COCHISE COUNTY
Highway & Floodplain

PRELIMINARY DRAFT UPDATE

Road Design & Construction Standards & Specifications For Public Improvements

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2017 EDITION

COCHISE COUNTY

Road Design & Construction Standards
& Specifications for Public Improvements

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SECTION A

INTRODUCTION

1. PURPOSE

The purpose of this manual (hereafter Design Standards) is to provide consistent design standards and specifications for the roadway network in Cochise County. It is also supports the specific infrastructure management goal of the County's Strategic Plan to prudently manage and preserve the County's infrastructure investment.

Cochise County has long had operations and maintenance manuals to guide the County's roadway network development but it was not until the 1970's that County Engineers began to sign and seal specific details for general use. Prior to 1978, County highway work was under the direct supervision of each of the County Supervisors. Resolution 78-44 delegated this authority to the County Engineer and, six years later, Resolution 84-80 designated a Floodplain Control Board and appointed a Floodplain Engineer. Under their guidance previous roadway typical sections and construction details were combined into a 1996 Design Standard Handbook. The Board of Supervisor formally adopted Cochise County Design Standards in May of 2003. Revisions were undertaken in April, 2005 and again in October of 2005. This 2017 update was adopted by the Board of Supervisors on *Month, Date, Year.*

When the application of a standard or specification is required, the words "must" or "shall" are used. When there is flexibility, the words "may" or "should" are used. This update reflects the experience of Cochise County highway/floodplain engineers and operations foremen, changes in applicable standards and publications, and evolving policies and practices regarding the County's transportation infrastructure.

These Design Standards may not apply to all situations. They are intended to assist the professional engineer's competent work but not to substitute for it. It is recognized that each roadway project is likely to have conditions that require site-specific treatment. These Design Standards are not a substitute for the design engineer's experience, professional judgment, comprehensive understanding of the referenced material, or ongoing communication with reviewers.

These Design Standards are also not intended to unreasonably limit any innovative or creative effort that might result in higher quality or cost savings for the public. Proposed variances from these adopted standards must be submitted to the Cochise County Engineer and approved before the project design is finalized. In the event of differences between these Design Standards and the scope of work or provisions of an executed County design contract, the executed contract shall govern.

2. APPLICABILITY

These Design Standards shall govern all construction and reconstruction of transportation facilities in County right-of-way or right-of-way that is intended to be dedicated to Cochise County.

The functional classification, future traffic characteristics (vehicle types and volumes), and topography of the area are the basic criteria used to determine the design standards to be used.

Before the County accepts a road into the County Road System for maintenance, it shall meet the standards contained herein. If field conditions change after plan approval, improvements shall be made, as necessary, to bring the transportation facilities up to these standards. These standards should be used by private parties, development engineers, consulting engineers, public utilities and agencies, and the Cochise County Highway and Floodplain Department (CCH&FD) staff. New roads or other public improvements will only be considered for acceptance into the County's maintenance system if they have direct access to another County-maintained road or another road that is maintained by a governmental entity.

These Design Standards do not apply to routine maintenance of existing facilities that do not meet these standards.

For the purposes of these Design Standards, the following definitions for maintenance, preservation, rehabilitation and construction shall be used:

- Roadway maintenance is defined as any work that is preformed to maintain the condition of the roadway or to respond to specific conditions or events that restore the roadway to a functional state of operation.

- Roadway preservation is defined as any work that is planned and preformed to improve or sustain the condition of the roadway in a state of good repair. Preservation activities generally do not add capacity or structural value, but do restore the overall condition of the roadway.

- Roadway rehabilitation is defined as any work that extends the service life of existing pavement either by restoring existing structural capacity through elimination of age-related, environmental cracking of embrittled pavement surface or by increasing the pavement thickness to strengthen existing pavement sections to accommodate existing or projected traffic loading conditions.

- Roadway construction and reconstruction is defined as any work that changes the geometric prism or surface type of the roadway or completely removes and replaces the existing pavement structure. Reconstruction is required when a pavement has either failed or has become functionally obsolete. Such work will include roadway widening, penetration and chip seal on existing gravel/dirt surfaces, overlays greater than two inches, and major drainage improvements.

3. VARIANCE REQUESTS

Variances from these Design Standards may only be granted by the Cochise County Engineer. Any proposed departure from these standards will be judged on if the requested variance is in the public interest and would not compromise public safety or the County's infrastructure investment. A request for a variance must be made in writing and include the following:

1. Standard or specification requested to be varied;
2. Alternative design or construction standard proposed;
3. Why the request is being made; and

4. Justification for the request – specifically addressing the potential impact on the public infrastructure system (safety, functionality, maintainability).

