS IS A REQUIRED FORM

Any claims under this bond may be addressed to:

(Name and Address of Surety)

(Name and Address of Agent or Representative for service of process in California, if different from above)

(Telephone number of Surety and Agent or Representative for service of process in California)

March 29, 2021

00 01



SECTION 00 62 00

PAYMENT BOND

BOND NO. _____

KNOW ALL MEN BY THESE PRESENTS: That

WHEREAS, the Board of Supervisors of the County of Yolo, State of California, (hereinafter designated as "County") and _____ (hereinafter designated as "Principal") have entered into an Agreement (County Agreement No. _____, dated _____, 20__) for the furnishing of all materials, labor, services and transportation, necessary, convenient, and proper to the construction of **Second Floor Tenant Improvement, 100 West Court Street:**, which Agreement and all of the Contract Documents attached to or forming a part of said Agreement are hereby referred to and made a part hereof; and

WHEREAS, said Principal is required under the terms of said Contract to furnish a bond to secure payment of all claims under Chapter 7 of Title 15 of Part 4 of Division 3 of the Civil Code of California and the other statutes noted below.

NOW, THEREFORE, said Principal and the undersigned _____, (hereinafter designated as "Surety"), are held and firmly bound unto the County, and unto all laborers, material men and other persons referred to in said statutes, in the sum of _____ DOLLARS (\$ _____) (not less than 50% of the Contract price), lawful money of the United States of America, for the payment of which sum well and truly made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

The condition of this bond is that if the Principal does well and truly pay any persons named in Civil Code Section 3181, or amounts due under the Unemployment Insurance Code with respect to work or labor performed by any such claimant, or any amounts required to be deducted, withheld and paid over to the Franchise Tax Board from the wages of employees of the Principal and his subcontractors pursuant to Section 18806 of the Revenue and Taxation Code with respect to such work and labor, pay all such persons and amounts, then this obligation shall become null and void; otherwise it shall be and remain in full force, virtue and effect.

If the said Principal or any of his or its subcontractors, or the heirs, executors, administrators, successors, or assigns of any, all or either of them, shall fail to well and truly pay any such persons or amounts then the Surety shall promptly pay the County the sum stated above. Surety, for value received, hereby expressly acknowledges and agrees that no change, extension of time, forbearance or waiver, prepayment or delay in payment, alteration or addition to the terms of the Contract

March 29, 2021



Documents, whether by virtue of the provisions for modifications contained therein or by separate Agreement between the Principal and the County, shall in any manner affect its obligations on this Agreement, and said Surety hereby expressly waives notice of and consents to any such change, forbearance or waiver, extension of time, prepayment or delay in payment, alteration or addition.

Death of the Principal shall not relieve Surety of its obligations hereunder.

This bond shall inure to the benefit of any of the persons named in the above referenced statutes so as to give a right of action to such persons or their assigns in any suit brought upon this bond.

In the event suit is brought upon this bond by County and judgment is recovered, the Surety shall pay all costs incurred by County in such suit, including a reasonable attorney fees to be fixed by the court.

IN WITNESS WHEREOF, two identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by Principal and Surety above named, on the ____ day of _____, 2020.

Principal (SEAL)

By: _____
Principal's Representative

Principal's Address

City, State, Zip

Surety (SEAL)

By: _____
Surety's Representative

Surety's Address

March 29, 2021

00 01



City, State, Zip

Telephone Number

NOTE: Signatures of those executing for Surety must be properly acknowledged. The bond must be accompanied by a properly acknowledged Power of Attorney from the Surety authorizing its agent to bind it to this bond. A copy of such Power of Attorney must be on file with the Yolo County Clerk.

State of California

County of _____

On _____ before me, (here insert name and title of the officer),
_____ personally appeared personally
known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose
name(s) is/are subscribed to the within instrument as the Attorney In Fact of
_____ ("Surety") and acknowledged to me that
he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their
signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted,
executed the instrument.

WITNESS my hand and official seal.

Printed Name

Signature of Notary

My Commission Expires

(Seal)

March 29, 2021

00 01



Section 2.05 of the General Conditions - **INDEMNIFICATION**

Contractor shall pay the cost of defense, indemnify, and save harmless the County of Yolo and all its officers, agents and employers from any and all claims, demands, damages, costs expenses, injury and liability of every kind, nature and description, arising or alleged to have arisen directly or indirectly from the performance or attempted performance of the Agreement for Construction of the Work, or from the nature of the Work, or by products, materials or equipment installed in or used on the Work, howsoever the same may be caused, without set off due to the Contractor's right, if any, to apportionment between joint tortfeasors.

This indemnity obligation extends to, but is not limited to, all acts, errors, omissions, and active and/or passive negligence by the Contractor, all subcontractors, all material suppliers, and their officers, employees, agents, or subcontractors, and includes all acts, errors, omissions, and active and/or passive negligence alleged to be joint or concurrent by them and the County or any of its officers, employees, agents, independent contractors or consultants, save only liability caused exclusively by the sole negligence, willful misconduct or defects in design provided by the County or its officers, employees, agents or independent contractors (other than the Prime Contractor) who are directly responsible to the County.

This indemnity obligation expressly extends to and includes, but is not limited to any and all claims, demands, damages, costs, expenses, or liability occasioned as a result of damages to the work, the Site or improvements thereon, or to adjacent property; and for injuries occurring after completion of the Work, as well as during the progress of the Work; and as a result of the violation of any provision of Federal or State law; and for inverse condemnation or equitable relief; and occasioned by personal and/or bodily injury to or death of any person, or any damage to property owned by any person while on or about the premises by right or not, whenever the work is alleged to have been a contributing cause in any degree whatsoever.

Nothing contained in this indemnity provision shall be construed to require the Contractor to indemnify the County in contravention of Section 2782 of the Civil Code. Contractor's responsibility for such defense and indemnity obligations shall survive the termination or completion of this Agreement for the full period of time allowed by law. The defense and indemnification obligations of this Agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained in this Agreement. In providing any defense under this Section, the Contractor shall use counsel reasonably acceptable to the County.

AGREEMENT/ACKNOWLEDGMENT

Contractor agrees that he/she has read and agrees to the indemnification clause as written above.

Date

Authorized Representative

Title

March 29, 2021

00 01



FOR USE BY THE PRIME CONTRACTOR WITH THE COUNTY OF YOLO

March 29, 2021

00 01



GENERAL CONDITIONS

- Index -

ARTICLE 1. DEFINITIONS AND PRINCIPLES OF INTERPRETATIONS	1
Section 1.01 - Defined Terms	1
Section 1.02 - Addendum/Addenda	1
Section 1.03 - Agreement for Construction	1
Section 1.04 - Allowance	1
Section 1.05 - Award of contract; Date	1
Section 1.06 - Bid	1
Section 1.07 - Board of Supervisors/County Administrative Officer	2
Section 1.08 - Certification	2
Section 1.09 - Change Order	2
Section 1.10 - Clarification	2
Section 1.11 - Contract Administrator/Project Manager	2
Section 1.12 - Contract Documents/Project Manual	2
Section 1.13 - Contract Drawings	3
Section 1.14 - Contract Price	3
Section 1.15 - Contract Time	3
Section 1.16 - Contractor/Prime Contractor	3
Section 1.17 - County	3
Section 1.18 - County Inspector	3
Section 1.19 - Day/Holiday; Working Day; Counting Days	3
Section 1.20 - Division 1	4
Section 1.21 - Materials	4
Section 1.22 - Notice of Cessation of Work	4
Section 1.23 - Notice of Completion	4
Section 1.24 - Program Manager	4
Section 1.25 - Project	5
Section 1.26 - Project Architect/Engineers/Consultants	5
Section 1.27 - Reference to Codes	5
Section 1.28 - Site	5
Section 1.29 - Specifications	5
Section 1.30 - Subcontractor	6
Section 1.31 - Submittals	6
A. Shop Drawings	6
B. Product Data	6
C. Samples	6
Section 1.32 - Supplemental Conditions	6
Section 1.33 - Work/Notice to Proceed	6
Section 1.34 - Work Authorizations	6
ARTICLE 2. BONDS INDEMNIFICATION AND INSURANCE	7
Section 2.01 - Bonds; Submittals	7
Section 2.02 - Performance Bond	7
Section 2.03 - Labor and Materials Payment Bond	7
Section 2.04 - Contract Bond	7



Section 2.05 - Indemnification.....	7
Section 2.06 - Indemnification of Adjacent Property Owners.....	8
Section 2.07 - Insurance; Submittals.....	8
Section 2.08 - Contractors Liability Insurance	8
Section 2.09 - Subcontractors Insurance.....	11
A. Insurance Coverage Requirements.....	11
B. Subcontractor Insurance.....	11
C. Contractor Responsibilities	11
Section 2.10 - Workers Compensation & Employees Liability Insurance	12
Section 2.11 - Posting at Site	12
Section 2.12 - Effective Date of Policies	12

ARTICLE 3. INITIAL SUBMITTALS AND TIME OF WORK..... 13

Section 3.01 - Progress Schedule and Schedule of Values	13
A. Progress Schedule	13
B. Schedule of Values.....	13
Section 3.02 - Initial Submittals.....	13
A. Schedule of Unavailable Materials	13
B. Schedule of Substitutions	13
C. Schedule of Item Requiring Long Order Lead Time	13
D. Subcontractor Insurance.....	14
1. First-Tier Subcontractors	14
2. Lower-Tier Subcontractors	14
E. Subcontractor: Allocation of Work	14
F. Schedule of Submittal Dates.....	14
Section 3.03 - Approval of Initial Submittals effect	14
Section 3.04 - Commencement and Prosecution of Work	14
Section 3.05 - Other Submittals	15
Section 3.06 - Time of Essence.....	15
Section 3.07 - Date of Completion.....	15
Section 3.08 - Extension of Time; Unavoidable Delays	15
A. Unavailable Materials	15
B. Force Majeure	15
C. Unseasonable Weather	15
D. Time Extension Due to Change Orders or Work Authorizations	16
E. Delay Due to Rejected Submittals.....	16
F. County Caused Delays.....	16
Section 3.09 - Notice of Delays; Submittals	17
Section 3.10 - Investigation; Procedure	17
Section 3.11 - Discretionary Time Extension for Best Interest of County	17
Section 3.12 - Liquidated Damages	18
Section 3.13 - Extension of Time Not a Waiver	18
Section 3.14 - Suspensions Exceeding One Year	18
Section 3.15 - Effect of Stop Work Notice	19

ARTICLE 4. SCOPE & INTENT OF CONTRACT DOCUMENTS; CLARIFICATIONS..... 19

Section 4.01 - Basic Intent and Scope of Contract Documents	19
Section 4.02 - Harmonization of Contract Documents	19



Section 4.03 - Locations	20
Section 4.04 - Site Conditions	20
Section 4.05 - Project Record Documents	20
Section 4.06 - Contractors Supervision and Coordination of the Work.....	20
Section 4.07 - Clarifications Authorized.....	21
Section 4.08 - Clarifications; Procedure	21
A. Contract-Initiated Requests.....	21
B. County-Initiated Clarifications.....	21
C. Incorporation in Contract	22
D. Procedure for Extra Work Claims.....	22
Section 4.09 - Contract Administrators Investigation and Response Time	22
Section 4.10 - Dispute as to Scope of Contract Documents	22
 <u>ARTICLE 5. SUBMITTALS</u>	 23
Section 5.01 - Required Submittals; Time	23
Section 5.02 - Time for Submittals	23
A. Time Generally	23
B. Submittals within Twenty-One (21) Days Following Notice to Proceed.....	23
C. Submittals after Twenty-One (21) Days Following Issuance of the Notice	24
to Proceed	
Section 5.03 - Contractors Responsibilities Regarding Submittals.....	24
Section 5.04 - Action on Submittals	24
Section 5.05 - Effect of Acceptance of Submittals	25
 <u>ARTICLE 6. MATERIALS; STORAGE; PAYMENT; CERTIFICATIONS</u>	 26
Section 6.01 - Quality of Material and Products.....	26
Section 6.02 - Better Materials or Process.....	26
Section 6.03 - Industry Standards	26
Section 6.04 - Materials and Products Storage	27
Section 6.05 - Time for Delivery of Materials; Early Delivery	27
A. Basic Requirement.....	27
B. Early Delivery of Materials.....	27
Section 6.06 - Spare Parts and Maintenance Materials.....	28
Section 6.07 - Providing and Paying for Materials, Etc.....	28
Section 6.08 - Warranty of Title	28
Section 6.09 - Patents and Royalties.....	29
Section 6.10 - Payment of Federal or State Taxes	29
Section 6.11 - Product Certification.....	29
 <u>ARTICLE 7. PRODUCT OPTIONS AND SUBSTITUTIONS</u>	 30
Section 7.01 - Applicability of Article.....	30
Section 7.02 - Effect of Brand Name Materials Specifications	30
Section 7.03 - Necessity for Substitution Requests	30
Section 7.04 - Time for Requesting Substitutions	30
Section 7.05 - Application for Substitutions; Contents.....	31
Section 7.06 - Action Request	31
Section 7.07 - Samples & Testing of Proposed Substitutions.....	32



Section 7.08 - Design Costs for Substitution	32
Section 7.09 - Effect of Acceptance.....	32

ARTICLE 8. SAMPLES, TESTS AND TESTING LABORATORIES..... 33

Section 8.01 - Contract Compliance Testing; Samples.....	33
Section 8.02 - Delivery of Samples	33
Section 8.03 - Testing Laboratory; Costs.....	33
Section 8.04 - Re-Testing	33
Section 8.05 - Access to Site, Cooperation.....	34
Section 8.06 - Damage Due to Testing	34
Section 8.07 - Results of Sampling and Testing	34
Section 8.08 - Effect of Sampling and Testing	34
Section 8.09 - Code Compliance Testing; Costs.....	34

ARTICLE 9. REJECTION AND REPLACEMENT OF WORK AND MATERIALS 35

Section 9.01 - Rejection of Materials and Workmanship	35
Section 9.02 - Removal of Rejected Materials	35
Section 9.03 - Failure to Remove Rejected Materials.....	35
Section 9.04 - Failure to Correct Rejected Work; Withhold and Deduction	35
Section 9.05 - Reservation of Rights	35

ARTICLE 10. SUPERVISION AND LABOR 36

Section 10.01 - Skilled Labor	36
Section 10.02 - No Tenancy.....	36
Section 10.03 - Dismissal of Unsatisfactory Employees	36
Section 10.04 - Personal Attention and Superintendence; Contractors Agent.....	36
Section 10.05 - Authorized County Visitors to the Site.....	36
Section 10.06 - Relationships of Employees and County Employees and Public	36

ARTICLE 11. SUBCONTRACTORS; LISTING AND BID; SUBSTITUTION..... 38

Section 11.01 - Subcontractors; Contractor's Supervision.....	38
Section 11.02 - Disputes Between Subcontractor and/or Contractor.....	38
Section 11.03 - Listing of Subcontractors.....	38
Section 11.04 - Termination of Unsatisfactory Subcontractors.	39
Section 11.05 - Subcontractors Insurance.....	39

**ARTICLE 12. STATE REQUIREMENTS REGARDING WAGES, HOURS AND
EQUAL OPPORTUNITY** 40

Section 12.01 – Prevailing Wage Rate Notice	40
Section 12.02 - Payment of Prevailing Wage Rates	41
Section 12.03 - Wage Rates for Crafts Not Listed.....	41
Section 12.04 - Records of Hours Worked and Wages.....	41
Section 12.05 – Additional Requirements for Labor Compliance	41
Section 12.06 - Underpayment of Wages	42
Section 12.07 - Apprentices	42



Section 12.08 - Penalties.....	42
Section 12.09 - Hours of Work and Approval of Schedules.....	43
Section 12.10 - Compliance with State Anti-Discrimination Laws.....	43

ARTICLE 13. FEDERAL REQUIREMENTS REGARDING WAGES, HOURS, & 44
EQUAL OPPORTUNITY

ARTICLE 14. ON-SITE SECURITY; RISK OF LOSS; SITE SAFETY 45

Section 14.01 - Project Site.....	45
Section 14.02 - Security of the Site.....	45
Section 14.03 - Risk of Loss	45
Section 14.04 - Protection of Workmen and Visitors to the Site	45
Section 14.05 - Excavation and Trenching; Safety.....	46
Section 14.06 - CAL OSHA	47

ARTICLE 15. OFF-SITE SAFETY AND PROTECTION OF ADJACENT..... 48
PROPERTY; INDEMNITY

Section 15.01 - Protection of Adjacent Property During Excavation or other Operations, Notices.....	48
Section 15.02 - Underground Utilities; "USA".....	48
Section 15.03 - Damage to or Blocking Streets, Street Improvements and Tracks	48
Section 15.04 - Fire Protection	49
Section 15.05 - Dust Control.....	49
Section 15.06 - Indemnity for Damage to Adjacent Property; Repairs	49
A. Indemnity	49
B. Repairs.....	49
Section 15.07 - Emergency Safety Actions	50

ARTICLE 16. CONDUCT AND PROSECUTION OF THE WORK 51

Section 16.01 - Basic Standard	51
Section 16.02 - Surveys and Field Engineering.....	51
Section 16.03 - Clearing Obstructions	51
Section 16.04 - Layout Work.....	51
Section 16.05 - Contractors Equipment	51
Section 16.06 - Discovery of Unknown Conditions; Procedure	52
Section 16.07 - Equipment and Methods	52
Section 16.08 - Temporary Facilities and Services.....	52
Section 16.09 - Coordination of Work.....	53
Section 16.10 - Joining Work	53
Section 16.11 - Cutting and Patching of Work	53
Section 16.12 - Inspection of the Work of Other Contractors	53
Section 16.13 - Combination of Work with Other Contractors or County	53
Section 16.14 - Overtime and Holiday Work	54
Section 16.15 - Proof of Compliance with Contractor Documents and Law.....	54

ARTICLE 17. CHANGE ORDERS; WORK AUTHORIZATIONS; ALLOWANCES..... 55



Section 17.01 - No Changes Without Consent; Performing Work Ordered	55
Section 17.02 - Change Orders Authorized; Procedure	55
A. Change Order Authorized	55
B. Methods of Calculations	55
C. Overhead and Profit on Change Orders.....	55
D. Actual Costs Defined	56
E. Audit and Verification	56
F. Deductive Change Orders.....	56
G. Periodic Change Orders	56
Section 17.03 - Work Authorizations; Procedure	56
A. Work Authorizations Authorized	56
B. Maximum Amounts	56
C. Quotation by Contractor.....	57
D. Claim for Price Adjustment	57
E. Claim for Time Adjustment.....	57
F. Cumulation of Work Authorizations	57
G. Immediate Work Authorizations.....	57
Section 17.04 - Extra Work Claims; Procedure	57
A. Notice to Contract Administrator.....	57
B. Action by Contract Administrator.....	57
C. Time	58
D. Effect of Proceeding.....	58
E. Scheduling	58
Section 17.05 - Allowances; Procedures.....	58
Section 17.06 - Minor Change Orders by County Administrative Officer	59
Section 17.07 - Change Orders Regarding Time for Completion	59
Section 17.08 - Change Orders Due to Unavailable Materials	59
Section 17.09 - Effect of Contractor's Acceptance of Change Order	59
Section 17.10 - Effect on Sureties.....	60
<u>ARTICLE 18. INSPECTIONS</u>	61
Section 18.01 - Access for Inspection.....	61
Section 18.02 - Notice of Readiness for Inspection.....	61
Section 18.03 - Contract Compliance Inspection.....	61
Section 18.04 - Inspection of Complete Work.....	61
Section 18.05 - Authority of county; Stop Work Notice	61
Section 18.06 - Effect of Inspections	62
Section 18.07 - Authority of Contract Administrator	62
Section 18.08 - Authority of County Inspector (s).....	62
Section 18.09 - Building Inspections and Codes	63
<u>ARTICLE 19. PUBLIC UTILITIES</u>	64
Section 19.01 - Utilities Used During Construction	64
Section 19.02 - Lighting	64
Section 19.03 - Permanent Utilities; Installation	64
Section 19.04 - Toilet Facilities for Workers.....	64
Section 19.05 - Disruption of Utility Service	64



Section 19.06 - Utilities for County Personnel	65

ARTICLE 20. PERMITS, LICENSES, ORDINANCES, AND REGULATIONS..... 66

Section 20.01 - Compliance with Construction Regulations	66
Section 20.02 - Permits; Fees.....	66
Section 20.03 - Compliance with Laws and Regulations	66
Section 20.04 - Violation of Laws and Regulations; Indemnity	66
Section 20.05 - Specific State Laws and Regulations.....	66
Section 20.06 - Compliance with Conditions of Permits	67
Section 20.07 - Compliance with Conditions of Grants	67
Section 20.08 - Harmonization with Contract Documents	67
Section 20.09 - Compliance with Hazardous Materials Reporting and Use Requirements;.....	68
Clean-up; Indemnity; Withhold	

ARTICLE 21. PRESERVATION AND CLEARING..... 69

Section 21.01 - Protection of Work	69
Section 21.02 - Periodic Cleaning of Project.....	69
Section 21.03 - Final Cleaning of Project.....	69

ARTICLE 22. OCCUPANCY BY COUNTY..... 70

Section 22.01 - Use of Completed Work	70
Section 22.02 - Repairs or Renewals in the Work	70
Section 22.03 - Effect of Occupancy	70
Section 22.04 - Coordination with Other Activities.....	70
Section 22.05 - Price or Time Adjustments	70

ARTICLE 23. PROGRESS PAYMENTS 71

Section 23.01 - Submission of Claims	71
Section 23.02 - Payment; Withholds.....	72
Section 23.03 - Posting Securities in Lieu of Withholds	72
Section 23.04 - Retaining Additional Amounts; Grounds	72
Section 23.05 - Disbursement of Retained Amounts	73
Section 23.06 - Correction of Statement and Withholding of Payment.....	73
Section 23.07 - Effect of Progress Payments.....	74

ARTICLE 24. FINAL INSPECTION 75

Section 24.01 - Notice of Final Inspection	75
Section 24.02 - Punch List	75
Section 24.03 - Additional Submittals	75
Section 24.04 - Systems Demonstration	76

ARTICLE 25. ACCEPTANCE & FINAL PAYMENT; ADMINISTRATION OF..... 77



THE WITHHOLD ACCOUNT

Section 25.01 - Contractor's Request for Final Payments and Change Order.....	77
Section 25.02 - Contract Administrator's Estimate.....	77
Section 25.03 - Protest to Board of Supervisors	77
Section 25.04 - Resolution Authorizing Acceptance of Contract.....	78
and Recordation of Notice of Completion	
Section 25.05 - Determination of Final Progress Payment and Withhold Amount	78
Section 25.06 - Submittals for Release of Withheld Amounts	78
Section 25.07 - Administration of Withhold Account	79
Section 25.08 - Payment of Withheld Account.....	79
Section 25.09 - Non-Waiver	80
Section 25.10 - Work after Notice of Completion	80
Section 25.11 - Stop Notices; Where to File; Enforcement.....	80
<u>ARTICLE 26. GUARANTEES AND WARRANTIES</u>	81
Section 26.01 - Guarantee Required	81
Section 26.02 - Form of Guarantee.....	81
Section 26.03 - Guarantee Contract Bond	82
Section 26.04 - Other Guarantees	82
Section 26.05 - Guarantees Not Waiver.....	82
<u>ARTICLE 27. COUNTY'S RIGHT TO TERMINATE AGREEMENT</u>	83
Section 27.01 - Grounds for Termination	83
Section 27.02 - Procedure for Termination.....	83
Section 27.03 - Reconstruction in the Event of Loss	84
Section 27.04 - Option in Event of a Loss	84
Section 27.05 - Provision for Termination of Contract.....	84
<u>ARTICLE 28. ADDITIONAL PROVISIONS</u>	85
Section 28.01 - Conflict of Interest.....	85
Section 28.02 - Notices	85
Section 28.03 - No Verbal Agreement.....	85
Section 28.04 - Examination of Proposed Project Location and Contract Documents.....	85
Section 28.05 - Notice of Potential Claim	86
Section 28.06 - Continuing Work in Dispute.....	86
Section 28.07 - Assignment of Certain Claims.....	86
Section 28.08 - No Third Party Beneficiaries	87
END OF GENERAL CONDITIONS	87



SECTION 00700

GENERAL CONDITIONS

ARTICLE 1.

DEFINITIONS AND PRINCIPLES OF INTERPRETATION

Section 1.01. DEFINED TERMS.

Whenever the following terms, titles, or phrases are used in the Contract Documents, the intent and meaning thereof shall be as defined in this Article.

Section 1.02. ADDENDUM/ADDENDA.

"Addendum" or "Addenda" are written documents furnished by the County before Award of the Contract which interpret Drawings and/or Specifications or answer questions of intended bidders and shall be incorporated in and are a part of the Contract Documents.

Section 1.03. AGREEMENT FOR CONSTRUCTION.

The "Agreement for Construction" is the written contract between the County and the Contractor by which the Contractor agrees to perform the Work necessary for full completion of the Project as intended, or the portions of the Project incorporated into the Contract. The Agreement for Construction includes the Contract Documents.

Section 1.04. ALLOWANCE.

An "Allowance" is the County's monetary and/or quantity estimate for equipment, materials, or work, the quantity and/or quality of which the County has not determined at the time of the Award of the Contract. The Contractor's bid includes all specified allowances, if any. "Allowance" also includes the contingency allowance specified to be included in the Contractor's bid, if any.

Section 1.05. AWARD OF CONTRACT; DATE.

The "Award of the Contract" is the action by the General Services Department of the County to execute the Agreement for Construction with the lowest responsible bidder and constitutes the County's acceptance of the Bid offer.

The Award of the Contract occurs after the County has determined which bid alternates, if any, are to be included in the Work, and has determined whether the apparent low bidder for the Work, including such alternates, is the lowest responsible bidder.

The date of the Award of the Contract is the date the General Services Department acts to authorize execution of the Agreement for Construction by the County, even though actual execution of the Agreement by the County does not occur until the Contractor submits the bonds and insurance certifications required by Article 2.



Section 1.06. BID.

The "Bid" shall mean the offer of the bidder to do the Work, when submitted on the prescribed bid form, duly executed and bonded. After Award of the Agreement for Construction by the County to the lowest responsible bidder, "Bid" shall mean the Contract Price.

Section 1.07. BOARD OF SUPERVISORS/COUNTY ADMINISTRATIVE OFFICER.

"Board of Supervisors" shall mean the duly elected officials constituting the Yolo County Board of Supervisors.

"County Administrative Officer" (CAO) is the chief executive officer of the County and reports to the Board of Supervisors.

Section 1.08. CERTIFICATION.

When used in the context of required submittals regarding quality assurance, "Certification" shall be the verification required from recognized producers or associations attesting to a product's compliance with the Contract Documents. Examples include Underwriters Laboratory ("UL") listings.

Section 1.09. CHANGE ORDER.

A "Change Order" is a written order from the County to the Contractor authorizing an addition, deletion, or revision in the Scope of the Work, and/or an adjustment in the Contract price or Contract Time, issued after the execution of the Agreement for Construction.

Section 1.10. CLARIFICATIONS.

"Clarifications" are supplementary explanations, interpretations, instructions, and/or drawings issued by the Contract Administrator to further define the intent of the Contract Documents, pursuant to Article 4 of the General Conditions and procedures developed by the Contract Administrator pursuant thereto.

Clarifications involve no change in the Scope, Price or Time of the Agreement for Construction.

Section 1.11. CONTRACT ADMINISTRATOR/PROJECT MANAGER.

See Section 3(a) of the Agreement for Construction.

Section 1.12. CONTRACT DOCUMENTS/PROJECT MANUAL.

The "Contract Documents" shall include the Bid Proposal; the Designation of Subcontractors; the Agreement for Construction; the Bonds required thereby; these General Conditions; the Supplementary Conditions, if any; the Technical Specifications; all Documents comprising the bidding package; the Contract Drawings, (collectively referred to as "Project Manual"); all duly issued Addenda, Clarifications, Field Orders, and Work Authorizations; Change Orders; Supplemental Drawings; Contractor's Submittals approved pursuant to Articles 3 and/or 5 hereof, and the Contractor's Guarantee and Bonds. The Contract Documents comprise the "Agreement for Construction."



Section 1.13. CONTRACT DRAWINGS.

The "Contract Drawings" or "Drawings" shall mean the working drawings of the Work approved by the Board of Supervisors for the receipt of bids, plus all supplemental drawings approved by the County as Addenda or Clarifications, or reproductions thereof, which show the location, character, dimensions, and details of the Work to be done, and which are part of the Agreement for Construction.

Section 1.14. CONTRACT PRICE.

The "Contract Price" is the total consideration for which the contractor agrees to perform the Work to produce a fully complete Project as intended by, and in accordance with, the Contract Documents. Unless modified by a duly issued Change Order, the Contract Price is the Contractor's Bid.

Section 1.15. CONTRACT TIME.

The "Contract Time" is the time specified in the agreement for Construction within which Contractor shall fully complete the Project in accordance with the Agreement for Construction. The Contract Time may be changed only by a Change Order duly issued by the Board of Supervisors. Contract Time begins with the date of the Notice to Proceed and ends with acceptance of project work completion by the County. The number of days included in the agreement form includes the estimated number of construction days required and not the 35 days allowed for initial submittals and the 21 days allowed for County review of those submittals.

Section 1.16. CONTRACTOR; PRIME CONTRACTOR.

"Contractor" and "Prime Contractor" shall mean the person or persons, co-partnership or corporation, or his or their legal representatives, or successors, assigns, executors, or heirs, who have entered into the Agreement for Construction with the County of Yolo.

Section 1.17. COUNTY.

"County" shall mean the County of Yolo, a political subdivision of the State of California.

Section 1.18. COUNTY INSPECTOR.

The "County Inspector" is the person(s) and/or firm(s), if any, employed or engaged as (an) independent contractor(s) by the County to inspect the performance of the Work by the Contractor for compliance with the Contract Documents. The County Inspector is supervised by and reports to the Contract Administrator. The authority of the County Inspector is limited to that specified in the Contract Documents, and no additional authority has been granted nor shall be inferred.

The Project Manager performs the duties of the County Inspector unless a separate person or firm is engaged as County Inspector.

Section 1.19. DAY/HOLIDAY; WORKING DAY; COUNTING DAYS.

A "day" shall mean a calendar day of 24 hours, including each and every day of the year.

A "working day" is Monday through Friday, but shall exclude "holidays" established by the Sacramento Builders' Exchange.



Unless specified as being working days, all references herein to the number of days within which an action is to occur shall mean calendar days.

In computing working days or calendar days, the first day is excluded and the last day is included, unless it is a Saturday, Sunday, or holiday.

Section 1.20. DIVISION 1.

"Division 1" of the Technical Specifications sets forth general procedures by which the Contractor complies with the requirements of the Contract Documents.

Division 1 is intended to supplement, not supersede or prevail over, the requirements of the General Conditions, Supplementary Conditions, or remaining divisions of the Technical Specifications. Thus, in the event of a conflict between the requirements of Division 1 and other portions of the Contract Documents, the Contractor shall notify the Contract Administrator of the claimed discrepancy, and the Contract Administrator shall issue a Clarification correcting the discrepancy. The Contractor shall follow such written instructions.

Section 1.21. MATERIALS.

"Materials" shall include all building materials, articles, supplies, and equipment delivered to the Site for incorporation in the Work. "Materials" includes everything incorporated into the work except personal services and labor, unless otherwise noted.

"Equipment" shall mean all pre-manufactured or partially pre-assembled products or components, assembled or partially assembled before delivery to the Site, and intended for incorporation into the Work.

Section 1.22. NOTICE OF CESSATION OF WORK.

A "Notice of Cessation of Work" is a notice containing the information required by Civil Code Section 3092, recorded in the Yolo County Recorder's Office, indicating that there has been a continuous cessation of labor on the Work of the Agreement for Construction for at least thirty (30) days prior to recordation of the Notice. The Notice shall specify the date on or about when the cessation of labor commenced.

Section 1.23. NOTICE OF COMPLETION.

A "Notice of Completion" is a notice containing the information required by Civil Code Section 3093, recorded in the Yolo County Recorder's Office, indicating that the Work of the Agreement for Construction has been accepted by the County.

Section 1.24. PROGRAM MANAGER.

If assigned by the Contract Administrator, "the Program Manager" is that County official responsible for team leadership in coordinating departmental program requirements; for preparation of the statement of project objectives; for presenting project objectives to the County Administrator and Board of Supervisors; for heading the design team (for designated projects); for arranging project financing; for maintaining program oversight during the bidding and construction phases; and for providing joint progress reports, with the Contract Administrator, to the Board of Supervisors. The program manager represents the County to State and/or Federal program offices sponsoring the project. In the absence of an assigned program manager, the Director of General Services shall discharge these duties.



Section 1.25. PROJECT.

The "Project" is the total construction, of which the Work performed under the Agreement for Construction is the whole unless the Contract Documents specifically note to the contrary.

Unless so noted, the terms "Project" and "Work" are synonymous.

Section 1.26. PROJECT ARCHITECT/ENGINEER/CONSULTANT.

The "Project Engineer" is the firm employed or engaged as an independent contractor by the County to design the Project, and all sub-consultants or joint ventures of the Project Engineer. The authority of the Project Engineer to bind the County is limited to that authority specified in the Contract Documents, and no additional authority has been granted nor shall be inferred.

The Project Engineer advises the Contract Administrator in all aspects of the construction phase of the Project. His/Her functions include advice and assistance to the Contract Administrator in the correct interpretation and application of the Contract Documents. However, the Contract Administrator or his/her designate is the County's representative on the Project, not the Project Engineer. The Project Engineer is not authorized independently to issue Addenda, Clarifications, Field Orders, Work Authorizations, or Change Orders, or in any other way to bind the County in discussions with the Contractor.

The Contractor shall deliver all correspondence relating to the proper execution of the Work to the Contract Administrator, with a copy delivered to the Project Engineer. The Contract Administrator reserves the right to consult with the Project Engineer prior to responding to the Contractor's correspondence.

When discussions between the Contractor and the Contract Administrator occur either on the Site or elsewhere, but the Project Engineer is not present, the Contract Administrator reserves the right to consult with the Project Engineer prior to issuing his final decision or instruction.

See Division 1, Section 01 10 00 – County Personnel for details.

Section 1.27. REFERENCE TO CODES.

Unless otherwise noted, all references to statutes are to the law of the State of California as codified in the various specified codes.

Section 1.28. SITE.

"Site" is the area designated in the Contract Documents within which the Project is to be constructed.

Site for this purpose includes the area where Work on utility systems for the Project is to be performed by the Contractor under the Agreement for Construction, even though such areas may be designated as "off-site" on the Contract Drawings.

Section 1.29. SPECIFICATIONS.

"Specifications" shall mean the Technical Specifications portions of the Project Manual consisting of the Division 1 requirements and subsequent Divisions regarding qualities of materials and/or methods of workmanship to be furnished under the Contract. Specifications are organized into divisions, sections, and articles to enable grouping of the various portions of the Work into logical format, but this organization does not in any way restrict the Contractor in dividing the Work among subcontractors, or in establishing the extent of the Work to be performed by any trade.





Section 1.30. SUBCONTRACTOR.

Unless other specified, "subcontractor" refers to all contractors doing any work on the Project, including first, second, and subsequent tier contractors, excluding only the Prime Contractor.

Section 1.31. SUBMITTALS.

As used in Articles 3 and 5 hereof, "submittals" shall mean shop drawings, product data, and samples, as defined below:

- A. Shop Drawings are drawings, diagrams, schedules and other data specifically prepared for the Work by the Contractor or any subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work, and/or the method of installation of Materials.
- B. Product Data are illustrations, standard schedules, performance charts, certifications, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
- C. Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

See Division 1, Section 01340 for details.

As used elsewhere herein, "submittals" is a general term including all information, certifications, data or samples required to be delivered by the Contractor to the County.

Section 1.32. SUPPLEMENTAL CONDITIONS.

The "Supplementary Conditions" are specific clauses in the Project Manual setting forth conditions or requirements peculiar to the Work, and supplementary to the General Conditions.

Section 1.33. WORK/NOTICE TO PROCEED.

The "Work" is the completed construction required by the Contract Documents to perform the Agreement for Construction fully and completely, and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

Unless specifically noted in the contract Documents as not included in the Agreement for Construction, "work" includes all construction necessary to fully complete the Project as intended, including all bid alternates selected by the County for inclusion in the Work.

Unless so noted, the terms "Work" and "Project" are synonymous.

The Work shall commence upon issuance by the County of a Notice to Proceed so authorizing.

Section 1.34. WORK AUTHORIZATIONS.

"Work authorizations" are written orders to the Contractor, which amend the Contract Documents as described, and authorize the Contractor to proceed with the Work noted therein. Pursuant to Section 17.03 hereof, Work Authorizations may be cumulated into periodic Change Orders to adjust the Contract Price and/or Time, upon verification by the Contractor of the actual cost and delay, if any, caused by the Work Authorization.



ARTICLE 2.

BONDS; INDEMNIFICATION; INSURANCE

Section 2.01. BONDS; SUBMITTALS.

Within ten (10) calendar days following the Award of the Contract, and before the County will execute the Agreement for Construction, the Contractor to whom the Contract is awarded shall obtain and submit to the County bonds as set forth below in Sections 2.02 and 2.03. The Contractor is advised that a copy of the Power of Attorney authorizing execution of the bonds on behalf of the corporate surety must be filed with the Yolo County Clerk prior to approval of the bonds by the County.

Provision of the bonds required by Sections 2.02 and 2.03, and the insurance certificate required by Section 2.07 is a condition precedent to the Contractor's rights on the Agreement for Construction and a material covenant thereof.

Section 2.02. PERFORMANCE BOND.

The Contractor shall submit a faithful performance bond on the form provided with the Instructions to Bidders, duly executed by a responsible corporate surety authorized to do business in the State of California and acceptable to the county, conditioned upon the faithful performance by the contractor of all requirements of the Contract Documents. The amount of said bond shall be in a sum no less than One-Hundred Percent (100%) of the total Contract Price.

Section 2.03. LABOR AND MATERIALS PAYMENT BOND.

The Contractor shall submit a payment bond on the form provided with the Instructions to Bidders, duly executed by a responsible corporate surety authorized to do business in the State of California and acceptable to the County, which in all respects complies with Civil Code Section 9550 and following. This bond, hereinafter referred to as a "Payment Bond", shall be in a sum no less than One-Hundred Percent (100%) of the total Contract Price.

Section 2.04. CONTRACT BOND.

Prior to final payment as provided in Article 26, Contractor shall furnish a bond issued by a responsible corporate surety licensed to do business in the State of California in a form provided or approved by the County, and securing the performance by Contractor of his obligation undertaken by virtue of the guarantees required by Article 26. Such bond shall remain in full force and effect for a period of no less than one (1) year from and after recordation by the County of a Notice of Completion or a Notice of Cessation of Work, and shall be in a sum no less than ten (10%) percent of the total amount of the final Contract Price. In lieu of such bond, the Contractor may submit a certified or cashier's check, cash, or an irrevocable, unconditional letter of credit in a form acceptable to County, or may extend the final withhold account on terms and conditions acceptable to the county to secure performance of Contractor's obligations on the guarantee.

Section 2.05. INDEMNIFICATION.

Except to the extent that specific indemnity provisions of these General Conditions may apply, Contractor's indemnity, defense, and related obligations shall be as specified in the Agreement for Construction.



Nothing contained in the indemnity provisions of the Agreement for Construction shall be construed to require the Contractor to indemnify the County in contravention of Section 2782 of the Civil Code.

Section 2.06. INDEMNIFICATION OF ADJACENT PROPERTY OWNERS.

In the event the Contractor enters any agreement with the owners of any property adjacent to the Site and enters upon such property for the purpose of performing the Work, the Contractor shall fully indemnify, defend and save harmless such person, firm, or corporation, State or other governmental agency which owns or has any interest in such adjacent property. The form and content of such indemnification agreement shall be approved by County prior to commencement of the Work on or about such property. Contractor also shall indemnify the County as provided in Section 15.06.

Section 2.07. INSURANCE; SUBMITTALS.

The Contractor shall obtain, at its sole cost and expense, all insurance specified in the Agreement for Construction, and shall require all subcontractors to maintain insurance as specified therein. Continued maintenance of such insurance is a material covenant of the Agreement for Construction.

In addition to the submittals required by the Agreement for Construction, the County reserves the right to examine the insurance policies referenced in any such Certificate at any time, before or after issuance of the Notice to Proceed. Issuance of the Notice to Proceed shall not constitute a waiver of the County's right strictly to enforce the requirements of this Article.

The Contractor shall submit photocopies of its insurance and/or subcontractors' insurance policies when requested by the Contract Administrator.

Section 2.08. CONTRACTOR'S INSURANCE REQUIREMENTS.

Consistent with the Agreement for Construction, Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property that may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees or subcontractors. Any deviation from the required coverage specified in the Agreement for Construction must be approved by the County prior to the commencement of the work.

Section 2.09. SUBCONTRACTORS' INSURANCE.

Subcontractors

A. **Insurance Coverage Requirements.** Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated in the Agreement for Construction and herein.

B. **(Reserved)**

C. **Contractor Responsibilities.** It shall be the responsibility of the Contractor to certify that all subcontractors (including lower-tier subcontractors) comply with these provisions, and to enforce their continued compliance through out the progress of the Work. The submittals required to demonstrate initial compliance with this Section are specified in Section 3.02 hereof. Thereafter, the Contractor shall submit a certification to the required subcontractor's insurance when requested by the Contract Administrator. In lieu of the above the contractor can name all subcontractors on its policy as additional insured as approved by the County.





Section 2.10. WORKERS' COMPENSATION AND EMPLOYEES' LIABILITY INSURANCE

In accordance with Section 3700 of the Labor Code, the Contractor, and each subcontractor, shall secure the payment of workers' compensation to its employees as specified in the Agreement for Construction.

In the event that there is any employee working on the Project who is not protected under the Workers' Compensation statute for any reason, including because he is engaged in hazardous work, the Contractor shall provide, and shall cause each subcontractor to provide, adequate insurance for the protection of such employee. Such insurance shall comply with all requirements of the Labor Code.

Section 2.11. POSTING AT SITE.

The Contractor shall post, and cause all subcontractors to post, in a conspicuous place on the Project Site, a statement as required by Labor Code Section 3550, stating the name of the employer's compensation insurance carrier or that the employer is self-insured, and who is responsible for claims adjustment.

Section 2.12. EFFECTIVE DATE OF POLICIES.

The insurance required by this Article shall be in full force and effect at all times during prosecution of the Work and until the final completion and acceptance thereof by County, and every policy shall state that it shall not be assigned, canceled or reduced in coverage without thirty (30) days' prior written notice to County.



ARTICLE 3.

INITIAL SUBMITTALS AND TIME OF WORK

Section 3.01. PROGRESS SCHEDULE AND SCHEDULE OF VALUES.

- A. **Progress Schedule.** No later than thirty-five (35) calendar days following the Award of the Contract by the County and before issuance of a Notice to Proceed, the Contractor shall submit to the Contract Administrator a schedule showing the date on which work will commence on each part or class of the Work described with reference to the Divisions in the Technical Specifications and the responsible subcontractor(s); estimated dates of completion of such parts or classes; the working days proposed for work, and the approximate percentage of Work scheduled for completion at any time. Critical path sequencing items shall be identified. The Progress Schedule shall be practicable and consistent with the time requirements of the Agreement.

When requested by the Contract Administrator, or when the Contractor requests a Contract Time Extension Change Order, the Contractor shall submit a revised Progress Schedule showing changes to the originally approved Schedule necessary to complete the Work within the requested Contract Time.

- B. **Schedule of Values.** Simultaneously with the Progress schedule, the Contractor shall submit a Schedule of Values, showing a breakdown of the Contract Price with reference to the parts or classes or work shown on the Progress Schedule, and with reference to the Divisions in the Technical Specifications.

This schedule shall include products and materials allocated to each Allowance specified by the Contract Documents.

When requested by the Contract Administrator, or when the Contractor requests a Contract Price adjustment, the Contractor shall submit a revised Schedule of Values incorporating the requested Price adjustment(s).

Section 3.02. INITIAL SUBMITTALS.

No later than thirty-five (35) calendar days after the Award of the Contract by the County, and before issuance of a Notice to Proceed, the Contractor shall make the following initial submittals:

- A. **Schedule of Unavailable Materials:** A schedule showing any materials called for in the Contract Documents which are not obtainable for installation in the Project within the time limits set forth in the Progress Schedule, and the reasons known to Contractor for the unavailability.

The schedule shall detail Contractor's efforts to obtain the materials in question.

- B. **Schedule of Substitutions:** Contractor shall submit a schedule of all proposed Substitutions. The request for Substitutions shall in all respects comply with Article 7 of these General Conditions and shall include all requests for Substitutions of "an equal" item as defined by Public Contracts Code Section 3400 and Sections 7.02 and 7.03 hereof.

Failure to indicate such requested Substitutions on this schedule shall be deemed a waiver of the request for Substitution.



- C. **Schedule of Items Requiring Long Order Lead Time:** Contractor shall submit a schedule of all materials, the delivery of which will require more than 50% of the total Contract Time. The dates shown on this schedule shall be consistent with the Progress Schedule, and the Schedule shall specify the dates of order and expected delivery dates for the specified materials.
- D. **Subcontractor Insurance:**
1. **First-Tier Subcontractors:** The Contractor shall submit certificates of insurance for liability and workers' compensation insurance for all first-tier subcontractors, as required by Article 2 hereof. The County reserves the right to examine copies of the subcontractors' insurance policies.
 2. **Lower-Tier Subcontractors:** If requested by the Contract Administrator, Contractor shall submit certificates of liability and workers' compensation insurance for any or all lower-tier subcontractors. The County reserves the right to examine copies of the lower-tier subcontractors' insurance policies.
- E. **Subcontractors: Allocation of Work:** Contractor shall submit a chart showing all first and lower-tier subcontractors, and the contractual relationships between them, and identifying the Work to be done by each.
- F. **Schedule of Submittal Dates:** Contractor shall submit a schedule indicating the dates upon which all required submittals will be submitted. Such schedules shall conform to Section 5.02 of the General Conditions, and Section 01340 of Division 1, and shall include all submittals required by Divisions 2-16.

Section 3.03. APPROVAL OF INITIAL SUBMITTALS; EFFECT.

Prior to issuance of a Notice to Proceed, the Contract Administrator shall act upon the initial submittals required by Section 3.02.

The time for the Contract Administrator's action shall be twenty-one (21) days or less, from the date Contractor delivers submittals that conform to the Contract Documents.

In the event the Contract Administrator rejects an initial submittal, the Contractor shall not be entitled to any Contract Time extension on account of delay associated with re-submittal and re-approval. The County reserves the right to reject initial submittals in whole or in part, and the Contractor shall correct the submittal to comply with the Specifications and any requirements noted by the Contract Administrator in rejecting the submittal before issuance of a Notice to Proceed.

Once approved, all initial submittals shall be incorporated as part of the Agreement and Contractor shall comply therewith. The Contract Administrator is authorized to approve revisions to the Progress Schedule or Schedule of Values as required to incorporate approved changes in the Contract Time or Price.

Failure to meet the approved Progress Schedule is grounds for withholding Progress Payments pursuant to Article 23.

Section 3.04. COMMENCEMENT AND PROSECUTION OF WORK.

The Contractor shall not commence nor allow any subcontractor to commence work before receiving a Notice to Proceed from the County, specifying the day work is to commence. The Contractor shall



commence work on such day, and shall prosecute the Work diligently to completion thereafter, at a rate that meets or exceeds the approved Progress Schedule.

Section 3.05. OTHER SUBMITTALS.

The Contractor shall make all submittals specified by the Technical Specifications for all Work to be done in the first ninety (90) days after issuance of the Notice to Proceed.

Section 3.06. TIME OF ESSENCE.

Time is of the essence of the Agreement for Construction.

Section 3.07. DATE OF COMPLETION.

The Contractor obligates himself to make the whole Work fully complete and satisfactory on or before the completion date specified in Section 2 of the Agreement for Construction, plus any Contract Time extensions approved by Change Order. The date of completion is the date of recordation of the Notice of Completion pursuant to Section 25.04; provided, however, that the date of completion for purposes of determining whether the Contractor has completed the Work within the time required by the Agreement for Construction shall be deemed to be the date the Contractor filed the "Contractor's Request for Final Payment" pursuant to Section 25.01 if, and only if, the Work was in fact fully complete and in full conformity with the Contract Documents when the Contractor's request was filed.

Section 3.08. EXTENSION OF TIME; UNAVOIDABLE DELAYS.

The Contractor shall not be granted a Contract Extension except on the issuance of a Change Order by the Board of Supervisors, upon a finding that the delay in completion was unavoidable.

Delays in prosecution of parts or classes of the Work that are not demonstrated to prevent or delay completion of the entire Project within the Contract Time are not "unavoidable delays" for purposes of this section.

In all cases, the time authorized for extension of the Contract Time shall be no greater than the number of days directly attributable to the unavoidable delay which caused delay in the completion of the Project. "Unavoidable delay" for this purpose shall be defined as follows:

- A. **Unavailable Materials.** That materials or articles called for in the Contract Documents are not obtainable within the time required for timely completion; provided that such materials or articles were listed by the Contractor in the schedule required by Section 3.02 hereinabove; that the Contractor demonstrates that the unavailability of the materials is in fact the cause for the delay, and could not have been cured by adjusting the Progress Schedule; and that the unavailability of such materials is due to circumstances beyond the Contractor's control. If good cause for a delay is demonstrated pursuant to this subsection, the County, at its sole discretion, may grant a time extension or apply Section 17.09 hereof.
- B. **Force Majeure.** That delays in construction have resulted from circumstances beyond the control of the Contractor and which the Contractor could not have provided against by the exercise of reasonable care, prudence, foresight, and diligence. Unavoidable delays within the meaning of this subparagraph shall be those caused by acts of neglect of the County or its officers, agents, or employees; by acts of God, war, insurrection, civil disorder, fire, floods, epidemic, or strikes.



- C. **Unseasonable Weather.** An extension of time may be granted due to weather which is unsuitable for the Work currently in progress, upon the findings that the weather conditions in fact caused the delay in completion of the Project and that such weather conditions were not, and could not in the exercise of reasonable diligence, have been foreseen by the Contractor. Unseasonable weather that, in the exercise of reasonable foresight and diligence, should be expected in the area at the time of year in question is not cause for an extension of time.
- D. **Time Extension Due to Change Orders or Work Authorizations.** A time extension may be granted due to a delay in the Project caused by the approval by the County of a Change Order or Work Authorization pursuant to Article 17. The Contractor shall be entitled to a time extension Change Order only when the extra work is demonstrated by the Contractor to have caused a delay in the Project. When a Work Authorization is issued, the Contract Administrator or County Administrative Officer is authorized to approve an allocation of time attributable to that Work Authorization. Approval of such allocation shall not constitute County's approval of a time extension to the overall Contract time but shall constitute County approval of the time allocated by the Contractor to perform the particular extra work in question.

The provisions of Sections 3.08 and 3.09 shall be applicable to requests for time extensions due to extra work.

The Contract Administrator may cumulate requests for time extensions due to Work Authorizations and process periodic Change Orders therefore, if warranted, or may process a Contract Time Extension Change Order simultaneously with the Contract Price Change Order, in his sole discretion. Such Contract Time Extension Change Orders may be approved only by the Board of Supervisors, however.

- E. **Delay Due to Rejected Submittals.** In the event the Contract Administrator rejects a submittal, the Contractor shall not be entitled to any Contract Time extension on account of delay associated with re-submittal.

The procedure for submittals shall be as specified in Articles 5 and 7 (Substitutions) and the Technical Specifications. The Contract Administrator shall approve or reject submittals within twenty-one (21) days of the Contractor's delivery of the submittal, unless a different time is specified in the Technical Specifications for the particular submittal in question.

- F. **County Caused Delays.** In the event that the Project is delayed by acts of the County not authorized by the Contract Documents which the Contractor demonstrates will or have caused an unavoidable delay as defined by Subparagraph "B", the Contractor shall be entitled to a Contract Time and/or Contract Price Change Order to offset the extra time and/or costs incurred by the Contractor. Such extra costs shall be limited to those "actual costs" as defined in Section 17.02-D directly caused by the delay and incurred on this Project only. Overhead and profit shall be limited to that specified in Section 17.02-C hereof. Extra costs shall not include indirect costs nor loss of profits or increased costs on other work. Extra time shall be limited to that directly caused by the delay, as defined in Subparagraph "B" hereof.

The Contractor specifically agrees that a time extension and cost adjustment as provided herein is its sole remedy for County-caused delays and agrees to make no claim or demand for additional damages, nor claim an acceleration of the time for performance.

The Contractor shall not be entitled to any Contract Time Extension nor Contract Price adjustment for alleged County delays if the County has acted within the time limits specified by the Contract Documents.



The Contractor shall not be entitled to any cost adjustment for delays except for County caused delays as specified in this subsection.

Section 3.09. NOTICE OF DELAYS; SUBMITTALS.

Whenever the Contractor foresees any delay in the prosecution of the Work, and in any event immediately upon the occurrence of any delay which the Contractor regards as grounds for an extension and/or cost adjustment as specified in section 3.07., the Contractor shall notify the Contract Administrator in writing of the delay. Such notification shall specify with detail the cause asserted by the Contractor to constitute grounds for an extension, and/or cost adjustment. Failure of the Contractor to submit such a notice within five (5) days after the initial occurrence of the event giving rise to the delay shall constitute a waiver by the Contractor of any request for a time extension and/or cost adjustment, and no extension and/or cost adjustment shall be granted as a consequence of such delay.

With its request for time extension and/or cost adjustment, the Contractor shall submit evidence to demonstrate that the delay in prosecution in the work will result in an unavoidable delay in completion of the entire Project. Such evidence shall include a demonstration that the delayed portion of the Work will affect the critical path scheduling of the entire Project. The Contractor shall also submit a proposed revised Project Schedule, which accounts for the delay in completion of the entire Project caused by the delay in prosecution of part of the Project, and includes a revised critical path demonstrating how the Project will be completed within the proposed revised Contract Time.

Section 3.10. INVESTIGATION; PROCEDURE.

Upon receipt of a request for a Contract Time extension and/or cost adjustment, the Contract Administrator shall conduct an investigation of the facts asserted by the Contractor to constitute grounds for an extension and/or cost adjustment. The results of this investigation shall be reported by the Contract Administrator to the Contractor and the Contract Administrator shall indicate whether he will recommend for or against such extension to the Board of Supervisors.

The Contract Administrator may, in his sole discretion, defer this recommendation to allow the accumulation of time extensions and/or cost adjustment due to Work Authorizations into a periodic or final Change Order request.

Upon receiving the Contract Administrator's recommendation to the Board of Supervisors regarding the Contractor's request for a time extension and/or cost adjustment, the Contractor may either withdraw its application for extension or request that it be scheduled for action by the Board of Supervisors. If the Board of Supervisors disallows the request, there shall be no allowance made for the time during which the request was pending, and the Contractor shall remain obligated to complete the Work in the time specified.

If the Board of Supervisors approves the time extension change order, the new Progress Schedule submitted by the Contractor and approved by the County shall be deemed to amend the original Progress Schedule approved by the County pursuant to Section 3.03 hereof; thereafter, the amended Progress Schedule shall have the same force and effect as the originally approved Progress Schedule.

The Contractor agrees that the determination of the Board of Supervisors as to whether grounds for an extension and/or cost adjustment exist, and if so, the duration of the extension and/or cost adjustment, shall be final and binding upon both County and Contractor.



Section 3.11 DISCRETIONARY TIME EXTENSION FOR BEST INTEREST OF COUNTY.

The County reserves the right to extend the Contract Time for completion of the Work if the Board of Supervisors determines that such extension is in the best interest of the County.

Section 3.12. LIQUIDATED DAMAGES.

If the Work is not completed by Contractor in the time specified in Section 2 of the Agreement for Construction or within any period of extension authorized pursuant to this Article, the Contractor acknowledges and admits that the County will suffer damage, and that it is impracticable and infeasible to fix the amount of actual damages. Therefore, it is agreed by and between the Contractor and the County that the Contractor shall pay to the County as fixed and liquidated damages, and not as a penalty, the sum specified in the Agreement for Construction for each calendar day of delay until the Work is completed and accepted, and that both the Contractor and the Contractor's surety shall be liable for the total amount thereof, and that the County may deduct said sums from any monies due or that may become due to the Contractor.

This liquidated damage provision shall apply to all delays of any nature whatsoever, save and except only unavoidable delays approved by the Board of Supervisors pursuant to Section 3.07 hereinabove, are discretionary time extensions approved by the Board of Supervisors pursuant to Section 3.10 hereinabove.

The Contractor also acknowledges that the contract completion date for purposes of liquidated damages shall be the date of the Board of Supervisors' Resolution of Acceptance, unless Section 3.06 applies.

Section 3.13. EXTENSION OF TIME NOT A WAIVER.

Any extension of the Contract Time granted pursuant to this Article shall not constitute a waiver by the County, nor a release of the Contractor, from his obligations to perform this Contract in the Contract Time.

Granting of a time extension due to one circumstance on one request therefore shall not constitute a granting by the County of an extension of time for any other circumstance or the same circumstance occurring at some other time, and shall not be interpreted as a precedent for any other request for extension.

Section 3.14. SUSPENSIONS EXCEEDING ONE YEAR.

Should the Work be suspended for a period exceeding one (1) calendar year due to war conditions, labor conditions, legal actions, or for other conditions constituting the legal defense of impossibility of performance, the Contract and the County agree to enter an agreement terminating the Agreement for Construction upon the following terms and conditions:

The County shall be responsible only to pay the Contractor the actual value of the completed Work, to the County, less progress payments made to date, less any deductions authorized by the Contract Documents, and plus the ten (10%) percent withhold from previously issued progress payments.

As between the Contractor and the County, it shall be conclusively presumed that the actual value to the County for the Contractor's Work to the date of the last progress payment is not more than the actual amount of progress payments made to date plus the ten (10%) percent withhold from such progress payments; provided, however, that this section shall not preclude the County from deducting charges for work or materials which do not meet the requirements of the Contract Documents.





Such final payment shall be due only after any stop notices are resolved or the time to file stop notices has expired.

Section 3.15. EFFECT OF STOP WORK NOTICE.

If the County orders a suspension of the Work pursuant to Section 18.05, the days on which the suspension is in effect shall be included in determining the required completion date and shall not otherwise modify or extend the time within which the Contractor is to perform. In such event, the Contractor shall not be entitled to any damages or compensation on account of such suspension or delay, and the suspension and/or delay shall not constitute an acceleration of the performance time.

If the Contract Administrator determines that the Work conforms in all respects to the Contract Documents and releases the Stop Work Notice, the Contractor shall recommence work and may thereafter request a time extension pursuant to Section 3.07-F hereof. Sections 3.07, 3.08, and 3.09 shall apply to such requests.



ARTICLE 4.

SCOPE AND INTENT OF CONTRACT DOCUMENTS; CLARIFICATIONS

SECTION 4.01. BASIC INTENT AND SCOPE OF CONTRACT DOCUMENTS.

The basic intent of the Contract Documents is to describe the complete Project, including all materials, labor, equipment, and incidentals necessary for the proper execution and full completion of the work. The scope of the Agreement for Construction shall include everything directly called for by the contract Documents, and all work reasonably to be foreseen and/or inferred by competent contractors of the various required trades in order to completely perform the Work to produce the complete Project as intended.

The Agreement for construction does not recognize "substantial performance" as equivalent to "complete performance"; by entering the agreement, the contractor agrees, as a material covenant, to provide "complete performance" within the contract Time, for the amount included in the Contractor's bid as the Contract Price, unless modified by Change order. No extra compensation shall be allowed for any work or materials not directly appearing in the Contract Documents, but which a competent contractor should have foreseen and/or inferred would have been within the scope of the Agreement for Construction for work of the type and in the area of the Project. Even though items of work are not separately mentioned in the contract Documents, the Scope of the Agreement includes the furnishing and installation of all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for the sound, secure and fully complete performance of the work.

The Contract Price shall include all compensation for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary fully to complete the Project as intended.

Section 4.02. HARMONIZATION OF CONTRACT DOCUMENTS.

The Contract Documents are complimentary, and what is required by anyone shall be as binding as if required by all. The Documents are intended to be coordinated to describe and provide for the complete Project.

In the event of a conflict between the Contract Drawings and the Technical Specifications of the Project Manual, the Contract Drawings shall govern in matters of quantity and the Specifications shall govern in matters of quality. In the event of conflict within the contract Drawings involving quantity or within the Specifications involving quality, the greater quantity and the higher quality shall be furnished.

Scale drawings, full sized details, and technical specifications are intended to be coordinated and to agree fully. unless specifically noted otherwise in the Technical Specifications, all work and materials necessary for each unit of construction, even though only briefly mentioned or indicated, shall be furnished and installed fully and completely as specified in accepted submittals and the manufacturers' instructions and/or recommendations.

For convenience, the Specifications and Drawings in the Contract Documents are arranged in several sections, but such separation shall not be considered as the limits of the Work required by any separate trade. The terms and conditions of the Work to be performed by any subcontractor are strictly between the Contractor and such subcontractor.



Section 4.03. LOCATIONS.

The locations of equipment, wiring, piping, and similar materials and equipment are shown diagrammatically in the Contract Documents; actual Site conditions may not always permit their installation precisely in the location shown on the Contract Drawings. Contractor shall coordinate installation of equipment.

Section 4.04. SITE CONDITIONS.

Where investigations have been conducted by the County of existing conditions on the Site including subsurface conditions, such investigations are made for the purpose of design only and for the information of bidders. The results of such investigations represent only the statement by the County as to the circumstances and character of materials actually encountered by the county during the investigations. The County makes no guarantee or warranty, express or implied, that the conditions indicated are representative of conditions existing throughout the Site of the Project or any part of it, or that unanticipated conditions might not occur.

All excavation work shall be performed on an "unclassified basis; that is, shall include the removal of all material encountered including earth or rock formations, regardless of type or hardness thereof or groundwater conditions in the excavation, the cost of such excavations being included in the Contract Price at the time of bidding. Unclassified excavation work does not include drilling or blasting operations, unless otherwise specified in the Technical Specifications.

Section 4.05. PROJECT RECORD DOCUMENTS.

The Contractor shall maintain at the Site such Project record documents as are required by Section 01720 of Division 1.

At a minimum, the Contractor shall maintain one record copy of all drawings, specifications, addenda, work authorizations, change orders and other modifications, in good order and marked currently to record all changes made during construction, and accepted submittals.

With his request for final payment, the Contractor shall submit such record drawings to the Contract Administrator for approval. The contractor shall make all corrections necessary to produce accurate and complete record drawings showing the "as-built" Project.

The Project Record Documents shall be kept accurately and currently to show the precise locations and depths below finish grade of all components of the Project, as constructed.

Section 4.06. CONTRACTOR'S SUPERVISION AND COORDINATION OF THE WORK.

It is the Contractor's basic responsibility to execute and complete the Work necessary to construct the Project as intended by the Contract Documents, whether the Work is being performed directly by the Contractor, or by subcontractors of the Contractor. In all cases, the Contractor shall cooperate reasonably and in good faith with the Contract Administrator to the end that unnecessary Clarification requests are avoided, and the Work flows smoothly to a fully completed Project for the Contract Price, within the Contract Time.

The Contractor is responsible to thoroughly review and become familiar with the Contract Documents, and to identify conflicts, internal inconsistencies and/or ambiguities claimed by the Contractor to exist in the documents. By execution of the Agreement for Construction, the Contractor represents that it is fully competent, skilled and experienced to secure the performance of all Work needed to complete the Project intended and will utilize fully such competence, skill, and experience in interpreting the Contract





Documents to produce the results intended. Prior to requesting a Clarification, the Contractor shall exert its best efforts to resolve problems in the field.

The Contractor is responsible to supervise and coordinate the work of all subcontractors. The Contractor shall exert its best efforts to resolve problems presented by Subcontractors.

The Contract Administrator shall consider no request by Contractor for a Clarification on its own behalf or on behalf of a subcontractor unless the request details the Contractor's efforts to resolve the issue, the results thereof, and demonstrate that the Contractor's efforts comply herewith. In all such cases, the Contract Administrator reserves the right to require the Contractor to make additional efforts to resolve the issue rather than issuing a Clarification.

Section 4.07. CLARIFICATIONS AUTHORIZED.

The Contract Administrator is authorized to furnish during the progress of the Work such Clarifications as the Contract Administrator deems are necessary to make clear and to define in greater detail the intent of the Contract Documents. Such Clarifications shall be incorporated by reference into the contract Documents, and the Contractor shall make his Work conform to all such Clarifications. In the event of conflict between the original Contract Documents and subsequently issued Clarifications, the Clarification most recently issued shall control.

Section 4.08. CLARIFICATIONS; PROCEDURE.

- A. **Contract-Initiated Requests.** Should the Contractor discover any conflicts or errors in the Contract Documents, or have any question concerning interpretation or clarification of the Contract Documents; or if it appears to the Contractor that the Work to be done or any matters relative thereto are not sufficiently detailed or explained in the Contract Documents; and provided that the Contractor has exerted its best efforts to interpret the Contract Documents and resolve the issue as required by Section 4.06; then before proceeding with the Work affected, the Contractor shall notify the Contract Administrator and request a Clarification.

The Contractor's request for Clarification shall be in writing, accompanied by sketch drawings and the materials necessary to explain and illustrate the problem in detail, and shall explain the Contractor's previous efforts to resolve the issue and the results thereof.

If the Contractor has proceeded with Work which was eligible for a clarification, but regarding which the Contractor failed to request a clarification, the Contractor shall not be entitled to, nor shall it request, any adjustment to the Contract Price or Time, caused by or resulting from such Work. The Contractor proceeds with such Work at its own risk, and shall make good any resulting damage, defect or extra work produced by such work.

- B. **County-Initiated Clarifications.** At any time, the Contract Administrator may issue Clarifications to explain the Work more fully. The Contractor shall perform the Work as required by the Clarification.
- C. **Incorporation in Contract.** All duly issued Clarifications shall become part of the Contract Documents upon delivery to the contractor.
- D. **Procedure for Extra Work Claims.** If the Contractor contends that any clarification requires Work beyond the Scope of the Agreement, the procedures in Section 17.05 shall be followed.



Section 4.09. CONTRACT ADMINISTRATOR'S INVESTIGATION AND RESPONSE TIME.

Upon receipt of Contractor's request for a Clarification, the Contract Administrator shall conduct such investigations as he deems appropriate, including consultation with the Project Architect as necessary to decide the Contractor's request for Clarification.

In all cases, if the request is incomplete or does not demonstrate the Contractor's compliance with this Article, the Contract Administrator may reject the request unprocessed, and return it to the Contractor. There shall be no time extension on account thereof.

Within fourteen (14) days following receipt of the Contractor's fully documented request for Clarification, the Contract Administrator shall issue his written response to the Contractor. If the Contract Administrator rejects the Contractor's request for Clarification, the Contractor shall perform the Work in accordance with the Contract Documents.

If the contract Administrator issues a Clarification, the Contractor shall perform the Work in accordance with the Clarification.

Section 4.10. DISPUTE AS TO SCOPE OF CONTRACT DOCUMENTS.

If the Contractor contends that any Work required by a clarification is outside the Scope of the Contract Documents as specified in section 4.01, the Contractor shall, within five (5) days of receipt of the Clarification, submit a written request for a Change Order to the Contract Administrator.

Such request shall specify all details of why the Contractor contends that the Work exceeds the Scope of the Contract Documents, and shall include an estimate by the Contractor of the cost to perform the Work, which complies with Section 16.05 hereof, and of the time to perform the Work, which complies with Section 3.08 hereof.

Upon timely delivery of a request by the Contractor, the Contract Administrator shall, within fourteen (14) days, consult with the Project Architect, as needed, and respond to the Contractor's request.

Such response shall either confirm the original Clarification, as within the scope of the work, and order the Work to be performed with no extension of time or increase in contract amount, or approve the Contractor's request, in which case a work Authorization will be issued, if authorized by Section 16.03 hereof, or Change Orders will be processed to adjust the Contract Price and/or Time equitably.

The Contractor acknowledges that the purpose of this Section is to allow the County advance Notice of Contractor's contention that a Clarification is beyond the Scope of the Agreement, so that the County may reconsider the Clarification before the Clarification Work is incorporated in the Project and such reconsideration is futile. Therefore, the Contractor agrees that if it proceeds with such Work without providing such Notice or before the Contract Administrator's response, the Contractor does so at its own risk and cost. Extra costs and/or time caused by or resulting from such Work shall be at the Contractor's expense, and the Contractor shall make good any resulting damage, defect, or extra Work produced by such Work.



ARTICLE 5.

SUBMITTALS.

Section 5.01. REQUIRED SUBMITTALS; TIME.

No portion of the Work requiring submittals shall be commenced until the submittal has been accepted by the Contract Administrator. Should the Contractor proceed with any work requiring a submittal before acceptance thereof, the Contractor shall remove and replace any Work which is not in accordance with the Contract Documents and shall bear the risk of loss due to resulting damage, defects, or added costs.

The Contractor shall provide all submittals required by the Technical Specifications in accordance with the procedures set forth in Section 01340 of Division 1.

All submittals shall be complete in every respect and shall include all information required both by the particular Technical Specification section and by Section 01340 of Division 1.

The Contract Administrator shall not process submittals that are not complete in all respects, legible, reproducible, and sufficiently dimensioned and detailed to demonstrate compliance with the Contract Documents.

The Contract Administrator may reject all or any portions of a submittal which fails to comply with the Contract Documents, and the Contractor shall resubmit the entire submittal or the rejected portion, whichever is ordered by the Contract Administrator.

The Contractor shall be entitled to no Contract Time or Price adjustment for delays occasioned by the failure of the Contractor's submittals to comply with the Contract Documents.

Section 5.02. TIME FOR SUBMITTALS.

- A. **Time Generally.** All submittals shall be submitted by the Contractor at the time specified by Section 01340 of Division 1, and the applicable portions of the Technical Specifications; provided, however, that in all events, Contractor shall submit all submittals so as not to cause a delay in the Work, including a reasonable time for review by the Contract Administrator. Unless otherwise specified in the Technical Specifications, the time for review by the Contract Administrator shall be no more than twenty-one (21) days.
- B. **Submittals within Twenty-One (21) Days Following Notice to Proceed.** Within the first twenty-one (21) days following issuance by the County of a Notice to Proceed, the Contractor shall make the following submittals, including all information required by the General Conditions, Section 01340 of Division 1, and all other the applicable Technical Specifications:
- 1) All data required by Sections 01340 and 01640 of Division 1 to substantiate a Request for Substitution.
 - 2) Proposed substitutions, with all substantiating data, for all materials listed as "unavailable materials" on the Contractor's initial submittal, pursuant to Section 3.02-A hereof.
 - 3) A critical path schedule, if required by Section 01340 of Division 1.
 - 4) Any other submittals requested by the Contract Administrator to be received within the first 21 days following issuance of a Notice to Proceed.



- C. **Submittals After 21 Days Following Issuance of the Notice to Proceed:** All other submittals required by the Contract Documents shall be submitted in conformity with the time requirements thereof, and in no event later than specified on the schedule of submittals approved pursuant to Section 3.02-G hereof.

Section 5.03. CONTRACTOR'S RESPONSIBILITIES RE: SUBMITTALS.

The Contractor shall review and approve all submittals, including those originating with subcontractors and suppliers, before submitting them to the Contract Administrator.

By making a submittal, the Contractor represents that it has determined and verified all materials, field measurements, and field construction criteria related thereto, and that it has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

It is the Contractor's responsibility to specifically point out any variation or discrepancy between submittals and the Contract Documents, or between a re-submittal and the notations on the original Submittal. The Contractor shall make specific mention of all such variations, along with an explanation of why they are requested, in his letter of transmittal.

Failure by the Contractor to identify in his letter of transmittal with the submittal any variation, discrepancy, or conflict with the Contract Drawings shall render acceptance of the submittal null and void, and the Contractor shall bear all risk of loss and reconstruction costs or delays.

The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Contract Administrator's action on a submittal unless the contractor has complied with this section and the Contract Administrator expressly authorizes such deviation.

If any plumbing, mechanical, electrical, or structural modifications are required as a result of submittals that do not comply with the Contract Documents, such modification shall be made without extra cost to the County, and without extension of the Contract Time.

Section 5.04. ACTION ON SUBMITTALS.

The Contract Administrator shall take one of the following actions on a submittal:

"APPROVED": Fabrication, manufacture, or construction may proceed providing submittal complies with Contract Documents.

"APPROVED AS NOTED": Fabrication, manufacture, or construction may proceed providing submittal complies with Project Architect's notations thereon and Contract Documents. If for any reason the Contractor cannot comply with notations, the Contractor shall resubmit as described for submittals stamped **"REVISE AND RESUBMIT"**.

"REVISE AND RESUBMIT": Submittal does not comply with Contract Documents, and fabrication, manufacture, or construction shall not proceed. The Contractor shall make a new submittal conforming to the Contract Documents. Submittals stamped **"REVISE AND RESUBMIT"** shall be attached as an Exhibit to the re-submittal(s) for the specified items.

"NOT APPROVED": Fabrication, manufacture, product and/or construction does not conform to Contract Documents. Such fabrication, manufacture, product or construction shall not proceed and



are not permitted on the site. The Contractor shall make a new submittal, including a new proposed for fabrication, manufacture, product and or construction conforming to the Contract Documents.

"NO ACTION REQUIRED: Submittal is not required by this contract for this material or product. If Contractor wishes comment on this particular material or product, a submittal of a letter from Contractor explaining his purpose for submittal should accompany any future submittal.

Approval is only for conformity with the Design concept of the Project and compliance with the intent of the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

Section 5.05. EFFECT OF ACCEPTANCE OF SUBMITTALS.

The acceptance of submittals shall not relieve the Contractor of any obligation for quantities, accuracy of dimensions and details for property coordination, fitting and construction of the Work; for errors or omissions in the submittals; for conforming the Work to the requirements of the Contract Documents and all applicable laws and regulations; or from responsibility to fulfill the Contract at no extra cost to the County, within the Contract Time.

The County will review submittals for conformity with the Contract Documents, and acceptance thereof operates only with reference to such conformity. The County will attempt to discover errors, but the responsibility for accuracy and completeness of all submittals is the Contractor's.

After a submittal has been accepted, the Work shall proceed in accordance therewith.

The acceptance of samples provided with submittals shall be for the characteristics thereof, for the uses named in the action on the submittal, and for no other. Acceptance of samples shall not constitute a modification in any requirement of the Contract Documents unless expressly so noted, nor shall it relieve the Contractor of its obligation fully to perform the Agreement for Construction. All material or work installed after acceptance of a sample shall be equal or better than the sample in all respects.



ARTICLE 6.

MATERIALS: STORAGE; PAYMENT; CERTIFICATIONS.

Section 6.01. QUALITY OF MATERIAL AND PRODUCTS.

The Contractor shall, if required by the Contract Administrator, furnish satisfactory evidence as to the kind and quality of materials provided in addition to the submittals required by the Technical Specifications.

The Contract Administrator may require, and the Contractor shall submit, a list designating the source of supply of each item of material entering into the Construction of the Work, and in such event, such materials or products shall not be delivered to the Work nor installed therein until after the Contract Administrator has approved such list.

Section 6.02. BETTER MATERIAL OR PROCESS.

In the Event that Contractor furnishes a material, product, process or article better than that specified in the Contract Documents, the difference in cost of such material, product, process or article shall be borne by the Contractor, unless the County previously specifically authorized the use of such item and a Contract Price adjustment therefore.

Section 6.03. INDUSTRY STANDARDS.

Unless otherwise specified in the Technical Specifications:

- A. Any material specified by reference to a number, symbol or title or a specified standard such as a Commercial Standard, a Federal Specification, a Trade Association Standard, or other similar standard, shall comply with requirements in the latest revision thereof including any amendments or supplement thereto, in effect on the date of the Contractor's Bid, except as limited to type, class or grade, or modified in such reference.
- B. The standard referred to, except as modified in the Specifications, shall have full force and effect as though printed in these Specifications. These standards are not specified in detail for the reason that the manufacturers and trades involved are assumed to be familiar with their requirements.
 - 1) Where Federal Specifications are referred to as a measure of quality and standard, they refer to Federal Specifications established by the Procurement Division of the United States Government and are available from the Superintendent of Documents, U.S. Government Printing Office.
 - 2) Where Federal Specification numbers are used, they refer to the latest edition including amendments thereto.
 - 3) Where Commercial Standards or Product Standards are referred to as a measure of quality, standard and method of fabrication, they refer to Commercial Standards and Product Standards issued by the U.S. Department of Commerce.
 - 4) Where industry standards numbers are used, they refer to the latest tentative specifications, standards specifications, standards method or standard methods of testing, issued for example by the American Society for Testing Materials, unless specifically noted.



See Section 01 42 13 - Standard Abbreviations and Symbols for details on Abbreviations and Symbols.

Section 6.04. MATERIALS AND PRODUCTS STORAGE.

The Contractor shall confine the storage of all materials, products and equipment required in the performance of the Work to the area specified on the contract Drawings.

The County reserves the right, at the sole discretion of the Contract Administrator, to require materials to be stored off the Site in a bonded warehouse or other approved location. The County shall provide such location free of charge to the Contractor, or the Contractor shall be entitled to a Contract Price change order to off-set the actual cost thereof as defined in Section 17.02-D. Contractor shall not be entitled to overhead and profit on the rent of such facility.

The Contractor is admonished that the County has no obligation to provide a secure warehouse or other storage facilities; the Contractor takes the sole risk of loss or vandalism to any products or materials stored anywhere other than in a warehouse provided by the County.

All materials and products shall be stored in accordance with their manufacturers' instructions, with seals and labels intact and legible. Further particulars regarding methods of storage are provided in Section 01600 of Division 1.

All materials, supplies and equipment to be incorporated in the Work shall be new, unless otherwise specified; of the type, capacity and quality specified; and free from defects. All materials shall remain in their original packages or containers until ready for use. The labels of all packages or containers shall remain affixed and shall be kept legible.

The Contractor shall protect the Work, materials and equipment from damage due to action of the elements, trespassers, and other causes. It shall properly store materials and equipment and, when necessary or when specified by the Technical Specifications, erect such temporary structures as is required to protect them from damage.

Section 6.05. TIME FOR DELIVERY OF MATERIALS: EARLY DELIVERY.

- A. **Basic Requirement:** Unless early delivery is authorized by the Contract Administrator pursuant to Subsection B. hereof, the Contractor shall limit delivery of materials and equipment to the Site to those materials and/or equipment needed for installation within thirty (30) days of the date of delivery. The Contract Administrator shall refuse payment for materials delivered to the Site that are not intended to be used within thirty (30) days of the date of delivery.
- B. **Early Delivery of Materials:** The County reserves the right to allow an earlier delivery date of any materials and/or equipment. Upon inspection and approval as specified below, the Contractor shall be entitled to progress payments therefore as specified in Section 23.01.

Upon application by the Contractor, the Contract Administrator, in his sole discretion, may authorize early delivery of materials and/or equipment, and payment therefore, subject to the following requirements:

1. For purposes of this Section, "materials and equipment" eligible for payment are defined as finished goods made specifically for the Project and requiring extensive time to be manufactured or obtained. Raw materials or work in progress and not yet delivered to an approved storage location are not eligible for payment. Finished items that are readily available for purchase are not eligible for payment.



2. The Contractor's request shall demonstrate that the proposed early payment is in the best interest of the Project by accomplishing time and/or money savings.
3. In his application for payment for such materials, the Contractor shall separately list the items for which payment is sought pursuant to this subsection. No payment shall be authorized unless the Contractor demonstrates that he is the unconditional owner of the equipment or material and executes a transfer of title to such equipment or material to the County with each request for early payment.
4. The materials for which a progress payment has been received shall be fully insured, with the County named as co-insured, segregated from the manufacturer's other work in progress and raw materials at the manufacturer's place of storage, and separately identified as being the property of the County of Yolo. Such insurance shall be primary, and the County's Builders' Risk insurance secondary.
5. The County retains the right to conduct inspections of such materials either during fabrication or during storage, at the manufacturer's plant or place of storage. The Contractor shall retain all risk of loss for such materials, however.
6. Payments for such materials shall be due only after such materials have either been delivered to the job site or to a storage location acceptable to the County, except that such payments shall not be included in the value for work in place for the purpose of calculating payments for labor and mark up.
7. The County reserves the right to specify requirements in addition to those stated above or in Division 1 regarding early payment for materials. Such requirements shall be listed on the Contract Administrator's consent for early payments; the Contract Administrator hereby is authorized to provide such consents, with additional requirements, as are deemed necessary to protect the County.

See Section 01 20 13 - Payment for Delivered Materials and Equipment for further particulars.

Section 6.06. SPARE PARTS AND MAINTENANCE MATERIALS.

The Contractor shall provide spare parts and maintenance materials as required by the Technical Specifications.

Section 6.07. PROVIDING AND PAYING FOR MATERIALS, ETC.

Except as otherwise specifically stated in the Contract Documents, Contractor shall provide and pay for all materials, products, articles, processes, tools, equipment, and installation, and all associated superintendence of every nature whatsoever necessary to execute and complete the Work within the specified time.

Section 6.08. WARRANTY OF TITLE.

No material, article, product, supplies, or equipment for the Work under this Agreement shall be subject to any chattel mortgage, or a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier.

The Contractor warrants that, upon demand by County at any time after a progress payment has been made therefore, the Contractor will deliver to the County clear title to any materials, supplies, and/or equipment for which such progress payment was made, but which has not as yet been incorporated into the





Work, such title to be free from any claims, liens, or changes, save only the Contractor's claim for the 10% withhold attributable to such materials, supplies, or equipment.

The Contractor further warrants clear title to all material, supplies, and equipment installed or incorporated in the Work, and agrees upon completion of the Work to deliver the premises, together with all improvements and appurtenances, constructed or placed thereon pursuant to the Agreement for Construction, to the County, free from any claims, liens, or charges.

The Contractor agrees that neither he nor any person, firm or corporation furnishings any materials or labor for any Work pursuant to the Agreement for construction shall have any right to a lien upon the premises or any improvement or appurtenances thereon; provided, however, that nothing contained in this section shall defeat or impair the rights of persons furnishing materials or labor under the Payment Bond posted by the Contractor, nor any rights covered under any law permitting such persons to look to funds due to the Contractor but withheld by the County.

This section shall not disallow the Contractor's installing any devices or equipment of utility companies or of governmental agencies, the title to which is commonly retained by the utility company or the agency.

Section 6.09. PATENTS AND ROYALTIES.

All fees, claims, or royalties for any patented or copyrighted invention, article, arrangement, or plan that may be used upon or in any manner connected with the doing of the Work or any part thereof shall be included in the price bid for doing the Work. The Contractor and his sureties shall protect and hold harmless the County and all of its officer, agents, and employees against any and all demands made for such fees or claims and against any and all suits, demands, claims, or causes of action brought or made by the holder of any invention, patent, copyright or trademark, or arising from any alleged infringement of any invention, patent, copyright, or trademark.

Before final payment, the Contractor shall furnish acceptable proof to the Contract Administrator of proper release from all such fees or claims.

Section 6.10. PAYMENT OF FEDERAL OR STATE TAXES.

Any Federal, State, or local tax, specifically including sales and use taxes, payable on materials incorporated in the Work shall be included in the Contract price and paid by the Contractor.

The County will furnish the contractor with a certificate, on forms provided by the Contractor, to the effect that such materials are for the exclusive use of the County.

Section 6.11. PRODUCT CERTIFICATION.

Where required by the Technical Specifications, the Contractor shall submit proper product Certifications, which demonstrate the product's conformity to the Technical Specifications. Article 5 shall apply thereto.



ARTICLE 7.

PRODUCT OPTIONS AND SUBSTITUTIONS.

Section 7.01. APPLICABILITY OF ARTICLE.

This Article authorizes the Contractor to request substitutions of equal materials pursuant to Public Contracts Code Section 3400. Applications for such Substitutions shall be considered by the County only if the contractor's submittal is received within the time and includes all information specified herein and in Section 01640 of Division 1.

The Contractor is responsible to file all such requests on behalf of all subcontractors and product supplies; the County shall consider no request filed by a subcontractor or product supplies.

Only one request for Substitution shall be considered for each product specified. If the Contractor's request for Substitution is denied, the Contractor shall provide the specified first preference product.

Section 7.02. EFFECT OF BRAND NAME MATERIALS SPECIFICATION.

Unless otherwise expressly specified, whenever in the Contract Documents any materials, products, processes or articles are indicated or specified by the name brands of the manufacturers or products, or by patent or proprietary names, such Specifications shall be deemed to be followed by the words, "or equal", unless the specification expressly states that there is no known equal, or that the particular product specified is a unique or novel product application required to be used in the public interest. When materials are specified by reference to brand names, such specification is intended to incorporate all specifications of the listed brand as the measure of the type, quality and utility of the material so specified, and is not intended to limit the bidding, directly or indirectly, to any one specific concern.

Section 7.03. NECESSITY FOR SUBSTITUTION REQUESTS.

If materials are specified only by reference to standards, with no brand or proprietary trade name listed, any product meeting the specified standards may be provided, and no request for Substitution is required. No product not meeting the specified standards shall be provided unless a change order is approved so authorizing.

If materials are specified by listing more than one manufacturer or product, and the specification does not list one as the first preference manufacturer or product and the others as optional, any manufacturer or product listed may be provided, and no request for Substitution is required. If material is proposed other than the listed manufacturers or products, a Substitution shall be proposed by the Contractor pursuant to this Article.

Section 7.04. TIME FOR REQUESTING SUBSTITUTIONS.

All requests for Substitutions shall be submitted to the Contract Administrator no later than thirty-five (35) calendar days from the date of the Award of Contract. Thereafter, this Article shall be of no further effect, and the Contractor shall provide only the material specified.

Any further requests to provide materials other than those specified shall be treated as Change Orders, subject to Article 16. The County reserves the right to refuse to accept applications for such Change Orders and has no obligation to review such applications. Such applications shall not be accepted for review unless the Contract Administrator has previously determined that it is in the County's best interest to do so.



Section 7.05. APPLICATION FOR SUBSTITUTIONS; CONTENTS.

Applications for Substitutions shall be accepted for review only if the application is timely filed, and includes the following information:

- A. All Technical Specification Section Number(s) where the material is specified;
- B. If the material is proposed as an "or equal" Substitution, submittals to demonstrate that the material in fact is equal in all respects to that specified or, if applicable, to the first preference specified, including detailed drawings, construction specifications, performance specifications and warranty information for the material proposed for Substitution.
- C. Complete Working Drawings and specifications demonstrating how the Substitution is to be incorporated into the Work so that the system of which the substituted material is a component will be a coordinated system fully compatible with all related systems, in conformity with the intent of the Contract Drawings.
- D. Complete identification of all changes in related Work necessary to accommodate the Substitution, including but not limited to structural, mechanical and electrical changes.
- E. Cost information necessary to evaluate the net difference in cost of the specified material against that proposed for Substitution, including the supplies' cost quotations and the Contractor's labor estimates.
- F. Contractor's written assurance that the material is in fact equal in all respects to the material specified, or if applicable, the first preference specified; and that if the Substitution is accepted, the Contractor will bear all costs of incorporating the substituted material into the Work to provide a complete system which conforms to the design intent; and that no Contract Price or Time increase will be sought by Contractor on account thereof.

Failure by the Contractor to identify all deviations from the Contract Documents in his request for Substitution shall render any County action taken thereon null and void. Contractor shall bear all costs resulting from any error in the request for Substitution.

Section 7.06. ACTION ON REQUEST.

Within twenty-one (21) days of receipt of complete submittals requesting a Substitution, with all supporting data necessary to evaluate the request, the Contract Administrator shall evaluate and act on the request. The decision of the Contract Administrator shall be final. No Contract Time Extensions shall be allowed on account of an incomplete request for Substitution or the timely decision on such request.