Documentation and exhibits to support the request should be included. Additional information, studies, reports and/or alternative design sealed by a civil engineer licensed to practice in Arizona may be requested by the County Engineer prior to making a decision on the variance request. A written decision will be conveyed within 20 business days after receipt of a complete submittal.

4. DEVELOPMENT OF PLANS AND SPECIFICATIONS

Except where these standards provide otherwise, testing, report preparation, principles, practices, design, design details, workmanship, construction, and materials shall be in accordance with the latest edition and current revision of the following publications:

- Uniform Standards Specifications and Details for Public Works Construction, sponsored and distributed by the Maricopa Association of Governments (MAG). See Section D and E for Cochise County amendments to MAG Standards.
- A Guide for Erecting Mailboxes on Highways, as distributed by the American Association of State Highway and Transportation Officials (AASHTO)
- A Policy on Geometric Design of Highways and Streets, as distributed by AASHTO
- Arizona Department of Transportation (ADOT) Traffic Control Design Guidelines
- Arizona Manual of Approved Signs (MOAS), as distributed by ADOT
- Arizona Supplement to the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, ADOT
- Cochise County Floodplain Regulations, Cochise County Flood Control District
- Design of Riprap Revetment, Hydraulic Engineering Circular 11 (HEC-11), as distributed by U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA)
- Guide for the Development of Bicycle Facilities 2012, 4th Edition, published by AASHTO
- Guidelines for Geometric Design of Very Low-Volume Local Roads (Average Daily Traffic [ADT] ≤ 400 vehicles per day [vpd]), as distributed by AASHTO
- Highway Capacity Manual, as distributed by the Transportation Research Board (TRB)
- Highway Drainage Design Manual, Volume 2, Hydrology, ADOT
- Highway Drainage Design Manual, Hydraulics, ADOT
- Hydraulic Design of Energy Dissipaters for Culverts & Channels, Hydraulic Engineering Circular 14 (HEC-14), USDOT, FHWA
- Hydraulic Design of Highway Culverts, Hydraulic Design Series (HDS) No. 5, USDOT, FHWA

- MUTCD for Streets and Highways, as distributed by the USDOT, FHWA; and as amended and approved by ADOT
- Materials Preliminary Engineering and Design Manual, prepared by ADOT
- Pavement Marking Design Manual, published by Pima County Department of Transportation and City of Tucson Department of Transportation
- Roadside Design Guide, as distributed by AASHTO
- Roadway Lighting Design Guide, published by AASHTO
- Roundabouts: An Informational Guide, as distributed by USDOT, FHWA
- State Standards, Arizona Department of Water Resources (ADWR) Flood Mitigation Section, SS1-97, SS2-96, SS3-94, SS4-95, SS5-96, SS6-05, SS7-98, SS8-99, SS9-02, SS10-07 and SS10-09
- Traffic Control Devices Handbook, 2nd Edition, as distributed by the Institute of Transportation Engineers (ITE)
- Traffic Engineering Handbook, ITE.
- Traffic Impact Analyses, Section 240 of ADOT Traffic Engineering Guidelines and Processes
- Trip Generation Manual, 9th Edition or update, as distributed by ITE
- Trip Generation Handbook, 2nd Edition or update, as distributed by ITE

5. TIME LIMITATION OF CONSTRUCTION PLAN APPROVAL

The approval of road construction plans shall be valid for a time period of three years from the date of final design approval by the County. Improvements not under construction within this time period must be resubmitted to and reapproved by the County unless a longer time period has been specifically authorized with the County's original approval. Requests for extensions must be submitted in writing with appropriate justification warranting such an extension. Road construction plans may be required to be revised to meet with updated standards, if changes have occurred since the date of first approval.

A written decision will be conveyed within 20 business days of receipt of complete submittal.

SECTION B

ROADWAY FUNCTIONAL CLASSIFICATION

1. SYSTEMS AND CLASSIFICATIONS

Functional classification is the system by which rural and urban roads are grouped into classes according to the character of service they are intended to provide. The basic functional systems are arterials, collectors, and local access roads. Travelers use a combination of arterial, collector, and local roads for their trips.

Each type of road has a specific purpose or function. Arterials provide for long distance travel; local streets provide access to serve each end of the trip; and collectors provide travel mobility between the higher volume, higher speed roads to the lower volume, residential roads.

A transportation system consists of each street type, as shown at right, and described in Table 1, below.