The Contract Administrator shall authorize a Substitution only if he finds that the material requested is equal in all respects to that specified and is consistent with the design intent of the Contract Drawings.

The Contractor shall bear the burden of proving to the County's satisfaction that the material proposed in the substitution request is of equal quality and performance to the originally specified material in all respects and is compatible with the design intent.

The Contract Administrator's evaluation shall consider, but is not limited to, the following factors:

- A. All product data for the originally specified material as against that for the requested Substitution;





- B. The compatibility of the substitution with the remaining components of the system(s) of which it is a part.
- C. The conformity of the Substitution with the design intent.
- D. The length and terms of the warranties for the material proposed in the Substitution.
- E. The net cost advantage to the County for granting the Substitution request.

Section 7.07. SAMPLES AND TESTING OF PROPOSED SUBSTITUTIONS.

If the Contract Administrator determines that samples and/or testing are required to decide a request for a Substitution, he shall so advise the Contractor, and specify the materials or work to be sampled and/or tested. The Contractor shall at no cost to the County, provide such samples and testing as required to evaluate the requested Substitution. The results of the testing shall be evaluated by the Contract Administrator before action on the Substitution request. The time during which the sampling and testing is being conducted shall not be included within the time specified in Section 7.06.

Section 7.08. DESIGN COSTS FOR SUBSTITUTION.

If a Substitution is accepted, Contractor shall bear all costs associated therewith, including the cost of architect's and/or engineer's services required to adapt the substitution to the design to the complete satisfaction of the County, and all costs of mechanical, electrical, structural or other changes needed to adapt the Substitution to the Work. Contractor shall also bear all cost increases to the County for construction management services being provided to the County by independent contractors, resulting from the substitution.

Section 7.09. EFFECT OF ACCEPTANCE.

If a Substitution is accepted, the Contractor shall be solely and directly responsible for setting accepted substituted materials and/or equipment and systems into the available space, and for the proper operation of the substituted equipment with all other equipment with which it may be associated, all in a manner acceptable to the County and which conforms to the design intent.

No time extension shall be granted on account of a Substitution. The Contract Price shall be adjusted by the price difference between the accepted Substitution and the originally specified (first preference) material. Neither acceptance nor rejection of a Substitution request shall relieve the Contractor of any obligation to perform the Agreement for Construction according to its terms, other than as expressly modified by the accepted Substitution.



ARTICLE 8.

SAMPLES, TESTS AND TESTING LABORATORIES.

Section 8.01. CONTRACT COMPLIANCE TESTING; SAMPLES.

Materials and/or work that require sampling and/or testing to determine compliance with the Contract Documents are specified in the Technical Specifications. The Contractor shall bear the full cost of providing samples when required to perform the specified tests, and shall take, store and provide such samples in the manner specified in the Technical Specifications, including Division 1.

All such samples shall be selected by the Contract Administrator or the Testing Laboratory employed by the County.

Section 8.02. DELIVERY OF SAMPLES.

The Contractor shall, at his sole cost and expense, furnish, package, mark, and store all samples to be tested. Chain-of custody and sample security precautions shall be utilized, as specified or as instructed by the Contract Administrator.

Collection, preparation, curing and delivery of all samples shall be made in ample time to allow the test to be made without delaying construction. No extra time will be allowed for the completion of the Work by reason of delay in testing.

Section 8.03. TESTING LABORATORY; COSTS.

The County shall employ and pay for the services of one or more independent testing laboratory(ies) ("Test Laboratory") to perform all required contract compliance testing expressly specified in the Technical Specifications as being provided by the County.

The County reserves the right to utilize the Yolo County Public Works concrete testing laboratory for any and/or all specified concrete or paving tests.

All testing not specified as being provided by the County shall be provided by the Contractor, using testing agencies with the specified qualifications.

The County reserves the right to require the Contractor to provide samples and to perform tests in addition to those samples and/or tests specified in the Technical Specifications. In the event the County orders such additional samples and/or tests, the County shall be obligated to pay therefore only if the sample and/or test is acceptable. If the sample and/or test does not comply with the Contract Documents, the County shall deduct the cost of the extra testing, and any subsequent re-testing, from the next progress payment.

If the Contractor determines that testing in addition to that specified is necessary and/or convenient, the Contractor shall employ a separate testing laboratory. The results of such tests shall not be binding on the County.

Section 8.04. RE-TESTING.

If as a result of any test, whether originally specified or not, any material or work is found to be unacceptable, it shall be rejected, and the original test and all further sampling and testing required by the County shall be at Contractor's expense. Re-testing shall not be charged against the specified contingency or testing allowances, if any.





Section 8.05. ACCESS TO SITE; COOPERATION.

The Contractor shall allow free access at all times to the representatives of the County's testing laboratory or consultant to the Work, or to any off-site area where Work is being performed and shall point out the sources from which samples are taken.

The Contractor shall cooperate with the testing laboratory to facilitate execution of its services and shall provide quantities of samples as specified.

Section 8.06. DAMAGE DUE TO TESTING.

Contractor shall, at his sole cost and expense, repair all damage resulting from testing or retesting specified in the Contract Documents. The County shall issue a Contract Price adjustment for repair of damage due to sampling or testing in addition to that specified in the Contract Documents, if and only if the additional testing shows full compliance with the Contract Documents; otherwise, the Contractor shall be obligated to repair such damage.

Section 8.07. RESULTS OF SAMPLING/TESTING.

No materials or work of which samples and/or tests are required shall be used or covered until the Contract Administrator approves such samples and/or tests. If the Contractor installs, uses or covers any such material, article or work prior to testing and approval, such shall be at Contractor's sole risk and expense, and he shall bear all costs of uncovering, repair and replacement thereof.

Upon testing of any sample of material or work, no additional sample shall be considered.

Section 8.08. EFFECT OF SAMPLING AND TESTING.

The County assumes no obligation, and the Contractor shall be relieved of no obligation undertaken pursuant to the Agreement for Construction, by virtue of sampling and testing specified in this Article. The responsibility for incorporating satisfactory materials and workmanship, which meet the Contract Documents, into the Work rest entirely with the Contractor, notwithstanding any prior samples or tests.

The Contractor is not relieved of this obligation by virtue of the results of any test or the failure of the testing laboratory or consultant accurately to ascertain or report test results.

Section 8.09. CODE COMPLIANCE TESTING; COSTS.

The Contractor shall bear all costs for all sampling and/or testing required by all agencies of jurisdiction regarding compliance of the Work with the Codes those agencies enforce. Examples include but are not limited to Building, Fire, Health, Air Pollution, and CALOSHA Code and regulation and compliance testing.

The Contractor shall arrange for and conduct all such testing in conformity with applicable codes and regulations and shall schedule the testing so as not to delay the Work.



ARTICLE 9.

REJECTION AND REPLACEMENT OF WORK AND MATERIALS.

Section 9.01. REJECTION OF MATERIALS AND WORKMANSHIP.

The County shall reject materials that are determined by the Contract Administrator to be defective or fail to comply fully with the Contract Documents, and workmanship that is not first-class, competent and workmanlike in all respects. Rejected workmanship shall be corrected satisfactorily and rejected materials shall be removed from the premise and replaced, all without cost to the County.

Section 9.02. REMOVAL OF REJECTED MATERIALS.

The Contractor promptly shall remove from the Site all materials that have been rejected.

Upon request by the Contract Administrator, the Contractor shall submit a statement of the source for rejected materials. The County reserves the right to notify such source that the specified materials have not been and will not be incorporated into the Work, and no claim or stop notice therefore will be recognized. The Contractor shall fully indemnify the County for any claims, costs, or demands made by any supplier regarding such materials. The County reserves the right to satisfy any such supplier's claims by issuing a warrant jointly payable to the Contractor and the supplier, the amount of which shall be deducted from the next progress payment due to the Contractor.

Section 9.03. FAILURE TO REMOVE REJECTED MATERIALS.

If the Contractor does not remove rejected materials within a reasonable time, fixed by the written notice from the Contract Administrator, the County may remove such materials and may store or return the materials to the supplier, all at the expense of the Contractor. Contractor shall also bear the cost of replacement of any work damaged due to the removal of materials pursuant to this Section.

Any materials removed and stored pursuant to this section shall remain the property and the responsibility of the Contractor, and it is the Contractor's obligation to dispose of such materials. Such materials shall not again be brought upon the Site or any County-approved storage facility.

Section 9.04. FAILURE TO CORRECT REJECTED WORK; WITHHOLD AND DEDUCTION.

If the Contractor fails to correct rejected workmanship and/or materials, the County may withhold the cost to correct the rejected work, and the value of the rejected materials, from the Progress Payments due the Contractor.

If the work is not corrected prior to recordation of a Notice of Cessation or Notice of Completion, the County shall process a Contract Price Change Order to decrease the Contractor's final payment by an amount equal to the cost to cure the defect, measured by the cost the County would incur to purchase and install the specified material, and/or to correct the faulty workmanship, to bring the Work into full compliance with the Contract Documents.

Section 9.05. RESERVATION OF RIGHTS.

The County's authority to reject work under this Article is in addition to all other County rights under the Agreement for Construction. Neither the County's action or inaction under this Article shall relieve the Contractor from any obligation under this Agreement, nor constitute a waiver by the County of any other right under the Agreement for Construction.





ARTICLE 10.

SUPERVISION AND LABOR.

Section 10.01. SKILLED LABOR.

All labor shall be especially skilled for the kind of Work required, shall be conducted under the direction of a competent foreman, and workmanship shall be of the highest quality and finish, competent and workmanlike in all aspects.

All workers shall meet the skill and experience requirements specified in the applicable sections of the Technical Specifications.

Section 10.02. NO TENANCY.

All workers, contractors, or Contractor's representatives are admitted to the Site only for the proper execution of the Work and have no tenancy.

Section 10.03. DISMISSAL OF UNSATISFACTORY EMPLOYEES.

All employees engaged in the Work will be considered employees of the Contractor.

The Contractor shall discharge, or cause a subcontractor to discharge, any incompetent employee, any employee not skilled for the type of work required, or any employee who violated the standard set forth in Section 10.06 habitually or flagrantly.

Section 10.04. PERSONAL ATTENTION AND SUPERINTENDENCE; CONTRACTOR'S AGENT.

The Contractor shall supervise the Work to the end that it shall be faithfully prosecuted.

The Contractor at all times keep a Project Superintendent, fully empowered to act as agent for the Contractor, on the Site or available by telephone and within a reasonable distance. Contractor shall advise the County in writing of its agent, and of any limitations on the agent's authority to act on behalf of the Contractor. Regardless of such limitations, the Contractor shall be responsible for the faithful observation of all instructions delivered to it or its Project Superintendent, and representations on behalf of the Contractor by the Superintendent shall be binding on the Contractor.

Section 10.05. AUTHORIZED COUNTY VISITORS TO THE SITE.

The Contract Administrator shall specify those individuals who are entitled to access to the Site.

If the Contractor has complaints regarding the presence or conduct of any authorized individual on the Site, the Contractor shall report such complaint to the Contract Administrator, and shall conform to the instructions of the Contract Administrator regarding the complaint.

After consultation with the Contract Administrator, the Contractor may enforce reasonable regulations to secure the safety of authorized visitors. Such regulations may include the requirements to check in at a designated location and wear "hard hats" in specified areas.

Section 10.06. RELATIONSHIPS OF EMPLOYEES AND COUNTY EMPLOYEES AND THE PUBLIC.





It is the policy of the County of Yolo and the law of this State that all County employees be free from sexual, racial, or other harassment at their workplace; it is the policy of the County that all members of the public likewise be free there from.

It is Contractor's responsibility to supervise all workers on this Project to the end that their conduct does not result in a violation of this policy.



ARTICLE 11.

SUBCONTRACTORS; LISTING AND BID; SUBSTITUTION.

Section 11.01. SUBCONTRACTORS; CONTRACTOR'S SUPERVISION.

Nothing contained in the Agreement for Construction shall create any contractual relationship between any subcontractor and the County of Yolo. The County's only contract is with the Contractor.

The Contractor shall be as fully responsible to the County for the performance and/or omissions of all first-tier and lower-tier subcontractors and their employees and agents as it is for its own performance and omissions.

It is the Contractor's responsibility, not the County's, to resolve disputes between subcontractors and/or between the Contractor and subcontractors. The Contractor shall not simply refer issues raised by subcontractors to the Contract Administrator. Prior to referring any controversy, issue, or request made by any subcontractor to the County, the Contractor shall exert his good faith best efforts to resolve the issue. Upon referring any such request, the Contractor shall accompany it with a submittal specifying efforts taken by the Contractor to resolve the issue. Should the Contract Administrator determine that the Contractor has not satisfied his obligation pursuant to this section, the Contract Administrator may reject the Contractor's submittal. The Contractor shall not be entitled to either a Contract Price or a Contract Time Change Order as a result of such rejected submittal.

It is also the Contractor's responsibility to supervise all subcontractors' compliance with all safety, wage and hours, equal employment opportunity and related regulations, including reporting requirements.

The County shall not entertain any request for, nor engage in, arbitration or dispute resolution between subcontractors, subcontractors and the Contractor, nor any agency with Code compliance, safety, wage and hours, and/or equal employment opportunity jurisdiction. However, in the event of such dispute, the Contract Administrator may request the Contractor to provide a complete written explanation of all facts underlying the dispute and may attend or call any meetings between the disputing parties. The Contractor shall provide such information to the Contract Administrator upon his request.

The County shall not be liable to the Contractor for any claims by subcontractors, suppliers, laborers, workers, or any other person, including claims that are settled by and assigned to the Contractor. The Contractor shall indemnify, defend and hold harmless the County, its officers, agents and employees from and against any and all such claims.

Section 11.02. DISPUTES BETWEEN SUBCONTRACTORS AND/OR CONTRACTOR.

If, through acts of neglect on the part of the Contractor, including failure to supervise and control his subcontractors, any other contractor, subcontractor, or workman shall suffer loss or damage on the Work, Contractor agrees to settle with such other contractor, subcontractor, or workman by agreement or arbitration, if such other contractor, subcontractor, or workman shall assert any claim against the County of Yolo or any of its officers, agents, or employees, on account of any damage alleged to have been so sustained.

In the event of the receipt of any such claim, the County shall notify the Contractor, who shall defend, indemnify, and save harmless the County and all of its officers, agents, and employees against any such claim, pursuant to Section 2.05 hereof.



Section 11.03. LISTING OF SUBCONTRACTORS.

Contractor shall comply with the requirements in the Instructions to Bidders regarding the listing of subcontractors and shall comply with the requirements of the Subletting and Subcontracting Fair Practices Act, Public Contracts Code Sections 4100 and following, forbidding bid shopping and bid peddling and requiring accurate listing of all subcontractors.

Should the Contractor violate any provision of that Chapter, such violation shall be deemed a breach of the Agreement for Construction, and the County shall have all remedies provided by California law including, but not limited to, those provided in Public Contracts Code Section 4110, allowing termination of the Contract or a penalty assessment of 10% of the subcontract.

Section 11.04. TERMINATION OF UNSATISFACTORY SUBCONTRACTORS.

When any portion of the Work that has been subcontracted by the Contractor is not being prosecuted in a satisfactory manner, the Contractor shall terminate the subcontract for such work.

Any such subcontractor who is discharged shall not again be employed on the Project.

Any termination of a subcontractor pursuant to this section shall be in strict conformity with the Subletting and Subcontracting Fair Practices Act, Public Contracts Code Sections 4100 and following.

Section 11.05. SUBCONTRACTORS' INSURANCE.

All subcontractors shall procure and maintain the insurance required by Article 2 hereof. Contractor shall supervise subcontractors to enforce this requirement and shall allow no subcontractor to evade this requirement.



ARTICLE 12.

STATE REQUIREMENTS REGARDING WAGES, HOURS, AND EQUAL OPPORTUNITY.

Section 12.01. PREVAILING WAGE RATE NOTICE

As provided under Labor Code Sections 1726-1861, the Director of the Department of Industrial Relations (DIR) of the State of California has determined the prevailing rate of wages in the locality in which the Work on the project is to be performed for each craft, classification, or type of Worker needed to execute this Contract. The prevailing rates so determined are on file with the COUNTY, and they are available for public inspection. They may also be obtained on the internet at http://www.dir.ca.gov/DIR/S&R/statistics_research.html. Those prevailing wage rates hereby are incorporated in this agreement and made a part hereof.

The CONTRACTOR shall obtain and post copies of these prevailing wage rates in a prominent place at the job site, in accordance with the regulations of the Department of Industrial Relations.

If the Project is subject to the requirements of Title 8 of the California Code of Regulations, Section 16461, the CONTRACTOR shall post on the jobsite a Notice containing the following language:

DIR will no longer charge awarding bodies for prevailing wage compliance monitoring and enforcement by the CMU.

SB 854 established a new public Works CONTRACTOR registration program to replace prior Compliance Monitoring Unit (CMU) and Labor Compliance Program (LCP) requirements for bond-funded and other specified public Works projects.

Contractors will be subject to a registration and annual renewal fee that has been set initially at \$300. The fee is non-refundable and applies to all contractors and subcontractors who intend to bid or perform Work on public Works projects (as defined under the Labor Code).

Contractors will apply and pay the fee online and must meet minimum qualifications to be registered as eligible to bid and Work on public Works projects:

Contractors will apply and pay the fee online and must meet minimum qualifications to be registered as eligible to bid and Work on public Works projects:

- Must have Workers' compensation coverage for any employees and only use subcontractors who are registered public Works contractors.
- Must have Contractors State License Board license if applicable to trade.
- Must have no delinquent unpaid wage or penalty assessments owed to any employee or enforcement agency.
- Must not be under federal or state debarment.
- Must not be in prior violation of this registration requirement once it becomes effective. However, for the first violation in a 12-month period, a contractor may still qualify for registration by paying an additional penalty.

The registration fee is not related to any project. It is more like a license that enables the registrant to bid on and perform public Works.

- Registrations will begin after July 1, 2014, once the registration system is ready to go online. The preferred method of payment will be by credit card.
- The requirement to list only registered contractors and subcontractors on bids becomes effective on March 1, 2015. The requirement to only use registered contractors and subcontractors on public Works projects applies to all projects awarded on or after April 1, 2015.

All contractor registration fees will go into the State Public Works Enforcement Fund and be used to fund the following items:





- Administration of contractor registration requirement
- all DIR costs for administering and enforcing public Works laws
- Labor Commissioner's enforcement of other Labor Code violations on monitored public Works projects.

Section 12.02. PAYMENT OF PREVAILING WAGE RATES.

Pursuant to Labor Code Section 1772, Workers employed by contractors or subcontractors in the execution of any contract for public Work are deemed to be employed upon public Work as defined in Labor Code Sections 1720-1725. Therefore, the CONTRACTOR shall pay, and shall cause all subcontractors, whether under contract with the CONTRACTOR or under contract with any subcontractor, to pay not less than the specified prevailing wage rates to all Workers employed in the execution of this Contract.

In accordance with Labor Code Section 1775, the CONTRACTOR shall monitor the payment of the specified general prevailing rate of per diem wages by subcontractors to employees by periodic review of the certified payrolls of the Subcontractors.

Section 12.03. WAGE RATES FOR CRAFTS NOT LISTED.

The responsibility to check prevailing wage rates is the CONTRACTOR's. Pursuant to Labor Code Section 1773, the CONTRACTOR may file with the Director of DIR or the Chief of the Division of Labor Standards Enforcement ("DLSE") a petition to review a determination of any rate or rates made by the Director of DIR. The CONTRACTOR may also petition the Director of DIR to make a determination for a particular craft, classification or type of Work not covered by a general determination. Pending the review or determination, the wages may be assumed to be those in the applicable collective bargaining agreement, but no adjustment in the bid or Contract Price shall be made if such assumption is incorrect.

Section 12.04 RECORDS OF HOURS WORKED AND WAGES

The CONTRACTOR shall keep, and shall cause all subcontractors on the Project to keep, certified payroll records of the hours and wages of all employees employed on the Project, and those records shall be open at all times for inspection by the COUNTY and/or the Division of Labor Statistics and Enforcement, in accordance with Sections 1776 and 1812 of the Labor Code. The certified payroll records shall contain at least the following information: the name, address, social security number, Work classification, dates of payroll period, straight time, and overtime hours Worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, Worker, or other employee employed by the CONTRACTOR and/or each Subcontractor in connection with the Work.

In the event that the CONTRACTOR and/or any subcontractor fails to submit certified payroll records to the COUNTY within ten (10) calendar days of a request from the COUNTY for the records, the CONTRACTOR and/or the Subcontractor shall, as a penalty, forfeit one hundred dollars (\$100) per calendar day, per Worker, until strict compliance is effectuated. These penalties shall be withheld from progress payments then due and/or to become due. The CONTRACTOR is not subject to this penalty assessment due to the failure of a Subcontractor to comply with these requirements if the CONTRACTOR can demonstrate that it has fully complied with the provisions of Labor Code Section 1776.

The CONTRACTOR shall not carry on its payrolls any person not actually employed by the CONTRACTOR, nor shall it carry on its payroll's employees of any Subcontractor. The CONTRACTOR shall show on its payrolls all persons actually employed by the CONTRACTOR on the Project, in any capacity. The CONTRACTOR shall cause all subcontractors on the Project, whether under contract with the CONTRACTOR or under contract with any subcontractor, to comply with this Section.

In accordance with Government Code Section 8546.7, or any amendments thereto, all books, records, and files of the CONTRACTOR, or any subcontractor connected with the performance of this Contract, shall be subject to examination and audit by the Auditor General for a period of three (3) years after final payment. CONTRACTOR shall preserve and cause all Subcontractors to preserve such books, records and files for the audit period.

Section 12.05. ADDITIONAL REQUIREMENTS FOR LABOR COMPLIANCE

In accordance with Section 16463 of Title 8 of the California Code of Regulations ("8 CCR Section 16463"), the COUNTY may, on its own or if required by the Labor Commissioner, withhold funds due to the CONTRACTOR when payroll records are delinquent or inadequate. The amount withheld shall be those payments due or estimated to be due to the CONTRACTOR or subcontractor whose payroll records are delinquent or inadequate, plus any additional amount that





the Labor Commissioner has reasonable cause to believe may be needed to cover a back wage and penalty assessment against the CONTRACTOR or subcontractor whose payroll records are delinquent or inadequate. The CONTRACTOR shall cease all payments to a Subcontractor whose payroll records are delinquent or inadequate until the Labor Commissioner provides notice that the Subcontractor has cured the delinquency or deficiency. When payments are withheld under 8 CCR Section 16463, the Labor Commissioner will provide the CONTRACTOR and Subcontractor, if applicable, with immediate written notice that includes all of the following: (1) a statement that payments are being withheld due to delinquent or inadequate payroll records, and that identifies what records are missing or states why records that have been submitted are deemed inadequate; (2) specifies what amounts the CONTRACTOR has been directed to withhold; and (3) informs the CONTRACTOR or subcontractor of the right to request an expedited hearing to review the withholding of payments under Labor Code Section 1742, limited to the issue of whether the records are delinquent or inadequate or the Labor Commissioner has exceeded his or her authority under 8 CCR Section 16463. The withholdings under 8 CCR Section 16463 do not preclude assessment of penalties under Labor Code Section 1776(g) for failure to timely comply with a written request for certified payroll records, as set forth below.

Section 12.06 UNDERPAYMENT OF WAGES

The CONTRACTOR agrees that in the event of underpayment of wages to any employee on the Project, whether by the CONTRACTOR or any subcontractor on the Project, the COUNTY may retain from payments due to the CONTRACTOR, an amount sufficient to pay such Worker the difference between the wages required to be paid by the DIR, and the wages actually paid such Worker for the total number of hours Worked, plus any penalties and forfeitures. The COUNTY may disburse such retention to such employees.

Section 12.07. APPRENTICES.

Attention is directed to the provisions of Sections 1777.5, 1777.6 and 1777.7 of the Labor Code concerning the employment of apprentices by the CONTRACTOR or any subcontractor.

The CONTRACTOR and all subcontractors on the Project shall comply with the requirements of Sections 1777.5 and Section 1777.6 of the Labor Code in the employment of apprentices. Violation of these requirements shall subject the CONTRACTOR and/or subcontractor to the penalties set forth in Section 1777.7 of the Labor Code and/or otherwise provided by law or Contract.

Information relative to apprentice standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex-officio the Administrator of Apprenticeship, San Francisco, California, from the Division of Apprenticeship Standards or its branch offices, and/or on the DLSR website at www.dir.ca.gov/DLSR/PWD. Apprentices employed on the Project must at all times Work with or be under the direct supervision of a journeyman or journeymen.

Section 12.08 PENALTIES

In accordance with Articles 2 and 3, Chapter 1, Part 7, Division 2 of the Labor Code, particularly Sections 1775, 1776, 1777.7 and 1813, the CONTRACTOR shall forfeit to COUNTY as a penalty the sum specified below, over and above any retention or withholds otherwise authorized by the agreement, as follows:

- A. Up to two hundred dollars (\$200) for each calendar day, or portion thereof, for each Worker paid less than the applicable prevailing wages for any Work done by him/her under this Contract or under any subcontract on the Project, with the amount to be determined by the Labor Commissioner in accordance with the considerations set forth in Labor Code section 1775. If a Worker employed by a Subcontractor on the Project is paid less than the prevailing wages by the Subcontractor, the CONTRACTOR is not subject to this penalty assessment if the CONTRACTOR can demonstrate that it did not have knowledge of that failure of the Subcontractor to pay the prevailing wages and that it strictly complied with the requirements of Labor Code Section 1775(b).
- B. Twenty-five dollars (\$25) for each Worker employed in the execution of this agreement by the CONTRACTOR or by any Subcontractor on the Project for each calendar day during which such Worker is required or permitted to Work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of the provisions of Article 3.
- C. Failure to provide certified payroll records to the COUNTY or, if applicable, to the CMU, within ten (10) calendar days of a request, shall, in addition to resulting in a withholding of payments due or estimated to be due, result in a penalty in the amount of one hundred dollars (\$100) for each calendar day, or portion thereof, for each Worker until strict compliance is effectuated. The CONTRACTOR is not subject to this penalty assessment due



to the failure of a Subcontractor to comply with these requirements if the CONTRACTOR can demonstrate that it has fully complied with the provisions of Labor Code Section 1776.

- D. Knowing violation of Labor Code Section 1777.5 shall yield a penalty in an amount not exceeding one hundred dollars (\$100) for each full calendar day of non-compliance. A CONTRACTOR or Subcontractor who knowingly commits a second or subsequent violation of Section 1777.5 within a three-year period, where noncompliance results in apprenticeship training not being provided as required, shall forfeit as a civil penalty the sum of no more than three hundred dollars (\$300) for each full calendar day of noncompliance.

Section 12.09. HOURS OF WORK AND APPROVAL OF SCHEDULES

Eight (8) hours of labor constitutes a legal day's Work, and forty (40) hours constitutes a legal Work week. No Worker employed at any time by the CONTRACTOR, or by any subcontractor upon the Project, shall be required or permitted to Work more than eight (8) hours in any one calendar day or forty (40) hours in any one week, except as provided in Labor Code Sections 1810 through 1815.

Overtime shall be paid at the rate of not less than one and one-half (1-1/2) times the basic rate of pay, or at such other rate as stated on the applicable Determination issued by the DIR, or as may be required by applicable statutes or collective bargaining agreements.

The COUNTY reserves the right to approve or disapprove the days scheduled for Work, and the hours during which Work is in progress.

Section 12.10. COMPLIANCE WITH THE STATE ANTI DISCRIMINATION LAWS

The CONTRACTOR shall comply with Section 1735 of the Labor Code, which provides as follows:

"A contractor shall not discriminate in the employment of persons upon public Works on any basis listed in subdivision (a) of Section 12940 of the Government Code, as those bases are defined in Sections 12926 and 12926.1 of the Government Code, except as otherwise provided in Section 12940 of the Government Code. Every contractor for public Works who violates this section is subject to all the penalties imposed for a violation of this chapter."



ARTICLE 13.

**FEDERAL REQUIREMENTS REGARDING WAGES, HOURS,
AND EQUAL OPPORTUNITY**

SEE SUPPLEMENTARY CONDITIONS



ARTICLE 14.

ON-SITE SECURITY; RISK OF LOSS; SITE SAFETY.

Section 14.01. PROJECT SITE.

The Contractor shall confine his equipment, materials, and construction apparatus to the site limits designated in the Contract Documents and/or directed by the Contract Administrator.

The Site and equipment storage areas shall be kept in a neat and safe condition, conforming to all requirements of the Contract Documents and applicable Codes regarding the storage of materials, including flammable materials.

Section 14.02. SECURITY OF THE SITE.

The Contractor shall take such steps as are necessary to secure the Site at all times, including times workmen are not present. The Contractor shall maintain adequate security and protection of all structures, facilities, equipment, tools, materials, and any other property on or adjacent to the Site, against damage, vandalism, loss of fire, or theft.

The Contractor's attention is directed to the Technical Specifications and/or Supplementary Condition for specified fencing, screening, gate and lighting requirements, if any.

The Contractor may, at its option and expense, provide night watchmen for the Site. The facilities for such watchmen shall be subject to approval by all agencies with jurisdiction.

At the Contract Administrator's request, the Contractor shall meet with representatives of the police and fire agencies with jurisdiction and shall comply with the Contract Administrator's request on behalf of such departments regarding security of the Site.

Section 14.03. RISK OF LOSS.

The Contractor assumes full responsibility for site security and full liability for the risk of loss from any cause of materials stored, work performed and existing improvements on the site, and agrees to repair and replace, at no cost to the County, at the time they are needed for incorporation in the Work, any materials or work that may have become lost, damaged, destroyed, stolen, vandalized, or have otherwise been rendered unsuitable for use from any cause. Contractor shall repair or replace any such damage and remove any damaged or defaced materials and/or equipment from the Project Site, at no cost to the County, and Article 9 hereof shall apply to such material or equipment.

Section 14.04. PROTECTION OF WORKMEN AND VISITORS TO THE SITE.

Contractor shall take all necessary precautions for the safety of all employees and visitors to the Site and shall comply with all applicable provisions of the Federal, State and local safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the Site.

Contractor shall erect and properly maintain at all times, as required by the condition and progress of the Work, all necessary safeguards for the protection of workmen, visitors to the Site, and the public, and shall post danger signs warning against construction hazards as needed.

The responsibility for maintaining a safe site shall be the Contractor's and the County undertakes no obligation to suspend the Work or notify the Contractor of any hazardous condition or noncompliance with



safety laws.

Contractor shall designate a responsible member of his organization on the Work, whose duty shall be the prevention of accidents. The name and position of persons so designated shall be reported to the Contract Administrator by the Contractor; absent designation of some other individual by the Contractor, the Contractor's Project superintendent shall be responsible for the Contractor's safety program.

Contractor shall immediately replace or repair any unsafe, dangerous, or hazardous condition that may exist.

Section 14.05. EXCAVATION AND TRENCHING; SAFETY.

The Contractor shall comply with of all provisions of law regarding safety requirements for trenches or excavations.

A. Public Contract Code '7104 provides:

(a) That the contractor shall promptly, and before the following conditions are disturbed, notify the public entity, in writing, of any: (1) Material that the contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law; (2) Subsurface or latent physical conditions at the site differing from those indicated; (3) Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

(b) That the public entity shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in the contract.

(c) That, in the event that a dispute arises between the public entity and the contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the contractor's cost of, or time required for, performance of any part of the work, the contractor shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all work to be performed under the contract.

B. Labor Code Section 6705 provides that in advance of any excavation of any trench or trenches or other excavation five (5) feet or more in depth, the Contractor shall submit a detailed plan to the Contract Administrator for information only showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from California State Shoring System standards, the plan shall be prepared by a registered civil or structural engineer.

C. Nothing in the Contract Documents shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the State of California.

Nothing in this Section shall be construed to impose liability on the County of Yolo or any of its officers, agents, or employees, or to relieve the Contractor of its obligations to provide a safe site.



Section 14.06. CAL OSHA.

The contractor shall comply with all requirements of the California Occupational Safety and Health Administration or its successor, and the Federal equivalent, and shall provide a safe work environment for all workers employed on the Work, as required by such agencies. The Contractor shall supervise performance of the Work with all occupational health & safety requirements applicable to the type of work being done, and the materials and equipment being utilized. (See also Section 20.05).



ARTICLE 15.

OFF-SITE SAFETY AND PROTECTION OF ADJACENT PROPERTY; INDEMNITY.

Section 15.01. PROTECTION OF ADJACENT PROPERTY DURING EXCAVATION OR OTHER OPERATIONS; NOTICES.

In addition to any requirements imposed by law, the Contractor shall shore up, brace, underpin, and protect as may be necessary all foundations and other parts of all existing structures on the Site or adjacent to the site which are in any way affected by the excavations or other operations connected with performance of the Work.

Not less than five (5) days prior to commencing any work which may detrimentally affect adjoining or adjacent land or buildings thereon, the contractor shall send the owner and occupants thereof a notice, which specifies the type of Work to be done, the schedule of the Work, the effects expected from the Work, and the protective measures being taken by the Contractor. A copy of the notice shall be sent to the Contractor Administrator.

The basic standard to determine whether the Work may detrimentally effect adjoining properties shall be whether the work will create noise, dust, vibration, and/or settling on such properties. Examples include, but are not limited to, blasting, pile driving and excavations within 30 feet of any structure not owned by the County.

The Contractor shall, at the instruction of the Contract Administrator, meet with any recipient of such notice to explain and discuss the proposed Work. The Contractor shall make such modifications to the proposed working methods as are required to comply with all provisions of law, and shall exert its best efforts to address the concerns expressed by recipients of such notices.

Section 15.02. UNDERGROUND UTILITIES; "USA".

The Contractor is responsible to coordinate all excavation work with the owners of existing underground utilities, and to avoid unintentional disruptions in services by those utilities. Locations of existing utilities shown on the Contract Drawings are schematic only and shall not relieve the Contractor's duty to precisely locate and avoid them.

If the underground utility service is disrupted by the Work, the Contractor shall take emergency action appropriate to the situation and immediately notify the owner of the utility. Repair thereof shall be the Contractor's responsibility, at no cost to the County.

The Contractor is advised that the County participates in the Underground Service Alert-Northern California ("USA"), which may be contacted by telephone at (800) 227-2600. Except in an emergency, the Contractor shall contact the USA Notification center at least two working days prior to commencing an excavation in any area that contains subsurface installations.

Section 15.03. DAMAGE TO OR BLOCKING STREETS, STREET IMPROVEMENTS AND TRACKS.

The Contractor is responsible to avoid damage to existing streets, sidewalks, curbs, traffic signs and signals, streetlights, control boxes, meters, railroad tracks, crossing guards, and all other appurtenances thereto. The Contractor shall take necessary precautions to avoid damage to such property, and if damage occurs, shall take emergency action appropriate to the situation and immediately notify the owner of the damaged property. Repair thereof shall be the Contractor's responsibility, at no cost to the County.





Existing traffic signs, lights, traffic signals, railroad crossing warnings, control boxes, hydrants, meters and related safety items occurring within the street and/or sidewalk area shall be kept visible, free of obstructions and accessible at all times.

Should it be necessary to cover up, move, or alter such items, this shall be done only with permission of the authorities having jurisdiction of the items involved.

Should it is necessary to block a street or sidewalk, the Contractor shall first notify the police, fire, or public works agencies with Jurisdiction, and shall comply with their instructions, including scheduling limitations.

Section 15.04. FIRE PROTECTION.

The Contractor is responsible to protect all structures from fires and sparks originating in the work, and all laws and regulations regarding fire protection, and shall comply with all instructions of the fire department with jurisdiction.

The Contractor shall notify the Contract Administrator and the fire department prior to disconnection of either water or electrical service to the Site, and shall comply with the fire department's instructions regarding fire safety.

The Contractor shall provide fire extinguishers as necessary to protect the Site and adjacent structures at all times, in accordance with applicable Fire Codes, regulations and Fire Department instructions.

Section 15.05. DUST CONTROL.

The Contractor shall at all times control dust originating from the Site by sprinkling as needed. The Contractor shall not allow dust to be blown onto adjacent properties. In the event that complaints are received by the County regarding dust control, the Contractor shall increase sprinkling to control the dust.

Section 15.06. INDEMNITY FOR DAMAGE TO ADJACENT PROPERTY; REPAIRS.

- A. **Indemnity.** Without limitation of its indemnity obligations set forth in Article 3 hereof, Contractor shall defend, indemnify, and save harmless the County from any claim, loss or damages on account of any harm to person or property alleged to have resulted from the Work, the performance of this Agreement or Contractor's acts or omissions in protecting the public from the effects of the Work including settlement and/or the loss of lateral subjacent support of adjoining property; damage to utilities' or governmental agencies' equipment or installations; injuries to persons using the public streets; and from all loss or expense and from all damages for which the County may be liable as a consequence of such injury or damage to person an/or adjoining or adjacent property and/or structures' or equipment or installations, including those owned by Yolo County.
- B. **Repairs.** Any damage arising from or in consequence of the performance of the Agreement for Construction to tracks, pavement, curbs, sidewalks, walls, stairs, sewage and/or drainage structures, mains, pipes, valves, conduits, poles, wires, transformers, trees, shrubs, adjoining work, or to any other improvement or property above or below the surface of the ground, whether private or public, shall be repaired at once by Contractor without expense to the County, if the owner thereof consents.



Section 15.07. EMERGENCY SAFETY ACTIONS.

In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without previous instructions or authorizations from the County, shall act at the Contractor's discretion and risk to prevent such threatened loss or injury, and shall bear all costs of such action. The Contractor immediately shall notify the Contract Administrator of such actions, and thereafter shall comply with any instructions issued by the Contractor Administrator.



ARTICLE 16.

CONDUCT AND PROSECUTION OF THE WORK.

Section 16.01. BASIC STANDARD.

The Contractor is responsible for all aspects of the full, complete, satisfactory and faithful performance of the Work strictly as specified by the Contract Documents or any duly issued amendments thereto as well as all applicable laws and regulations.

Section 16.02. SURVEYS AND FIELD ENGINEERING.

Unless otherwise specified, the Contractor is responsible for all survey and field engineering work required for performing the Work. All such survey and field engineering work shall conform to the Technical Specifications.

The County shall identify existing control points and property line corner stakes, as indicated on the Drawings. Benchmarks, baselines, property boundaries, line and grade hubs, and other reference and construction points shall thereafter be maintained by the Contractor who shall be responsible for keeping their accuracy and who shall pay all costs of re-establishing them if they are disturbed.

The Contractor shall notify the Contract Administrator in writing at least ten (10) days prior to the time he will commence work on any part of the construction requiring surveys to be commenced by the County.

Section 16.03. CLEARING OBSTRUCTIONS.

Unless specified otherwise, the Contractor shall clear all obstructions and prepare the site for the construction. The Contractor shall verify all dimensions and levels shown on the Drawings against the Site after it has been graded and prepare for construction, and properly reset all survey control points and property line corner stakes.

Section 16.04. LAYOUT WORK.

The Contractor shall be responsible for all layout work, and shall lay out all lines, corners, levels and grade stakes after the Site has been prepared. The exact locations of all partitions shall be laid out on forms, walls and flooring, as the Work progresses. It is the Contractor's responsibility to verify all dimensions shown on the Drawings before layout of the Work, and to properly locate the Project on the Site and the components within the structure, as specified by the Contract Documents. See Section 01720 of Division 1 for further particulars.

Section 16.05. CONTRACTOR'S EQUIPMENT.

The Contractor shall provide adequate and suitable equipment and means of construction to meet all the requirements of the Contract Documents, including completion of the project within the time specified. The Contractor alone shall be responsible for the safety, adequacy, and efficiency of his plant, equipment and methods, and those of all subcontractors on the Site. By entering the Agreement for Construction, the Contractor agrees to provide all specialized plant, equipment and methods of construction required to perform the Work on schedule, whether separately specified or not, at no extra cost to the County.



Section 16.06. DISCOVERY OF UNKNOWN CONDITIONS; PROCEDURE.

Should concealed or unknown conditions be encountered in the performance of the work below the surface of the ground or in existing structures on the Site, which conditions are at variance with the Contract Documents, the Contractor immediately shall seek a Clarification from the Contract Administrator, pursuant to Section 4.08 hereof.

The Contract Administrator shall investigate, and if the Contractor has demonstrated the following, a Change Order shall be processed pursuant to Article 17:

- A. The conditions are at variance with the Contract Documents; and,
- B. The conditions require work beyond the Scope of the Agreement for Construction; and,
- C. The conditions differ materially and substantially from conditions normally encountered and generally recognized as inherent in work of the character of the Project in the area of the Project Site; and
- D. The Contractor has provided Notice of its claim as required by Section 17.05.

Time extensions necessitated by concealed conditions are governed by Section 3.07-D.

No claim for extra compensation or time for conditions described herein shall be allowed unless the Contractor has given the notice required by this Section and/or Section 3.08 hereof (regarding Notice of Delay). (See also: Section 4.04 regarding Site Conditions).

Section 16.07. EQUIPMENT AND METHODS.

Only equipment and methods suitable to produce the quality of Work required to conform to the Technical Specifications shall be permitted by the Contractor to operate on the Work. If any part of the Contractor's plan, equipment or methods of execution of the Work are determined by the Contract Administrator to be nonconforming to applicable safety regulations or to be non-conforming to applicable Technical Specifications, the Contract Administrator may order the Contractor to conform to the applicable requirements, and the Contractor shall promptly comply with such orders; provided, however, that neither compliance with such orders nor failure by the Contract Administrator to issue such orders shall relieve the Contractor from his obligation to perform the Work as required by the Contract Documents.

Section 16.08. TEMPORARY FACILITIES AND SERVICES.

The Contractor shall be responsible for providing and maintaining all necessary storage places, field offices, temporary roads, fences, and all utilities, including telephone, electric, gas and water service to the Site during construction at his sole cost and expense unless otherwise specified in the Technical specifications. The Contractor shall not connect to fire hydrants for construction water without the prior consent of the fire department with jurisdiction,

The Contractor shall comply with all requirements of Federal and State law and Yolo County Ordinances regarding the placement of temporary facilities on the Site, and the County shall not be deemed by this Agreement to have consented to such placement. See Section 01500 of Division 1 for further particulars.



Section 16.09. COORDINATION OF WORK.

The Contractor shall be responsible for coordinating the work of the various subcontractors and trades employed on the Work. He shall adjust, correct, and coordinate this work with the work of others so that no discrepancies will result nor unnecessary delays occur.

If completion is delayed because of any acts or omissions of any subcontractors, the Contractor shall on that account have no claim against the County for extra compensation or time.

Section 16.10. JOINING WORK.

Where work of one trade or subcontractor joins or is installed upon the work of another trade or subcontractor, there shall be no discrepancy in mating or joining such work, which shall be done and finished in a good and workmanlike manner. In joining one kind of work with another, the marring or damaging of either shall be corrected at no expense to the County.

Should improper work of any trade be covered by that of another, it shall be the Contractor's responsibility to correct the improper work and to adjust costs between the various subcontractors, without cost to the County.

Section 16.11. CUTTING AND PATCHING OF WORK.

The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the work or to make its several parts fit together properly.

The Contractor shall not damage or endanger any portion of the Work or work being done by the County or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the County or any separate contractor except with the written consent of the Contract Administrator and of such separate contractor. The Contractor shall not unreasonably withhold from the County or any separate contractor his consent to cutting or otherwise altering the Work.

Section 16.12. INSPECTION OF THE WORK OF OTHER CONTRACTORS.

It shall be the duty of the Contractor and all subcontractors, before beginning any work, to examine all construction and work of other contractors and/or subcontractors that may affect their work, and to satisfy themselves that everything is in proper condition to receive such work.

Section 16.13. COMBINATION OF WORK WITH OTHER CONTRACTORS OR COUNTY.

If the Project requires performance of work by the County or other Prime Contractors, as specified in the supplementary Conditions, the following provisions shall apply:

- A. The County reserves the right to perform work related to the Project with its own forces, and/or to award separate contracts in connection with other portions of the Project or other work on the Site.
- B. When separate contracts are awarded for different portions of the Project or other Work on the Site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Agreement for Construction.
- C. The County will provide for the coordination of the work of its own forces and of each separate contractor with the Work of the Contractor, who shall cooperate therewith as provided below.





- D. The Contractor shall provide the County and separate contractors reasonable opportunity for the storage of their materials and equipment and the execution of their work on the site and shall connect and coordinate his Work with theirs as required by the Contract Documents. The Contract Administrator may designate separate areas on the Site for the use of separate contractors.
- E. If any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Contract Administrator any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to report shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive his Work, except as to defects that may subsequently become apparent in such work by others.
- F. Any costs caused by defective or ill-timed work shall be borne by the party responsible, therefore.
- G. Should the Contractor unintentionally cause damage to the Work or property of the County, or to another contractor's work on the site, the Contractor shall, upon notice from the Contract Administrator, promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues or initiates a legal proceeding against the County on account of any damage alleged to have been caused by the Contractor, the County shall notify the Contractor who shall defend such proceedings, and if any judgment or award against the County arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the County for all attorneys' fees and court or legal costs which the County has incurred.
- H. If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up, the County may clean-up and charge the costs thereof to the contractors responsible therefore, as determined by the Contract Administrator.

Section 16.14. OVERTIME AND HOLIDAY WORK.

The Contractor shall secure the approval of the Contract Administrator before allowing work on the Project before 6:00 A.M. or after 6:00 P.M. on any working day, or any work on weekends or legal holidays.

The Contract Administrator may deny permission for such work, or impose conditions thereon, if needed to protect adjacent properties or land uses from noise, dust, or other work-related impacts not normally expected in the area during the terms proposed for such work. The Contract Administrator may consult with all governmental agencies with jurisdiction before responding to such requests.

The Contractor shall reimburse the County for all added costs to the County resulting from overtime and holiday work not specified by the Contract Documents, including Project Management and inspections by County employees and/or independent contractors, Project Architect cost increases, and any costs claimed by any other contractor. Such reimbursement shall be made from the next progress payment due to Contractor.

Section 16.15. PROOF OF COMPLIANCE WITH CONTRACT DOCUMENTS AND LAW.

In order that the Contract Administrator may determine compliance with the requirements of the Contract Documents and applicable laws and regulations which are not readily ascertainable through inspection and tests of materials and work, the Contractor shall, at any time requested by the Contract



Administrator, submit such documents or other satisfactory proofs as required by the Contract Administrator to demonstrate compliance by the Contractor with the Contract Documents and applicable laws and regulations.



ARTICLE 17.

CHANGE ORDERS; WORK AUTHORIZATIONS; ALLOWANCES.

Section 17.01. NO CHANGES WITHOUT CONSENT; PERFORMING WORK ORDERED.

No extra work shall be performed, and no change shall be made, except pursuant to a written Change Order or Work Authorization from the County stating that the extra work or change is authorized, and no claim for any addition to the Contract Price or Time for completion shall be valid unless so ordered; provided, however, that nothing in this Article shall excuse the Contractor from diligently proceeding and fully completing the Project.

Section 17.02. CHANGE ORDERS AUTHORIZED; PROCEDURE.

- A. **Change Orders Authorized.** Subject to legal requirements relating to competitive bidding, the County may require changes in, additions to, or deletions from the scope of the work to be performed or the materials to be furnished pursuant to the Contract Documents.
- B. **Methods of Calculation.** Adjustments, if any, to the Contract Price by reason of any such change, addition or deletion, shall be determined by one or more of the following methods, at the County's sole discretion. The Contractor shall provide sufficient substantiating data to allow the County to evaluate the Contractor's claim for a Change Order.
1. By a lump sum proposal from the Contractor accepted by formal action by the County; and/or
 2. By unit prices contained in the Contractor's original bid and incorporated in the Contract Documents or fixed by subsequent agreement between the County and the Contractor; and/or
 3. By time and materials charges if approved by formal action of the County, limited to the "Actual Cost" to perform the Work, as defined by Paragraph "D" of this Section, plus overhead and profit as allowed by Paragraph "C" of this Section.
 4. If the Change Order implements an Allowance procedure, the Contract Price adjustment shall be as specified in the Allowance.
- C. **Overhead and Profit on Change Orders.** The maximum amount allowable on any change order for overhead and profit shall not exceed the following:
1. For change order work performed by the prime contractor, the maximum amount for overhead and profit shall be the following percentages of the "actual cost to perform the work" as defined in Paragraph D of this Section, plus a maximum of 1% of such costs for extra bond premiums, upon submission of a paid invoice for such premiums:
 - a. If the change order is up to \$1,000.99, 20%;
 - b. If the change order is up to \$1,001.00 and \$4,000.99, 15%;



- c. If the change order is between \$4001.00 and \$12,000.99, 12%;
 - d. If the change order is \$12,001.00 or more, 10%.
 - 2. For change order work performed by subcontractors, the maximum amount for all subcontractors' overhead and profit shall not exceed the percentages set forth in Subparagraph (1) above. The prime contractor may add 5% for the prime contractor's overhead and profit, and 1% for bond premiums if a paid invoice for extra bond premiums is submitted, both percentages being of the "actual cost" as defined in Paragraph B.
 - 3. The allowances for overhead and profit as enumerated in the preceding subparagraphs shall include full compensation for any and all items of overhead including superintendence, layout, field engineering, and any related work, whether or not included within the definition of "actual cost" specified in Paragraph D.
- D. **"Actual Costs" Defined.** The actual cost to perform the Work for purposes of this Section is limited to the applicable labor rates set forth in Article 12 hereof, including Contractor's contributions directly attributable to the Work authorized; and the material man's or supplier's invoice amount for all material and equipment actually used to accomplish the work authorized. All other direct and indirect costs, all costs attributable to the time needed to perform the work ordered by such Change Orders, and all profit associated with such work shall be included in the maximum overhead and profit amounts stated hereinabove.
- E. **Audit and Verification.** All Change Order claims are subject to examination and audit before payment, if ordered by the Contract Administrator. If requested by the Contract Administrator, the Contractor shall furnish a detailed itemized breakdown and copies of all invoices for all costs being claimed for such Change Order, prior to the Contract Administrator's decision thereon. The Contract Administrator may order a more detailed audit of the Contractor's claim and supporting documentation if necessary to decide the claim.
- F. **Deductive Change Orders.** If a Substitution, Field Order, Work Authorization, or Change Order is issued which reduces either the Scope of the Contract, the cost to perform the Work, the time to perform the work, or any combination thereof, the County shall be credited therefore on a Change Order. The credit shall be calculated in the same method as an extra-work Change Order. The Contractor shall submit time and materials data for approval by the Contract Administrator detailing the credit due the County. The County reserves the right to verify such data by reference to standard estimating manuals, the Contractor's Schedule of Values, or other documents, and to review the Contractor's estimate of the credit due.
- G. **Periodic Change Orders.** The Contract Administrator is authorized to cumulate Work Authorizations and to process periodic Change Orders including additions and deletions, and to develop procedures providing the methods for such processing in addition to and consistent with those set forth in Division I.

Section 17.03. WORK AUTHORIZATIONS; PROCEDURE.

- A. **Work Authorization Authorized.** The Contract Administrator or the County Administrative Officer, depending on amount, is authorized to issue Work Authorizations instructing the Contractor to proceed with extra work subject to the following maximum amounts, above which a Change



Order must be approved by the Board of Supervisors.

- B. **Maximum Amounts.** Work Authorizations may be issued by the Contract Administrator up to \$2,000.99, and by the County Administrative Officer up to \$25,000, maximum price adjustment authorized thereby. Either may approve a time allocation for such work, subject to the procedure and limitations specified in Section 3.07-D.
- C. **Quotation by Contractor.** Other than in extraordinary circumstances as described below, before a Work Authorization is issued the Contractor shall submit a quotation setting forth an estimated cost of the extra work to be performed with sufficient substantiating data to allow the County to evaluate the quotation, and an estimate of the time necessary to perform the extra work. If requested by the Contract Administrator, the Contractor shall provide additional data to support the quotation. The Contractor shall acknowledge the quotation as binding.
- D. **Claim for Price Adjustment.** After the extra work specified on the Work Authorization is completed, the Contractor may submit a claim for a Contract Price Change Order due to the Work Authorization. The claim shall be supported with substantiating data to show the actual costs to perform the Work and the overhead and profit being claimed, as defined in Section 17.02 C and D. The maximum price adjustment claimed shall not exceed one-hundred-ten (110%) percent of the approved quotation.
- E. **Claim for Time Adjustment.** If the Contractor claims that the Work Authorization has delayed the Contract Completion Time, he shall verify the claimed delay by demonstrating with reference to the approved Project Progress Schedule that the Work Authorization in fact caused a delay in the overall completion date of the Project. Upon such demonstration, the Contract Administrator shall process a request for a Contract Time extension Change Order pursuant to Article 3 hereof.
- F. **Accumulation of Work Authorizations.** At the Contract Administrator's sole discretion, the Contractor's claims for change Orders arising from several Work Authorizations may be accumulated into periodic Change Orders adjusting Contract Price, Time, or both, separately or in one Change Order.

Such periodic Change Orders shall include deductions for Changes that constitute Deductive Change Orders, as defined in Section 17.02-F during the time period being considered in the periodic Change Order.

- G. **Immediate Work Authorizations.** In the event extraordinary circumstances arise which require extra work to be authorized before a quotation is prepared by the Contractor, the Contract Administrator or County Administrative Officer may issue an immediate Work Authorization without such quotation. Such Work Authorization shall include a maximum authorized sum over which no price adjustment will be authorized. The determination as to whether circumstances as described above exist is discretionary with the County. Such Work Authorizations otherwise shall be processed as specified in this Section.

Section 17.04. EXTRA WORK CLAIMS; PROCEDURE.

If the Contractor claims that any Clarification or other instruction issued by the County requires work beyond the scope of the Agreement for Construction, the following provisions shall apply:



- A. **Notice to Contract Administrator.** The Contractor shall notify the Contract Administrator of its claim, and submit a quotation for the claimed costs, in the same manner as specified in Section 17.03-C. The Contractor shall submit additional information requested by the Contract Administrator to decide the claim.
- B. **Action by Contract Administrator.** The Contract Administrator shall review the Contractor's submittals and either approve or deny the Contractor's claim. The Contract Administrator shall issue his decision within twenty-one (21) days of receipt of a complete submittal from the Contractor. If the claim is approved, the Contract Administrator may process either a Change Order or Work Authorization, pursuant to this Article. If the claim is denied, the Contract Administrator shall so advise the Contractor. Thereafter, the Contractor shall proceed with the work in issue.
- C. **Time.** If the claim is approved, the time during which the claim was being considered shall be included in the time allocation for the Work Authorization adjusting the claim, and Section 17.02 shall apply thereto; if the claim is adjusted by Change Order, any Time extension authorized thereby shall include the time during which the claim was pending. If the claim is denied, no time adjustment shall be authorized.
- D. **Effect of Proceeding.** If the Contractor proceeds with the work without notifying the Contract Administrator pursuant to Paragraph A, or before a decision pursuant to Paragraph B, any claim for a Contract price and/or time adjustment shall be waived.
- E. **Scheduling.** The Contractor is responsible to schedule the work and submit extra-work claims so the time required for decision, as specified in Paragraph B, does not delay the Work in general.

Section 17.05. ALLOWANCES; PROCEDURE.

The Contractor's bid includes the amounts specified for Allowances in the Contract Documents. Work or materials specified as included in the Allowance shall be provided by the Contractor for the Allowance amount.

The County reserves the right to specify work and/or materials which differ from those specified as included in the Allowance, in which case additive or deductive changes to the Contract Price shall be processed pursuant to this Section.

Unless otherwise expressly specified in the Contract Documents, the following provisions shall control the Price adjustment for the Allowance:

- A. The Contract Price bid by the Contractor shall include the cost for the Allowance item(s), delivered to the Site, unloading, handling, storage, taxes, and all overhead and profit pertaining thereto. If the Allowance is specified as including labor, the Contract Price bid by the Contractor shall include all costs of such labor, including superintendence, overhead and profit.
- B. If the County orders item (s) or labor different from those specified as included in the Allowance, the Contract Price shall be adjusted by either a deductive or additive Change Order pursuant to Section 17.02, or a Work Authorization pursuant to Section 17.03.
- C. Unless another method is specified by the Allowance, the price adjustment shall be based upon the



following:

1. The actual costs of the items ordered by the County, delivered to the Site and made ready for incorporation in the Project shall be compared to the material cost specified in the Allowance. "Actual costs" is defined by Section 17.02-D.
2. The actual costs of labor to incorporate the items ordered by the County in the Project shall be compared to the labor amounts specified in the allowance, if any. "Actual Costs" is defined by Section 17.02-D.
3. The results of the materials and labor adjustments shall then be compared. If the net adjustment resulting from this comparison is additive, the Contractor shall be entitled to overhead and profit as specified by Section 17.02-D only on the net amount resulting from the previous calculations. Such overhead and profit shall include all sums authorized for all indirect costs associated with the Allowance, including materials, shipping, handling, unloading and storage and labor superintendence. If the net adjustment is negative, nothing shall be deducted for overhead and/or profit.
4. The resulting adjustment shall either be reflected in a separate Change Order or cumulated in a periodic Change Order, at the Contract Administrator's sole discretion.
5. Any Contract Time adjustment claimed by the Contractor shall be subject to Section 3.07.

Section 17.06. MINOR CHANGE ORDERS BY COUNTY ADMINISTRATIVE OFFICER.

The Yolo County Board of Supervisors has authorized the County Administrative Officer to order changes or additions in the work being performed under construction contracts, pursuant to Public Contracts Code Section 20142,

This authorization allows any change or addition in the Work to be ordered in writing by the County Administrative Officer when the extra cost to the County does not exceed the sum of TWENTY-FIVE-THOUSAND DOLLARS (\$25,000) plus 5% of the amount of the contract in excess of \$250,000.00, up to 10% of the Contract Price, whichever is less.

Section 17.07. CHANGE ORDERS REGARDING TIME FOR COMPLETION.

Any time extension authorized by the County pursuant to Article 3 hereof shall be set forth in a Change Order issued by the Board of Supervisors.

Section 17.08. CHANGE ORDERS DUE TO UNAVAILABLE MATERIALS.

In the event that the Contractor demonstrates good cause for a delay in the Contract Time due to the unavailability of materials, the County, in its sole discretion, may either grant a Contract Time extension change order pursuant to Section 3.07-A hereof, or utilize this Section.

In the event that the Project is unable to be completed due to unavailable materials, and if the Project is complete otherwise, the Contractor may request to delete the portion of the Project not yet completed from the Agreement for Construction, thereby allowing a Notice of Completion to be filed on the remainder of the Project. The County shall approve no such Change Order unless the Contractor accompanies his request with an offer to perform the work so deleted for a price not to exceed the value of the work deleted by such



Change Order, such work to be commenced upon delivery of the materials, and diligently prosecuted to completion. In the event the County elects to accept the Contractor's offer, work done pursuant thereto shall not be construed as work done on the Project, nor shall such work be construed as affecting, in any way, the legal significance of the Notice of Completion filed on the Project.

The application of this Section is limited as follows:

- A. No Change Order shall be issued pursuant to this Section until the Contractor has submitted all documents required for final payment.
- B. This Section shall apply only to work the Completion of which is precluded due to unavailable materials.
- C. Utilization of this Section lies solely within the discretion of the County, and such discretion hereby is delegated to the Contract Administrator.

Section 17.09. EFFECT OF CONTRACTOR'S ACCEPTANCE OF CHANGE ORDER.

By acceptance of a Change Order, Contractor agrees to the changes, if any, in the Contract Price specified for each item and to the specified extension of Time allowed, if any, for completion of the entire work on account of such Change Order, and agrees to furnish all labor and materials and perform all work necessary to complete all additional work specified therein for the price adjustment and within the time specified therein. Contractor shall make no additional claim for adjustment to the Contract Price or Time, nor for additional costs or damages, on account of the Work referenced in such Change Order. A Change Order duly issued by the County and accepted by the Contractor shall constitute a complete accord and satisfaction as to the Work, Contract Price and Contract Time changed thereby. Contractor shall defend and indemnify the County, as required by section 2.05, if any subcontractor asserts any claim against the County due to a duly issued and accepted Change Order.

Section 17.10. EFFECT ON SURETIES.

All changes authorized by the Contract Documents may be made without notice to or consent of the sureties on the performance and payment bonds, and shall not reduce their liability on the bonds.

The County reserves the right to require additional performance and payment bonds to secure a Change Order. In this event, the Change Order shall be increased by the actual cost of the bond premium for the additional bond amounts, if any, up for a maximum of 1%.



ARTICLE 18.

INSPECTION.

Section 18.01. ACCESS FOR INSPECTION.

The Contract Administrator, the Project Architect, the County Inspector(s), and other designated employees or agents of the County, and inspectors of all agencies of jurisdiction over the Project or funds used for the Project shall at all times have access for the purpose of observation to all parts of the Work and to all shops wherein the Work is in preparation. The Contractor shall cooperate and furnish such facilities and assistance as needed for the Inspector(s).

Sections 18.02. NOTICE OF READINESS FOR INSPECTION.

Where the Contract Documents, instructions by the Contract Administrator, laws, ordinances, or any public authority having jurisdiction requires work to be inspected, tested or approved before any portion of the Work proceeds, such work shall not proceed, nor shall it be covered up without inspection.

The Contractor shall give notice to the Contract Administrator at least two (2) days in advance of the readiness for any Contract compliance inspection by the County Inspector. The Contractor shall give notice as required by all other inspection agencies of jurisdiction for Code and regulation compliance inspection. In all cases, the Contractor shall schedule inspection so as not to delay the Work.

Section 18.03. CONTRACT COMPLIANCE INSPECTIONS.

All work done and all materials furnished shall be subject to the inspection and approval of the Contract Administrator for compliance with the Contract Documents, either acting personally or through the County Inspector(s).

Any work covered without required inspection, or not in compliance with the Contract Documents or instructions to the Contract Administrator, shall, upon the instruction of the Contract Administrator, be uncovered for inspection and properly restored after inspection and approval, at no cost to the County.

Section 18.04. INSPECTION OF COMPLETED WORK.

Should the Contract Administrator determine that it is necessary or advisable to make an inspection of Work already completed and inspected at any time before final inspection and acceptance of the Project, by removing or exposing the Work, Contractor shall, upon instruction of the Contract Administrator, promptly furnish all necessary facilities, labor and materials to do so. If such work is found to be defective in any aspect, the Contractor shall bear all expenses of such examination and satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract Documents, the additional cost of labor and materials necessarily involved in the examination and replacement shall be allowed the Contractor, and a Change Order shall be issued.

This Section shall not apply in the case of Work covered without required inspection, which is governed by Sections 18.02 and 18.03.



Section 18.05. AUTHORITY OF COUNTY; STOP WORK NOTICES.

The Contract Administrator and the County Inspector shall have the authority to order the Work stopped if either determines that the Work is proceeding in violation of the Contract Documents or any orders issued by the Contract Administrator. Such order shall be effective only upon the posting of a stop work notice upon the Work or portions of the Work in question.

Upon issuing a stop work notice, the County Inspector shall immediately notify the Contract Administrator, who shall inspect the Work in question and determine whether it does or does not comply with Contract Documents. The decision of the Contract Administrator shall be final. The Contractor shall thereafter comply with the instructions of the Contract Administrator regarding corrections needed to cure the defect. The stopped Work shall be resumed only when such instructions are fulfilled, and a resume work notice is issued by the Contract Administrator. The Contractor shall not be entitled to an extension in time in the event of such suspension of Work, except as authorized in Section 3.14 hereof.

Section 18.06. EFFECTS OF INSPECTIONS.

Neither the final inspection and payment, nor any interim inspection or progress payment shall relieve the Contractor of any obligation to fully perform the Agreement for Construction as required by the Contract Documents and all applicable laws and regulations.

Any work, materials, or equipment not meeting the requirements and intent of the Contract Documents and all applicable laws and regulations may be rejected, and suitable work or materials shall be made good, notwithstanding the fact that such work or materials may previously have been inspected and/or payment therefore may have been made.

Section 18.07. AUTHORITY OF CONTRACT ADMINISTRATOR.

The Contract Administrator shall decide all questions which may arise as to the quality or acceptability of materials and/or equipment furnished or work performed, and as to the interpretation of Contract Documents and Specifications; all questions as to the acceptable performance of the Contract; and all questions as to compensation.

Section 18.08. AUTHORITY OF COUNTY INSPECTOR(S).

The designated County Inspector is a representative of the Contract Administrator for purposes of inspection of the work for compliance with the Contract Documents and monitoring the Contractor's performance. He is authorized to order a cessation of non-complying Work pursuant to Section 18.05, and to certify the field copies of the Contractor's requests for progress payments. He conducts meetings as required by Division 1 and the Technical Specifications and generally monitors the contractor's performance for the Contract Administrator.

If a person or firm other than the Construction Manager is engaged as County Inspector, the Inspector is not authorized to bind the County in discussions with the Contractor, nor to issue Clarifications, Field Orders, Work Authorizations, or Change Orders.

No interpretations of the Contract Documents made by the Inspector are binding on the County unless the Contract Administrator adopts such interpretation by a written clarification.



The Contractor shall not attempt to influence the Inspector in the performance of his duties, nor request him to exceed his authority. The County shall honor no request by the Contractor that is based on any action of the Inspector beyond the scope of the Inspector's authority as specified in this Section.

Section 18.09. BUILDING INSPECTIONS AND CODES.

The Contractor shall provide access to inspectors from all agencies having jurisdiction over the Project.

Such inspectors are independent of the Contract Administrator and the County Inspector(s), and approval by either shall not constitute approval by the other.

The Contractor shall obey all orders of the inspectors with jurisdiction, and if such inspector reports a violation of any Code within his jurisdiction, the Contractor immediately shall notify the Contract Administrator.

The Contractor is responsible to comply with all applicable Codes in the construction of the Work.



ARTICLE 19.

PUBLIC UTILITIES.

Section 19.01. UTILITIES USED DURING CONSTRUCTION.

Unless otherwise specified in the Contract Documents, the Contractor shall provide and pay for all necessary water, gas, and electricity required for himself, and all trades employed in the performance of the Agreement for Construction.

The Contractor shall send all required notices, make all necessary arrangements, and perform all other services required in the care and maintenance of such utilities, and assume all financial responsibility concerning the care and maintenance of said utilities.

All temporary connections to such utilities shall be maintained in such manner as not to interfere with the continuing use of such utilities by the County during the entire progress of the Work.

The enclosing of such public utility equipment shall be done by the Contractor consistent with the requirements of the utility. Upon completion of the Work, the Contractor shall remove all enclosures and fill-in and leave in a finished condition all openings for such utilities.

Section 19.02. LIGHTING.

Contractor shall furnish, wire for, install and maintain temporary electric light whenever it is necessary to provide illumination for the proper performance and inspection of the Work, unless otherwise specified. The lighting shall provide sufficient illumination and shall be so placed and distributed that the Contract Documents can be easily read in every place where the Work is being performed. This temporary lighting equipment may be moved about, but shall be maintained throughout the Work and available for the use of the Contract Administrator or County Inspector(s) whenever required for inspection.

Section 19.03. PERMANENT UTILITIES; INSTALLATION.

The Contractor shall install all permanent utilities called for by the Construction Documents strictly in compliance with all laws, regulations and requirements of the particular utility company or governmental agency providing the utility.

Section 19.04. TOILET FACILITIES FOR WORKERS.

The Contractor shall provide and maintain for the duration of the Work temporary toilet facilities as required by the Yolo County Health Department, which shall be weather-tight structures with raised floors.

The Contractor shall service such facilities daily and shall pump such facilities as required, to maintain them in a clean and sanitary condition.

Section 19.05. DISRUPTION OF UTILITY SERVICE.

The Contractor shall secure the advance approval of the Contract Administrator regarding scheduling of any disruption of utility service to other structures necessitated by the Work.



The Contractor is advised that unscheduled disruptions of electrical service to County buildings may seriously damage computer and word-processing equipment and/or software, and other equipment and/or material in use in such building, and the Contractor will be liable for all resulting repair and re-programming costs if occasioned by an unscheduled disruption caused by Contractor.

Section 19.06. UTILITIES FOR COUNTY PERSONNEL.

If the Contract Documents call for the Contractor to provide temporary on-site office trailers for County personnel involved in the Project, the Contractor shall provide utility services for such trailers pursuant to this Article.



ARTICLE 20.

PERMITS, LICENSES, ORDINANCES AND REGULATIONS.

Section 20.01. COMPLIANCE WITH CONSTRUCTION REGULATIONS.

The Contractor shall conduct the Work so that all laws, regulations, and ordinances for the protection of the public and the workers shall be obeyed fully both by the Contractor and by all subcontractors on the site.

The Contractor shall obtain and keep current all licenses or permits required by the State Contractor's Licensing Act and/or other licenses required to authorize him to perform the Work and shall require all subcontractors to comply with this section.

Section 20.02. PERMITS; FEES.

Unless otherwise specified by the Contract Documents or ordered by the Contract Administrator, the Contractor shall obtain all permits, licenses and/or entitlements that are required for the performance of the Work by all laws, ordinances, rules, and regulations or orders of any officer and/or body with jurisdiction, shall give all notices necessary in connection therewith, and shall pay all fees required relating thereto and all costs or expenses incurred on account thereof.

Section 20.03. COMPLIANCE WITH LAWS AND REGULATIONS.

The Contractor shall keep himself fully informed of and shall observe and comply with, and shall cause all subcontractors and all employees to observe and comply with all Federal and State laws, and County or Municipal Ordinances, regulations, orders or decrees which in any manner affect those engaged or employed on the Work, or the materials used in the Work, or in any way affect the conduct of the Work. The Contractor shall ensure that the Work is constructed and completed in compliance with all applicable laws and regulations.

Section 20.04. VIOLATION OF LAWS AND REGULATIONS; INDEMNITY.

The Contractor shall save harmless, defend, and indemnify the County and all of its officers, agents, and employees against any liability or claim arising from or based upon the violation of any law, ordinance, regulation, order or decree, whether by himself, his agents, employees, or his subcontractors or their agents or employees.

Section 20.05. SPECIFIC STATE LAWS AND REGULATIONS.

In addition to the general requirements set forth above, the Contractor's attention is directed to and Contractor shall be responsible for performing and completing the Work in compliance with all laws of the State of California governing the construction of buildings in general as well as those governing construction of public buildings, including, without limitation, the following:

- A. The California Health & Safety Code and all applicable Administrative Code regulations adopted pursuant thereto.
- B. All laws governing the employment of labor, qualifications for employment of aliens, payment of



employees, convict-made materials, domestic and foreign materials, and accident prevention.

- C. Title XIX of the California Administrative Code entitled, "Public Safety", Chapter 1, State Fire Marshal, Sub-chapter 12, General Fire and Panic Safety".
- D. General Industrial Safety Orders, including but not limited to the provisions of Title VIII of the California Administrative Code relating to safe and proper use, construction, disposal, etc. or materials, machinery, and building appurtenances as therein set forth.
- E. All rules and regulations of the State Fire Marshall; the safety orders of the Division of Industrial Safety; and Department of Industrial Relations regulations.

All of the above laws and regulations are expressly incorporated in the Agreement for Construction and are as much a part of the Contract Documents as if they were incorporated in their entirety in these General Conditions.

The Contractor shall not interpret the enumeration set forth above as being a complete listing of all applicable laws. It is also the Contractor's responsibility to inform himself regarding the requirements of all applicable laws regarding the performance of construction contracts for California counties and to obey them, and the Contractor agrees by execution of the Agreement for Construction to do so at his sole cost, expense and risk. (See also Section 14.07 regarding Cal OSHA and Section 20.08 regarding hazardous materials).

Section 20.06. COMPLIANCE WITH CONDITIONS OF PERMITS.

The Contractor shall conduct the Work in conformity with the conditions imposed on all permits or other entitlements which address the performance of the Work by the Contractor, whether or not such permits or entitlements are incorporated in the contract Documents.

Such permits may include, but are not limited to, measures required during the construction of the Work and incorporated in the Project to avoid or mitigate the environmental effects of the Project, pursuant to the California Environmental Quality Act, and conditions imposed on use permits issued by any agency with jurisdiction.

It shall be the Contractor's responsibility at all stages, from bidding through final completion, to inform himself of the requirements of any such permits. Copies are available from the Contract Administrator.

The Contractor's attention is directed to the Supplementary Conditions and Technical Specifications setting forth additional requirements, if any, regarding this subject.

Section 20.07. COMPLIANCE WITH CONDITIONS OF GRANTS.

The Contractor shall conform to all requirements of Federal and/or State authorities that have provided grant funding for the Project. Specific requirements are specified in the Supplementary Conditions and Division 1. Without limitation thereof, Contractor shall keep financial, wage and hours, equal employment opportunity and other records required by any such grant and shall allow access to the Site by inspectors from such agencies.

The Contractor shall cooperate fully with and assist the County in its efforts to comply with all



conditions imposed on such grant funding.

Section 20.08. HARMONIZATION WITH CONTRACT DOCUMENTS.

The Contract Documents are intended to be coordinated to described and provide for the complete Project in a manner that complies with all applicable laws and regulations.

In the event of a conflict between the Contract Documents and the applicable laws and regulations, the applicable laws and regulations shall govern; provided, however, that in the event of conflict involving quantity or quality, the greater quantity and the higher quality shall be furnished. All other conflicts shall be handled in the manner described in the Agreement for Construction.

Section 20.09. COMPLIANCE WITH HAZARDOUS MATERIALS REPORTING AND USE REQUIREMENTS; CLEAN-UP; INDEMNITY; WITHHOLD.

- A. **Reporting and Use:** The Contractor shall file all reports required by Federal and/or State agencies regarding the presence on the Site and/or use of toxic or any hazardous material and shall store and/or use such materials in strict conformity with all applicable laws and regulations.
- B. **Clean-Up:** The Contractor shall clean-up any toxic or hazardous spill or pollution caused by the Contractor and/or any subcontractor, material man or carrier occurring on the Site, and shall remove all polluted water, dirt or materials to an approved disposal site, as required by the Federal and/or State agencies with jurisdiction or, if none, by the County Health Department, all without cost to the County.
- C. **Indemnity:** The Contractor shall save harmless, indemnify and reimburse the County for all costs for defense of any County liability, cost, claim or damages resulting from the Contractor's failure to perform Paragraphs "A" and/or "B" of this Section, and/or a toxic or hazardous spill within Paragraph "B" of this Section.
- D. **Withhold:** In addition to all withholds or retentions authorized by the Agreement for Construction, the County shall retain sums sufficient to offset the County's costs resulting from Contractor's failure, refusal or neglect to conform to all requirements of this Section.



ARTICLE 21.

PRESERVATION AND CLEANING.

Section 21.01. PROTECTION OF WORK.

The Contractor shall protect and preserve the Work from all damage or accident, and shall at its cost provide any temporary roofs, window and door coverings, enclosures, boxing, or other construction as required for this purpose.

Section 21.02. PERIODIC CLEANING OF PROJECT.

The Contractor shall properly clean the Site and the Work as it progresses, and from time to time shall remove all dirt, debris, waste, rubbish, and implements of service from the Project and the Site. Debris, waste, or unused construction materials shall not be left under, in, or about the Project, nor allowed to accumulate in the Project or the Site. The Technical Specifications specify additional requirements regarding this subject.

The Contractor, at its sole cost, shall contract with a disposal company to remove all such rubbish, and shall have the containers therefore emptied at frequent enough intervals so that waste does not overflow the containers.

Section 21.03. FINAL CLEANING OF PROJECT.

Prior to the request for Final Inspection, the Contractor shall thoroughly clean the interior and exterior of the Work, and do all things required by the Technical Specifications regarding final cleaning.

Final cleaning shall not be accepted unless the Project is in all respects ready to occupy without further cleaning by County forces.



ARTICLE 22.

OCCUPANCY BY COUNTY.

Section 22.01. USE OF COMPLETED WORK.

Whenever, in the opinion of the County, the Work or any part thereof is in a condition suitable for use, and the best interests of the County require such use, the County may take possession of, connect to, and open for public or County use, the Work or any part thereof, subject to this Article.

Section 22.02. REPAIRS OR RENEWALS IN THE WORK.

Prior to the date of final acceptance of the Work by the County, all necessary repairs or renewals of the portion of the Work occupied pursuant to Section 22.01 hereinabove (or part thereof) shall be made at the Contractor's expense if necessary due to defective material and/or workmanship, or to the operations of the Contractor, ordinary wear and tear excepted.

Section 22.03. EFFECT OF OCCUPANCY.

The occupancy by the County of the Work or any part thereof as authorized by this Article shall in no case be construed as constituting acceptance by the County of the Work or any part thereof. Such use shall neither relieve the Contractor of any of his responsibilities under the Contract Documents, nor act as a waiver by the County of any of the terms or conditions of the Agreement for Construction. Notwithstanding occupancy by the County pursuant to this Article, the warranty periods on all products and the Contractor's basic warranty pursuant to Article 26 shall not commence, and the term thereof shall not be diminished, as a result of County occupancy. The warranty periods commence only upon recordation of a Notice of Cessation of Work or a Notice of Completion.

Section 22.04. COORDINATION WITH OTHER ACTIVITIES.

In the event that the Project, or any portion of the Site, is occupied by the County during the Work, it shall be the responsibility of the Contractor to conduct his operations so as not to unreasonably interfere with the use of the occupied portions by the County.

The Contractor shall submit periodic schedules to the Contract Administrator proposing the times, areas, and types of work to be done within such areas. The Contract Administrator shall approve, conditionally approve, or reject such schedule, and the Contractor shall comply with the Contract Administrator's instruction.

In the event that the Work produces conditions rendering uninhabitable the portions of the Project, the Site, or other areas occupied by the County, either because of noise, dust, vibration, smoke, fumes, or for any other cause, the Contract Administrator may order the Work ceased, or modifications to the schedule, and the Contractor shall comply at its sole cost and expense.

Section 22.05. PRICE OR TIME ADJUSTMENTS.

In the event the County exercises its right to take early occupancy pursuant to this Article, and provided that the Contract Documents at the time of bidding did not specifically indicate the County's intention to do so, the Contractor may request an adjustment to the Contract Price and/or Time, for extra



costs and/or time directly caused by the early occupancy. Article 17 shall apply to any request by the Contractor for a Contract Price adjustment, and Article 3 to a Contract Time adjustment, resulting from the County's occupancy pursuant to this Article.



ARTICLE 23.

PROGRESS PAYMENTS.

Section 23.01. SUBMISSION OF CLAIMS.

On or before the seventh (7th) day of each month, the Contractor shall prepare and forward to the Contract Administrator a statement in writing, on forms provided by the County, detailing the following work done during the preceding month:

- A. The units or work completed during the preceding month, with reference to the Progress and Value Schedules approved pursuant to Article 3, or approved modifications thereto, and the date of inspection and approval thereof.
- B. The portion of the progress claim attributable to such units of work.
- C. All acceptable materials furnished and delivered to and stored on the Site or other approved location for use in the performance of the Work, but not yet incorporated in the Work.
- D. The value of such materials, with reference to the Schedules of Value provided pursuant to Article 3 hereof.
- E. The date of inspection and approval by the County of any such materials and labor.

If the Contract Documents require the sampling and testing of any such materials or labor, the claim shall indicate whether such sampling and testing has been approved and, if so, the date thereof.

As part of such claim for payment, the Contractor shall agree that, upon payment of such claim (or part thereof), the Contractor will indemnify, defend and hold harmless the County, its officers, agents and employees from and against any and all claims for damages, costs, compensation or any other recovery, including but not limited to claims of the Contractor, subcontractors, suppliers, laborers and workers, based upon the portion of the Work for which payment is claimed (or such part thereof for which payment is made). As part of such claim for payment, Contractor shall also provide proof that all subcontractors, suppliers, etc. have been paid and have provided releases for all portions of the Work for which the Contractor has previously been paid. Such claims shall be executed by the Contractor under penalty of perjury.

Each payment request shall be reviewed by the Contract Administrator as soon as practical after receipt for the purpose of determining that the payment request is a proper payment request. Any payment request determined not to be a proper payment request suitable for payment shall be returned to the contractor as soon as practicable, but not later than seven days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.

Within seven (7) days of receipt of a fully completed claim form, the Contract Administrator shall verify such claim and shall take such steps as are necessary to investigate the accuracy of any statements made by the Contractor. Contractor shall provide such other and further documentation as ordered by the Contract Administrator to enable verification of a claim for a progress payment and the time until such additional documentation is delivered shall extend the time for processing the claim.



The Contract Administrator shall verify the claims for progress payments by use of the Progress and Value schedules approved pursuant to Article 3 hereinabove, or subsequently approved modifications thereto.

Section 23.02. PAYMENT; WITHHOLDS.

Upon approval of a claim for progress payment by the Contract Administrator, such claim shall be paid; provided, however, that the following amounts shall be withheld as security:

- A. No greater than Ten (10%) percent of the value of the Work done;
- B. Ten (10%) percent of the value of the acceptable materials delivered to and accepted by the County, but not yet incorporated in the Work.

Within the time specified in Division 1, the County shall pay to the Contractor, while the Contractor is carrying on the Work, the balance of any progress payment not withheld as set forth above, after deducting therefrom all previous payments and all sums to be retained under the provisions of law or of the Contract Documents.

No payment by the County shall be construed to be an approval by the County of any defective work or improper materials, nor as an acceptance as completed of any portion of the Work.

If the County fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request, the County shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

Section 23.03. POSTING SECURITIES IN LIEU OF WITHHOLDS.

Pursuant to Public Contract Code Section 22300, at the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the County, or with a state or federally chartered bank as the escrow agent, who shall pay such monies to the Contractor upon satisfactory completion of the Contract.

Securities eligible for investment under this section shall include those listed in Government Code 16430 or bank or savings and loan certificates of deposit.

The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest hereon.

The escrow agent shall be a trustee of the County.

Section 23.04. RETAINING ADDITIONAL AMOUNTS; GROUNDS.

In addition to the amounts which the County withholds as provided in Section 23.02, the County shall retain a sufficient amount of any payment otherwise due to the Contractor as in the sole discretion of the Contract Administrator may be necessary to protect the County in the event of the following:

- A. The receipt of Stop Notices and Claims against the Contractor or any subcontractor for labor



or materials furnished on the Project;

- B. For the cost to correct defective work not remedied, including failure to periodically clean the Site and Work as specified in Section 21.02.
- C. For failure of the Contractor to make progress payments to any of its subcontractors;
- D. For the occurrence of reasonable doubt that the Project can be completed for the balance of the Contract Price, as reflected in the approved Schedule of Values, or within the Contract Time, as shown on the approved Progress Schedule;
- E. For the refusal of the Contractor to commit sufficient resources so that the Work proceeds in accordance with the approved Progress Schedule. Section 3.11 regarding Liquidated Damages shall apply in such event;
- F. For failure of the Contractor to comply with any lawful or proper direction concerning the work given by any County representative authorized to have given such instruction;
- G. For claims and/or penalties which State or Federal law assesses against the Contractor for violation of such law, including prevailing wage claims;
- H. For any claim or penalty asserted against the County by virtue of the Contractor's failure to comply with the provisions of all governing laws, ordinances, regulations, rules and orders;
- I. For any reason specified elsewhere in the Contract Documents as grounds for retention.

In order to adequately to protect the County, the basic standard to determine the amount of retention pursuant to this section shall be ONE-HUNDRED-TWENTY-FIVE (125%) PERCENT of the amounts claimed or the value of the Work not done or defectively done, plus interest and litigation costs; provided, however, that County retains the authority to retain greater sums should such sums be necessary in the County's discretion adequately to protect it.

In the event the progress of the Work does not meet the approved Progress Schedule, the County may retain the amounts specified in Section 3.11 and Section 2 of the Agreement for Construction for each day the Work is behind schedule.

The County retains the right to make, or not to make, any partial progress payment involving sums not in dispute, or to retain the total progress payment pending resolution of any such dispute.

Section 23.05. DISBURSEMENT OF RETAINED AMOUNTS.

The County, in its sole discretion, may apply any such retained amount or amounts to the payment of any such claims resulting in a retention. Any payment, so made by the County, shall be considered as a payment made under this Contract by the County to the Contractor. The County shall not be liable to the Contractor for any such payments made in good faith. Such payments may be made without a prior judicial determination of the claim or claims. The County shall render to the Contractor a proper accounting of any such funds dispersed on behalf of the Contractor. The County reserves the right to utilize warrants issued to the Contractor and Claimant as joint payees for this purpose.



Prior to applying such amounts as stated hereinabove, County shall afford the Contractor an opportunity to present good cause, if any he has, why the claim or claims in issue are not valid or just claims against the Contractor. The County then reserves the right to take such further steps as are appropriate, in its sole discretion, including, but not limited to, seeking a judicial resolution of the controversy.

Section 23.06. CORRECTION OF STATEMENT AND WITHHOLDING OF PAYMENT.

No inaccuracy or error in any claim provided by the Contractor shall operate to release the Contractor or any surety from the error, or from damages arising from such error, or from any obligation imposed by the Contract Documents. The County shall retain the right subsequently to correct any error made in any previously approved claim for the progress payment, or progress payment issued, by later adjustments to subsequent progress payments.

Section 23.07. EFFECT OF PROGRESS PAYMENTS.

Neither the payment, the withholding, nor the retention of all or any portion of any progress payment claimed to be due and owing to the contractor shall operate in any way to relieve the Contractor from his obligations under the Agreement for Construction. The Contractor shall continue diligently to prosecute the Work without reference to the payment, withhold or retention, of any progress payment. The payment withhold or retention of any progress payment shall not be grounds for an adjustment to the Contract Time or Contract Price. By making progress payments, the County waives no right nor releases any obligation of the Contractor to the County.



ARTICLE 24.

FINAL INSPECTION.

Section 24.01. NOTICE OF FINAL INSPECTION.

When the Work is completed, the Contractor shall request a final inspection. Within ten (10) days of the receipt of such request, the Contract Administrator shall make a final inspection. The Contractor or his representatives may be present at the final inspection. The purpose of such final inspection shall be to determine whether the Work has been fully completed in accordance with the Contract Documents, including all modifications previously issued.

Section 24.02. PUNCH LIST.

The Contract Administrator shall notify the Contractor in writing of any deficiencies to be remedied prior to final acceptance, by preparing a written list of deficiencies, known in the industry as a "punch list".

The Contractor shall remedy all items shown on the punch list prior to final acceptance by the Contract Administrator.

The Contract Administrator is not authorized to amend the Contract by use of the punch list; it is provided solely for the benefit of the Contractor to enable him to determine whether items must be corrected before final acceptance will be recommended by the Contract Administrator. The County reserves the right to require compliance with the Contract Documents, notwithstanding the issuance of a punch list or the completion by the Contractor of all items on the punch list.

In the event that the Work still does not comply with the Contract Documents, the County reserves the right to issue such further punch lists as may be required, or to deduct from the final payment the cost of correction of any Work not completed in accordance with the Contract Documents without the issuance of further punch lists.

Section 24.03. ADDITIONAL SUBMITTALS.

After completion of work on punch list items, and before the Contractor's Request for Final Payment, the Contractor shall submit the following items:

- A. A complete and accurate accounting, showing the total amounts claimed by the Contractor, all subcontractors and all suppliers due for final payment of the Project. The accounting shall identify first-tier subcontractors (those with a contract directly with the contractor) separately from all other claimants and shall include all subcontractors listed by the Contractor pursuant to Article 11. This accounting shall be submitted under penalty of perjury.
- B. A complete and accurate set of Record (as-built) Drawings prepared by the Contractor pursuant to Section 4.05, Section 01720 of Division 1, and the Technical Specifications.
- C. The Contractor's guarantee required by Article 26 hereof, and all other guarantees and warranties required by the Contract Documents.
- D. The Contract bond securing the Contractor's guarantee pursuant to Article 26 hereof.



- E. Proof acceptable to County of proper release from all claims regarding patents and/or copyrights pursuant to Section 6.09 hereof.
- F. All operating manuals required by the Technical Specifications for all mechanical and electrical installations.
- G. All other submittals required by the Contract Documents prior to final payment.