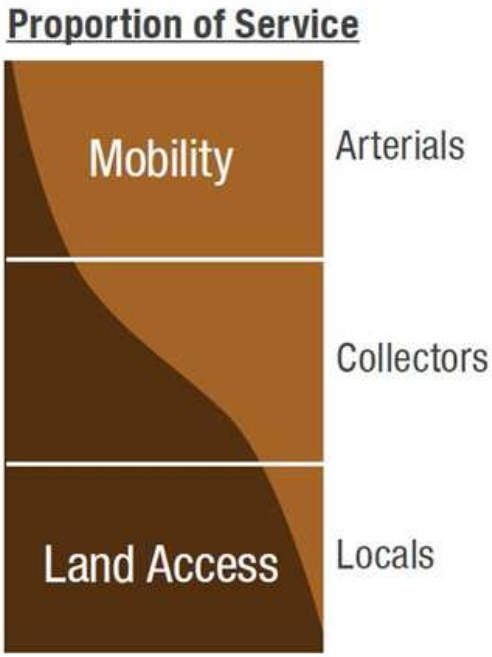


Table 1 – Roadway Functional Classification

Functional Classification	Ideal Character and Function of the Roadway	Types
Arterial	Provides the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control. These are the best developed roads in roadway network.	Serves major activity and economic centers; connects dense urban areas; provides linkages to other arterials; connects to the Interstate system.
Collector	Provides a less highly developed road with a lower speed; collects traffic from local roads and connects them with arterials; provides alternative routes to higher classed roadways.	Collects traffic from the local roadway network and distributes them to the major collector or arterial system. Serves smaller scaled activity and economic centers.
Local	Consists of all roads not defined as arterials or collectors; multiple access points for individual users, lowest speeds for short distances on the least developed roads.	Provides access to land with little or no through movement; typically residential or rural ranch/agricultural areas; individualized access points.

Specific criteria guide the designation of roadways as a Federal Functional Classified roadway, as opposed to a County level designation. Both a Federal and a County classification designation serve as a basis for establishing speed limits, design standards, and access controls. However, an important distinction is that the use of most Federal or State funds for roadway improvements is limited to those roadways designated as a Federal Functional Classified roadway.

This section discusses both Federal and County functional classifications for County roadways.

The desired Level of Service (LOS) designations for each County functional classification is used in traffic analysis to support roadway function classifications, sizing of roads, and determining the number of intersection auxiliary lanes that are required during peak hours.

Federal Functional Classification definitions are adapted from Federal Highway Administration *Highway Functional Classification Concepts, Criteria and Procedures, Chapter 3,Criteria,* https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section03.cfm

2. FEDERAL FUNCTIONAL CLASSIFICATIONS

Minor Arterial Road

Minor arterial roads provide service for trips of moderate length, serve geographic areas that are smaller than their major arterial counterparts and offer connectivity to the major arterial system.

Minor arterial roads consist of roads with the following service characteristics:

A. Link cities and larger towns (and other major destinations capable of attracting travel over long distances) and form an integrated network providing interstate and inter-county service
B. Be spaced at intervals, consistent with population density, so that all developed areas are within a reasonable distance of an arterial roadway
C. Provide service to corridors with trip lengths and travel density greater than those served by collectors and local roads and with relatively high travel speeds and minimum interference to through movement

Example: Naco Highway, SR 191, SR 92

Major Collector Road

Major collectors in rural areas tend to connect to State or Interstate routes, provide service to the larger communities not directly served by the higher road systems, and serve the principal business area or a concentration of community facilities in rural communities. Collectors generally serve primarily intra-county travel (rather than statewide) and constitute those routes on which travel distances are typically shorter than on arterial routes. Generally, major collector routes are longer in length; have lower connecting driveway densities; have higher speed limits; are spaced at greater intervals; have higher annual average traffic volumes; and may have more travel lanes than minor collector roads.

Major collector roads consist of roads with the following service characteristics:

A. Provide service to any county seat not on an arterial route, to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intra-county importance such as consolidated schools, shipping points, county parks and important mining and agricultural areas
B. Link these places with nearby larger towns and cities or with arterial routes
C. Serve the most important intra-county travel corridors

Example: N. Fort Grant Road, Davis Road, S. Kansas Settlement Road, Charleston Road

Minor Collector Road

Minor collector roads in rural areas collect traffic from local roads and tend to feed predominantly residential traffic from side streets into collector streets.

Minor collector roads consist of roads with the following service characteristics:

A. Be spaced at intervals, consistent with population density, to collect traffic from Local Roads and bring all developed areas within reasonable distance of a Collector
B. Provide service to smaller communities not served by a higher-class facility
C. Link locally important traffic generators with their rural hinterlands

Example: W. Gleeson Road, Noland Road, S. Hereford Road, S. Apache Pass Road

3. COCHISE COUNTY FUNCTIONAL CLASSIFICATIONS

Collector Road, Commercial/Industrial

Collector roads connect local streets to arterial roads in urban areas. These collectors provide land access and traffic circulation within commercial, and industrial areas. Collector roads consist of roads with the following service characteristics:

A. Traffic movements in urban areas between local roads and arterial roads.
B. Traffic movements are subject to high levels of side and median friction, such as driveways and cross streets.
C. Development may front directly on the road.
D. Signal spacing is two miles or less.
E. Has more than 10 uncontrolled access points per mile on one side.
F. Local areas could include residential neighborhoods, commercial, and industrial areas.
G. Right-of-way width typically between 80 -100 feet
H. Desired LOS B.