Section 24.04. SYSTEMS DEMONSTRATION.

Before submitting a Request for Final Payment, Contractor shall demonstrate the operation of all systems in the Work to such persons as directed by the Contract Administrator, and shall instruct County personnel in the operation, adjustment, and maintenance of all equipment and systems, as required by Section 01735 of Division 1.



ARTICLE 25.

ACCEPTANCE AND FINAL PAYMENT; ADMINISTRATION OF THE WITHHOLD ACCOUNT.

Section 25.01. CONTRACTOR'S REQUEST FOR FINAL PAYMENTS AND CHANGE ORDERS.

When the Work is fully (100%) complete and all items on the punch list have been satisfied, or the Contractor contends that such items are not required by the Contract Documents, the Contractor shall submit Requests for Final Progress Payment and Final Payment.

The request for Final Progress Payment shall include the total amount the Contractor contends is due on the Contract Price less the amounts to be withheld for Final Payment. The amounts to be withheld for Final Payment shall include no less than One-Hundred Twenty-Five Percent (125%) of the total of all claims identified by the Contractor in the accounting submitted pursuant to Section 24.03-A, plus One-Hundred-Twenty-Five Percent (125%) of all unpaid claims against the Project by the County or any other claimant, which claims authorize a County withhold and/or retention pursuant to the Contract Documents, State or Federal law.

With the requests for Final Progress Payment, the Contractor shall submit its request for a final Contract Price Change Order with all information required by Article 17, and/or Contract Time Change Order, with all information required by Article 3, if the Contractor requests an adjustment in the Contract Price and/or Contract Time then in effect.

Section 25.02. CONTRACTOR ADMINISTRATOR'S ESTIMATE.

Upon receipt of all required submittals and the Contractor's Requests for Final Payments, the Contract Administrator shall conduct a final inspection to identify any deviations from the Contract Documents in the Work, and estimate the cost of corrections of such deviations.

After Final Inspection, the Contract Administrator shall prepare an estimate of the final sum due the Contractor. Said estimate shall take into account the Contract Price, as adjusted by any Change Orders; amounts previously paid; the Final Progress Payment; and sums to be withheld and/or retained for claims against the Project for incomplete work, liquidated damages, and for any other cause under the Contract. The Contract Administrator shall also prepare a recommendation on the Contractor's request for a Final Change Order, if any. The final estimate shall be transmitted to the Yolo County Board of Supervisors along with the Contractor's Request for final payment and the Contract Administrator's recommendations on the Contractor's request for final Change Order, if any. The Contract Administrator shall deliver a copy of this transmittal to the Contractor.

The Contract Administrator's estimate shall address whether the completion date for purposes of calculating liquidated damages should relate back to the date of the Contractor's Request for Final Payment, pursuant to Section 3.06.

Section 25.03. PROTEST TO BOARD OF SUPERVISORS.

If the Contractor contests the estimate of sums due prepared by the Contract Administrator, the Contractor shall, within five (5) days following delivery of the Contract Administrators' final inspection report, file his protest in writing with the Clerk of the Board of Supervisors, setting forth in detail all grounds alleged to justify adjustment to the Contract Administrator's final estimate. Failure to file such protest shall



constitute a waiver of the right to contest or otherwise challenge the Contract Administrator's final inspection report and estimate, and acceptance of the rest by Contractor.

Section 25.04. RESOLUTION AUTHORIZING ACCEPTANCE OF CONTRACT AND RECORDATION OF NOTICE OF COMPLETION.

Acceptance of the Work by the Board of Supervisors and the recordation of a Notice of Completion shall be in the manner prescribed by law, provided that the County is of the opinion that the Work is fully and satisfactorily completed and the provisions of the Contract Documents fully and satisfactorily performed in all respects. The acceptance of the Work by the County will only be made by resolution of the Board of Supervisors in a regular session. The Notice of Completion shall specify the date of the Resolution of Acceptance as the completion date and shall be recorded in the manner provided by law.

The County reserves all rights provided by law and/or the Contract Documents if the Work is not fully satisfactory and complete in all respects.

The resolution shall specify the final Contract Price and Time, with deductions and/or offsets for liquidated damages, the cost of correction of defective work or workmanship, inadequate clean-up, non-compliance with the Contract Documents, or statutory fines, forfeitures or penalties.

Section 25.05. DETERMINATION OF FINAL PROGRESS PAYMENT AND WITHHOLD AMOUNT.

After the Board of Supervisors has approved a Final Contract Price and Time, the Contract Administrator shall adjust the withhold Amount, as follows:

- A. At no time shall the withhold amount be less than five (5%) percent of the Final Contract Price, or One-Hundred-twenty-Five (125%) percent of the total of all claims against the Project from all sources, including the County, whichever is the greater amount.
- B. The Contract Administrator is authorized to withhold additional sums necessary to protect the County in his sole discretion, if claims, including State or Federal prevailing wage claims, and/or stop notices are filed, or to secure the County's own claims.
- C. The Contract Administrator is authorized to process payment(s) to the Contractor at such frequency as the Contract Administrator shall determine, when the Contractor has provided acceptable submittals with its request(s) for release of withheld amounts, as specified in Section 25.06.

Section 25.06. SUBMITTALS FOR RELEASE OF WITHHELD AMOUNTS.

With its request for release of amounts withheld and/or retained by the County, the Contractor shall submit the following:

- A. Receipts and releases on forms standard in the industry and approved by the County, from all first-tier subcontractors, releasing the County from all further claim or liability.
- B. Receipts and releases, including Stop Notice releases if stop notices have been filed, from any persons or firms claiming against the Project; or fully executed agreements by such claimants specifying a settlement of their claims.



- C. Releases and authorizations to pay from any State or Federal agency claiming against the Project, including prevailing wage claims.
- D. Waiver of all claims by the Contractor against the County except those which the Contractor expressly specifies therein as being outstanding and not included in the waiver.

The maximum amount the Contractor may request to be released shall not exceed the amount specified in Section 25.05-A.

Section 25.07. ADMINISTRATION OF WITHHOLD ACCOUNT.

The County reserves all rights regarding its administration of the withhold fund, with or without filed Stop Notices, including all judicial remedies provided by law.

In its sole discretion, the County may contact such claimants, or any of them, and reach independent settlement of their claims, through use of warrants jointly payable to claimants or otherwise.

In addition, the County is authorized to retain sums as needed, in its sole discretion, to secure its own claims.

Section 25.08. PAYMENT OF WITHHELD AMOUNTS.

On the thirty-fifth (35th) calendar day following recordation of a Notice of Completion, the undisputed balance owing in the withhold account shall be due and payable to Contractor.

The "undisputed balance owing" shall be the difference between the final Contract Price fixed by the Board of Supervisors' Resolution of Acceptance less the following amounts:

- A. All payments made to date;
- B. One-Hundred-Twenty-Five (125%) percent of the total amounts claimed in unresolved stop notices on file with the County or wage claims and related penalties in the jurisdiction of any State or Federal wage compliance office;
- C. The total of any claims by the County for defective work, and/or liquidated damages.

The balance owing shall be "due and payable" upon presentation by the Contractor of releases executed by the Contractor, releasing the County of Yolo from all claims arising by virtue of the Agreement for Construction related to the amounts released from the withhold.

Payment of undisputed contract amounts is contingent upon the Contractor furnishing the County with a release of all claims against the public entity arising by virtue of the Agreement for Construction. The Contractor shall specifically identify in the release any disputed claim, including the amount thereof, which is excluded from the release. Any claim not so specified within the release shall be forever released, discharged, and waived. If the Contractor disputes the amount owing by the County, the final balance in the Withhold Account shall become due and payable only upon execution by the Contractor and the County of an accord and satisfaction agreement acceptable to both, by which both release the other from all claims.

If the Contractor accepts the final balance in the Withhold Account as the total due and payable by



the County, and provides a written final release, the accord and satisfaction agreement shall not be required.

Nothing in this Article shall be construed as requiring the Contractor to waive any claim against the County in violation of Public Contracts Code Section 7100, nor as constituting a waiver by the County of any claim or legal right against the Contractor.

Section 25.09. NON-WAIVER.

Neither acceptance of nor payment for the Work or any part thereof, nor any extension of time, nor any possession taken by the County shall operate as a waiver of any of the provisions of the Agreement for Construction, nor shall a waiver of any breach of this Agreement be held to be a waiver of any other or subsequent breach. In addition, adoption of a Resolution of Acceptance and recordation of a Notice of Completion shall not be deemed an acceptance of latent defects, shall not constitute a waiver of any of the provisions of the Agreement, and shall not relive the Contractor of its obligation to complete the work as specified in the Contract Documents and in compliance with all applicable laws and regulations.

Section 25.10. WORK AFTER NOTICE OF COMPLETION.

Contractor shall do no work after recordation of a Notice of Completion, save only work required by the warranties and guarantees provided under the Agreement for Construction.

Any work done after recordation of a Notice of Completion shall be conclusively presumed to be in furtherance of the Contractor's obligations on such warranties and guarantees for all purposes.

Section 25.11. STOP NOTICES; WHERE TO FILE; ENFORCEMENT.

All persons are advised hereby that all Preliminary Notices and Stop Notices shall be filed at the following address:

County of Yolo
General Services Director
General Services Department
120 West Main Street, Suite D
Woodland, CA 95695

The envelopes and the Notice shall clearly designate the name of the Project.

The Contractor shall cause the provisions of this Section to be inserted in all subcontracts and material contracts executed by the Contractor and notice of this provision shall be given to all persons furnishing materials for the Work.

All Stop Notice claimants are referred to Civil Code Section 3103 for the required contents of a Stop Notice, and Sections 3179 and following regarding enforcement/release of Stop Notice.



ARTICLE 26.

GUARANTEES AND WARRANTIES.

Section 26.01. GUARANTEE REQUIRED.

In addition to any guarantees required elsewhere by the Contract Documents, the Contractor shall guarantee the Work for a period of one (1) year from and after the recordation of the Notice of Completion, Notice of Cessation or, if neither is recorded, upon actual cessation of the Work. Such guarantee shall be made on the form provided, as set forth in Section 26.02 below.

Such guarantee is in addition to, and not in lieu of, the County's rights to enforce the Agreement for Construction in all respects, and the County's rights on all other guarantees and warranties required by the Technical Specifications.

Section 26.02. FORM OF GUARANTEE.

The guarantee required by this Article shall provide as follows:

The (Contractor) hereby unconditionally guarantees that the Work performed pursuant to the (Name of Project) Agreement for Construction (Yolo County Agreement No.) has been fully performed and completed in accordance with the requirements of the Agreement for Construction therefore and in compliance with all applicable laws and regulations, and further guarantees the Work of the Contract to be and remain free of defects in workmanship and materials for a period of one (1) year from the date of recordation of a Notice of Completion, Notice of Cessation, or actual cessation of work, whichever is longer. The Contractor hereby agrees to repair or replace any and all the Work, together with any adjacent Work which may have been damaged or displaced in so doing, that is not in accordance with the requirements of the Agreement and applicable laws and regulations, or that may be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to the County of Yolo, ordinary wear and tear excepted. The Contractor has provided contract bonds that will remain in full force and effect during the guarantee period.

The Contractor further agrees that within ten (10) calendar days after being notified in writing by the County of Yolo of any Work not in accordance with the foregoing requirements he will commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee, and to complete the Work within a reasonable period of time. In the event he fails to so comply, he does hereby authorize the County of Yolo to proceed to have such Work done at the Contractor's expense and he will pay the cost thereof upon demand. The County shall be entitled to all costs, including reasonable attorney fees, necessarily incurred upon the Contractor's refusal to pay the above costs.

Notwithstanding the foregoing paragraph, in the event of an emergency constituting an immediate hazard to the health or safety of the employees or property of the County of Yolo, the County may undertake, at the Contractor's expense and without prior notice, all Work necessary to correct such hazardous condition when it was caused by the Work and/or the Contractor's not being in accordance with the foregoing requirements, and to charge the same to the Contractor as specified in the preceding paragraph.

This guarantee set forth herein is not intended by the parties, nor shall it be construed, as in



any way limiting or reducing the County of Yolo's rights to enforce all terms of the Agreement for Construction referenced hereinabove or the time for enforcement hereof. This guarantee is provided in addition to, and not in lieu of, the County's rights on such Agreement.

This Agreement is in addition to, and not in lieu of, the County's rights on all other guarantees and warrants required by the Contract Documents.

CONTRACTOR' SIGNATURE

(CORPORATE SEAL)

Section 26.03. GUARANTEE CONTRACT BOND.

Prior to Final Payment, the Contractor shall post a surety securing performance of his guarantee, as required by section 2.04 hereof.

Section 26.04. OTHER GUARANTEES.

All other guarantees or warranties required by the Contract Documents shall be subject to approval as to form by the County. At a minimum, such guarantees or warranties shall provide that the guarantor/warrantor shall repair or replace defective materials and/or workmanship, along with adjacent work that may be damaged or displaced in so doing and shall be unconditional. Such guarantees are in addition to, and not in lieu of, the product manufacturers' warranties, expressed or implied, and the Contractor's guarantee required by this Article.

Section 26.05. GUARANTEES NOT WAIVER.

By accepting the guarantees required by the Contract Documents, the County shall not be deemed to have waived any warranty or buyer protection implied, required and/or provided by the law of the State of California, nor to have altered any applicable statute of limitations regarding enforcement of any right of the County created by the Agreement for construction or otherwise. These guarantees and warranties are in addition to, and not in lieu of, such rights.

No disclaimer or limitation of any such right shall be valid unless properly executed by the County.



ARTICLE 27.

COUNTY'S RIGHT TO TERMINATE AGREEMENT.

Section 27.01. GROUNDS FOR TERMINATION.

The County may terminate the Agreement for Construction, pursuant to the provisions of this Article, for the following causes:

- A. The Contractor has been adjudged bankrupt or has made a general assignment for the benefit of creditors, or that a receiver has been appointed on account of the insolvency of the Contractor.
- B. The Contractor or any of his subcontractors violates any of the provisions of the Contract Documents or fails to perform the Work within the Contract Time specified in the Progress Schedule then in effect and approved by the County;
- C. The Contractor or any of his subcontractors fails to make prompt payment to subcontractor or material men for material or for labor.
- D. The Contractor or a subcontractor persistently disregards laws, ordinances, or the instructions of the County.
- E. The Contractor fails to provide and keep in full force and affect all required insurance, and to cause all subcontractors to so comply.
- F. Neglect of the work amounting to material breach of the Agreement for Construction.
- G. Any other material breach by the Contractor.

Section 27.02. PROCEDURE FOR TERMINATION.

Upon the certification of the Contract Administrator that sufficient cause exists to justify the termination of the Agreement for the Construction, the County Board of Supervisors may, without prejudice to any other right or remedy of the County, give written notice to Contractor and his surety or sureties of its intention to terminate the Agreement.

Unless within seven (7) days of the giving of such notice, the Contractor shall cease such violation and make satisfactory arrangements for a correction thereof, the Agreement shall, upon the expiration of the said seven (7) days, cease and terminate.

In the event of any such termination, the County shall immediately give written notice thereof to the surety and to the Contractor and the surety shall have the right to take over and perform the Contract; provided, however, that if the surety within fourteen (14) days after service of the notice of termination, does not commence performance of the Contract, the County may take over the Work and prosecute the same to completion by contract or by any other method it may deem available, for the account and at the expense of the Contractor, and the Contractor and his sureties shall be liable to the County for any costs occasioned by the County thereby. In such event, the County may, without liability, take possession of and utilize in completing the Work, such materials as may be on the Site of the Work and necessary, therefore. In any such



case, the Contractor shall not be entitled to receive any further payment until the work is finished.

Section 27.03. RECONSTRUCTION IN EVENT OF LOSS.

In the event of a partial or total destruction of any or all of the work or materials to be provided pursuant to this Agreement, at any time prior to the final completion of the Project and the final acceptance of the Work by the County, the Contractor promptly shall reconstruct, repair, replace or restore, all work or materials so destroyed at no cost to the County.

Nothing herein provided shall in any way excuse the Contractor from the obligation of furnishing all the required materials and completing the Work in full compliance with the terms of the Contract Documents; provided that a reasonable time extension shall be negotiated by the parties.

This section shall not apply if the destruction is by an "Act of God" as defined in Public Contract Code Section 7105 and the loss is in excess of five percent (5%) of the total Contract price.

Section 27.04. OPTION IN EVENT OF A LOSS.

In the event that any destruction or loss should exceed twenty percent (20%) of the value of the construction completed to date, as determined at the end of the preceding month, or is due to an "Act of God" as defined above, the County shall have the option at its sole discretion to terminate this Contract.

Section 27.05. PROVISION FOR TERMINATION OF CONTRACT.

This Contract is subject to termination as provided by Section 4410 and 4411 of the Government Code, being portions of the Emergency Termination of Public Contracts Act of 1949.



ARTICLE 28.

ADDITIONAL PROVISIONS.

Section 28.01. CONFLICT OF INTEREST.

No official of the County who is authorized on behalf of the County to negotiate, make, accept, or approve, any architectural, engineering, inspection, construction, or materials supply contract, or any subcontract in connection with the construction of the Project, or any land acquisition in connection with the Project, shall become directly or indirectly interested personally in the Agreement for Construction or in any part thereof.

No officer, employee, architect, construction manager, attorney, engineer or inspector of or for the County who is authorized on behalf of the County to exercise any executive, supervisory, or other similar function in connection with the construction of the Project shall become directly or indirectly interested personally in the Agreement for Construction or any party thereof.

Section 28.02. NOTICES.

Any notice from one party to the other pursuant to the Contract Documents shall be in writing and shall be dated and signed by the party giving such notice or by a duly authorized representative of such party. Any such notice shall not be effective for any purpose whatsoever unless served in the following manners: If the notice is given to the Contract Administrator, it must be served personally at his office or by depositing same in the United States Mails, in a sealed envelope, correct postage prepaid, and correctly addressed to the address shown the Instructions to Bidders.

If the notice is given to the Contractor, it must be by personal delivery thereof to Contractor or to Contractor's Project superintendent at the Site of the Work, or by depositing the same in the United States Mails, in a sealed envelope, addressed to the Contractor at the place designated in the Bid by the Contractor for the receipt of correspondence.

If the notice is given to a surety of the Contractor, it must be by personal delivery to such surety or by depositing the same in the United States Mails, in a sealed envelope, addressed to such surety or other person at the address last communicated by him to the County. Copies of all such notices shall be delivered to the Contractor.

Section 28.03. NO VERBAL AGREEMENTS.

No verbal agreement or conversation with any officer, agent, or employee of the County, either before, during, or after the execution of the Contract Documents shall affect or modify any term or condition contained in the Contract Documents, nor shall such verbal agreement or conversation entitle the Contractor to any additional payment or time to perform whatsoever under the terms of the Agreement for Construction.

Section 28.04. EXAMINATION OF PROPOSED PROJECT LOCATION AND CONTRACT DOCUMENTS.

By submitting its Bid and executing the Agreement for Construction, the Contractor warrants that prior to bidding it carefully examined the location of the Project, that it carefully reviewed the Contract Documents, and that it is fully aware of all the Work called for by the Contract Documents, the nature of the



Site, and the requirements of all Specification including these General Conditions. The Contractor also warrants that it is familiar with all relevant circumstances and conditions affecting construction projects in Yolo County, California, and the particular site, and has the requisite experience and skill to perform the Agreement for Construction on the Site of the Project.

Section 28.05. NOTICE OF POTENTIAL CLAIMS.

A. The Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act or failure to act, by the County or any of its officers, agents, or employees, or the happening of any event, thing or occurrence, unless he shall have given the County written notice of potential claims as specified herein.

The written notice of potential claims shall set forth the reasons for which the Contractor believes additional compensation should be paid, a firm estimate or accounting of the cost involved, and, insofar as possible, the total amount of the claim.

Such notice must have been given to the County prior to the time that the Contractor shall have performed the work giving rise to the potential claim if based on an act or failure to act by the County, or in all other cases within five (5) days after the happening of the event, thing, or occurrence giving rise to the potential claim or such other time as may be specified herein.

It is the intention of this Section that differences between the parties arising as a result of performance of the Contract shall be brought to the attention of the County at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken. The Contractor hereby agrees that he shall have no right to additional compensation for any claim that may be based on any such act, failure to act, event, thing or occurrence, for which no written notice of potential claim was filed as required by this section.

This subsection shall not supersede, but shall be superseded by, any provisions of these Contract Documents that specifically set forth the procedure for the Contractor to give notices of claims to the County in any particular case.

B. Any lawsuit, action or other proceeding seeking damages, costs, compensation or any other recovery, based upon any claim related to the Project, including but not limited to claims of the Contractor, subcontractors, suppliers, laborers and workers, must be preceded by a claim filed in accordance with Government Code Sections 900 et seq.

Section 28.06. CONTINUING WORK IN DISPUTE.

The Contractor shall not delay or suspend performance of the work pending resolution of any dispute or controversy between the County and the Contractor or any other person, firm, or entity involved in the Work.

If these General Conditions specify a procedure to resolve the particular issue, it shall be followed. If no specific procedure is specified, the Contractor shall give notice of the dispute as provided in Section 28.05.

The County's resolution of the issue shall be followed by all parties for the remainder of the Work. If notice has been filed pursuant to Section 28.05, the Contractor is authorized and shall request a Final Change



Order to satisfy the unresolved Contract Price or Time claims arising from the issue, pursuant to Section 25.01.

Section 28.07 ASSIGNMENT OF CERTAIN CLAIMS

In entering into this contract, or any subcontract to supply goods, services, or materials pursuant to this contract, the Contractor and any subcontractor offers and agrees to assign to the County all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the contract or the subcontract. This assignment shall be made and become effective at the time the County tenders final payment to the Contractor, without further acknowledgment by the parties.

Section 28.08 NO THIRD-PARTY BENEFICIARIES

Except where specifically stated otherwise in the Agreement for construction, the promises in the Agreement benefit the COUNTY and CONTRACTOR only. They are not intended to, nor shall they be interpreted or applied to, give any enforcement rights to any other persons (including corporate) that might be affected by the performance or non-performance of this agreement, nor do the parties hereto intend to convey to anyone else any "legitimate claim of entitlement" with the meaning and rights that phrase has been given by case law.

END OF GENERAL CONDITIONS

SECTION 27 10 00**STRUCTURED CABLING SYSTEM****PART 1 – GENERAL****1.01 DESCRIPTION OF WORK**

- A. The extent of telephone/data system, Structured Cabling System (SCS) work is indicated and is hereby defined to include, but not be limited to cable, cable supports, raceway, connectors, racks, cabinets, panels, wire management, device plates, patch cords, backboard, grounding, firestop and miscellaneous items required for a complete, tested and operational system.
- B. Provide, install and test the complete cable and outlet system as indicated and described herein. Work includes procurement, project management, installation, labeling, termination, testing and cleanup of all cables installed under this project.
- C. Provide system testing, as-builts (redlines) of installed cables and numbering plan, Operations & Maintenance Manuals (O&M's), and processing of warranty registration with Manufacturer.
- D. Project coordination with General Contractor, Owner, Owners Representative, and other trades before, during and upon completion of project as necessary for a well-executed project.
- E. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
- F. Horizontal copper cabling system consists of four twisted pairs of solid annealed copper. Each four-pair cable is terminated onto 8 position 8 conductor ("RJ45", or 8P8C) outlet connectors ("Jacks") using Insulation Displacement Conductors (IDCs). Color-coded connectors are placed into NEMA rated faceplates at the work area and placed into corresponding rack-mounted patch panels in the equipment / networking rooms. The jacks use state-of-the-art techniques to effectively eliminate Alien Crosstalk.
- G. Bridged taps and/or splices will not be installed in the horizontal cabling.
- H. Communications cables shall be rated CMR (riser) or CMP (plenum). CMP cable ratings are required for cables passing through or contained within plenum air handling spaces, such as above drop ceilings and return or supply air shafts. The contractor is responsible for installing the correct cable type in the appropriate environment, and any failures to do so according to the Owner or the Authority Having Jurisdiction (AHJ) will result in the contractor removing the unsuitable cable and installing the correct cable, at their own expense.
- I. The maximum allowable horizontal cable length installed in the permanent link (jack to jack) is 295 feet (90 m). This maximum allowable length does not include an allowance for patch cords, maximum length of 16 feet (5 m) to the workstation equipment and of 16 feet (5 m) in the horizontal cross-connect.

1.02 DIVISION OF RESPONSIBILITY

- A. Owner:
 - 1. All Local Area Network (LAN) hub equipment
 - 2. All active electronics required at the telecom room.
 - 3. Server Room Cabinets
- B. Contractor:
 - 1. As indicated on plans and specifications.
 - 2. Testing

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. ACCEPTABLE MANUFACTURER SOLUTIONS:
 - 1. Panduit

2. General Cable
 3. Owner Pre-approved equal
- B. Owner has standardized on a unified, end-to-end copper and optical fiber cabling system design based on Panduit jacks, patch panels, patch cords, (Panduit / General) fiber cords, (Panduit / General) fiber connectors, trunk cables, (Panduit / General) fiber enclosures and modules, as well as General Cable field-terminable copper and (Panduit / General) fiber cables. The Owner is satisfied that the products specified herein are qualified for the purpose intended, and has performed due diligence in establishing a consistent set of standards based on performance and feature set.
- C. Prior to ordering any material, provide a complete submittal, in electronic format to include copies of brochure information on all products for installation on this project. All product data and specification sheets shall be organized in the same manner as the products portion of the specifications. If more than one product is listed on the same page of the brochure or specification sheet submitted, the intended product or part number shall be clearly indicated or highlighted by the Contractor
- D. Contractor shall submit along with the materials submittal all Proposed Test Procedures and a sample of the printout or test result form as well as a list of all Test Equipment to be used for cable testing. Within two (2) weeks of completion of testing all cabling systems, Contractor shall submit an electronic copy of the test results as directed in the Testing portion of the Specifications.
- E. Products which are proposed in the bid response which are of an alternative solution are to be prequalified as "equal or better" by the Designer and Owner, in writing, prior to bid acceptance. If substitutions are allowed, they are at the discretion of the Owner and based on performance, suitability, quality, administrative requirements, warranty and other factors deemed important to the Owner. Written acceptance of substitutions from Owner must be included in bid package to avoid disqualification of bid.
- F. Submit manufacturer's data and installation details for all devices, plates, cable, terminal blocks, patch cords, racks, wire management, labels and similar equipment which are not in accordance with Owner standards.
- G. Submit a copy of 3rd party testing and certification documents which prove they meet or exceed the requirements as set forth in this document, for any product or system not specified herein or proposed as an "equal" substitute for Owner-approved products. All products must have independent test data published prior to bid.
- H. Any substitutions must be approved by Designer, Owner and/or Owner's Representative in writing prior to acceptance of bid.
- I. Company Certification: The Proposer must be certified by the manufacturer of the submitted system. If different manufacturers will be used there must be a company certification for each, and its use to be approved and authorized by County Telecommunications Staff. The Proposer must provide evidence of this certification as part of the submittal process.

1.04 REFERENCE STANDARDS

- A. Strictly adhere to all Building Industry Consulting Service International (BICSI), and Telecommunications Industry Association (TIA) recommended installation, best practices, codes, and standards when installing The Structured Cabling System.
- B. Material and work specified herein shall comply with the applicable requirements from the following Codes and Standards.
1. AAAC-B – Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers
 2. ANSI/TIA-492.AAAD – Detail Specification for 850-nm Laser- Optimized, 50- μ m Core Diameter/125- μ m Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber
 3. ANSI/TIA-492.CAAB – Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak. Current Edition

4. ANSI/TIA-568.0-D – Generic Communications Cabling for Customer Premises
 5. ANSI/TIA-568.1-D – Commercial Building Communications Cabling Standard
 6. ANSI/TIA-568-C.2-1 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards
 7. ANSI/TIA-568.3-D – Optical Fiber Cabling and Components Standard
 8. ANSI/TIA-569-D – Telecommunications Pathways and Spaces
 9. ANSI/TIA-606-B.1 – Administration Standard for the Commercial Telecommunications Infrastructure.
 10. ANSI/TIA-607-C – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
 11. ANSI/TIA-862-B – Structured Cabling Infrastructure Standard for Intelligent Building Systems
 12. ANSI/TIA-942-A – Telecommunications Infrastructure Standard for Data Centers
 13. NFPA 70 – National Electrical Code (NEC).
 14. BICSI – TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM)
- C Fire stopping shall be in accordance with ASTM E 814, ASTM E 136, and UL 1479 as well as Section 300-21 of the National Electric Code.
- D Other applicable standards. ANSI C2-2010 National Electric Safety Code. UL 497 Electrical Grounding and Bonding Equipment.
1. IEEE 802.3 Carrier Sense Multiple Access with Collision Detection.
 2. FCC Rules and Regulations, Part 68.
 3. Basic, Uniform, and Standard Building Codes (BOCA, ICBO, SSBC).
 4. REA Cable Designations - PE Series Specifications
 5. NFPA 101 - Life Safety Code
- E Conditions: Materials and equipment provided must be new products of manufacturers regularly engaged in the production of such products.
- F UL Listing: Products must be UL listed where a UL test procedure is applicable.
- G Communications system materials and equipment shall be FCC Type-accepted and certified as such by supplier.

1.05 ADMINISTRATION REQUIREMENTS

- A. The Electrical Code referred to in these specifications is the National Electrical Code as currently adopted by the State of California. All work will be provided in strict compliance with the Electrical Code and all regulations that may apply.
- B. Where standards exist, for a category, products used on this project will be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL), and be approved or listed for the intended service and application.
- C. These specifications do not undertake to repeat the requirements of codes, regulations or NRTL listing or labeling instructions. The Specifications or Drawings may require items or work beyond the requirements of applicable codes or regulations. The stricter, higher quality, greater quantity or higher cost will be allowed, and accommodations must be approved by Owner/Designer prior to procurement or installation. It is incumbent on the Installer, material and equipment suppliers to meet these specifications, applicable codes, regulations, and NRTL listing agency restrictions.
- D. The word "Manufacturer" will include the Manufacturer, the Manufacturer's Representative, the Distributor, the Fabricator, and the Supplier of the particular classification of equipment, system, product, and material.
- E. All work, equipment, and systems will be manufactured, provided, repaired, installed, and tested in accordance with the latest edition and all current amendments of the applicable publications and standards of the organizations listed below as of the date of the Contract Documents.

When the Specification requirements exceed the requirements of these publications and standards the Specifications will govern:

1. State Building Code (SBC)
 2. Building Department Inspectional Services
 3. American Society for Testing and Materials (ASTM)
 4. Underwriter's Laboratories, Inc. (UL)
 5. Insulated Cable Engineers Association (ICEA)
 6. National Electrical Manufacturers Association (NEMA)
 7. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
 8. American National Standards Institute, Inc. (ANSI)
 9. National Fire Protection Association (NFPA)
 10. Local Electric Code
 11. Department of Public Safety (DPS)
 12. Building Officials and Code Administrators International, Inc. (BOCA)
 13. Department of Labor USA. Safety and Health Regulations for Construction (OSHA)
 14. Energy Codes
 15. National Electrical Contractors Association (NECA)
 16. National Bureau of Standards (NBS)
 17. Federal Communications Commission (FCC)
 18. Utilities Serving Project.
 19. Fire Department.
 20. Americans with Disabilities Act Applications Guidelines (ADAAG).
 21. Accessibility Guidelines for Buildings and Facilities.
 22. Any and all Federal, State and Local Standards, Codes and Authorities having Jurisdiction (AHJ).
 23. Buy America Act (BAA), 41 U.S.C. § 8301-8305
- F. In addition, all phases of the Structured Cabling System installation will adhere to applicable Local Area Network (LAN) Specifications of the IEEE, Electronics Industry Association/Telecommunications Industry Association (TIA/EIA), and Building Industry Consulting Service International (BICSI). The entire system and all components will be Nationally Recognized Testing Laboratory (NRTL) certified to appropriate TIA/EIA performance rating Category, Latest ANSI/TIA/EIA Standards 455-A, 492, 568, 569-A, 570, 606, 607 and 758 (latest revisions), and ANSI/TIA TSB 67, TSB 72, TSB 75, TSB 95 plus other standards as applicable.
- G. The above requirements will not in any way limit responsibility or requirements to comply with all other codes, standards and laws.
- H. Material, equipment, enclosures, and systems will be designed for use as required to suit the conditions, exterior or interior operation, dust tight, water tight, explosion-proof, or other special types.
- I. All materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.

1.06 QUALIFICATIONS

- A. The Structured Cabling System (SCS) required for this project shall be the following: The Contractor must have current Panduit Partner ONE Certified Installer Certificate and be qualified to offer a Panduit Certification PLUS 25-year A PanGen system performance warranty.
- B. A PanGen™ System Warranty shall provide a complete system warranty to guarantee end-to-end high-performance cabling systems that meet application requirements. The guarantee shall include cable and connectivity components and have one point of contact for all cabling system issues. The system shall be warranted for a period of at least 25 years.
- C. In order for the structured cabling system or additional links to be eligible for warranty coverage, an installation company trained and certified by PANDUIT® and General Cable must install

them. The contractor shall have completed standards based product and installation training. A copy of the PCI Certificate or PanGen Installer Certificate shall be submitted in the proposal.

- D. All PANDUIT ® Pan-Net ® non-consumable products have a 20-year guarantee. When installed per TIA or ISO/IEC standards, the Cabling System will operate the application(s) for which the system was designed to support.
- E. In order to qualify for the guarantee, the structured cabling system must be installed per the following:
 - 1. Meet all TIA/EIA commercial building wiring standards.
 - 2. PANDUIT ® categorized product must be used in conjunction with an equivalent or higher Category UL or ETL verified cable.
 - 3. PANDUIT ® Products must be installed per PANDUIT ® instruction sheets.
 - 4. Categorized copper product shall be used in conjunction with General Cable of equivalent or higher Category cable as verified by ETL, UL or PANDUIT ® engineering
- F. The company must have a minimum of three (3) years' experience in low voltage installations for voice, data, and fiber optic cabling systems.
- G. The Panduit Partner ONE Certified Installer Certificate must be in place 45 days prior to bid. All personnel performing work on this project must have gone through the Panduit Partner ONE Certified Installer Certificate training program as required by Panduit prior to performance of work.
- H. Warranty: All repair, including labor and material, shall be made at no cost to the owner during the warranty period. All warranties shall be provided in writing to Owner prior to acceptance of the cabling system.
 - 1. The contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data and voice systems. The Contractor shall at a minimum possess the following qualifications:
Provide references of the type of installation provide in this specification.
 - 2. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
 - 3. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
 - 4. Be in the Low Voltage or Telecommunications Installation business for a minimum of three (3) years. If project is in California, contractor must possess a current California C7 or C10 license. Projects in other states must be supported by the appropriate minimum level contractor's license required for the work involved.
 - 5. Maintain a certified RCDD on staff and utilize manufacturer trained, or BICSI certified Installers for this project.
 - 6. Contractor must be less than 100 miles from project location.
- I. Be an approved Member in good standing of the Certified Installer network associated with the products listed in this Specification and authorized for use in this Project. Contractor must be a member of this installer program before, during, and through completion of the system installation. Supporting documentation will be required as part of the submittal.
- J. Product manufacturer and cabling solution hardware are specified for performance, applications requirements, and warranty purposes. Contractor may provide an, "or equal cabling solution" if the contractor is an authorized installer certified to provide full manufacturer warranties.
- K. All structured cabling products shall be installed according to any applicable instructions.
- L. All networks and other applications shall be installed per applicable standards and manufacturers' guidelines and transmitted over the appropriate minimum Category copper cable or fiber cable for which it was intended to operate on
- M. All applicable local, state, national, and federal electrical and fire safety standards shall be adhered to during and after installation.

1.07 WARRANTY

- A. Panduit Certification PLUS 25-year system performance warranty covering all components (cable, jacks, panels, patch cords, equipment, workmanship, etc.) shall be provided to the Owner, submitted in writing with system documentation. The warranty period shall begin on the system's first use by the owner.
 - 1. Horizontal channels shall be completed with Panduit/General factory-terminated copper and/or fiber optic patch cords in order to be eligible for the applicable Warranty with channel performance guarantees.
 - 2. Approved product shall be listed on the most recent version of the applicable Manufacturer's data sheets for each listed solution.
 - 3. The Contractor must pre-register the project with the Manufacturer before installation has begun. Following project completion, contractor is responsible for completing all warranty registration procedures on behalf of the Owner.
 - 4. Should the cabling system fail to perform its expected operation within this warranty period due to inferior or faulty material and/or workmanship, the contractor shall promptly make all required corrections without cost to the owner.
- B. Certified Installer shall provide labor, materials, and documentation in accordance with Manufacturer requirements necessary to ensure that the Owner will be furnished with the maximum available Manufacturer's Warranty in force at the time of this project.
- C. The installed structured cabling system shall provide a warranty guaranteeing the specified performance in the installed channel performance above the ANSI/TIA-568 requirements for Augmented Category 6 (CAT 6A) cabling systems or ISO 11801 requirements for Class E and Class EA, respectively.
 - 1. Standards-compliant channel or permanent link performance tests shall be performed in the field with a Manufacturer-approved certification tester in the appropriate channel or permanent link test configuration.
- D. Necessary documentation for warranty registration shall be provided to the manufacturer by the installer (within 10 days) following 100 percent testing of cables.
 - 1. Installation Contractor shall submit test results to Manufacturer in the certification tester's original software files.
 - 2. Installation Contractor shall ensure that the warranty registration is properly submitted, with all required documentation within 10 days of project completion.
 - 3. Certified Contractor/Integrator must adhere to the terms and conditions of the respective manufacturer's warranty programs.
- E. Manufacturer shall ensure that the Owner receives the project warranty certificate within 60 calendar days of warranty registration.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials in manufacturer's standard protective packaging.
- B. Do not remove protective packaging until ready for installation.
- C. Follow manufacturer's instructions for storage & handling.
- D. Protection: Contractor shall take all necessary precautions to protect materials from the following:
 - 1. Theft
 - 2. Vandalism/Tampering
 - 3. Dents
 - 4. Scratches
 - 5. Dust
 - 6. Temperature
 - 7. Weather
 - 8. Cutting
 - 9. Paint
 - 10. Other Hazardous Conditions

- E. Replacement: Contractor shall replace any damaged or lost material as required by Owner or Consultant.
- F. Installed Materials: Installed materials remain the responsibility of the Contractor until Acceptance. Contractor shall take necessary precautions to ensure the safety and security of installed materials.

1.09 CONTRACT DRAWINGS AND SPECIFICATIONS

- A. The intent of the drawings and specifications is to establish the type of system and functions, but not to set forth each item essential to the functioning of the system. The drawings are generally diagrammatic and show approximate location and extent of work. In case of doubt of work intended, it is the responsibility of the Contractor to request instructions from the Engineer or Owner prior to bid. The Contractor shall be responsible for installing a complete functioning system.
- B. Contractor shall review all drawings and specifications before starting the work. Where discrepancies occur, Contractor shall immediately notify Engineer for clarification.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the specified system. Where a material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be a part of these specifications, as if completely contained herein in every detail. Each material, device or piece of equipment provided hereunder shall comply with all the manufacturer's published specifications for that item.
- B. Quantity: Provide quantity as shown on Contract Drawings, or as otherwise defined herein.
- C. Preference: Where more than one manufacturer is listed herein as acceptable or equivalent, preference is intended and implied by the order of listing.
- D. Substitutions: Comply with provisions of Division 01. Burden of proof of equivalence is on the Contractor.
- E. Provide Complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section as if specified in full herein.
- F. Provide New: All materials provided under the Work of this Section shall be new, shall be the manufacturer's latest design/model, and shall be permanently labeled with the manufacturer's name, model number and serial number.
- G. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.
- H. Safety Agency Listing: All devices provided under the Work of this Section which are connected to the Project electrical system shall be listed by Underwriters Laboratories (UL), and shall be so labeled.

2.02 TELECOMMUNICATIONS HORIZONTAL CABLING SYSTEM

- A. Category cable (data cable)
 - 1. Category 6a (cat6a) unshielded twisted-pair (UTP) cable
 - a. 100-Ohm, 23 AWG, Category 6A 4-pair balanced unshielded twisted pair solid annealed copper
 - b. Cable shall be characterized to 750 MHz and UL/ETL Listed by the Manufacturer printed on the cable jacket and package, as well as Intertek (ETL) Verified to TIA-568 Category 6A and ISO/IEC 11801 Class EA requirements for channel, link and component performance to support IEEE 10GBASE-T (802.3an) networks
 - c. Maximum Cable Outer Diameter: 0.250".

- d. Documentation available from an independent third-party testing agency that verifies through random sampling that cable components perform at or above the levels contained on their product specifications, not simply at or above the standard.
- e. Guaranteed cable balance improves overall performance and reduces emissions which results in error-free performance up to 10 Gigabit Ethernet with full duplex transmission
- f. The unshielded twisted pair conductors are surrounded by a non-conductive aluminum/polyester tape and jacketed with flame-retardant polymer alloy to reduce alien crosstalk, reduce cable diameter and improve performance.
- g. Provided on spools or reels-in-box to reduce risk of kinking cable upon deployment
- h. Cable shall be Plenum-rated (CMP) for any location where plenum cable is required.
- i. Category 6A cables shall have the following cable jacket (Yellow) for all outlets.
- j. Be made by an ISO 9001 and 14001 Certified Manufacturer.
- k. Guaranteed to meet or exceed Channel margin guarantees as stated above under System Performance

Approved Products:

- 1) Panduit: Yellow, PUP6AS04YL-G (Cat.6A/ Plenum/ Yellow/ solid model/ .250 O.D.)
- 2) Panduit: Yellow, PUR6AM04YL-CG Cat.6A/ Riser rated/ Yellow/ Matrix Model/ .285 O.D.)

B. Category-Rated Data Connectors (Rj45 Insert Jacks)

- 1. CATEGORY 6A Mini-Com® TX6A™ 10Gig™ UTP Jack Modules shall be Category 6A performance featuring Split Foil MaTriX Technology. These Category 6A (CAT6A) connectors shall be individual snap-in style, and exceed compliance with TIA/EIA-568-C.2 specifications. The connectors shall comply with the following:
 - a. The eight position modules shall terminate unshielded twisted 4 pair, 22 - 26 AWG, 100-ohm cable.
 - b. Comply with FCC Part 68; UL listed and CSA Certified. Verified to exceed all channel performance requirements in TIA-568-B.2-10 from 1 MHz to 500MHz to support the IEEE 802.3an standard for 10 Gigabit Ethernet over UTP Cable.
 - c. Jack module shall use Enhanced Giga-TX™ Technology with forward motion termination to optimize performance by maintaining cable pair geometry and eliminating conductor untwist.
 - d. The Mini-Com® TX6A™ Jack Modules include Split Foil MaTriX Technology on the external portion of the jack module, which assists in suppressing alien crosstalk. Connector shall have Pair Separation Towers on IDC to facilitate quick, easy terminations without a complete untwist of each pair of conductors.
 - e. The jack modules shall be universal in design, including complying with the intermateability standard IEC 60603-7 for backward compatibility.
 - f. The connector shall provide a ledge directly adjacent to the 110-style termination against which the wires can be directly terminated and cut in one action by the installation craftsperson.
 - g. Connector wiring label shall provide installation color codes for T568B wiring schemes on separate labels.
 - h. The Mini-Com® TX6A™ 10Gig™ Jack Module must be installed as part of a complete Copper Cabling System in order to achieve 10GBASE-T certified performance.
 - i. All Category 6A jack modules shall be UL and CSA approved and RoHS compliant.
 - 1) CJ6X88TG**.
 - 2) Where ** = one of 12 colors. See drawings or check with Owner for application.(OR)=Orange,

- j. The RJ11 type modules shall be available in six position/three pair USOC coded version and in 11 standard colors. They shall snap into all Mini-Com® outlets and patch panels. The module shall include a white base to signify Category 3.
- 1) CJ66U**
 - 2) Where ** = one of 12 colors. See drawings or check with Owner for application.
2. Additional Copper Cabling Connectors
- a. Additional Mini-Com® Modules for copper shall include the following:
 - 1) 50 and 75 Ohm BNC coax coupler modules, male-male
 - 2) F-Type coax coupler module, male-male threaded
 - 3) The connectors shall snap into all Mini-Com® outlets and patch panels.

a)	Part Number	Style	Medium	Termination Style	
b)	CMFBA**	F-Type	Copper	Coupler	5
c)	CMFSR**	F-Type	Copper	Coupler	5
d)	CMB**	Blank	-	-	5
- C. Faceplates, Frames and Inserts
1. Faceplates (wall plates) secure information outlets to the work area. Contractor shall provide and install single gang faceplate kits to house all jacks as required for all work area outlets, workstation base feeds, and furniture openings. Unused telecom backboxes shall receive a solid blank faceplate.
 2. CLASSIC SERIES WITH LABEL AND LABEL COVER Frames shall be vertical, single and double gang frames with combination head screws, screw covers, labels, and a curved designer appearance.
 3. The faceplates shall mount onto standard U.S. NEMA boxes and adapters with screw-to-screw dimensions of 3.28" (83.3mm).
 4. Each faceplate frame shall accept flat, sloped, sloped shuttered, sloped recessed and blank 1/2 and 1/3 size module inserts that can be individually inserted and removed as required from the front of the frame without removing the frame.
 5. Telecommunications faceplates shall:
 - b. Utilize a ("QuickPort") footprint to match the approved connectivity manufacturer, and be made by the same manufacturer as the connectors.
 - c. Precisely match colors and materials of the power wiring device plates.
 - d. Support any connectivity media type, including fiber, AV and copper applications.
 - e. Have write-on or printable designation labels for circuit identification together with a clear plastic cover.
 - f. Be available in single-gang and double-gang configurations.
 - g. Have surface-mount boxes and standoff rings available for both single and double gang faceplates.
 - h. Have single-port blank inserts to match faceplate color, available in packs of 10.
 - i. Color shall match nearby electrical devices exactly. Off-color ivories or whites will not be accepted.
 - j. Furniture faceplates shall fit existing knockouts for telecom receptacles, and snap in without screw mounts.
 - k. Decora® inserts shall hold from 1 to 6 jacks per device plate.
 - 1) Classic Series: CFP1**
 - 2) Classic Series: CFP2**
 - 3) Classic Series: CFP4**
 - 4) Where ** = one of 12 colors. See drawings or check with Owner for application.