See Standard Detail CC010, Collector Road, Commercial Industrial for design standards.

Example: Foothills Drive, Towner Avenue, Dale Road

Major Collector Road

In Cochise County, major collector roads tend to connect to state or interstate routes, which are typically classified as arterial routes. Major collector routes can also provide service to larger communities not directly served by the arterial system. Major collector routes can serve traffic generators of regional importance such as economic generators, ecotourism destinations or a cluster of community facilities in rural communities. Major collector roads consist of roads with the following service characteristics:

A. Paved roads with traffic volumes greater than 2,600 vpd
B. Serves traffic movements with trip length and density suitable for trips between counties, between traffic generators and larger cities, and between traffic generators and routes of a higher classification.
C. Traffic movements are subject to low level of side friction.
D. Development may front directly on the road but joint access is preferred, when feasible.
E. Signal spacing is two miles or greater.
F. Design to the same horizontal and vertical design characteristics as arterial roads, but to specified collector road widths.
G. Striped for one lane in each direction.
H. Right-of-way width is typically between 100 – 150 feet, depending on drainage
I. Desired LOS C.

See Standard Detail CC011, Major Collector Road for design standards.

Example: Fort Grant Road, Davis Road, Charleston Road.

Minor Collector Road, ADT>2,000 vpd

Minor collector roads move traffic from local roads to major collector or arterial roads. This category of minor collector roads carry relatively higher traffic volumes than other minor collector roads, typically more than 2,000 vehicles per day. Minor collector roads with traffic volumes greater than 2,000 vpd consist of roads with the following service characteristics:

A. Paved roads with traffic volumes between 2,000 and 2,600 vpd
B. Serves traffic movements between local roads and major collector or arterial roads
C. Traffic movements between smaller communities, or locally important traffic generators and developed areas
D. Two-lane undivided roads with intersections at grade, and designed to limit, when feasible, interference of traffic from residential driveways.
E. Striped for one lane in each direction
F. Right-of-way width typically between 80 -100 feet, depending on drainage
G. Desired LOS B

See Standard Detail CC012, Minor Collector Road, ADT>2,000 vpd for design standards.

Example: Ocotillo Road, Hereford Road, J- Six Ranch Road

Minor Collector Road, ADT<2,000 vpd

Minor collector roads collect traffic from local roads and distribute this traffic to major collectors or arterials. Minor collector roads have lower traffic volumes than major collectors, typically less than 2,000 vpd. Minor collector roads, with ADT less than 2,000 vpd consist of roads with the following service characteristics:

A. Paved roads with traffic volumes between 1,000 and 2,000 vpd
B. Traffic movements between local roads and major collector or arterial roads.
C. Traffic movements between smaller communities, or locally important traffic generators and developed areas.
D. Two-lane undivided roads with intersections at grade frequently with rural, residential driveway access.
E. Right-of-way width typically between 80 -100 feet
F. Desired LOS B.

See Standard Detail CC013, Minor Collector Road, ADT<2,000 vpd for design standards.

Example: County Hospital Road, Hereford Road, Treasure Road

Major Local Road, Double Bituminous Surface Treatment

Major local roads serve primarily to provide access to adjacent land uses and connect them to collector and arterial roadways. The main function of most local roads is to provide movement for travelers to and from residences. Roads in this classification are maintained by Cochise County and because their higher levels of local traffic, typically between 400 and 1,000 vpd, a double bituminous surface treatment is preferred. These streets provide direct access to abutting properties and provide access into and through subdivisions.

The major local roads consist of roads with the following service characteristics:

A. Paved roads with traffic volumes between 400 and 1,000 vpd
B. Two-lane undivided roads with intersections at grade
C. Traffic movements between collectors and adjacent lands
D. Traffic movements involving relatively short distances
E. Right-of-way width typically between 60-80 feet, depending on drainage
F. Desired LOS A

See Standard Detail CC014, Major Local Road, Double Bituminous Surface Treatment for design standards.

Example: Coy Street, Sunrise Street, Judd Street

Minor Local Road, Unpaved, Low Volume

Minor Local roads provide access to adjacent land uses and connect them to collector roadways. The main function of most local roads is to get travelers to and from residences.

Minor local roads in this classification are low volume unpaved roads and are maintained by Cochise County. These roads typically carry between 250 and 400 vpd. These streets provide direct access to abutting property and connect to collector roadways.

The minor local roads typically have the following service characteristics:

A. Unpaved road with traffic volumes between 250 and 400 vpd
B. Two-lane undivided roads with intersections at grade
C. Traffic movements between collector roads and adjacent lands
D. Traffic movements involving relatively short distances
E. Right-of-way width between 60 – 80 feet
F. Desired LOS A

See Standard Detail CC015, Minor Local Road - Unpaved, Low Volume for design standards.

Example: Ed Street, Ironwood Road, Apache Pass Road

Context Sensitive Road, Unpaved, Very Low Volume

Context sensitive roads are unpaved and generally provide local access to residences. Context sensitive roads are public roadways but are substandard dirt roads that were constructed and in use prior to 1975. A.R.S. § 28-6705 and 6706 sets out the statutes allowing for minimal maintenance with limited liability for these types of roadways. These roadways are signed warning the traveling public that they are on a roadway that is only minimally maintained.

Cochise County also has several areas with extraordinary environmental, ecological or culturally significant features. In some cases, these unique areas require additional consideration to balance access and safety with preservation of these valued resources. Flexibility in design standards, allowing accommodation of site specific concerns, may make this the most appropriate standard to apply to mitigate potential adverse impacts on the topography, water courses, wildlife habitat, vegetation, cultural resources or the integrity of the area as a whole.

Context sensitive roads have the following service characteristics:

A. Unpaved road with traffic volumes less than 250 vpd
B. Constructed and in use prior to 1975
C. Minimal County maintenance requirement with limited liability
D. Right-of-Way between 50-70 feet.
E. May potentially be signed for a 25 mph or less speed limit.

See Standard Detail CC016, Context Sensitive Road, Unpaved, Very Low Volume, for maintenance standards.

Example: Airstrip Road, Double U Ranch Road, Escalante Crossing Road

SECTION C

ELEMENTS OF ROADWAY DESIGN

1. DESIGN STANDARDS

This section highlights the important considerations and requirements in designing and preparing plans for new and improved Cochise County roadways. The use of widely accepted industry standards typically reduces design and review timeframes. Reference documents are cited in this section and are also listed in Section A. Note that these documents are revised periodically; therefore, users should use most recent version of the document specified.

Cochise County minimum design standards are described in the current edition of A Policy on Geometric Design of Highways and Streets, published by AASHTO, commonly referred to as the Green Book.

The typical road cross-sections for Cochise County roadways are shown in Section D. For roadways which may be annexed in the near future by a city or town, Cochise County may elect to incorporate elements of the adjacent city's or town's standards into the design.

2. NEW ROADS ACCESSING A COUNTY MAINTAINED ROAD

A road is any vehicular travelway that serves two or more lots or parcels. See Detail CC205-3. New public and private roads accessing a County maintained road shall require an approved right-of-way permit.

All roads intersecting an arterial, major collector, or section-line road shall do so at a 90° angle; intersections of minor collectors and local roads shall not vary from the 90° by more than 15°.

Intersecting road jogs with centerline offsets shall be a minimum of 200 ft on local and minor collector roads and 300 ft on all other roads.

At road intersections, property line and road alignment shall be rounded with a minimum radius of 25 ft for local and minor collector roads and 50 ft for all other roads. When acceleration or deceleration lanes are present, curve radii may be reduced to 25 ft. The centerline tangents shall be a minimum of 50 ft for local roads and 100 ft for all other roads, measured from the right-of-way line.

The crossover crown of two adjacent intersecting pavements shall not exceed an algebraic difference of 4 percent for arterial and collector roads and 6 percent for local roads.

Functional clear visibility shall be provided in both directions along the centerline of all intersecting roads.

Intersections should be located along tangent sections of roadway. In no case shall an intersection be located on or near the inside of a sharp curve.

The provision of exclusive right- or left-turn lanes should be considered at major intersections and at locations where safety is significantly improved by providing a deceleration area for

vehicles moving from the major roadway and turning left or right into a cross road or driveway. Turn lane design shall be per ADOT Traffic Engineering Policy 430, Turn Lanes. Specific design values and marking for turn lanes and storage are given in Pima County Department of Transportation and City of Tucson Pavement Marking Design Manual.

A. ROADWAY ACCESS APRON

The surface type of the roadway apron shall meet or exceed the surface type of the adjacent County-maintained roadway and shall be designed to adequately handle roadside drainage. Applicant shall demonstrate that additional stormwater from the new roadway shall not result in stormwater overtopping any part of the existing County-maintained travelway or cause erosion or deposition within the County right-of-way. Further, applicant shall demonstrate that the new roadway shall not increase stormwater drainage onto neighboring properties.

Uncurbed intersections shall include concrete ribbon curb, per MAG Detail 220, Type B, along the curb return to prevent pavement raveling.

Stopping sight distance shall be provided at all intersections. Both horizontal and vertical curves should be as flat as possible at intersection and driveways where vehicles have to decelerate, stop, and accelerate.

Obstructions in both the horizontal plane and the vertical plane must be reviewed when designing intersections. Sight triangles provide areas at the corners of intersections of roads and driveways where views of approaching traffic are not obstructed. Sight distance triangles shall be identified and shown at all road intersections and noted on the final subdivision plat and on commercial site plans, see Detail CC300. These areas are required to remain free of all obstructions that will obstruct vision between a height of 3 ft and 10 ft to include, but not be limited to, structures, trees, shrubbery, and signs, except utility poles, fire hydrants, and traffic control signs. Intersection sight triangles are applied to approaching vehicles and departing vehicles.

B. CONTEXT SENSITIVE ROAD CLASSIFICATION

Cochise County has a special designation for roadways that have historically been maintained by the County (some prior to statehood) and are located in unique ecosystems that require flexibility in design standards. This roadway section, CC016, is not for use for new roads being constructed or brought into the County's maintenance system. This road or road segment is typically signed in a manner that is consistent with the MUTCD as a "Scenic Road," or a "Primitive Road" together with "Narrow Width, Limited Shoulder" and, when designated by the County Engineer, speed limit signs.

3. DRIVEWAYS

A driveway is any access constructed within the public right-of-way, connecting the public roadway with an adjacent property. There are three general driveway categories and corresponding details for Residential Driveways, Detail CC205-1, Commercial Paved Driveways, Detail CC205-2, and Roadway Access Aprons, CC205-3. Roadway access aprons are required for private roads that provide access to 2 or more parcels. Though each has typical guidelines for layout, application, and typical materials, all driveway configurations must receive approval by the County Engineer before installation. The driveway general requirements are listed below followed by specific requirements for each classification.

Spacing :The location and spacing of driveways has an impact on both safety and capacity of the roadway. The distance between adjacent driveways shall be adequate to allow

driveway vehicles to safely queue, accelerate, decelerate, and cross conflicting traffic without excessive interference with through traffic or adjacent driveway traffic. A minimum of 150 feet, measured at the right-of-way line, shall separate the nearest pavement edge of any entrance or exit driveway and the nearest intersecting road. Driveways near median openings shall either be centered with the center of the median opening or be a minimum of 100 feet from the median opening. Driveways that access onto local streets shall be a minimum of 50 feet from the nearest intersecting road.

Length & Width: The design of a driveway should take into consideration the space necessary to store vehicles using the driveway. This applies to both vehicles making a left turn from the roadway and to vehicles stopped on the driveway waiting to enter the roadway. Joint access will be required for two adjacent developments where a proposed new access will not meet these spacing requirements.

Skew: Driveway design shall seek to make the driveway alignment at a 90 degree angle (perpendicular) to the road they are accessing. When parcel circumstances cannot accommodate 90 degrees, a reduction minimum to 60 degrees may be considered for approval by the County Engineer.

Sight Distance: Adequate sight distance shall be provided for vehicles exiting and entering a driveway. The location should be evaluated to determine whether a sight obstruction exists, such as buildings, signs, vegetation, parked vehicles, or horizontal or vertical roadway alignments, etc. In all cases, stopping sight distance shall be provided. See Detail CC300, Sight Distance Triangles.

Vertical Alignment/Grades: Adequate design of driveway grades should reflect consideration for the basic functions of the adjacent street and the site that the driveway serves. In order to enable safe ingress and egress maneuvers, driveway profiles should provide for sufficient clearance between the vehicle and the driveway surface. Grade/vertical limitations are listed below under each driveway classification.

Drainage: The Design Engineer shall provide for drainage at each driveway and consider the surrounding terrain, on and off site flows, and shall calculate the capacity need for any drainage structures. Drainage structures shall be provided under driveways when necessary. When flows are deemed suitable, driveway at grade crossings can be utilized, see Detail CC205-4, Driveway & Landscaping within Drainage Ditch. Desirable side slopes for all driveways is 6:1. The Design Engineer shall detail ditch or channel design and slopes and protection requirements including rip rap gradation. When driveways have sag curves, Details 560-1 and 2 should be considered.

A. RESIDENTIAL DRIVEWAYS

Residential driveways typically provide access to one single family residence. These driveways can be chamfered or have radii, and can be constructed of many different types of materials including: Gravel, Concrete, Chip-Seal (DBST), and Asphalt. Some driveways may be native or stabilized earth, if taking access onto an unpaved roadway or was pre-existing prior to driveway permitting was established. The minimum requirement for new driveways is 2" of ¾" minus uniform gravel or crushed rock over compacted subgrade. Driveways within new subdivisions shall be consistent throughout the subdivision, as approved by the County Engineer.