(IW)=Off White, (AW)=Artic White, (EI)=Electric Ivory, (YL)=Yellow,
 (OR)=Orange, (BU)=Blue, (VL)=Violet, (WH)=White, (RD)=Dark Red,
 (GR)=Green, (IG)=International Grey, (BL)=Black
- D. Surface-Mount Blocks (SMB)
1. Surface-Mount Blocks (SMBs) are used to protect terminated CAT6A cables at the endpoints where they are not contained within walls or furniture. Example locations may be

Wireless Access Points (WAPs), Group Work Areas fed by conduits run down columns, security cameras, or other network-enabled device locations.

2. Ceiling, WAP, Camera and other non-wallmount locations will use a 2-port plastic SMB.
3. Small Surface-Mount Boxes shall exhibit the following characteristics:
 - a. Outlet housings for WAPs and other devices shall be a high-density, low profile design with (1) to (12) field-configurable ports, snap-lock cover, and cable knockouts on back.
 - b. Housing cover shall have raceway knockouts for top and bottom entry. Base shall include Tie-wrap anchor points at all cable entrances.
 - c. The housing shall be mountable with screws, tape or a single magnet.
 - d. The cover shall provide the option of securing it to the base with a screw that is hidden under the outlet identification window.
 - e. Shall be constructed of high-impact self-extinguishing plastic rated UL 94V-0, and be UL Listed and compliant with FCC Part 68 and TIA-568 specifications.
 - f. 1- and 2-port housings are suitable for installation in air-handling spaces (plenum)

Approved Products:

- 1) CBX1**-A (1 port)
- 2) CBX2**-AY (2 port)
- 3) CBXJ2**-A (2 port, low profile)
- 4) Where ** = one of 12 colors. See drawings or check with Owner for application.

(IW)=Off White, (AW)=Artic White, (EI)=Electric Ivory, (YL)=Yellow,
(OR)=Orange, (BU)=Blue, (VL)=Violet, (WH)=White, (RD)=Dark Red,
(GR)=Green, (IG)=International Grey, (BL)=Black

E. Modular Furniture Faceplates

1. Modular Furniture Faceplates shall be four-port flat or angled and two port angled faceplates that snap directly into TIA/EIA standard furniture openings.
2. The two port, angled faceplate shall provide a 45° slope to the side, in-line with the cable running through the furniture channel. If required, an extender shall be used with the four-port flat faceplate to provide 12.7mm (0.5") additional depth.
3. Each faceplate shall accept Mini-Com modules that can be individually inserted and removed as required.
 - a. UICFFP4** (snaps into standard knockouts)
 - b. CFFP4** (flat with (4) modules)
 - c. CFFPA2** (sloped with (2) modules)
 - d. CFFPL4** (flat with label (4) modules)
 - e. CFFPLA4** (sloped with label (4) modules)
 - f. Where ** = one of 12 colors. See drawings or check with Owner for application.

(IW)=Off White, (AW)=Artic White, (EI)=Electric Ivory, (YL)=Yellow,
(OR)=Orange, (BU)=Blue, (VL)=Violet, (WH)=White, (RD)=Dark Red,
(GR)=Green, (IG)=International Grey, (BL)=Black

F. Modular Patch Panels

1. Telecommunications Room Patch Panels shall be manufactured with empty ports, which allow for the insertion of appropriately-graded and colored jacks.
 - a. Available in either 24- or 48-port 2RU versions.
 - b. Independently tested and verified by Intertek (ETL) to meet or exceed all TIA component, permanent link, and channel requirements of TIA-568 for Cat 6A, FCC part 68, and IEC 60603-7.
 - c. An appropriate cable management bar shall be included with standard density flat panels.
 - d. Shall be sized to fit a TIA standard, 19-inch relay rack and hole pattern.
 - e. There shall be pre-printed numbers above each port for easy identification and white write on areas for port and/or panel identification on the 24 and 48 port version.

- f. The panel shall have vertical and horizontal cord organizers available as to improve patch cord management.
 - g. Verify angled or flat panel use per design documentation or verification with Owner's Representative.
 - 1) Approved Products:
 - 2) Mini-Com Flush Mount Modular Angled Patch Panel, 24 Port, CPPA24FMWBLY
 - 3) Mini-Com Flush Mount Modular Angled Patch Panel, 48 Port, CPPA48FMWBLY
- G. Copper Patch Cords
- 1. Category 6a patch cords
 - a. TX6A™ 10Gig™ Patch Cords shall be constructed with Category 6A 23 / 26-AWG stranded cable featuring MaTriX Technology. Patch Cords shall be factory terminated with modular plugs featuring a one-piece, tangle-free latch design and black strain-relief boots to support easy moves, adds and changes. TX6A™ 10Gig™ Patch Cords have incorporated MaTriX Technology and a barrier tape into the patch cable design to help suppress alien crosstalk and improve internal electrical performance. Patch cords shall be wired to be compatible with both T568A wiring schemes.
 - b. The patch cords shall be ETL verified ANSI/TIA-568-C.2 Category 6A and IEC/ISO 11801 Class EA channel performance. Each patch cord shall be 100% performance tested at the factory in a channel test to the ANSI/TIA-568-C.2 and IEC/ISO standards. The TX6A™ 10Gig™ Patch Cords must be installed as part of a complete TX6A™ 10Gig™ UTP Copper Cabling System in order to achieve 10GBASE-T certified performance.
 - c. Patch Cords shall be Contractor furnished/Owner Installed (CFOI)
 - 1) Part numbers:
 - 2) UTP6ASD5**
 - 3) UTP6ASD10**
 - 4) Where ** = one of 10 colors. See drawings or check with Owner for application.
(YL)=Yellow,
 - d. Provide Category 6A data patch cords, Panduit or approved equal for 50% of all data connections.
 - e. Provide 10', Panduit UTP6ASD*** yellow for workstation use and 5' lengths, Panduit UTP6ASD***yellow for closet use.

2.03 GROUNDING AND BONDING

- A. Wall-Mount Busbars
- B. Telecommunications Main Grounding Busbar (TMGB)
 - 1. Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
 - 2. Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
 - 3. The busbar shall be 4" (100 mm) high and 20" (510 mm) long and shall have 30 attachment points (two rows of 15 each) for two-hole grounding lugs.
 - 4. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 27 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.
 - 5. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
 - 6. The busbar shall be UL Listed as grounding and bonding equipment.
 - 7. Design Make shall be:
 - 8. Chatsworth Products, Inc. (CPI),
 - 9. Telecommunications Main Grounding Busbar:
 - 10. Part Number 40153-020, 20" x 4" (510 mm x 100 mm) Telecommunications Main Grounding Busbar, UL Listed.
- C. Telecommunications Grounding Busbar (TGB)

1. Telecommunications Grounding Busbar (TGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
 2. The busbar shall be 2" (50 mm) high and 12" (300 mm) long and shall have 9 attachment points (one row) for two-hole grounding lugs.
 3. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 6 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.
 4. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
 5. The busbar shall be UL Listed as grounding and bonding equipment.
 6. Design Make shall be:
 7. Chatsworth Products, Inc. (CPI),
 8. Telecommunications Grounding Busbar:
 9. Part Number 13622-012, 12" x 2" (300 mm x 50 mm) Telecommunications Grounding Busbar, UL Listed.
- D. Grounding Conductors
- a. Bare stranded copper ground conductors shall be provided and installed by the Contractor as shown on the project drawings to provide a grounding system consistent with the 2016 National Electric Code as well as TIA 607B.
 - b. Ground conductors shall be minimum 6 AWG between MDF/IDF Closets, and the Building Service Ground point and minimum 6 AWG green jacketed cable between hardware components located within the MDF/IDF closets.

2.04 BACKBONE CABLING SYSTEMS

- A. Interbuilding Backbone Copper Cable
1. Conductors-Solid, annealed copper, 24 AWG.
 2. Insulation-Solid, high density polyethylene, color coded in accordance with telephone industry standards.
 3. Twisted Pairs-Insulated conductors are twisted into pairs with varying lay lengths to minimize crosstalk.
 4. Core Assembly-25 pairs & less: pairs are assembling together in a single group. More than 25 pairs are arranged in groups or binders, each binder having a color-coded unit binder.
 5. Filling Compound-The entire core assembly is filled with ETPR compound, filling the interstices between the pairs and under the core tape.
 6. Core Wrap Non-hygroscopic dielectric tape applied longitudinally with an overlap.
 7. Aluminum Sheath-Corrugated, copolymer coated, 0.0008" aluminum tape applied longitudinally with an overlap. The sheath interfaces are flooded with an adhesive water blocking compound.
 8. Jacket-Black, low density polyethylene.
 - 1) Other multiples of 25 acceptable (50, 100, 200, 300pr as required or applicable)
 9. Acceptable Manufacturer: General Cable
- B. Intrabuilding Riser Cable
1. Multi pair riser twisted pair Cable Conductors category 5e.
 - a. Conductors-Solid, annealed copper, 24 AWG.
 - b. Twisted Pairs-Insulated conductors are twisted into pairs with varying lay lengths to minimize crosstalk.
 - c. Core Assembly-25 pairs & less: pairs are assembled together in a single group. More than 25 pairs are arranged in groups or binders, each binder having a color-coded unit binder.
 - d. Core Wrap-Non-hygroscopic dielectric tape applied longitudinally with an overlap.
 - e. Category 25-pair 5e cable shall have a GRAY cable jacket.

Acceptable Manufacturers:

- 1) General Cable: Blue Jacket CMR (non-plenum), 2133694E

- 2) General Cable: Gray Jacket CMR (non-plenum), 2133269E
 - 3) General Cable: White Jacket CMP (plenum), 2131550E
 - 4) Riser rated, CMR rated jacket.
 - 5) Plenum rated, CMP rated jacket.
- C. Horizontal 25 Pair Telephone Interconnect Cables
1. Category 3 25 Pair Voice Cable
 - a. Conductors-24 AWG solid bare annealed copper.
 - b. Sequential footage markers located on the jacket.
 2. Compliances:
 - a. ISO/IEC 11801
 - b. ANSI/TIA 568-B.2
 - c. UL Listed Type MPP/CMP, MPR/CMR
 3. Category 3 25-pair cable shall have a WHITE cable jacket
Acceptable Manufacturers:
 - 1) General Cable: White Jacket CMP (plenum), 2131505
 - 2) Plenum rated, CMP rated jacket.
 - b. Other multiples of 25 acceptable (50, 100, 200, 300pr as required or applicable)
- D. Wall-Mount Termination Fields:
1. Wall-mounted 110-style termination frames with legs
 - a. 110 Style termination/wiring blocks for cross connecting between voice station and riser cables shall be provided and installed as shown on the project plans.
 - b. 110 blocks shall be wall-mountable and manufactured with standoff legs to allow cables to pass behind. All required connecting blocks (4-pair and 5-pair), and labeling strips shall be included.
 - c. Connecting Blocks shall be Category 6 for all voice station cable installed.
 - d. Connecting Blocks shall be C-4 for all station cable installed.
 - e. Connecting Blocks shall be C-5 for all riser cable installed.
 - f. Acceptable Manufacturers: Cross-connects and wall terminations blocks will be: Panduit

1) GPB24-X	Standard Density Base	24 port	Rack/Frame
2) GPB72-X	Standard Density Base	72 port	Rack/Frame
3) GPBW72-X	Standard Density Base	72 port	With Legs
4) GPB144-X	High Density Base	144 pair	Rack/Frame
5) GPB432-X	High Density Base	432 pair	Rack/Frame
6) GPBW144-X	High Density Base	144 pair	With Legs
7) GPBW432-X	High Density Base	432 pair	With Legs
8) GPCB4-X	High Density Connector	4	
- E. Communication Entrance Protection:
1. Wall-mount 5-pin circuit protector blocks:
 - a. Provide multi-pair tails or 110-style input/output terminations per application.
 - b. Provide 5-pin, solid state surge arresters for each position on circuit protection panel C4B1S Series, or approved equivalent.
 - c. Circa use: 1880ENA1-25G, 1880ENA1-50G and 1880ENA1-100G, or approved equivalent.
 - d. Porta Systems, or approved equivalent
 - e. Systimax 710-SLC-25 filled modules, or approved equivalent.
 2. Fiber Optic:
 - a. Provide as close as practicable (within 50-feet) of where OSP cable enters building in a duct or conduit system. Size splice cases(s) to accommodate strand count of the cable(s) entering building. Splice case must be capable of bonding to the Telecommunications Main Grounding Bus Bar (TMGB). Complete with end caps to

properly seal cable from expanding water blocking gel. Approved manufacturers: Preformed, Corning, and 3M.

3. Miscellaneous Hardware:

- a. Provide supporting hardware, cable ties, labels, underground vault racking, bullet bonds, gel blocking kits, mule tape, and other miscellaneous hardware for a complete and operable system.

F. Fiber Optic Cable

1. SINGLEMODE Optical Fiber Cable

- a. Optical fiber cables run shall be low-water-peak Singlemode (OS2), and meet all the requirements delineated within the specifications of ANSI/TIA-568 and ANSI/TIA-492.AAAC-B.
- b. Armored fiber optic cables will utilize an interlocking armor outer cover around an integrated tight-buffer (indoor only) or Loose-Tube (indoor/outdoor) cable construction. Plenum armored fiber may be run in open ceilings without conduit or innerduct.
- c. Indoor fiber optic cable shall be minimum 12 strands, typically 24 strands, tight buffered, and individual fiber strands shall be 900 micron jacketed.
- d. Outdoor or indoor/outdoor fiber optic cable used for building-to-building interconnections shall be minimum 24 strands, loose tube construction with 250-micron jacketed fiber strands in a 12-strand buffer tube.
- e. Cables are typically OFNR rated for in-conduit applications, but must always be constructed of materials and rated appropriate for the environment in which it is installed (Indoor, Indoor/Outdoor, Outside Plant (OSP), OFNP or OFNR, OFCP or OFCR). In-slab conduits are considered a "wet environment" and require OSP or Indoor/Outdoor rating. Cables running at least a portion of the length through an open-air plenum or air handling space must be OFNP or OFCP (plenum) rated. Contractor is solely responsible for installation of the correctly-rated cable in the appropriate environment, as required by the AHJ or local ordinance
- f. Loose tube fibers shall utilize a fan-out kit to fit 250-micron fibers into a 900-micron protective sheath when terminating. Loose Tube cables are generally expected for outdoor environments.
- g. See plans and scope of work for total strand count between locations.

Approved Products:

- 1) Fiber Optic Pigtail: F9TSR17NNSNM001
- 2) 12-Strand – APO121PNR
- 3) 12-Strand – APO121PNU
- 4) Grounding Kit
- 5) Or other strand counts as specified

G. MULTIMODE Optical Fiber Cable

1. Multimode fiber optical fiber cables shall meet all of the requirements delineated within the specifications of ANSI/TIA-568 and ANSI/TIA-492.CAAB (OM4). Must be a minimum of 12 strands, of Laser-Optimized 50 micron Armored optical fiber. Cable jacketing must be appropriate for the environment in which it is installed (Indoor, Indoor/Outdoor, Outside Plant, OFNP or OFNR).
2. Fiber optic cables will utilize an interlocking armor outer cover around an integrated Tight-Buffered (indoor only) cable construction and fiber strands with a 900-micron protective sheath.
3. See plans and scope of work for total strand count between locations.

Approved Products:

- 1) Fiber Optic Pigtail: FZTSR17NNSNM001
- 2) Furnish 12-fiber, 24" fan-out Kit: FO6CB and/or FO12CB
- 3) 12-Strand – BLO121PNU

- 4) 12-Strand – BLO121PNR
 - 5) Grounding Kit
 - 6) Or other strand counts as specified
- H. Outside Plant Fiber Optic Cable
1. Multimode Fiber cable will be 50/125 micron (Suggest 12 strand)
 2. Singlemode Fiber cable will be 8.3/125 micron (Suggest 12 strand)
 3. OSP fiber shall be loose tube, all dielectric, armored outdoor cable.
 4. Riser cable shall be tight buffered all dielectric, Indoor/Outdoor cable.
 5. The multimode fiber cable must comply with the following minimum transmission parameters of 40Gbe and 100Gbe.
 6. Outdoor design shall offers water blocking for aerial and duct applications for standards compliance and flexibility for outdoor use.
 7. Bend radius: Dynamic: 20 x Cable O.D.; Static: 10 x Cable O.D.
 - a. Acceptable Manufacturers of fiber cable are Panduit:
 - 1) General Cable, OSP Loose Tube Single Jacket 12 Strand Multimode OM4 Fiber cable, Part number: BL0124M1A-DWB
 - 2) General Cable, OSP Loose Tube Armored 12 Strand Multimode OM4 Fiber cable, Part number: BL0124M1F-DWB
 - 3) General Cable, OSP Loose Tube Single Jacket 12 Strand Multimode OM4 Fiber cable, Part number: BL0124M1A-DWB
 - 4) General Cable, OSP Loose Tube Single Jacket 12 Strand Multimode OS2 Fiber cable, Part number: AQ0124M1A-DWB
 - 5) Furnish 12-fiber, 24" fan-out Kit: FO6CB and/or FO12CB
 - 6) Grounding Kit
 - 7) ** = total number of strand count
- I. Rack-Mount Fiber Optic Enclosures, Panels and Trays
1. All Fiber enclosures shall provide cross connect, inter connect, and splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
 2. Fiber Adapter panel openings shall accept Fiber Adapter Plates (bulkheads).
 3. 2RU and 4RU enclosures shall hold up to 3, 6 or 12 adapter plates
 4. All Fiber enclosures, panels and trays (units) shall provide cross-connect, inter-connect, and splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
 5. Fiber enclosures shall exhibit the following characteristics:
 - a. Fiber enclosure shall be available in 2RU or 4RU versions to accommodate fiber adapter plates, MTP Modules, and/or termination and splicing of fiber as needed
 - b. Enclosures shall have a sliding tray which can be removed completely from enclosure (from front or rear) to facilitate field terminations and splicing. Sliding tray glides forward and backward providing accessibility to front and rear bulkhead after installation.
 - c. 17" depth for high density fiber termination and/or splicing.
 - d. Removable transparent hinged doors and slide away covers allow easy access during install and visibility of interior after installation.
 - e. Patch cord bend radius guides minimize macro bending.
 - f. Stackable and adjustable fiber rings simplify cable routing and organization
 - g. Fiber Jumper saddles pivot for improved patch cord routing and organization
 - h. Removable rubber grommets protect cable and minimize dust build-up
 - i. Multiple mounting bracket positions for 19" rack and cabinet installation.
 - j. Constructed of durable polycarbonate plastic and 16-gauge steel, powder-coated black
 - k. Door lock option available on front, rear, or both doors
 - l. Fiber cable management shall allow for routing, storage, and protection of patch cords, tight-buffer fiber, and backbone cables.
 - m. Enclosure shall be available either empty or in custom pre-loaded configurations.
- Approved Products:
- 1) Rack-Mount Enclosure, FRME2 (2RU)

2) Rack-Mount Enclosure, FRME4 (4RU)

J. Fiber Connectors

1. Pre-polished fiber optic connectors shall be the primary means of field-terminating individual fiber strands at the enclosure or faceplate location.
2. Shall meet or exceed the requirements described in TIA-568 and ANSI/TIA-604-10 (LC) Connector Impermeability Standards
3. Shall be pre-polished and field installable to eliminate the need for hand polishing, bonding, or epoxy in the field.
4. Shall utilize a precision zirconia ceramic ferrule, and be re-terminable up to 3 times during testing without loss of performance.
5. Shall require the use of a cleaver with a guaranteed maximum cleaving angle of 2 degrees for multimode and 1 degree for singlemode fibers.
6. Shall be provided in LC, single-mode or multimode (laser optimized) configurations, terminated on 250 or 900 μ m buffered fiber and/or 2mm or 3 mm jacketed fiber.
7. Maximum connector insertion loss shall be no greater than 0.5 dB, with an average of 0.1 dB (MM) or 0.2dB (SM). Typical connector return loss shall be 35 dB (multimode) and 56 dB (single mode). All versions shall allow continuity to be verified by use of a visual fault locator (VFL).
 - a. Panduit LC OptiCam® Pre-Polished Fiber Optic Connectors OM4 Multimode / 10Gig™ 50/125 μ m (laser optimized) simplex P/N: FLCSMCXAQY
 - b. Panduit LC OptiCam® Pre-Polished Fiber Optic Connectors OS2 Singlemode / 10Gig™ 9 /125 μ m (laser optimized) simplex P/N: FLCSSCBUY

K. Fiber Adapter Plates

1. The fiber adapter plate shall be modular and functional for use in either a wall-mount or rack-mount enclosure. The adapter plate shall be provided in LC styles, in 12- or 24-fiber configurations. 12-fiber adapter plates are used to terminate 12-fiber cables, and 24-fiber adapter plates are used to terminate 24-fiber (or greater) cables. Do not utilize adapter plates with unused ports at the rear.
2. The adapter plate shall be compliant to TIA-568 (for performance) and respective TIA-604-X (for intermateability) standards. Adapter plates shall use zirconia ceramic sleeves and be offered in standard fiber type colors pursuant to TIA-568 standards.
3. LC adapter plates shall be precision-molded in the USA and integrated to eliminate "rattle" and loose fit. All ferrules shall be zirconia-ceramic. Adapter plates shall be offered in standard fiber type colors. Singlemode color shall be BLUE.

Approved Products:

- a. Panduit, FAP12WBUDLCZ, FAP w/12 LC Dupl Adapters (BU) Zirconia
- b. Panduit, FAP12WAQDLCZ, FAP w/12 LC 10 GbE Dupl mm Adapters (AQ) Zirconia

L. Fiber Jumpers and Array Cords

1. Fiber optic LC-LC patch cords, or jumpers, will make LC connections from the rack termination points to the equipment. The jumpers will meet the following requirements:
 - a. Factory-manufactured using Singlemode OS2 optical fiber. Field terminations on fiber jumpers are not acceptable.
 - b. Shall utilize A-B polarity.
 - c. Shall exhibit <0.3 dB insertion loss and -25 dB return loss.
 - d. Shall be available in standard lengths of 2 meters and custom-orderable up to any length of feet or meters
 - e. Provide factory assembled patch cords meeting or exceeding all criteria specified in the horizontal cabling standard
 - f. Provide Duplex Fiber Optic Patch Cords, Panduit or approved equal
 - 1) Provide (1) ea., 2 meters in length, LC-LC Duplex fiber jumpers

Approved Products:

- 1) Panduit LC-LC SM duplex jumper, F92ERQNQNSNM002

2) Panduit LC-LC MM OM4 duplex jumper, FZ2ERQNNQNSNM002

2.05 CABLE SUPPORT HARDWARE AND MISCELLANEOUS MOUNTING EQUIPMENT

- A. Miscellaneous Equipment: shall be provided and installed by the Contractor as described below and on the drawings. Mounting hardware and accessories typically required to provide a complete and working installation but not listed in these specifications shall be provided and installed by the Contractor.
- B. Backboard Cable Management: shall be provided and placed by Contractor on all telecommunications backboards to provide effective routing of all telecommunications cabling. Contractor shall utilize D-rings, wire distribution spools, and cable clamps as required for a neat and organized installation.
- C. Wall Termination Devices: 110 blocks and primary protection blocks will be provided at all wall termination fields. Primary protector blocks will be provided on both ends of all copper outside plant cables. 110 blocks will be installed with appropriate standoffs and brackets for a complete installation.
- D. J-Hook assemblies:
 - 1. All cable shall be supported above ceiling on dedicated cable support hardware.
 - 2. Contractor is responsible for maintaining the maximum fill guidelines and spacing requirements as shown on the accompanying project plans. Contractor shall provide and install additional J-hook assemblies as required to meet these requirements.
 - 3. J-hook horizontal cable supporting hardware shall be UL listed. The J-hook(s) shall provide a broad base for proper cable support, thereby reducing stress and bending of cabling.
 - a. Contractor shall attach appropriate J-hook fasteners for wall, stud, beam, or flange mounting to the supporting structure. Fasteners shall be spaced a maximum of 5' apart, and no more than 4' from the final outlet destination or turn point as shown on the accompanying project drawings.
 - b. Cable saddles and J-hooks shall be used where cable tray or wire basket is not available. These must be supported on their own ceiling wires, threaded rod, or affixed to building structure by use of beam clamps (on metal beams) or wood screws (on wood beams). Affixing communication cable supports to existing ceiling support wires is not allowed.

Acceptable Product:

- 1) Caddy CableCat Clips
- 2) Erico
- 3) B-Line
- 4) Panduit
- 5) Required supporting hardware, or approved equivalent.

E. 110 Style Termination / Wiring and Connecting Blocks

- 1. 110 Style termination/wiring blocks for cross connecting between voice station and riser cables shall be provided and installed as shown on the project plans. 110 blocks shall be wall-mountable and manufactured with standoff legs to allow cables to pass behind. All required connecting blocks (4-pair and 5-pair), and labeling strips shall be included.
- 2. Connecting Blocks shall be Category 6 for all voice station cable installed.
- 3. Connecting Blocks shall be C-5 for all riser cable installed.

Acceptable Manufacturers:

- a. Panduit GP6™ PLUS Punchdown System: 96 pair (24-port) base with legs: GPBW24-X
- b. C-4 Connecting block: Panduit 4 pair P/N: GPCB4-XY
- c. 110 blocks, Panduit P/N: 288 pair (72-port) base with legs: GPBW72-X

- d. Connecting blocks, Panduit 5 pair P/N: GPCB5-XY

2.06 FIRESTOPPING

- A. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur. Such devices shall:
1. Meet the hourly rating of the floor or wall penetrated.
 2. Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.
 3. Permit multiple devices to be ganged together to increase overall cable capacity.
 4. Allow for retrofit to install around existing cables.
 5. Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes
 6. Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:
 - a. Opening or closing of doors.
 - b. Twisting an inner liner.
 - c. Removal or replacement of any material such as sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.
 7. Where single cables (up to 0.27 in. (7 mm) diameter) penetrate gypsum board/stud wall assemblies, a fire-rated cable grommet may be substituted. Acceptable products shall be molded from plenum-grade polymer and conform to the outer diameter of the cable forming a tight seal for fire and smoke. Additionally, acceptable products shall lock into the barrier to secure cable penetration.
 8. Where non-mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.
 - a. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.
 - b. Utilize an EMT sleeve as a stub through a rated wall
 - c. Surround annular space between EMT sleeve and wall material with a hardening intumescent caulk.
 - d. Utilize re-enterable, non-hardening putty around cables inside a metal sleeve. Do not exceed 40% fill capacity of sleeve and follow all rated assembly requirements per Manufacturer, local codes, and AHJ.
 9. Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.
 10. Clean surfaces to be in contact with fire stopping materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting or the required fire resistance.
 11. Install fire stopping materials as indicated, in accordance with manufacturer's instructions.
 12. Seal all holes or voids made by penetrations to ensure an effective smoke barrier.
 13. Unless protected from possible loading or traffic, install fire stopping materials in floors having void openings of 4 square inches or more to support the same floor load requirements.
 14. A small amount of hydrogen gas is released as foam cures. Use forced air ventilation when installing if areas of installation have less than 2 cubic feet of free air for each pound of liquid mixture being foamed.
 15. Examine fire stopped areas to ensure proper installation prior to concealing or enclosing fire stopped areas.

Approved Products:

- a. Specified Technologies, Inc. EZ-PATH series 22, 33 and 44+ fire-rated pathway devices
- b. Specified Technologies, Inc. EZ-PATH GROMMET
- c. Specified Technologies, Inc. SSS Intumescent Caulk
- d. Specified Technologies, Inc. SSP Intumescent Putty

2.07 LABELING

- A. All labeling shall be in accordance with and strictly adhered to TIA-568, TIA-606 (Class 2 Administration) and BICSI Standards.
- B. Provide machine-generated labels appropriate for all components supplied and installed. Under no circumstances shall hand written labels be used.
- C. The labeling scheme shall not include duplicates of any new or existing cable identification across the entire cable plant.
- D. The labeling scheme will be provided at all locations within the cable infrastructure.
- E. All cables shall be labeled, using the owners cable identification standard.
- F. Intrabuilding Cable: All Intrabuilding cables will be labeled. Provide legible and indelible marking on all cables as indicated in the Drawings. Contractor shall ensure labeling of the cables during installation.
- G. Interbuilding Cable: All Interbuilding cables will be labeled. Provide legible and indelible marking on all cables as indicated in the Drawings. Contractor shall ensure labeling of the cables during installation.
- H. Each faceplate, cable, or data outlet (drop) will be numbered with a unique identifier clearly indicating the voice and data jacks by floor number, station, and outlet identification. This labeling scheme will be independent of any assigned telephone numbers.
- I. Cables
 1. Horizontal and backbone cables shall be labeled at each end according to Owner labeling standards (see below). The cable or its label shall be marked with its identifier.
 2. Cable labels shall be machine-generated wrap-around labels with multiple cable ID's printed such that it can be viewable in place without turning the cable.
 3. Label cables within 6" of termination point at both ends.
- J. Faceplates
 1. A unique location identifier shall be marked on each faceplate to identify its location in the cable plant.
 2. Each port in the faceplate shall be labeled with its own unique identifier.
- K. Racks, Panels, Blocks
 1. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
 2. Each port on the connecting hardware shall be labeled with its own identifier to match the other end of the cable.

2.08 FLOOR MOUNT EQUIPMENT RACKS

- A. Two-Post Equipment Standard Relay Rack, Chatsworth Products, Inc. (CPI)
 1. Racks shall be rectangular in shape, manufactured from steel, welded construction with two pairs of removable (bolt-on) equipment mounting rails.
 2. The top of the rack shall be pre-punched with attachment holes for cable runway and a top-mount cable management jumper tray. The sides of the rack shall be pre-punched with attachment points for power strips, Snap-On cable guides and vertical cable managers. The bottom of the rack shall be pre-punched with attachment points for a junction box and attachment to the floor.
 3. Equipment mounting rails shall be L-shaped, set 6" (150 mm) or 3" (80 mm) apart and punched on the front flange with the EIA-310-D Universal hole pattern to provide 44 rack-mount spaces for equipment. Each mounting space shall be marked and numbered on the

mounting rails. Mounting rails shall be removable and reversible so that RMU numbering can start at the bottom or top of the rack.

4. Equipment-mounting rails shall be horizontally spaced to allow attachment of 19" EIA or 23" rack-mount equipment. Attachment points shall be threaded with 12-24 threads.
5. The rack shall have two masked ground connection points located near the top and bottom of the frame and will include a ground terminal lug to attach ground conductors from the Telecommunications Grounding Busbar. Equipment mounting rails will bond to the rack through assembly hardware.
6. The rack shall measure 7' (2.1 m) high, 24" (610 mm) wide and 15" (380 mm) deep at the base. The sides of the rack frame shall be 9.6" (294 mm) deep.
7. The rack shall be rated for 1,000 lb. (453.6 kg) of equipment in seismic areas and meet Telcordia Technologies GR-63-CORE Network Equipment Building Systems (NEBS) Zone 4 requirements.
8. Finish shall be epoxy-polyester hybrid powder coat in the color as specified below. Mounting rails will be painted to match or zinc-plated.
9. Part Number 55053-703, Standard Rack, 7'H (2.1 m) x 20.3" W (515.9 mm) x 15" D (381.0 mm), 45U x 19" EIA, Black, UL Listed.
10. Each rack must have one (1) 6' long 125V 15A multiple-outlet power strips each with twenty three-prong outlets and no switch, Chatsworth 12848-701. These power strips, with standoff mounting legs, must be installed vertically at the rear of the rack, with the bottoms of the power strips about 6" off the floor. The power strips must be UL-listed. All power strips must be furnished with a 15' three prong plug/cord, NEMA 5-15P.

2.09 EQUIPMENT ROOM CABLE MANAGEMENT

- A. Horizontal Cable Management System
 1. Product Description: Panduit, NetManager P/N: NM2, or approved equal, 3"x3" front, 2"x 5" back, mountable in an EIA standard 19" rack.
 2. Provide 3 per new installed rack
 3. Provide to ITD / Telecommunications for installation.
 4. Note: Do Not utilize Horizontal wire management between angle patch panels.
- B. Vertical Cable Management System
 1. Product Description: Panduit, PR2VD06, or approved equal, 7' Vertical Wire Manager, side mount with covers.
 2. Location: Both sides of Floor Mount Equipment Racks and in-between racks.
- C. Distribution Rings/Jumper Troughs
 1. Product Description: Panduit P110JTW-X or approved equal.
 2. Location: On all backboards as required for routing of voice cables in a neat fashion.

2.10 LADDER RACKING

- A. Cable Ladder Sections and Components
 1. General: Except as otherwise indicated, provide metal cable ladders, of types, classes and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
 - a. Materials and Finish: Material and finish specifications for each cable ladder type are as follows:
 - b. 1.5" Tubular Steel: Straight section and fitting side rails and rungs shall be extruded from ASTM A513 steel tube. All fabricated parts shall be finished with a black powder coat.
- B. Type of Cable Ladder System
 1. Ladder type cable ladders shall consist of two longitudinal members (stringers) with transverse members (rungs) welded to the stringers. Rungs shall be spaced 9" inches on center. Rung spacing in radius fittings shall be 9 inches and measured at the center of the cable ladder's width. Rungs shall have a minimum cable bearing surface of 1" with

radius edges. No portion of the rungs shall protrude below the bottom plane of the side rails.

2. Straight cable ladder sections shall have side rails fabricated as tubular steel channels. All straight sections shall be supplied in standard 10'-foot lengths, except where shorter lengths are permitted to facilitate cable ladder assembly lengths as shown on drawings.
 3. Cable ladder widths shall be 12" inches as indicated on drawings.
 4. Splice plates shall be the bolted type made as indicated below for each cable ladder type. The resistance of fixed splice connections between an adjacent section of cable ladder shall not exceed .00033 ohm. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing the cable ladder rated loading capacity.
 5. All splice materials shall be made of ASTM A570 structural steel using carriage bolts and serrated flange locknuts. Hardware shall be Yellow Zinc Dichromate. Chatsworth # 16299-001 or approved equal.
 6. Cable ladder Supports: Shall be placed so that the support spans do not exceed a maximum span of 5' feet. Supports shall be constructed from formed shape channel members 1 5/8" x 1 5/8" with necessary hardware such as trapeze support kits, ceiling support kits, triangular support brackets, or wall angle support kits as manufactured by Chatsworth Products or engineer approved equal.
 7. Trapeze hangers shall be supported by 3/8" (minimum) diameter all thread rods.
 8. Accessories - special accessories shall be furnished as required to protect, support, and install a cable ladder system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially-designed ladder drop-outs, barriers, etc.
- C. Acceptable Manufacturers
1. Manufacturer: Subject to compliance with these specifications, cable ladder and cable channel systems to be installed shall be as manufactured by Chatsworth, Inc. or engineer approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Furnish and install materials necessary for a complete and working system.
- B. Contractor must be a Certified Installer for selected manufacturer prior to, during, and through completion of the system installation, and must be able to provide the manufacturer's extended warranty.
- C. Perform work in a neat and workmanlike manner.
- D. Determine requirements for plenum rated cable and devices. When doubt exists, seek prior determination in writing by AHJ.
- E. Install cable after interior of building has been physically protected from the weather and mechanical work likely to damage cabling has been completed.
- F. Contractor shall give notice to all agencies requiring advance notification and comply with all regulations specified by all governing agencies having jurisdiction (AHJ) over the performance of the work.
- G. Before installing cabling, ensure cable pathways are completely and thoroughly cleaned:
 1. Inspect conduit, wireway, cable trays, and innerduct systems prior to installation.
 2. Swab any additional enclosed raceway and innerduct systems.
- H. Contractor shall coordinate with and abide by the construction schedule and sequencing as dictated by the General Contractor on the project. Storage and staging areas within the construction site shall be as dictated by the General Contractor.
- I. Provide protection for exposed cables where subject to damage. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal.

- J. The contractor shall provide and pay all permits.
- K. The contractor shall provide all labor, materials, equipment, tools, utilities and services necessary for the proper execution and completion of the telecommunications cabling system.
- L. Proper cable handling is critical to maintaining the design integrity of high-performance cabling. Cable handling recommendations include:
 - 1. Cable must be conditioned above 32 degrees F for 48 hours prior to installation.
 - 2. Do not use excessive force when pulling cable. The maximum pull-force guideline for a 4-pair horizontal UTP should not exceed 110N (25lbf). Meeting this guideline avoids stretching conductors during installation and the associated transmission degradation.
 - 3. The minimum bend radius for UTP should not exceed 4 times the cable outside diameter (O.D.) The O.D. of Cat 6A 100 ohm, balanced UTP cable is .30 in. ($4 \times .3 = 1.2$ in. bend radius).
 - 4. The minimum bend radius for fiber should not exceed 10x the cable outside diameter.
 - 5. Traditional combing and dressing (bundling) of Category 6A cabling for a combed appearance is required in all exposed locations.
 - 6. In TR, use appropriate horizontal cable management for patch cords on front of patch panels. Also, use appropriate cable management bar(s) for support of terminated horizontal cable.
 - 7. Do not use vinyl or plastic cable ties due to the potential for over-cinching of cable bundles which can alter the cable geometry and degrade the system cabling performance. Use only hook and loop ("Velcro") fasteners for bundling of horizontal cables.
 - 8. Install cable ties and other cable management clamps via hand so that it fits snugly. Do not over tighten or use mechanical tools which could compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted-pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices.
 - 9. Store cable slack in an extended loop configuration to alleviate cable stress. Excessive cable slack in bundled loops or traditional 'service loops' to provide additional cable length in TR has been shown to degrade cabling performance and are not recommended.

3.02 INSTALLATION METHODS

- A. Contractor is required to adhere to the following parameters whether or not Contractor and/or others have placed existing equipment. Contractor will notify the owner of any of the following requirements that cannot be met prior to bid or ordering of materials.
- B. General: Install an infrastructure cabling system as detailed by the contract drawings, details, and specifications.
- C. The maximum length of horizontal cabling from nearest closet to an outlet shall not exceed 295 feet as per TIA 568 standards. Contractor will notify the owner prior to commencement of any installation not meeting the 295-foot maximum distance limitation.
- D. Contractor will place all station cables in the ceiling area on Contractor supplied and installed wire hangers or in floor spaces and raceways. Contractor also will assess whether or not the ceiling space is a plenum air return, which shall dictate the use of the listed plenum type, or PVC type cable required in the materials specification section. The cables will be routed to the MDF/IDF locations, utilizing cable tray. Station cables must be strapped every 5 feet with tie straps in J-Hooks provided by the Contractor; strapping to any other wires (e.g., lighting, ceiling grid, etc.) is not permitted. Cable splicing at any point of a station cable is unacceptable. When cables are routed in non-ceiling spaces, such as below raised flooring, the Contractor will still assess whether or not the space is a plenum air return and pull the appropriate cable type.
- E. In hard wall (wallboard) or V wall type construction where accessible, Contractor will install a wall board adapter or equivalent, which will support mounting of the faceplate necessary for the jacks. This will eliminate the need for an electrical box (in-wall junction box) to accommodate the communications outlet.

- F. Cables will be run vertically in dedicated EMT conduit inside the wall and into the ceiling space. Once in the ceiling space, the cable will be routed to the closest cable tray. Cables shall be routed to their closest MDF/IDF utilizing the shortest path possible, while still following TIA standard guidelines. Station cables outside of cable tray must be strapped to tie wires with J-Hooks every 5 feet provided by Contractor; strapping to any other wires (e.g., lighting, ceiling grid, etc.) is not permitted.
- G. In areas where modular furniture is installed or in areas where office furniture is in an open office space, telecommunications cabling access will either be through the floor or from the ceiling.
- H. Where the cable access is from a duct under the floor, the Contractor will provide and install mounting hardware inside the floor box that will support the outlets.
- I. The Contractor will provide and install a plastic spiral wrap device or metal flexible conduit to the cable channel in the furniture or to a surface mount box located at each work station. The Contractor shall coordinate with the owner, the exact location of each cable termination and jack location.
- J. UTP cabling must conform to a 6-foot separation requirement from main power panels, switch gear and/or starter motors.
- K. All power feeds crossing the path of the UTP cables at right angles must be a minimum of 6 inches in distance from the UTP cables.
- L. Cables shall be run cable tray in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
- M. The cables shall be placed at a minimum of 6 inches above the ceiling.
- N. The cables are to be run so as to maximize accessibility. Contractor will notify the owner in the event this requirement cannot be met.
- O. Debris, boxes, leftover cables, and trash must be removed from construction sites upon completion of work. No debris or work material may be left in areas that have student access unless the affected area is marked with cones, tape, or temporary fencing.
- P. Contractor shall pull conductors together where more than one is being installed in a raceway. Cable bundles in raceways, in suspension systems, or on wallboards must be tie wrapped every 5 feet. There must be an independent system supporting the cable system. Cable bundles tied to the lighting-ceiling grid will not be permitted. Station wire cannot be attached to electrical conduit, gas or sprinkler piping, or other code-restricted items.
- Q. No cabling is allowed to rest on any ceiling tile or suspension system. Cable shall be kept 30 inches away from any heat source; i.e., steam valves, etc.
- R. Cables shall be pulled free of sharp bends or kinks, twists, or impact damage to the sheath.
- S. Cables shall not be pulled across sharp edges. Cables shall not be forced or jammed between metal parts, assemblies, etc.
- T. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
- U. Cables shall be protected from paint and any other chemicals during installation. Any paint or chemicals that adhere to the installed cable shall be cleaned from the cable per manufacturers requirements. The cable manufacturer and the design consultant shall be notified.
- V. Insulation shall be removed to expose shielding and conductors to the exact length required by manufacturer for proper termination of plugs and pins. Plugs and pins, upon termination, shall not be damaged in any way.
- W. All communications racks must be properly anchored to walls and floors and grounded to building ground grid (not to water pipes, etc.).
- X. Cable splicing will not be permitted in any horizontal cable run.

- Y. Contractor shall install system using tools and equipment specifically designed for the installation tasks. Use installation practices that ensure the highest quality installation. Perform all cutting, splicing, pulling and termination of cables using equipment specifically designed for each purpose.
- Z. Install tie wraps using a tension controlling cutting device. Tension shall not exceed that which is specified by the manufacturer of the cable. Tie wraps and other securing hardware shall be rated as required for the installation environment.
- AA. Where multiple conduits are being used, fill one conduit to its maximum fill ratio before going onto the next conduit. Wherever possible, leave as many spare conduits available as possible.
- BB. All cables requiring lubrication for installation in conduits shall be continuously lubricated during the pulling-in process. Maximum pulling tensions specified by the cable manufacturer shall not be exceeded. Monitor cable-pulling tension with a mechanical tension-indicator.
- CC. All new conduit will not exceed a 40% fill rate. All spare conduits or conduits filled with less than the maximum allowed fill ratio shall have a pull string installed and left for future installation of cable. Clearly label as "pulling line" indicating To/From.
- DD. Support cables running overhead that are not installed in raceways by bridle rings or J-Hooks spaced every 5 feet.
- EE. Install the telecommunication cabling system as detailed in the contract drawings in the exact location and layout shown in the details.
- FF. Openings around electrical raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
- GG. Label all cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. An acceptable labeling product is a self-laminating cable marker, such as Brady #DAT-9-292-series. All cable labeling shall include numeric designation, source, destination, and cable type.
- HH. All outlet plates shall be installed neatly and square with floor and walls.
- II. Category 6A installations shall conform strictly with EIA/TIA 568B and TSB-40B to insure a quality system that meets the transmission rate criteria.
- JJ. Install cable above fire-sprinkler systems and ensure that the cable does not attach to the system or any ancillary equipment or hardware. Install cable system and support hardware such that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- KK. Do not attach cables to ceiling grid or lighting fixture wires. Where support for cable is required, install appropriate carriers to support the cabling.
- LL. Any cable damaged or exceeding recommended installation parameters during installation will be replaced by the contractor prior to final acceptance at no cost to the Owner.

3.03 SEPERATION OF DATA AND POWER CABLING

- A. Design cable pathways to avoid potential sources of EMI. Avoid installing cable near sources of EMI (X-ray equipment, large motors/generators, electrical power cabling and transformers, Radio frequency (RF) sources and transmitters, lighting, copiers, etc.).
- B. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less.
 - 1. Open or Nonmetal Communications Pathways:
 - a. 12-inches from electric motors, fluorescent light fixtures, and unshielded power lines carrying up to 3 kVA.
 - b. 36-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - c. 48-inches from large electrical motors or transformers.
 - 2. Grounded Metal Conduit Communications Pathways:
 - a. 2 1/2-inches from electrical equipment and unshielded power lines carrying up to 2 kVA.

- b. 6-inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.
 - c. 12-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - d. 3-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
 - e. 6-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.
- C. Physically separate power & data cabling according to relevant code and standard requirements when run in a common pathway.
 - 1. Never run data and Class 1 power cabling in parallel closer than 2".
 - 2. Avoid crossing cables if possible. If necessary, always cross cables at 90 degrees.
 - 3. Maintain a minimum of 5 in. separation between data cable and all ballast controlled lighting.
- D. Minimum separation distances of telecommunications cabling from potential sources of EMI exceeding 5kVA:
 - 1. 24" away from Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways
 - 2. 12" away from Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway
 - 3. 6" away from Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway
 - 4. 48" away from Electrical motors and transformers

3.04 FURNITURE CABLING

- A. The contractor will pull all data cables in advance of the installation of the modular furniture workstations, and coil at basefeed or above ceiling for power pole feeds. Upon furniture arrival, the contractor will feed the cables through power poles or base feed/wall connected data/telecom conduit, and terminate as specified on the floor plans.
- B. Contractor to coordinate with Owner's furniture vendor for timing of the installation of systems furniture, and installation of electrical and voice/data cabling.

3.05 TERMINAL BLOCKS AND PATCH PANELS

- A. Arrange all terminal blocks in a manner that allows natural wiring progression and minimizes crossing of wires.
- B. Dress and comb all incoming cable bundles in groups of 24 cables each. Eliminate crossed cables and "divers".

3.06 TELECOMMUNICATION ROOMS

- A. The Data and Telco Rooms are a transition point between the backbone and horizontal distribution pathways. The rooms shall be able to contain data or telecommunications' equipment, cable terminations and associated cross-connection wiring. Closet spaces are not to be shared with electrical installations, other than those directly for telecommunications, video, security and information systems equipment. The rooms are not to be shared with other unrelated building service, for example plumbing. Any conflicts with these specifications require the approval of the Owner's project manager.
- B. Contractor shall submit a drawing of the Telco room showing layout of all components including necessary and required electrical outlets, conduits, environmental requirements and wire termination fields prior to start of the job. Any jack densities noted in these specifications are estimates only. The drawing will designate the most effective, scalable, jack termination cabling design to facilitate data/telecom outlets shown on the lease exhibits. Owner's Project Managers must approve drawings prior to installation.
- C. All racks, panels, and equipment finished shall be anchored to meet local seismic zone requirements and industry standards. The equipment racks are to be anchored to the concrete

floors via "Unistrut or equal metal framing strut systems", drop in anchors only for all floor mount racks, concrete anchors, bolts and washers.

- D. The overhead cable ladder system will provide a route for the Category 6A, and other communication cables while providing stability to the equipment racks.
- E. The vendor is responsible to provide and install the specified count of 19" EIA rack-mount 7' (45U) 2- post racks, Black, as required in the new Telco Room. The vendor is responsible for submitting Telco room layout drawings to Owner for approval prior to installation.
- F. The contractor shall provide high capacity horizontal and vertical cable manager channels are required in all data and equipment racks, and the racks will contain sufficient vertical and horizontal cable managers to facilitate the patch panel density and placement installed by the contractor.
- G. Contractor will install raceways, boxes, managers, and enclosures as indicated according to manufacturer's written instructions. Securely fasten each component to the surface to which it is mounted and remove burrs and sharp edges from all cable tray.
- H. A 12" ladder rack system is required and will be provided by the contractor and installed in the IDF to provide cable support to the rack system. This includes all of the required ladder rack support items such as rack to runway kits, wall angle brackets, ceiling supports, splices (junction and butt), radius drops and j-bolts. The final ladder rack layout will be included in the IDF layout drawing described above.
- I. Provide and install as needed in the Telco room 4' x 8" x 3/4" fire-rated plywood board and labeled with fire rating stamp facing into the room to accommodate rack ladder support, cabling support, grounding platform, data and voice equipment. Paint backboard white (leave stamp visible) to match existing backboard in room, if appropriate. Location of installation is to be determined with approval by Owner.
- J. No more than four (4) data patch panels will be mounted to a 7' equipment rack.
- K. If you need more than four (4) data patch panels to complete the job contractor will need to install an additional 7' rack.
- L. Patch panels for special circuits (fax, T1,) can be mounted to a rack that already has four (4) data patch panels mounted in it.

3.07 UNSHIELDED TWISTED PAIR TERMINATION

- A. Check plans and symbology for final determination of faceplate constitution or consult with Owner prior to bid.
- B. Install additional cables at drop locations and in quantities indicated on the drawings.
- C. Do not exceed manufacturers' recommendations for maximum allowable pulling tension, side wall pressure or minimum bending radius. Use pulling compound as recommended by cabling manufacturer.
- D. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.
- E. The combined length of jumpers, or patch cords and equipment cables in the telecommunications room/closet and the work area shall not exceed 10m (33 ft.).
- F. No run of UTP cable between horizontal portions of the cross-connect in the telecommunication closet and the information outlet shall contain splices.
- G. In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling. Minimum 6" is preferred.
- H. J-hooks shall be provided for all suspended cable, at a semi-irregular spacing not to exceed 5 feet between supports. Cables shall be supported by dedicated low-voltage cable support hardware. Support of cables or hanging hardware by means of supports or surfaces related to other trades or applications is not allowed.

- I. Provide a full-size service loop (at least once around the inside edge of the box) in each J-box in the communications system.
- J. Install all cable in plenum spaces with J-hooks of at least 1" in width to disperse the weight on the bottom cables. Homerun all cable to nearest TR Cabinet.
- K. Comply with ANSI/TIA-569 for conduit and splice box sizing.
- L. Install modular jacks at all outlets shown; one data jack for each data cable at each faceplate or termination point. Install additional cables and modular jacks as indicated on the drawings. Do not "split pairs" between different jacks.
- M. Terminate cables at each jack location and at termination board or patch panel. Follow industry guidelines and manufacturers' recommendations and procedures as required. All termination hardware shall be rated to exceed their associated Category rating as specified above.
- N. Field-installable RJ45 plugs are not to be used.
- O. For enclosed ceiling WAP locations, install and terminate CAT6A cables to approximate location as shown on plans. For open-ceiling environments, secure cables and surface-mount boxes to nearest appropriate support structure.
- P. For in-ceiling WAP locations, secure jacks inside a surface-mount block mounted to in-ceiling metal assembly, and provide a 5' patch cord or longer, as needed, to connect device to its final determined location in ceiling.
- Q. For wall-mounted device locations, utilize an in-wall bracket in lieu of faceplate as described above. Secure mounting bracket and device hardware directly over backbox. Connect device with 1' CAT6A cord (Security, AV, or WAP), or 1' high-flex CAT6 patch cord for other CAT6-based devices. Coil patch cord inside backbox.
- R. Label and identify each outlet and cable for data circuits. Label at outlet end and at termination board or patch panel with matching designations.
- S. Provide data outlets in surface raceway at 26" on center unless otherwise indicated.
- T. Extreme care must be taken not to nick any of the copper conductors when removing jacket. Use rip cord to expose pairs for termination onto Insulation Displacement Contacts. You can also use a precision stripper that allows the technician to set the depth of the blade.
- U. Maintain twists as close as possible to the point of termination. Untwisting of copper pairs should not exceed 1/4" to the termination point.
- V. Manage the cable bundles in a symmetrical orientation. For example, in a 48-port patch panel, distribute 24 cables through the vertical cable management on the left rear side of the rack and 24 cables through the vertical cable management on the right rear side of the rack.
- W. Do not dress cables in bundles larger than 24 cables. Multiple 24-cable bundles may be run in parallel with evenly-spaced Velcro cable ties in an orderly sequence.
- X. For cable management on rear of patch panel, cable shall sweep into termination points and be supported by appropriate rear cable management.
- Y. Horizontal patch cord management is required on all installations which do not use angled patch panels.
- Z. Maintain cable bend radius 4X outer diameter (UTP only) when mounting faceplate onto EMT backbox, box-eliminators or furniture knock-outs.
- AA. Faceplates and SMBs shall be fully installed and labeled prior to testing.
- BB. Loosely coil and store excess slack in the ceiling above each termination location when there is not enough space present to store slack cable.
- CC. Install cable in accordance with manufacturer's recommendations and best industry practices.
- DD. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.1 document, manufacturer's recommendations and best industry practices.

- EE. Terminate 4 pair cables on the jack and patch panels using T568B wiring scheme.
- FF. Maintain the cable jacket within 1-inch of the termination point.
- GG. Do not exceed 0.5-inch of pair untwist at the termination point.
- HH. Do not exceed 4 times the outside diameter of the cable in the termination area for bend radiance compliance.
- II. Neatly bundle and dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- JJ. Horizontal station cabling must have no less than 10' service loop at station end and 5' at patch panel ends. These loops should be dressed in an orderly fashion above T-bar.

3.08 FIBER OPTIC CABLE SYSTEM

- A. The fiber optic raceway system must be continuous between pull boxes and junction boxes. The raceway system must enter and be secured to enclosures.
- B. All fiber supplied to the campus, must be tested with an OTDR, Microtest Certifiber, or equal prior to installation, while still on the shipping reel, using an optical time domain reflectometer (OTDR) or a 850/1300/1510 nm power meter and stabilized light source. The test results must be compared to the manufacturer's test results. A discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier.
- C. All fiber must be tested after installation according to the procedures and acceptability criteria described in EIA/TIA 455A (Aug 1991) and all applicable addenda after installation and termination using an OTDR in one direction and an 850/1300 nm power meter and stabilized light source in both directions and in both optical windows. The results of these tests (printed OTDR results and tabular loss results) must be provided by the installer as documentation of the quality of installation and as a baseline for future troubleshooting. The results must be compared to the pre-installation test results for significant changes.
- D. All optical test equipment must have current, traceable calibration certification.
- E. All spare optical ports and connectors should have a dust cap in place to protect the cable from the environment.
- F. Manufacturer's specification for pulling stress and minimum bend radius must not be exceeded on any fiber cable.
- G. Installation contractor must develop and review conduit installation plan with the owner before beginning installation.
- H. Installation contractor must verify all device locations with the owner before installation.
- I. Installation contractor must review cable numbering and labeling scheme with the owner prior to installation.
- J. Installation contractor must review drawing notes and drawing back-annotations (red line) on site plans with the owner prior to installation.
- K. Fiber Optics Cable Labeling: Fiber termination locations must be labeled to corresponding fiber strand pairs at the Main Distribution Frame (MDF), and Intermediate Distribution Frame (IDF) Using embossed labels. The Contractor is expected to provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure over time. Hand written labels are not acceptable.
- L. All outside fiber cable will be installed through 1.25" innerduct from point of origin and destination.
- M. Securely fasten the fiber optics raceway to the cable tray, or walls when routed inside buildings, using clamps and clips designed for this purpose.
- N. Provide a nylon or polyethylene pulling line in all fiber optics raceways. Clearly label as "pulling line", indicating source and destination.

- O. Openings around fiber optics raceway penetrations shall maintain the fire resistance rating required. See NEC 300-21.
- P. All fiber optics cables are to be run as efficiently as possible, minimizing the amount of cable required.
- Q. All fiber optics cables shall be continuously lubricated during the pulling-in process. The maximum pulling tensions specified by the cable manufacturers shall not be exceeded. Monitor cable pulling tension with a mechanical tension meter.
- R. The fiber optics cables passing through pullboxes and manholes shall be neatly arranged and secured to cable jacks on the interior walls. Cables will not be accepted when diving through the manhole or pullbox.
- S. As fiber optics cables emerge from intermediate-point pull boxes, coil the cable in a figure eight pattern with loops not less than two feet in diameter.
- T. Label all fiber optic cables at both ends. The label shall be permanent. Labels shall be typed (not handwritten) and individual number strips are unacceptable. All cable labeling shall include numeric designation, source, destination, and cable type.
- U. Fiber optics raceways shall be clearly marked at each pull box indicating type and number of cables within.
- V. If connectors have been factory installed on fiber optic cables, protect the connector during the pulling-in by wrapping with a thin layer of foam and insert in a stiff plastic sleeve for protection.

3.09 GROUNDING

- A. All grounding (earthing) and bonding shall be done to applicable codes, standards and regulations.
- B. Grounding shall be accomplished by common single-point termination of all ground conductors.
- C. All metallic components of the infrastructure system shall be solidly grounded by the shortest possible route.
- D. Manhole Splices and Splice Cases - the Contractor will connect the splice case to the manhole ground as per GTE practice 605-100-201 using a #6 AWG solid copper wire.
- E. NEMA Enclosure splices and Splice Cases - the splice case must be grounded to the provided ground lug in the existing NEMA box with a minimum #6 AWG wire.
- F. MDF/IDF Splices and Splice Cases - the splice case must be grounded to the provided ground bar in the Voice/Data Equipment Room with a minimum #6 AWG wire.
- G. MDF/IDF Electrical Protection Splices - the Contractor must bond the cable's metallic sheath/shield to the metallic splice case with the bonding bar assembly provided with the splice case.
- H. Labeling: The splice case and all cables must be labeled using a stamped metal plate or indelible plastic plate, that the owner has approved, which details exact pair counts and destinations. Each 25-pair binder group, of each cable entering the splice case, must be labeled with a Panduit PAN-TY PLF1M-0 Flag with appropriate cable pair counts.
- I. Conduit Sealing: The Contractor will supply and install all necessary components to effectively seal all conduits. The Contractor will use Semco part #PR-851 conduit sealing kit. The PR-851 compound is a two-part polyurethane foam, which, when mixed for fifteen seconds, expands approximately fifteen times in volume. It forms a dense, tough foam with a density of three to four pounds per cubic foot. The expanding nature of the compound allows it to fill cracks and voids in conduit walls, and imperfections in the cable sheath. This effectively seals the conduit against the passages of gases and water. For additional information, refer to GTE Practice 628-020-203.
- J. Shielded cabling channels shall include appropriate method of bonding shield to approved ground for proper EMI/RFI mitigation.
- K. Shield Continuity Testing shall be Enabled when shielded cabling channels are installed.

- L. All shielded and armored cables shall be bonded to a telecom grounding system via shielded patch panels at the rack locations. Shielded Category-rated connectors must be properly installed to maintain electrical ground conductivity along entire length of cable and at both ends of the cable. UTP connectors shall not be used on shielded cables at either end.
- M. Shielded Patch cords shall be provided for use and employed at each workstation location utilizing shielded cable. Shielded patch cords can be identified by their gray color and metallic RJ45 plug.
- N. Telecom Contractor shall bond and ground all telecom room metals. Telecom Contractor shall provide and install TIA-rated Telecommunications Grounding Busbar (TGB) at all Telcom Room locations, and an in-cabinet grounding busbar at each remote wall-mounted cabinet or telecom enclosure. All ground lugs shall be 2-hole make-up and be compression style. Screw lug type will not be accepted.
- O. Electrician will provide connection between TGB and building ground; Telecom contractor (if separate, otherwise electrician) will provide a busbar and ground all equipment and telecom metals to the busbar.
- P. Telecom installer will ground and bond all armored and/or shielded cables, racks, cabinets, cable tray, ladder racking, and shielded panels to telecom grounding busbar.

3.10 WIRELESS ACCESS DEVICE INSTALLATIONS

- A. Above-ceiling and wall-mounted wireless access points and devices.
 - 1. All WAP locations shall receive (2) Category 6A cables from the nearest TE or TR (IDF). Multimedia, security and other video devices shall receive CAT6A cables as shown on drawings, documents and details.
 - 2. Clock/Speakers and other low-bandwidth mounted devices shall receive (1) CAT6A cable.
 - 3. WAP, IP Camera and other communications cables shall terminate on patch panels in the TE/TR (IDF).
 - 4. WAP cables shall terminate on Category 6A information outlets and shall be supported by an in-ceiling termination bracket. Affixing of a 2-port SMB to the bracket is recommended.
 - 5. SMB, jacks, and patch cords used in plenum spaces shall be plenum-rated.
 - 6. SMB shall be mounted in the ceiling on a specially-designed clip attached to a cable support ceiling wire or threaded rod support per cable management section in Part 2. SMB shall not be tie wrapped to supports, or left on ceiling tiles or other equipment located above the ceiling.
 - 7. Wall-mounted devices not requiring faceplates will be mounted directly to the backbox. Jacks will be secured inside backbox on a specially-designed in-wall bracket clip per cable management section in Part 2.
 - 8. Contractor shall mount Access Point (AP) electronics to the drop-ceiling suspended T-grid system. (AP and mounting hardware provided by Owner). Contractor to provide and install (2) white Cat 6A patch cords from the overhead WAP outlets to the AP. Contractor shall neatly cut holes into the ceiling tile and finish the holes with grommets or other industry-standard finishing piece for a professional look.

3.11 PATHWAYS AND TOPOLOGY

- A. Utilize "thin film" lubricants only! It has been shown that cable-pilling lubricants will affect your testing as the cable needs several weeks to dry before attenuation levels recover. Use of incorrect cable lubricants will erode cable jacket and void cable warranty.
- B. All cable and wire shall be concealed in conduits, floor ducts, paneling, ceiling or similar areas except at mutually agreed upon areas.
- C. Fill capacity in conduit, modular furniture and other horizontal pathways should not exceed 40%. A maximum of 60 % pathway fill is allowed to accommodate unplanned additions after initial installation. The Cat 6A cable is a larger O.D. 0.250. The increased diameter of Cat 6A cable will require appropriate design considerations when sizing conduit and other pathways. In most installations, conduit sizes will have to be increased in order to accommodate all of the cables being installed. This will impact the design and material selection of the project. To

calculate the fill ratio, divide the sum of the cross-sectional area of all cables, by the most restricted cross-sectional area of the pathway.

- D. Fill ratios for Augmented CAT6 cable (CAT6A) requires 1" EMT for 4 cables and sized larger for additional cables as required to maintain a 60% fill ratio.
- E. Flat-rung and/or solid bottom cable tray shall be utilized for large, high-density installations. J-hooks and other specific cable support hardware shall be used at all locations outside of cable tray.
- F. Pathway design should not exceed (2) 90-degree bends between pull points or pull boxes (PB). If more than (2) 90-degree bends are required, install a pull box between bends.
- G. Provide NEC-sized pull boxes for any run greater than 100 feet, or with more than two ninety-degree bends.
- H. J-hooks should be randomly spaced 60" or less. Do not exceed J-hook capacity for size and weight limitations.
- I. Land wireless access cabling above ceiling, secured onto in-ceiling bracket. Utilize varying-length patch cords when installing wireless access point devices for flexibility in length.
- J. Crimp-on plugs at wireless access points are not allowed. Terminate all WAP cabling onto jacks and ceiling-mount brackets and test all cables as appropriate.
- K. Mixing of various Category cables in the same pathway is allowed as long as the applications are appropriate for each category of cable used.
- L. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.
- M. Maintain a distance of at least 12 inches from all power conduits and cables, and 6 inches from all fluorescent lighting fixtures. Do not install power feeders 100 amps or greater above or within 5 feet of telecommunications backboard. Do not install telecommunications conduits above power panels or switchboards.
- N. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- O. The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications room/closets (TCs or IDFs) and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications room/closets and the main or intermediate cross-connect in a long single story building.
- P. Unless otherwise recommended by the Owner, all fiber cables will be encased in interlocking armor. All fibers will be terminated in the Telecom Rooms or Cabinets in rack-mounted enclosures equipped with sufficient ports to allow for growth, slack storage space and splice trays if required to terminate and secure all fibers.
- Q. Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all Telecommunications rooms/closets, such that no drilling of additional sleeves/slots is necessary. Sleeves may need to be provided and installed under the scope of this Project.
- R. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications room/closet. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect.
- S. For voice or data applications, 4 pair UTP or fiber optic cables shall be run using a star topology from the telecommunications room/closet serving that floor to every individual information outlet.
- T. Backbone and Horizontal pathways shall be installed or selected such that the minimum bend radius is maintained both during and after installation.

- U. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.
- V. Install $\frac{3}{4}$ " x 4' x 8' fire-rated plywood across all walls in telecom rooms, from 6" AFF to 8'-6" AFF. Coat with 2 coats of white paint. Do not paint over fire rating stamp.
- W. Contractor shall firestop all used pathways which enter or leave the telecom rooms via conduit, cable tray or slot. Contractor is responsible for installing sleeves at each wall or partition penetration, and firestopping all fire-rated penetrations. Intumescent caulk shall be applied around the outside of each sleeve, and intumescent putty inside the sleeve or conduits around the cables. Appropriate fill ratios must be followed when penetrating fire-rated walls.
- X. Do not run fiber cables in conduits which are less than 2" in diameter.
- Y. Abandoned cable shall be removed from pathways (i.e., from tunnels, manholes, plenum spaces, and conduit) under scope of this project. Previously unknown or unidentified cable which is apparently abandoned prior to work shall be brought to the attention of the Owner for authorization prior to removal.

3.12 SYSTEM TESTING

- A. The Contractor shall be responsible for separately testing and documenting the cables and termination throughout the entire cabling system. Ensure that the cable and equipment being installed in the system is without flaw and that no potential damage to the cable or equipment occurred in shipment, handling, or installation. The owner representative shall observe the testing of the installed cabling and terminations at any time during the testing process.
- B. Test cables and termination hardware for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C. Verify pairs of each installed cable prior to system acceptance. Repair or replace any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks in order to ensure 100 percent useable conductors in cables installed.
- C. Testing of all installed unshielded twisted pair telecommunications cabling shall be performed by the Contractor. Interim testing of the cabling system during and after installation is encouraged to ensure that the testing and acceptance criteria are met.
- D. Acceptance of the Telecommunications Cabling System shall be based on the quality of Contractor performance by analysis/inspection of the testing program documentation and the conformance of the system operation with the criteria described herein. Contractor shall make available all drawings and documentation prior to acceptance testing.
- E. Contractor shall provide all necessary testing equipment for performing the required acceptance test. Contractor shall verify the authenticity and display appropriate calibration data to include the expiration date of the correct calibration.
- F. Testing methods are provided herein as reference for the Contractor. Test equipment, methods, and criteria shall comply with the guidelines set forth in TIA TSB - 67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems where applicable.
- G. Copper Cable Testing:
 - 1. TEST TWISTED-PAIR copper cable links for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Test cabling using a Level IV test unit for Category 6 performance compliance as specified in ANSI/TIA/EIA-568-C.
 - 2. CONTINUITY - Test each pair of each installed cable using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Test shielded/screened cables with a device that verifies shield continuity in addition to the above stated tests. Record the test as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Correct or repair any faults in the wiring and re-test the cable prior to final acceptance.

3. LENGTH - Test each installed cable link for installed length using a TDR type device. Test the cables from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length will conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C standard. Record cable lengths, referencing the cable identification number and circuit or pair number. For multi-pair cables, record the shortest pair length as the length for the cable.
 4. Test all equipment and each outlet, horizontal cable, termination block, patch cords, etc. to verify compliance with requirements. Testing shall consist of attenuation and NEXT across all splices and devices installed in the field and shall meet latest requirements of EIA/TIA. Re-terminate any cable or connection found to be defective.
- H. Provide test results in electronic format, with the following minimum information per cable Tester is to be a Level IV device or better, and configured with the specific cable installed, and the Permanent Link test will be performed according to the Category's standard methodology.
1. All parameters must exhibit a PASS test result prior to project completion. PASS*, FAIL* or FAIL test results will not be accepted. Test Results for PASS test shall include the following:
 - a. Project Name
 - b. Date and Time of test (daily recording)
 - c. Circuit I.D. number with corresponding jack identifier
 - d. Applicable room number of jack location (per contract documents)
 - e. Applicable telecommunications room number
 - f. Test result, "Pass" or "Fail"
 - g. Wire Map – shall include the following:
 - 1) Continuity to the remote end
 - 2) Shorts between any two or more conductors
 - 3) Crossed pairs
 - 4) Reversed pairs
 - 5) Split pairs
 - 6) Any other mis-wiring
 - h. Length
 - i. Insertion Loss
 - j. Near-end Crosstalk (NEXT) Loss
 - k. PS-NEXT (Power Sum Near End Cross Talk)
 - l. FEXT (Far End Crosstalk)
 - m. ELFEXT (Equal Level Far End Cross Talk)
 - n. PS-ELFEXT (Power Sum Equal Level Far End Cross Talk)
 - o. Propagation Delay
 - p. Delay Skew
 - q. Return loss
 - r. PSFEXT (Power Sum Far End Crosstalk)
- I. Category 6A
1. Only a permanent link test for Category 6A will be required.
 2. All systems must pass Category 6A specifications and be accepted by the owner before the work will be considered complete.
 3. Inter- and Intra-building tie cables: all tie cables will be tested for pass-fail connectivity ground continuity.
 - a. Testing of Category 6A cable shall meet TIA 568A Requirements.
 - b. The vendor must utilize a check-off list for reference by the owner during tests.
 - c. The result of the measurements outlined shall be recorded and submitted to the owner as final proof of system performance. Electronic results will be supplied in Fluke or equivalent format. If the owner requires specific software to view the results, the contractor will supply a copy of software to the owner.
 4. Test Results for CAT6A shall include all of the above (3.12, H), plus the following:
 - a. AACRF (Alien Attenuation to Crosstalk Ratio, Far End)
 - b. AFEXT (Alien Far End Crosstalk)

- c. ANEXT (Alien Near End Crosstalk)
 - d. PSANEXT (Power Sum Alien Near End Crosstalk)
 - e. PSAACRF (Power Sum Alien Attenuation to Crosstalk Ratio, Far End)
- 5. Approved Tester Products:
 - a. Softing WireXpert series tester
 - b. Fluke DTX or later platform Cable Certification testers
 - c. Linkware Record Management Software
- J. Fiber Test Documentation:
 - 1. Provide electronic CD disk and hard copy test reports from ANSI/TIA/EIA-526-14A Method B Standards. Calculate a "Loss Budget" for each cable length based on cable length and connectors. Provide as a minimum, OTDR test results in the form of a printed waveform and text table for both 850 nm and 1300 nm for multimode fiber and 1350 nm and 1510 nm for singlemode fiber. Test fibers and connector systems for end-to-end attenuation. Provide a power meter test on fiber optic strands at both wavelengths A to B, B to A and OSPL (OSPL is as defined as $L_a + L_b$). Include the results of unsatisfactory tests, with an explanation of how the problem was corrected. Clearly label connector and fiber loss on test waveforms.
 - 2. Each pre-terminated fiber strand shall be tested for continuity and attenuation with an Optical Power Meter and light source for actual length and splice/connector loss. Each field-terminated fiber strand (if any) shall be tested for attenuation with an Optical Power Meter and light source and with an Optical Time Domain Reflectometer (OTDR) for actual length and splice/connector loss.
 - 3. Cable length shall be verified using sheath markings. The guidelines and procedures established for Tier 1 testing in TIA/TSB-140 shall apply.
 - 4. All fiber optic cables shall be tested from the site's MDF to each fiber terminals located in the IDF.
 - 5. The Contractor shall conduct a bi-directional power meter (loss) test of each fiber optic station and riser cable at both wavelengths, 850/1300nm for MM and 1310/1550nm for SM.
 - 6. No individual station or riser fiber link segment (including connectors) shall measure more than 2.0 dB loss for LC, and 1.5dB loss for MTP. LC links shall be tested with LC jumpers to the tester. MTP links shall be tested either with an MTP tester and array cord, or with an MTP-LC breakout harness and LC duplex fiber tester.
 - 7. Tests shall be conducted using ANSI/TIA-526-14A, Method B. Test results evaluation for the panel to panel (backbone) shall be based on the values set forth in ANSI/TIA-568.
 - 8. The Contractor shall provide an electronic printout for each strand tested with the Power Meter and the OTDR.
 - 9. Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of the test.
 - 10. The contractor shall perform all tests and adjustments, and shall furnish all test equipment necessary and perform all work required to determine or modify performance of the system in accordance with these specifications. The contractor will submit to the owner a complete test plan for Station Wiring/Information outlet (Voice, Data and Network), and Riser Cable to be used for this contract. At a minimum, the plan should show test configurations, calibration procedures, impedances, and measurement equipment. This plan must be approved by the owner prior to the start of testing. The test plan is a one-time requirement and will remain in effect for the duration of this contract unless specifications change requiring a re-submittal. The scope of this work includes, but is not limited to, the following:
 - a. Test all fiber with an OTDR, Microtest Certifiber or equal, prior to installation while fiber

is still on the shipping reel, using an optical time domain reflectometer (OTDR) or a 850/1300/1510 nm power meter and stabilized light source. Compare test results to the manufacturer's tests. A discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier. Contractor shall keep test results on file for future reference.

- b. Test all fiber after installation according to procedures and criteria described in TIA 455A and all applicable addenda after installation and termination using an OTDR in one direction and an 850/1300/1510nm power meter and stabilized light source in both directions and in both optical windows.
- c. All optical test equipment must have current, traceable calibration certification.

3.13 DELIVERABLES

- A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (4) manuals shall be delivered to the Owner. Manuals shall include all service, installation, and programming information.
- B. Four (4) copies of the general Copper, Category 6A, and Fiber ODTR results shall be submitted in a tabular, typewritten format at the completion of system testing. The test results must also be provided in an electronic file for future reference.
- C. Cable test results shall be submitted in hard copy and magnetic format along with viewing software from the tester manufacturer. Hard copy to be bound within loose leaf binder and organized by serving MDF or IDF, room number of outlet location, and station identifier.
- D. Contractor to provide all warranty information to APPROVED MANUFACTURER for processing. MANUFACTURE will send warranty document direct to Owner.

3.14 RECORD DRAWINGS

- A. All drawings shall be submitted in hard copy with all field changes and contractor labeling indicated in red line updates. Upon completion of the project, Contractor shall deliver to Owner documentation of the project to include.
- B. As-built telecommunications floor plans of the facility with cable, outlet placement and full labels clearly depicted.
- C. As-built elevations of all termination fields describing cable and outlet location labeling scheme, and any changes to the wall elevations and conduit placements in the IT rooms will be recorded on as-built drawings
- D. As-built logical riser diagram describing connectivity and cable sizes, for copper, fiber and grounding cabling systems. Diagram shall include as-built labeling of all OSP and rise cables.
- E. Provide a full set of "as-built" (redline) drawings in AutoCAD DWG and PDF format. Drawings to depict final location and drop/cable identification numbers and labels which match the test reports. Include (1) hard copy paper format of all as-builts in a laminated 30"x42" size or equivalent, posted in each telecom room involved in the project.

END OF SECTION

Exhibit 9



PLAN

CONSTRUCTION AND DEMOLITION DEBRIS DIVERSION PLAN

Contact Information:

County of Yolo - Division of Integrated Waste Management
44090 County Road 28H, Woodland, California 95776
Recycling Coordinator (530) 868-8858 or phedick@yolocounty.org

Step 1: Identify materials to be reused, recycled or disposed of at landfill by checking the correct box.

Step 2: Identify how the materials will be handled either source separated or mixed.

Step 3: Identify who will be hauling the material (Self-Haul, Contracted Service Provider Name)

Step 4: Identify where the materials will be disposed of and/or recycled (Material Destination)

Step 5: Submit completed plan to the Dept. of Community Services at 292 W. Beamer, Woodland, CA 95695

MATERIAL TYPE	Reuse	Recycle	Disposal	Source Separated	Mixed	Hauler	Material Destination
Asphalt/Concrete							
Brick/Tile							
Cardboard							
Carpet/Padding							
Dirt/Sod							
Doors/Gates							
Gypsum/Drywall							
Glass/Windows							
Metals/Scrap							
Plastic Film							
Roofing							
Rock/Stone/Sand							
Stucco							
Wood/Lumber							
Yard Trimmings							
Mixed C&D							
Trash/Insulation							
Sample: Insulation			X			Waste Management, Inc.	Yolo County Central Landfill

I have read the County of Yolo Construction & Demolition Ordinance and the Waste Diversion Section of the Cal Green Standards and acknowledge that I am responsible for complying with the requirements of its terms and conditions by ensuring, at minimum, 65% of the waste generated from my project is recycled and that I must save all WEIGHT RECEIPTS to demonstrate compliance. A permit(s) will not be issued until this completed Diversion Plan is approved.

Applicant/Owner Signature: _____

Date: _____

FOR COUNTY USE ONLY

Last Updated Jan. 2017

Standard Estimated Fees:

Administrative Fee:

Late Re-Submittal Fee:

Deposits:

First Time Applicants or Those in Compliance

Previous Project Good Faith Effort

Previous Project Non-Compliance

\$158.00
\$100.00
\$0.00
\$2,500.00
\$5,000.00

(See Section 6.16.08 of County Code or County C&D Ordinance No. 1375 for a complete definition of fees.)

ESS Environmental

Permit No: BP2021-0252

5716 Folsom Blvd.,/PMB #146 • Sacramento, CA 95819 • (916) 383-6642 • ess_environmental@yahoo.comJune 15th, 2020

Gene Wais
Yolo County General Services
120 W. Main St., #D
Woodland CA 95695

Job #5256.20

Re: Asbestos Renovation Survey Report for the planned roof work, second floor interior renovation areas and first floor electrical rooms of the two story office building located at 100 West Court St., Woodland CA.

Dear Mr. Wais:

Per your request ESS Environmental performed an asbestos renovation survey for the planned roof work, second floor interior areas and first floor electrical/storage rooms on and within the two story office building at the above referenced location. This asbestos renovation survey was performed on June 5th, 2020. The individuals who performed this survey for ESS Environmental were Michael Horan (CAC #92-0107) and Donald Horan (CAC #16-5608). The requested purpose for this survey was to ascertain if any asbestos containing materials were present on or within the areas of planned renovation on and within this building. Any asbestos containing materials or ACMs if found to be present by this sampling could then be properly notified for and be abated prior to any other disturbance. Following are the activities performed for this survey, the laboratory analysis results for those bulk samples of suspect ACMs taken and analyzed, our findings/recommendations and the required notification forms for the Yolo/Solano Air Quality Management District (YSAQMD).

Building Descriptions:

The building at this location from which the samples were taken consisted of a two story office building that is +/- 40 years of age. The areas of this building included in the scope of this survey report include the roof, selected second floor interior areas and first floor electrical/storage rooms.

Asbestos Survey:

For this survey we first visualized the selected areas of this office building and proceeded to take samples of the identified suspect ACMs. The bulk samples taken for this survey consisted of core samples of white paint over rolled roofing, core samples of white paint over roofing mastic and rolled roofing, white sealant over black mastic, red roof tile, roofing felt paper, roof tile mortar, brown roofing mastic, fiberglass T-bar ceiling tiles, T-bar ceiling tiles, core samples of sheetrock/joint compound, wall texture compounds, ceramic wall and floor tiles with grouts and mortars, multiple vinyl wallbase mastics, 12" x 12" vinyl floor tiles with black mastic, carpet glue over concrete, sink coating and 12" x 12" vinyl floor tile with multiple mastics (Samples 1B through 50B). As each of these samples were taken they were given a Sample ID Number and placed into a correspondingly numbered sample bag

Gene Wais
Page Two
June 15th, 2020

and sealed shut. The relevant information for that sample was then listed on a laboratory chain of custody form. The approximate location from where the sample was taken was also noted on a Google Earth overhead or floorplan that was provided to us and is included with this report. At the completion of this survey the bulk samples taken and the completed chain of custody forms were delivered to Precision Micro-Analysis Laboratory in Sacramento CA to be analyzed by Polarized Light Microscopy or PLM.

Laboratory Analysis Results:

The subsequent PLM analysis results for the fifty (50) bulk samples of suspect materials taken and analyzed for this survey were first e-mailed to ESS Environmental on June 11th, 2020. The results of this analysis showed that asbestos was found to be present in ten of the fifty samples taken and analyzed for this survey. The asbestos containing samples at this location consisted of roofing mastics and flooring mastics. See enclosed Precision Report #200611003, Pages 1-9.

Summary and Recommendations:

The results of this asbestos survey showed that asbestos was found to be present in ten samples of both roofing mastics and flooring mastics at this location (Samples 3B, 4B, 5B, 6B, 7B, 8B, 9B, 11B, 41B and 47B). These mastics are located both on the roof and in selected 2nd floor rooms at this location and are both categorized as Cat I, Non-Friable ACMs for their removal and disposal. These asbestos containing materials may only be disturbed by an abatement contractor who is asbestos licensed and DOSH registered. For more information on these ACMs please see the attached Table of ACMs.

If at any time during the planned renovation any other suspect asbestos containing material is seen that was not noted in this survey report it must not be disturbed until it too can be properly sampled and analyzed for possible asbestos in its content.

The Yolo-Solano Air Quality Management District requires that this asbestos survey report along with the YSAQMD questionnaire and the required fee be submitted to them for review prior to beginning this project. Please note that if any load bearing walls were to be disturbed during the course of this renovation this project would need to be re-classified as a demolition with new air quality forms submitted as well as observance of a 10 day waiting period and payment of required fees.

If I can be of further assistance please feel free to call.

Sincerely:



Michael L. Horan
Hygienist, CAC #16-5608



YOLO-SOLANO AIR QUALITY MANAGEMENT DISTRICT
1947 Galileo Court, Suite 103; Davis, CA 95618
www.ysaqmd.org (530) 757-3650

Jurisdiction: _____

Air District Questionnaire

A building permit cannot be issued unless this questionnaire is completed and submitted to the YSAQMD for approval.
This questionnaire is used to determine if a project requires an asbestos survey and/or Asbestos Demolition/Renovation notification.

Date: _____ Permit #: _____ Project Name: _____
Address: _____ City: _____

Contractor Info:

Company: _____
Contact Name: _____
Email: _____
Telephone Number: _____

Owner Info:

Company: _____
Contact Name: _____
Email: _____
Telephone Number: _____

1. Describe the work scope (include drawings, demo plan & room numbers/names):

2. Project involves one non-commercial residential building? ☐ Yes ☐ No

3. Project is new construction only (no demolition or alteration of existing materials)? ☐ Yes ☐ No

4. Identify existing materials being disturbed or removed: ☐ None (new construction only)

☐ Flooring _____ SF	☐ Ceiling _____ SF	☐ Roofing _____ SF/Squares
☐ Concrete _____ SF	☐ Insulation _____ SF	☐ Sheet Rock _____ SF
☐ Plaster walls _____ SF	☐ Exterior walls _____ SF	☐ Pipe Insulation _____ Linear Ft
☐ Other (Describe): _____		SF _____

5. Are any load bearing walls or structural members being removed or demolished? ☐ Yes ☐ No

If "Yes":

☐ Complete Bldg. demo	☐ Repair/replace	☐ Single structure
☐ Partial Bldg. demo	☐ Moving structure	☐ Several structures # _____

Total SF of demolition area: _____ SF

Printed name: _____ Signature: _____ Date: _____

(Your signature indicates that all information submitted is true, accurate and complete to the best of your knowledge)

Survey required? Submit questionnaire to the Building Dept. or directly to the District at notify@ysaqmd.org. Staff will review and notify you if survey report is needed. You may be contacted for additional information. Surveys must be performed by a certified Asbestos Consultant, CAC or Site Surveillance Tech, CSST (see survey advisory at <http://www.ysaqmd.org/permits-advisories.php>).

I wish to submit my questionnaire, survey report & fee. Deliver/mail hardcopy with check payable to YSAQMD to 1947 Galileo Ct., Ste. 103, Davis CA 95618. Send electronic submittals with proof of payment to payments@ysaqmd.org or fax to (530) 757-3670; make credit card payments at www.ysaqmd.org/permits/make-a-payment/ (service fees apply). To determine the applicable fee, see the fee schedule at <http://www.ysaqmd.org/asbestos/commercial.php> or consult the District. Regulated projects involving "friable" asbestos materials require a Notification form and waiting period (10 work days).

For more info, see www.ysaqmd.org/asbestos or call the District at (530) 757-3650.

DISTRICT USE ONLY:

Fee Amt: _____

Payment Amt: _____ (check _____ credit _____)

Database Entry done: _____

Date Rec: _____ Processed by: _____

Questionnaire Rec: _____

Release Approved/Date: _____

Notes: _____



Yolo-Solano Air Quality Management District
1947 Galileo Court, Suite 103; Davis, CA 95618

District Assigned Notification #

ASBESTOS DEMOLITION AND RENOVATION NOTIFICATION FORM

If a 10 work day waiting period applies, it does not begin until the survey report, fee payment and notification are received by the District. Fee table is at: <https://www.ysaqmd.org/master-fee-schedule/>. If paying by credit card (service fees apply) you may send completed form to payments@ysaqmd.org or fax to (530) 757-3670. See instructions for completing the notification.