Residential driveway return radii shall be 4'-10' for intersection roadway speeds of 35 mph or less and 25' for 35 mph or greater. Radii or chamfers if used, must remain within the projection of the subject parcel's property lines and shall not encroach upon any part of adjacent properties. The standard driveway width ranges from 12' minimum to 30' maximum.

New residential driveways on parcels that have potential for access onto two different roadways (e.g. corner lots) should place the access on the street with the lesser classification. Parcel access would be constructed onto the local road instead of the higher volume collector road in order to preserve the higher speeds on the higher volume roadways.

See Detail CC205-1 RESIDENTIAL DRIVEWAYS for additional information and requirements.

B. COMMERCIAL PAVED DRIVEWAY

Commercial driveways typically provide access to an office, retail or institutional building or to clustered residential units, such as an apartment building. Commercial and industrial driveways must take into consideration the needs of truck traffic and shall be designed using the appropriate turning template. These driveways can be chamfered or have radii, and can be constructed of many different types of materials including: Concrete, Chip-Seal (DBST), and Asphalt. For these driveways, the surface course must match, or be more durable, than the connecting roadway.

Commercial driveways shall have a minimum return radius of 35 ft, with a maximum of 50 ft. Radii or chamfers if used, must remain within the projection of the subject parcel's property lines and shall not encroach upon any part of adjacent properties.

Commercial paved driveways shall have a minimum width of 16 ft. A two-lane commercial driveway minimum is 24 ft in width and a maximum of 40 ft. Driveways having three or more lanes shall follow the design standards for street intersections. Where necessary for the safe and efficient movement of traffic, the County may require a Traffic Impact Analysis with specific recommendations and design for the access driveway. These types of driveways may be required to be geometrically designed to provide for only limited turning movements.

The vertical profile of a driveway should allow a smooth transition to and from the roadway. A minimum 20-foot-long landing area of no greater than 3% slope shall be provided for Commercial/Industrial Driveways.

Construction of curb, gutter, sidewalk or pathway may be required as a condition of permit approval. MAG Detail 220-1 Curb and Gutter, Type B ribbon curb is typically desired for commercial driveways taking access from major or minor collector roadways.

See Detail CC205-2 COMMERCIAL PAVED DRIVEWAYS for additional information and requirements.

C. DRIVEWAY ACCESS FOR MULTIPLE PARCELS

Private roads that provide access to two or more residential parcels should provide a roadway access apron in lieu of a driveway. See Detail CC205-3 ROADWAY ACCESS APRON and reference the information in this section titled New Roads Accessing a County Maintained Road for additional information and requirements.

D. DRIVEWAY STANDARD VARIANCES

Variances to these driveway standards may only be granted by the County Engineer. A variance may be considered when complying with the standards is an unreasonable hardship and making a modification would not jeopardize traffic circulation or safety. Requests must be made in writing to the County Engineer, with a justification statement, as to what modification to the standards is desired and why the modification is necessary. See Section A3 for additional information on requesting variances from these Design Standards.

4. UTILITIES WITHIN PUBLIC RIGHT -OF-WAY

This section applies to all public and private utilities including, but not limited to, communication, electric power, gas, water and sewer, cable television, telephone, fiber optics, irrigation, and similar facilities that are located on and under arterial roads and major collectors within Cochise County public right-of-way.

All new overhead utility lines, utility poles, and other above-ground utility structures shall be constructed outside the clear zone of the roadway. Underground utilities shall be constructed outside the paved areas of the roadway section (except for crossings). Fire hydrants shall be located a minimum of 6 ft from back of curb, one ft from back of sidewalk, or 10 ft from edge of pavement, if no curb is present. Utility poles and any other above-ground streetscape elements shall be located within 5 ft of the right-of-way line or 10 ft from the travel lane, whichever is most restrictive. Warning tape shall be installed a minimum 1 ft above underground utilities.

Where it is necessary for underground utility lines to cross a roadway, the crossing for such utility lines shall be constructed per Cochise County Standard Specifications and per the right-of-way permit.

Existing and new underground utility and culvert locations shall be appropriately shown in paving and drainage profiles.

5. ROADWAY CONSTRUCTION/RECONSTUCTION STEPS

Most improved roadways in the County are built with a sound sub-base of native soils, sometimes mixed with old asphalt materials, or other additives that enhance cohesion and/or compaction. The sub-base is then shaped and barrow ditches provided, as needed. The aggregate base course (ABC) is then placed, graded leveled and compacted to a consistent smooth service. Over time, Cochise County operations staff has developed time-tested methods for the construction of consistently strong roadway surfaces. These steps typically include:

- ☑ The old asphalt pavement or layers of chip seal and milled and mixed into 6" of native sub-base.
- ☑ Moisture is added to the sub-base as established by laboratory testing. Experience has shown that in order for the soils normally found in the County to be workable the moisture should be 1% to 2% less than optimum.
- ☑ The fine grain component of most soils fo0und in the County are non-plastic silts and low plastic clays that benefit from the addition of enzymes to improve cohesion and compaction.
- ☑ The sub-base is compacted to a consistent 100% of the maximum dry density. Any materials that are pumping or not compacting properly are removed and replaced.
- ☑ The sub-base is generally shaped with a 3% crown and 1' deep V roadside ditches with a 4:1 side slopes.
- ☑ ABC must have more cohesive strength than typically used with asphalt pavement. The gradation of ABC is therefore modified with 5% to 15% of minus 200 materials with a PI of 3% to 6%. If the ABC is too clean it will deform under the chip seal.
- ☑ The ABC is then graded, wetted, compacted and leveled to a smooth, consistent surface. Great care is taken to assure that compaction of the ABC is 100% of maximum dry density. The durability and structural strength of the road is all in the sub-base and ABC so moisture content and compaction of both are much more important than for asphalt pavement.
- ☑ Just prior to placing chip-seal, the AB is lightly wetted and given a final "tight" blading.
- ☑ A double layer asphalt chip seal is then placed on the ABC.

These steps provide a roadway with the durability and strength to last from 5 to 8 years. Towards the end of this time-period a maintenance layer of new chip-seal should be

provided to preserve the surface. Over time, vehicle traffic, in particular heavier commercial truck traffic, deforms the base and the sub-base and the surface treatment begins to unravel. Reconstruction to restore the underlying compacted base structure is typically needed every 15 to 30 years. See specific road typical sections for additional information on design parameters.

6. DESIGN CONSIDERATIONS

This section provides information about design features that should be considered when assessing a site and preparing public infrastructure plans. These include, but are not limited to, site traffic circulation, multi-modal connections and amenities, clear zones, roadway lighting, need for traffic signals or regulatory signs and other features that may be needed for a complete design (cattle guards, guard rails, medians, pavement striping).

A. TRAFFIC CALMING

Community scaled multi-modal circulation should be considered during street layout and design of a residential subdivision. Early consideration can minimize future speeding problems and improve the livability of the neighborhood.

Engineered solutions (e.g. traffic calming) to reduce vehicle speed, the volume of cut-through traffic and integrate pedestrian and bicycle travel is desired. Traffic calming can be achieved through the use of design features such as striping, landscaping, roundabouts, and sometimes, physical barriers. Speed humps or speed tables may be appropriate in some cases; however, designing to avoid these types of physical barriers is preferred. Speed humps shall be constructed per detail CC210 in Section D.

Subdivision streets should be designed to encourage 85th percentile speeds to be the same as the design speed. Intersection return radius may be reduced to 15 ft for local to local road. Road tangents should ideally not exceed 500 ft in length. Long tangent sections can be segmented by T intersections or conditions that require reduced speeds such as horizontal curve or knuckles. Tangent sections greater than 1,000 ft, with a proposed isolated traffic calming device, shall not be considered as traffic calming.

B. CLEAR ZONE

The clear zone is the lateral distance from the edge of the traveled way that is available for the safe use of errant vehicles. A recovery area or clear zone is the area outward from each outer travel lane that should be free of obstruction and non-traversable slopes. Rigid obstacles and certain other features with less than the minimum clear distance shall be adjusted so that:

- Obstacles which may be removed should be eliminated
- Obstacles which may not be removed should be relocated laterally or in a more protected location
- Obstacles which may not be moved should be reduced in impact severity; Breakaway devices and flattened side slopes offer such an improvement.
- Obstacles which may not be otherwise treated should be shielded by crash-worthy or guardrail devices

Obstacles and features which need to be analyzed include but are not limited to such items as:

- Rough rock cuts
- Rocks over 4 inches in diameter
- Streams or permanent bodies of water more than 2 ft deep

- Shoulder drop-offs with slopes steeper than 3:1 and heights greater than 2 ft
- Signs, traffic signals, and luminary supports with a concrete base extending 6 inches or more above ground
- Bridge piers and abutments
- Retaining walls and culverts
- Trees with an expected mature size greater than 4 inches in diameter, measured 12 inches above ground
- Wood poles or posts with a cross sectional area greater than 16 square inches
- Culverts, pipes, cattle guards, and headwalls. Drainage structures should