1. APPLICATION TYPE	2. FACILITY INFORMATION
☐ Renovation (10 work day waiting period)	Structure Name: _____
☐ Demolition (10 work day waiting period)	Address: _____
☐ Emergency Renovation (requires approval)	City & Zip: _____ No. of Floors: _____
☐ Ordered Demolition (requires approval)	Contact Person(s): _____
☐ Demolition: Fire Training Exercise	Phone: _____ Email: _____
☐ Initial Notification Date: _____	Structure Use (current/prior): _____
☐ Revision Rev#: _____ Date: _____	Number of Structures: _____ Total Demolition area: _____ SF
	Renovation (Rm #/Name): _____

3. OWNER INFORMATION

Name _____
Address _____ City, State, Zip _____
Contact Name _____ Phone _____ Email _____
☐ Send correspondence to this email

4. CONTRACTOR INFORMATION

Name _____ Building Permit No. _____
Address _____ City, State, Zip _____
Contact Name _____ Phone _____ Email _____
☐ Send correspondence to this email

5. ASBESTOS CONSULTANT (CAC)

Name FSS Environmental DOSH No. 92-0107
Address 5716 Folsom Blvd., #146 City, State, Zip Sacramento CA 95819
Contact Name Michael Horan Phone 916-716-9203 Email ess-environmental@yolo.com
☐ Send correspondence to this email

6. ASBESTOS ABATEMENT CONTRACTOR

Name _____ DOSH No. _____
Address _____ City, State, Zip _____
Contact Name _____ Phone _____ Email _____
☐ Send correspondence to this email

7. WASTE DISPOSAL INFORMATION

Transporter Name _____ Phone _____
Address _____ City, State, Zip _____
Disposal Site _____ Phone _____
Address _____ City, State, Zip _____

8. PROJECT INFORMATION

Abatement Schedule: Set-up Date _____ Start Date _____ Completion Date _____

Renov / Demo Schedule: Set-up Date _____ Start Date _____ Completion Date _____

(Start date must be after the 10 work day waiting period has been met)

Asbestos being removed:

RACM:**Cat I:****Cat II:**

Materials: _____

Materials: _____

Materials: _____

Quantity: _____ SF LF CF

Quantity: _____ SF LF CF

Quantity: _____ SF LF CF

Total Quantity of Asbestos Materials being abated: _____ SF _____ LF _____ CF

Removal Method: ☐ Hand methods ☐ Mechanical ☐ Glove bag ☐ Other: _____Engineering Controls: ☐ Full containment/negative pressure ☐ PPE ☐ Other: _____

Asbestos Material to remain in place | Identify material & quantity

☐ None RACM _____ Cat I _____ Cat II _____**9. Special Request Notification:**☐ An Emergency Renovation is requested (24 hour waiting period) Approved / Denied by: _____ Date: _____

Attach a letter with the date, time & nature of the unexpected event which threatens safety, equipment or unreasonable costs.

☐ This is a local or state agency ordered demolition Approved / Denied by: _____ Date: _____

Attach a copy of the order. Agency Contact: _____ Phone: _____

10. Signatures

I certify that an individual trained in the provisions of this Regulation (40 CFR Part 61, Subpart M) and familiar with District Rule 9.9 will be on site during the abatement process associated with this demolition/renovation notification, and evidence that the required training has been accomplished by this person will be available for inspection during normal business hours. If paying by credit card the signed application may be transmitted by facsimile (fax) or electronic mail (email), and any such signature shall have the same legal effect as an original.

Signature of Owner/Contractor_____
Date**MUST BE SIGNED**

I certify that the above information is correct. If paying by credit card signed application may be transmitted by facsimile (fax) or electronic mail (email), and any such signature shall have the same legal effect as an original.

Signature of Owner/Contractor_____
Date**DISTRICT USE ONLY:**

Payment Due _____ Payment Amt. _____ (check, credit card) Pmt Rec'd By: _____

Date Rec _____ Notes: _____

Stamp Date (Fee rec'd and Form Complete)

Entered Into Database By: _____ Scanned By: _____

TABLE OF ACMs
Two Story Office Building- Selected Areas Only
100 W. Court St., Woodland CA
Job #5256.20

Sample #	Suspect Materials	Location	Asbestos Content	EPA Category	Estimated Quantity
3B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, S. Side on Wall to Roof	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	+/- 230 Sq. Ft. 1. and 2.
4B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, N.E. Side on HVAC Roof Curb Corner	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.
5B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, E. Side on Roof Vent Base	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.
6B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, N. Side on Skylight Roof Curb Corner	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.
7B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, S. Side on HVAC Roof Curb Corner	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.
8B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, N.W. Side on HVAC Roof Curb Corner	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.
9B	Core Sample of White Paint over Black Roofing Mastic and Rolled Roofing	Roof, S.W. Side on Roof Vent Base	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.

11B	White Sealant over Black Mastic	Roof, N. Side on Metal Parapet Wall Cap Seam	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	Included Above in Sample 3B 1. and 2.
41B	12" x 12" Black Vinyl Floor Tile with Black Mastic	Interior, 2 nd Floor, Room 23, E. Side on Floor	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	+/- 70 Sq. Ft. 1. and 3.
47B	12" x 12" Dark Blue Vinyl Floor Tile with Black Mastic	Interior, 2 nd Floor, Room 7 on Floor	5-10% Chrysotile Asbestos (In Mastic Only)	Cat I, Non-Friable	+/- 60 Sq. Ft. 1. and 4.

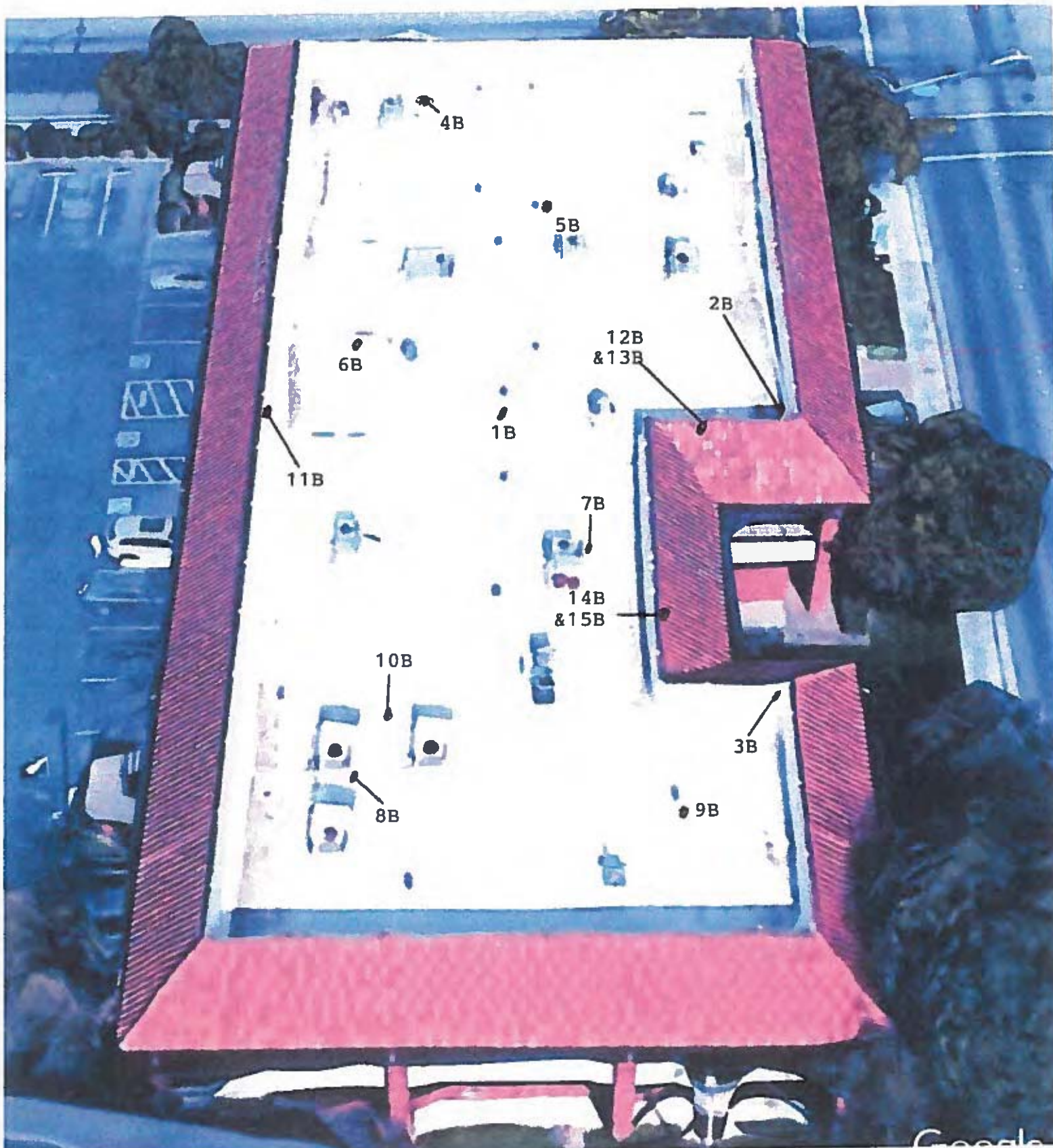
Notes:

1. This is an estimated quantity only of the ACM present at this location. This amount must be field verified by the abatement contractor for bid, notification and abatement purposes.
2. This roofing mastic is present on the roof at this location on multiple HVAC roof curbs, roof vent bases, side wall vents, side wall patches, wall to roof corners, roof drains, parapet wall seams and metal parapet wall cap seams etc.
3. This flooring mastic is present in Room 23 at this location.
4. This flooring mastic is present in Room 7 at this location.

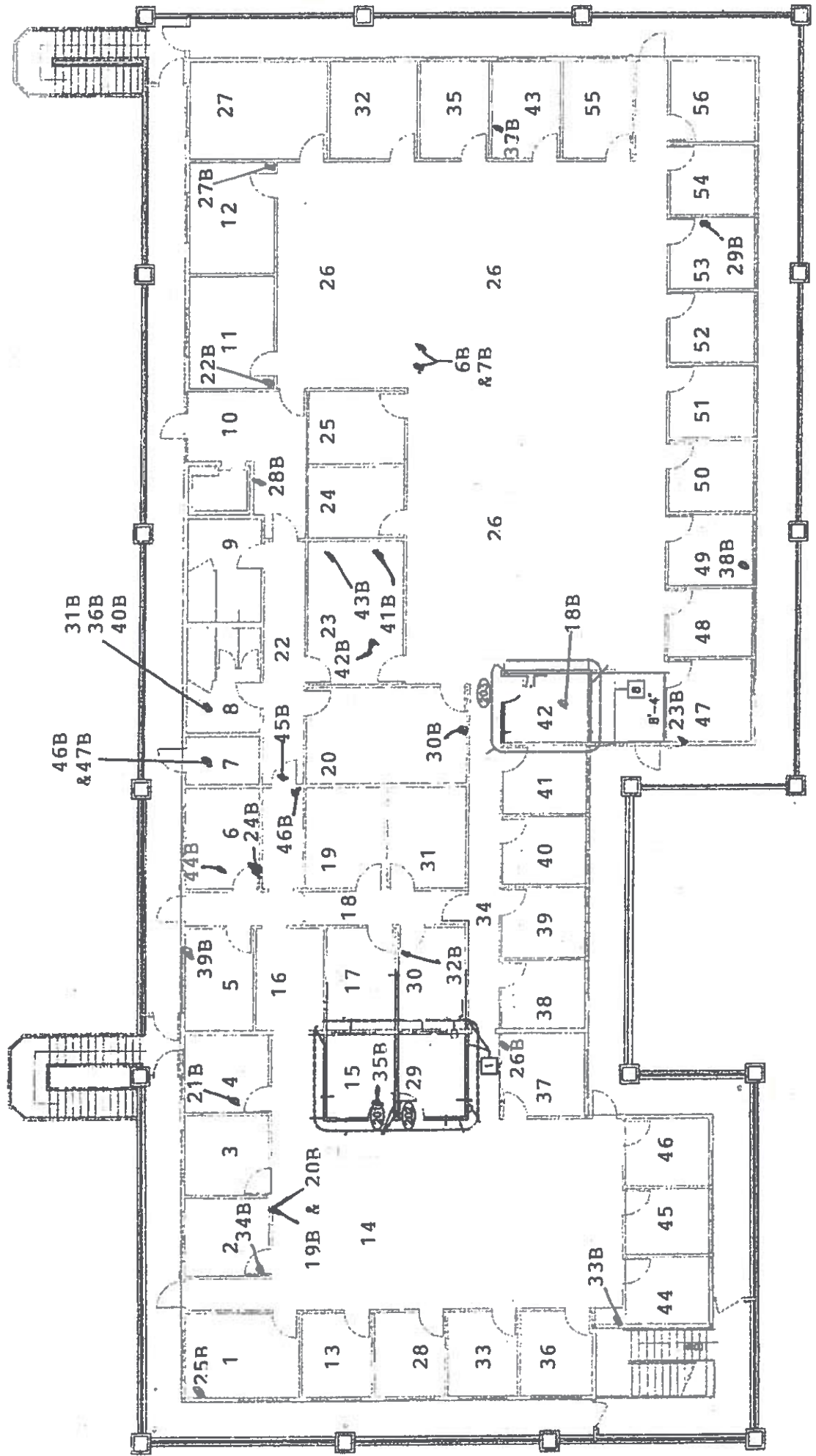
Roof plan for the two story office building located at 100 West Court Street, Woodland, CA

Note: ● - Denotes approx. sample locations

North



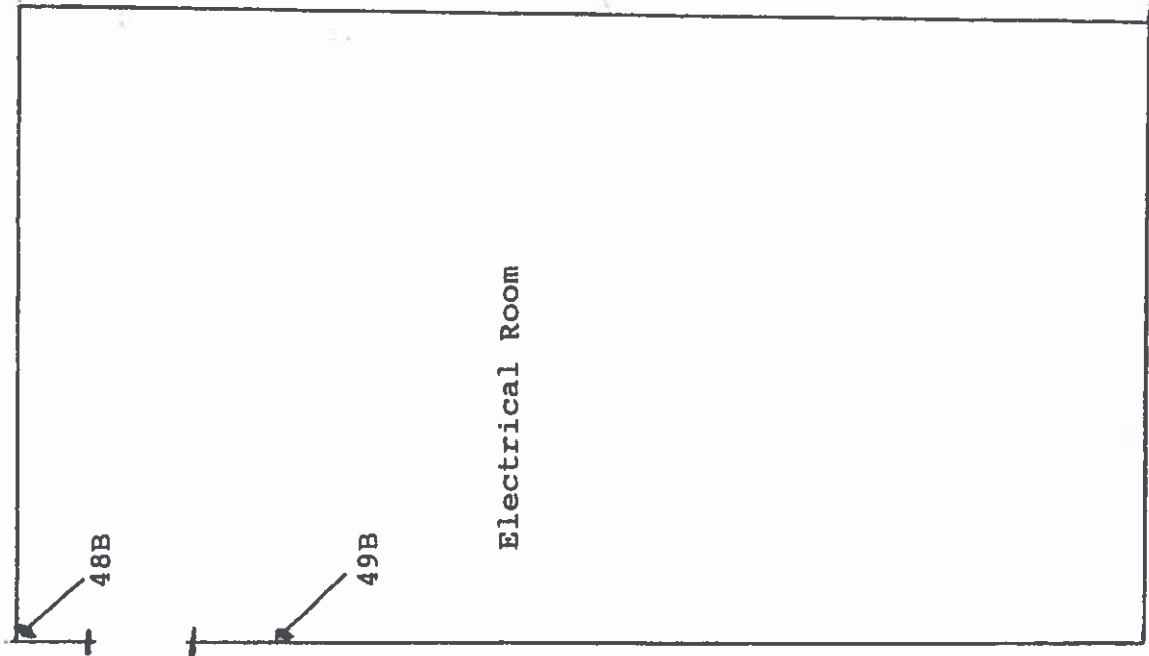
Note: ♣-Denotes approx. sample locations

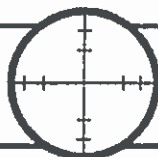


Floor plan showing first floor Electrical Room and Server Room located at 100 West Court Street, Woodland, CA

Note: ● - Denotes approx. sample locations
Drawing is not to scale

North





PRECISION^{INC}
MICRO-ANALYSIS

SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

Bulk Sample Analysis (PLM) Report

Report# 200611003

Mike Horan
ESS Environmental
5716 Folsom Blvd., PMB# 146
Sacramento, CA 95819

Date Collected: 06/05/20
Date Received: 06/05/20
Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
1B Lab# 20-363339	Roof - Center	Core sample of white painted rolled roofing	No asbestos detected 15-20% Synthetic fibers 5-10% Fibrous glass
2B Lab# 20-363340	Roof - South side on inside corner of parapet wall	Core sample of white paint over black roofing mastic and rolled roofing	No asbestos detected 15-20% Synthetic fibers 5-10% Fibrous glass
3B Lab# 20-363341	Roof - South side on wall to roof	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 5-10% Fibrous glass
4B Lab# 20-363342	Roof - Northeast side on HVAC roof curb corner	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 5-10% Fibrous glass
5B Lab# 20-363343	Roof - East side on roof vent base	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 5-10% Fibrous glass
6B Lab# 20-363344	Roof - North side on skylight roof curb corner	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 5-10% Fibrous glass

OFFICIAL NOTICE: After 45 days, samples are disposed of through a licensed waste hauler, unless client requests their return.

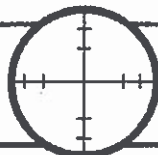
Total number of samples: 50

Page 1 of 9

Supervisor

Analyst

Note: The test result findings are made to the methodologies and parameters described on the reverse of this page.



PRECISION I
MICRO-ANALYSIS N
C

SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

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Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
7B Lab# 20-363345	Roof - South side on HVAC roof curb corner	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 5-10% Fibrous glass
8B Lab# 20-363346	Roof - Northwest side on HVAC roof curb corner	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 35-40% Cellulose fibers
9B Lab# 20-363347	Roof - Southwest side on roof vent base	Core sample of white paint over black roofing mastic and rolled roofing	Mastic: 5-10% CHRYSOTILE ASBESTOS Roofing: No asbestos detected 35-40% Cellulose fibers
10B Lab# 20-363348	Roof - Northwest side under wood support block	Core sample of black roofing pad and rolled roofing	No asbestos detected 5-10% Fibrous glass
11B Lab# 20-363349	Roof - North side on metal parapet wall cap seam	White sealant over black mastic	Mastic: 5-10% CHRYSOTILE ASBESTOS Sealant: No asbestos detected 75-80% Synthetic fibers
12B Lab# 20-363350	Roof - South side, tile pitched roof	Red roof tile	No asbestos detected

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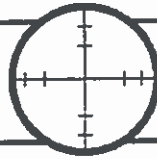
Total number of samples: 50

Page 2 of 9

Supervisor

Analyst

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**PRECISION^I
MICRO-ANALYSIS^N_C**

SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

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Date Received: 06/05/20
Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
13B Lab# 20-363351	Roof – South side, tile pitched roof, under 12B	Black roofing felt paper	No asbestos detected 85-90% Cellulose fibers
14B Lab# 20-363352	Roof – South side, tile pitched roof, under 12B	Red roof tile mortar	No asbestos detected
15B Lab# 20-363353	Roof – South side, tile pitched roof, on roof tile nail head	Brown mastic	No asbestos detected
16B Lab# 20-363354	Interior – 2 nd Floor, Room 26, center ceiling	Yellow 2'x4' fiberglass T-Bar ceiling tile with white paint	No asbestos detected 85-90% Fibrous glass
17B Lab# 20-363355	Interior – 2 nd Floor, Room 26, center ceiling	Yellow 2'x4' fiberglass T-Bar ceiling tile with white paint	No asbestos detected 85-90% Fibrous glass
18B Lab# 20-363356	Interior – 2 nd Floor, Room 42, center ceiling	Yellow 2'x4' fiberglass T-Bar ceiling tile with white paint	No asbestos detected 85-90% Fibrous glass

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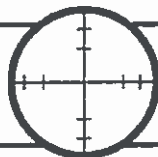
Total number of samples: 50

Page 3 of 9

Supervisor

Analyst

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SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

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Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
19B Lab# 20-363357	Interior - 2 nd Floor, Room 14, north side ceiling	Gray/white 2'x4' T-Bar ceiling tile	No asbestos detected 35-40% Cellulose fibers 25-30% Fibrous glass 15-20% Perlite
20B Lab# 20-363358	Interior - 2 nd Floor, Room 14, north side ceiling	Gray/white 2'x4' T-Bar ceiling tile	No asbestos detected 35-40% Cellulose fibers 25-30% Fibrous glass 15-20% Perlite
21B Lab# 20-363359	Interior - 2 nd Floor, Room 4, west side ceiling	Gray/white 2'x4' T-Bar ceiling tile	No asbestos detected 35-40% Cellulose fibers 25-30% Fibrous glass 15-20% Perlite
22B Lab# 20-363360	Interior - 2 nd Floor, Room 11, southwest corner wall	Core sample of white sheetrock / joint compound	No asbestos detected
23B Lab# 20-363361	Interior - 2 nd Floor, Room 47, west side wall	Core sample of white sheetrock / joint compound	No asbestos detected
24B Lab# 20-363362	Interior - 2 nd Floor, Room 6, southwest corner wall	Core sample of white sheetrock / joint compound	No asbestos detected

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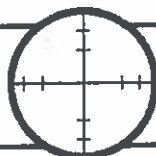
Total number of samples: 50

Page 4 of 9

Supervisor

Analyst

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**PRECISION^I
MICRO-ANALYSIS^N_C**

SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

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Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
25B Lab# 20-363363	Interior - 2 nd Floor, Room 1, northwest corner wall	Core sample of white sheetrock / joint compound	No asbestos detected
26B Lab# 20-363364	Interior - 2 nd Floor, Room 37, northeast corner wall	Core sample of white sheetrock / joint compound	No asbestos detected
27B Lab# 20-363365	Interior - 2 nd Floor, Room 12, southeast corner wall	White wall texture compound	No asbestos detected
28B Lab# 20-363366	Interior - 2 nd Floor, Room/Area 10, north side wall	White wall texture compound	No asbestos detected
29B Lab# 20-363367	Interior - 2 nd Floor, Room 53, east side wall	White wall texture compound	No asbestos detected
30B Lab# 20-363368	Interior - 2 nd Floor, Room 20, south side wall	White wall texture compound	No asbestos detected

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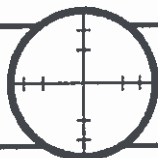
Total number of samples: 50

Page 5 of 9

Supervisor

Analyst

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SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

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Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
31B Lab# 20-363369	Interior - 2 nd Floor, Room 8, southeast side wall	White wall texture compound	No asbestos detected
32B Lab# 20-363370	Interior - 2 nd Floor, Room 30, north side wall	White wall texture compound	No asbestos detected
33B Lab# 20-363371	Interior - 2 nd Floor, Room 14, southwest corner wall	White wall texture compound	No asbestos detected
34B Lab# 20-363372	Interior - 2 nd Floor, Room 2, southwest corner wall	White wall texture compound	No asbestos detected
35B Lab# 20-363373	Interior - 2 nd Floor, Room 15, southwest corner wall	White wall texture compound	No asbestos detected
36B Lab# 20-363374	Interior - 2 nd Floor, Room 8, west side on lower wall	Yellow/brown ceramic tile with gray grout and mortar	No asbestos detected

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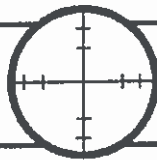
Total number of samples: 50

Page 6 of 9

Supervisor

Analyst

Note: The test result findings are made to the methodologies and parameters described on the reverse of this page.



PRECISION I
MICRO-ANALYSIS N
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SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

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Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
37B Lab# 20-363375	Interior - 2 nd Floor, Room 43, north side on lower wall	Tan vinyl wallbase mastic	No asbestos detected
38B Lab# 20-363376	Interior - 2 nd Floor, Room 49, south side on lower wall	Black vinyl wallbase with brown and tan mastic	No asbestos detected 5-10% Talc fibers
39B Lab# 20-363377	Interior - 2 nd Floor, Room 5, north side on lower wall	Brown and tan wallbase mastic	No asbestos detected 5-10% Talc fibers
40B Lab# 20-363378	Interior - 2 nd Floor, Room 8, south side on floor	Tan ceramic floor tile with gray mortar	No asbestos detected
41B Lab# 20-363379	Interior - 2 nd Floor, Room 23, east side on floor	12"x12" Black vinyl floor tile with black mastic	Mastic: 5-10% CHRYSOTILE ASBESTOS Tile: No asbestos detected
42B Lab# 20-363380	Interior - 2 nd Floor, Room 23, center on floor under carpet	Orange carpet glue over gray concrete	No asbestos detected

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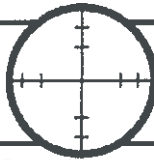
Total number of samples: 50

Page 7 of 9

Supervisor

Analyst

Note: The test result findings are made to the methodologies and parameters described on the reverse of this page.



**PRECISION^I
MICRO-ANALYSIS^N_C**

SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

Bulk Sample Analysis (PLM) Report

Report# 200611003

Mike Horan
ESS Environmental
5716 Folsom Blvd., PMB# 146
Sacramento, CA 95819

Date Collected: 06/05/20
Date Received: 06/05/20
Date Analyzed: 06/11/20

Phone: (916) 383-6642

Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
43B <i>Lab# 20-363381</i>	Interior - 2 nd Floor, Room 23, east side on bottom of sink	Tan coating	No asbestos detected 15-20% Cellulose fibers
44B <i>Lab# 20-363382</i>	Interior - 2 nd Floor, Room 6, west side under carpet	12"x12" Gray vinyl floor tile with yellow carpet mastic and vinyl tile mastic	No asbestos detected
45B <i>Lab# 20-363383</i>	Interior - 2 nd Floor, Room/Area 22, west side under carpet	Red ceramic floor tile with white thinset and gray mortar	No asbestos detected
46B <i>Lab# 20-363384</i>	Interior - 2 nd Floor, Room 7, northeast side on wall	Core sample of white sheetrock / joint compound	No asbestos detected
47B <i>Lab# 20-363385</i>	Interior - 2 nd Floor, Room 7, on floor	12"x12" Dark blue vinyl floor tile with black mastic	Mastic: 5-10% CHRYSOTILE ASBESTOS Tile: No asbestos detected
48B <i>Lab# 20-363386</i>	Interior - 1 st Floor, Electrical Room, northwest corner	Core sample of white sheetrock / joint compound	No asbestos detected

OFFICIAL NOTICE: After 45 days, samples are disposed of through a licensed waste hauler, unless client requests their return.

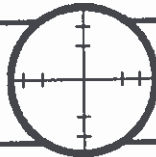
Total number of samples: 50

Page 8 of 9

Supervisor

Analyst

Note: The test result findings are made to the methodologies and parameters described on the reverse of this page.



PRECISION
MICRO-ANALYSIS

SPECIALISTS IN ASBESTOS-RELATED ANALYSIS

Bulk Sample Analysis (PLM) Report

Report# 200611003

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Job Information:
5256.20
100 West Court Street
Woodland, CA

Sample Number	Sample Location	Sample Description	Analytical Results
49B Lab# 20-363387	Interior - 1 st Floor, Electrical Room, west side lower wall	Tan vinyl wallbase with brown mastic	No asbestos detected 5-10% Talc fibers
50B Lab# 20-363388	Interior - 1 st Floor, Server Room, ceiling	Yellow 2'x4' fiberglass T-Bar ceiling tile with white paint	No asbestos detected 85-90% Fibrous glass

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Total number of samples: 50

Page 9 of 9

Supervisor

Analyst

Note: The test result findings are made to the methodologies and parameters described on the reverse of this page.

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Donald L. Hirsch

Name



Certification No. 1-35508

Expiration

This certificate is issued by the Division of Occupational Safety and Health authorized by Sections 7000-7009 of the Business and Professions Code



State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Michael L. Horan



Certification No. 33-0107

Expires on 07/30/20

This certification was issued by the Division of
Occupational Safety and Health as authorized
by Sections 7100 et seq. of the Business and
Professions Code.

ESS Environmental

5716 Folsom Blvd.,/PMB #146 • Sacramento, CA 95819 • (916) 383-6642 • ess_environmental@yahoo.com

LEAD BASED PAINT REPORT SELECTED SECOND FLOOR AREAS ONLY TWO STORY OFFICE BUILDING 100 WEST COURT ST., WOODLAND CA

1.0 INTRODUCTION

ESS Environmental (ESS) conducted on-site testing for lead-based paints on the selected areas of this structure at the above referenced location on June 5th, 2020. For this testing a total of two ceramic tile samples (Sample 1L and 2L) and eight (8) paint chip samples were taken (Samples 3L through 10L). For the paint testing at these locations Michael Horan, a DHS Certified Lead Inspector/Assessor, utilized EPA, HUD and DHS protocols as a general guideline. This lead based paint testing was performed for and authorized by Mr. Gene Wais of Yolo County. The scope of services, inspection and sampling methodology, laboratory analysis results and any recommendations are as listed in the following.

2.0 SCOPE OF WORK

The goal of this paint testing was to identify lead containing paints that may be present within the second floor area of this structure that would be disturbed during the upcoming planned renovation. This testing included the visual observation and identification of building components suspected of possibly containing lead based paint and a condition assessment of the painted surface where a chip sample was taken. The condition assessment for a painted surface from where a paint chip sample is taken calls for a surface that is cracking, peeling or damaged to be listed in poor condition. Painted surfaces not exhibiting these traits are noted to be in good condition.

3.0 PROPERTY DESCRIPTION

This is a two story office building of +/- 40 years of age.

4.0 QUALIFICATIONS

Michael Horan of ESS Environmental performed the lead paint testing. Mr. Horan is currently certified by the California Department of Health Services, Childhood Lead Poisoning Prevention Branch as an Inspector/Assessor (#779).

5.0 METHODS OF TESTING

For the ceramic tile sampling a piece of the glazed tile was taken and placed into a labeled sample bag and sealed shut. For the paint chip testing representative surfaces

with suspect lead containing paints were sampled by utilizing a heat gun to first lift the paint layers and then to remove the paint chips for analysis. Each paint chip sample was placed into a labeled container and sealed shut. After each paint chip or ceramic tile sample was taken the relevant information for that sample was listed on a laboratory chain of custody form.

6.0 TESTING PROTOCOL

Each representative painted component or surface was sampled using HUD Guidelines as published in October, 1997. For the painted components a minimum of one sample was taken of each representative component identified. As of this date the HUD and the EPA have not yet defined a lead-based paint survey. The overall objective of this testing was to determine the relative level of lead in the paints present at this location. Utilizing HUD protocols for noting the locations from where the samples were taken within each room or location was given a number or name. The interior location where the sample was taken was designated by assigning the street address side of the room/area as the A side. You then proceed clockwise around the room to the B side, C side and then the D side. You then note the building component being sampled. This protocol was utilized for this survey and is referenced on the Lead In Paint Results Table.

7.0 SITE SPECIFIC OBSERVATIONS

The general condition of this building at the time of this survey was good.

8.0 REGULATORY OVERVIEW FOR LEAD BASED PAINT AND LEAD IN DUST

Lead-based paint (greater than 600 mg/kg lead) was discontinued for public use by 1978.

The U.S. EPA, HUD, and the California Department of Health Services (DHS) define LBPs as paints containing greater than 5,000 ppm, 0.5% lead by weight or 1.0 mg/cm² total lead. OSHA and Cal-OSHA regulations (Lead Construction Standard) do not provide a definition for "lead-based paint" but do refer to the EPA, HUD, and DHS numbers mentioned above. Cal-OSHA has stated that disturbance of lead containing painted or stained surfaces containing 600 ppm or greater may pose a hazard. Cal-OSHA is primarily concerned with worker protection and therefore, regulates any amount of lead contained within painted building components. For this report the limit of detection and above will be utilized for positive lead content in a paint or ceramic tile.

9.0 LEAD-BASED PAINT AND CERAMIC TILE SAMPLE RESULTS & SUMMARY

ESS Environmental collected a total of ten paint chip or ceramic tile samples for this survey (Samples 1L through 10L). Based on the results of the subsequent Flame AA analysis of these samples received on June 9th, 2020 none of the samples taken from this location represents lead based paint as they did not contain greater than 5,000 ppm lead in their content. Only one of the ten samples (Sample 1L) is classified as lead containing.

The overall analysis of these ten samples showed results ranging from <39 ppm up to 110 ppm. See enclosed Eurofins Report #2418779. A complete summary of all ten of these ceramic tile and paint chip samples and their analysis results are attached as the Lead in Paint Results Table.

In addition to the above information, additional information on managing lead-based paint can be obtained from the California Department of Health Services (DHS) webpage (www.dhs.ca.gov/childlead), U.S. Housing and Urban Development (www.hud.gov/offices/lead), and the U.S. Environmental Protection Agency webpage (www.epa.gov/lead). Telephone information can be obtained from the California DHS (800-597-LEAD), and the National Lead Information Council (800-424-LEAD). The booklets "Reducing Lead Hazards When Remodeling Your Home" and "Lead Paint Safety" provide many good tips before disturbing paint in any building.

10.0 INSPECTION LIMITATIONS

This testing was planned, developed, and implemented based on the experience in performing lead-based paint surveys and inspections by ESS Environmental. The work was conducted in accordance with HUD guidelines, where applicable. ESS Environmental utilized state-of-the-art practices and techniques in accordance with regulatory standards while performing this inspection.

11.0 RECOMMENDATIONS

Any work involving the disturbance of the above listed lead containing materials must only be performed by a contractor who adheres completely to Cal-Oshas Lead in Construction Standard. Due to the age of this building and the sample analysis results the lead hazards posed by renovation work on the second floor of this structure are relatively low.

Lead in Paint Sample Results

Location: Two Story Office Building
100 W. Court St., Woodland CA

Inspector: Michael L. Horan
Date: 06-15-20

Representative: Mr. Gene Wais

Job #5256.20

Sample Location	Sample #	Paint Condition	Mg/kg (PPM)	Positive/Negative Results
2 nd Floor, Interior, Rm. 18, B. Side on Lower Wall (Yellow Ceramic Wall Tile)	1L	Good	110	Positive
2 nd Floor, Interior, Rm. 18, A. Side on Floor (Tan Ceramic Floor Tile)	2L	Good	<39	Negative
2 nd Floor, Interior, Rm. 27, C. Side on Wall	3L	Good	<39	Negative
2 nd Floor, Interior, Rm. 48, B. Side on Wall	4L	Good	<39	Negative
2 nd Floor, Interior, Rm. 23, C. Side on Cabinet Door	5L	Good	<39	Negative
2 nd Floor, Interior, Rm. 40, C. Side on Metal Door Frame	6L	Good	<39	Negative
2 nd Floor, Interior, Rm. 33, B. Side on Window Sill	7L	Good	<100	Negative
2 nd Floor, Interior, Rm./Area 16, A. Side on Cabinet Door	8L	Good	<48	Negative
2 nd Floor, Interior, Rm./Area 18, D. Side on Wood Door to Rm. 6	9L	Good	<190	Negative
2 nd Floor, Interior, Rm. 8, A. Side on Wall	10L	Good	<40	Negative



EMLab P&K

Report for:

Mr. Michael Horan
ESS Environmental
5714 Folsom Blvd.
PMB 146
Sacramento, CA 95819

Regarding: Project: 5256.20; 100 West Court St., Woodland, CA, 2nd Floor
EML ID: 2418779

Approved by:

Dates of Analysis:
Lead - Flame AA: 06-09-2020

Technical Manager
Andrew Ikeda

Service SOPs: Lead - Flame AA (EM-BC-S-8443)
AIHA-LAP, LLC accredited service, Lab ID #178697

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the samples as received. Sample size, as it relates to Wipe samples only, is supplied by the client.

Eurofins EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

Eurofins EMLab P&K's LabServe® reporting system includes automated fail-safes to ensure that all AIHA-LAP, LLC quality requirements are met and notifications are added to reports when any quality steps remain pending.

Client: ESS Environmental
C/O: Mr. Michael Horan
Re: 5256.20; 100 West Court St., Woodland, CA,
2nd
Floor

Eurofins EMLab P&K
17461 Derian Ave, Suite 100, Irvine, CA 92614
(866) 888-6653 Fax (623) 780-7695 www.emlab.com
Date of Sampling: 06-05-2020
Date of Receipt: 06-08-2020
Date of Report: 06-09-2020

LEAD: FLAME ATOMIC ABSORPTION SPECTROMETRY

Location:	1-L: 2nd Floor, Interior, Rm 18, B. side lower wall, Orange/ Yellow ceramic wall tile	2L: 2nd Floor, Interior, Rm 18, A. side on floor, Tan ceramic floor tile	3L: 2nd Floor, Interior, Rm 27, C. side on wall, 2" x 2" Multi- color paint chip	4L: 2nd Floor, Interior, Rm 48, B. side on wall, 2" x 2" White/ Tan paint chip
Comments (see below)	None	None	None	None
Lab ID-Version‡:	11534912-1	11534913-1	11534914-1	11534915-1
Analysis Date:	06/09/2020	06/09/2020	06/09/2020	06/09/2020
Sample type	Bulk sample	Bulk sample	Bulk sample	Bulk sample
Method*	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified
† Method Reporting Limit	39 ppm	39 ppm	39 ppm	39 ppm
Sample size	0.2558 grams	0.2539 grams	0.2567 grams	0.2550 grams
§ Total Lead Result	110 ppm	< 39 ppm	< 39 ppm	< 39 ppm

Comments:

Sample results have not been corrected for blank values.

Bulk samples are not covered under the AIHA-LAP, LLC service accreditation.

Wipe samples must meet ASTM E1792 criteria. Method Reporting Limits may not be valid for non-ASTM E1792 wipe samples.

*Sample preparation and analytical methods are based upon NIOSH 7082 and EPA 7000B.

† The Method Reporting Limit is the minimum concentration of Lead that the laboratory can confidently detect in the sample.

§ Total Lead Result has been rounded to two significant figures to reflect analytical precision.

‡ A "Version" indicated by "-x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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C/O: Mr. Michael Horan
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(866) 888-6653 Fax (623) 780-7695 www.emlab.com
Date of Sampling: 06-05-2020
Date of Receipt: 06-08-2020
Date of Report: 06-09-2020

LEAD: FLAME ATOMIC ABSORPTION SPECTROMETRY

Location:	5L: 2nd Floor, Interior, Rm 23, C. side on cabinet door int., 2" x 2" White paint chip	6L: 2nd Floor, Interior, Rm 40, C. side on metal door frame, 2" x 2" White paint chip	7L: 2nd Floor, Interior, Rm 33, B. side on window sill, 4" x 4" Brown stain/ Varnish	8L: 2nd Floor, Interior, Rm/Area 16, A. side cabinet door, 4" x 4" Brown stain/ Varnish
Comments (see below)	None	None	None	None
Lab ID-Version‡:	11534916-1	11534917-1	11534918-1	11534919-1
Analysis Date:	06/09/2020	06/09/2020	06/09/2020	06/09/2020
Sample type	Bulk sample	Bulk sample	Bulk sample	Bulk sample
Method*	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified
† Method Reporting Limit	39 ppm	39 ppm	100 ppm	48 ppm
Sample size	0.2535 grams	0.2535 grams	0.0975 grams	0.2099 grams
§ Total Lead Result	< 39 ppm	< 39 ppm	< 100 ppm	< 48 ppm

Comments:

Sample results have not been corrected for blank values.

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Wipe samples must meet ASTM E1792 criteria. Method Reporting Limits may not be valid for non-ASTM E1792 wipe samples.

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(866) 888-6653 Fax (623) 780-7695 www.emlab.com
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Date of Receipt: 06-08-2020
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LEAD: FLAME ATOMIC ABSORPTION SPECTROMETRY

Location:	9L: 2nd Floor, Interior, Rm/Area 18, D. side on wood door to Rm 6, 4" x 4" Brown stain/Varnish	10L: 2nd Floor, Interior, Rm 8, A. side on wall, 2" x 2" white paint chip
Comments (see below)	None	None
Lab ID-Version†:	11534920-1	11534921-1
Analysis Date:	06/09/2020	06/09/2020
Sample type	Bulk sample	Bulk sample
Method*	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified
† Method Reporting Limit	190 ppm	40 ppm
Sample size	0.0516 grams	0.2502 grams
§ Total Lead Result	< 190 ppm	< 40 ppm

Comments:

Sample results have not been corrected for blank values.

Bulk samples are not covered under the AIHA-LAP, LLC service accreditation.

Wipe samples must meet ASTM E1792 criteria. Method Reporting Limits may not be valid for non-ASTM E1792 wipe samples.

*Sample preparation and analytical methods are based upon NIOSH 7082 and EPA 7000B.

† The Method Reporting Limit is the minimum concentration of Lead that the laboratory can confidently detect in the sample.

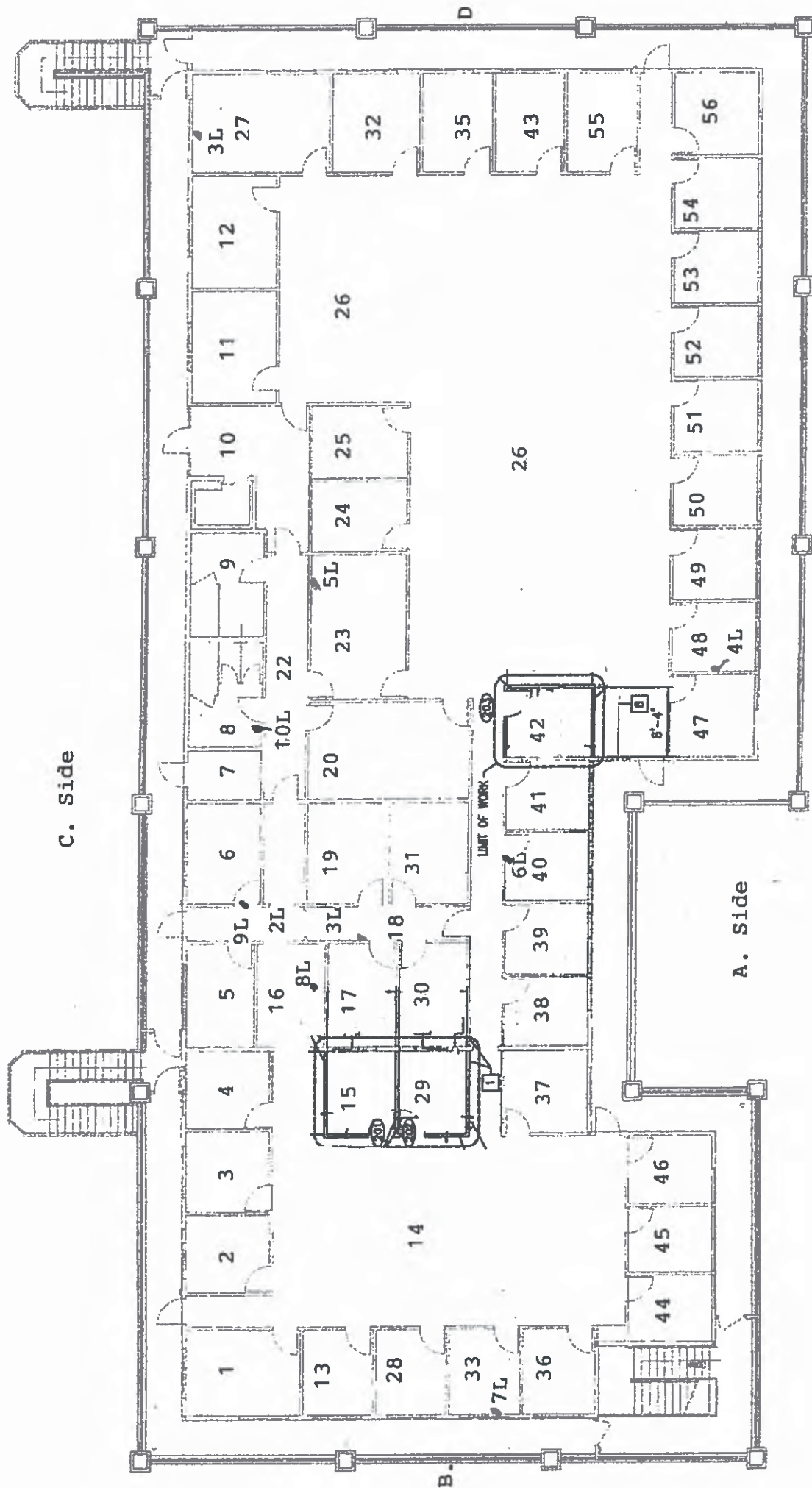
§ Total Lead Result has been rounded to two significant figures to reflect analytical precision.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Second floor plan for the two story office building located at 100 West Court, Street, Woodland, CA

Note: ♦ - Denotes approx. lead in paint sample locations

North





STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH



LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:



Michael Horan

CERTIFICATE TYPE:

Lead Inspector/Assessor

NUMBER:

LRC-00005768

EXPIRATION DATE:

5/12/2021

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD.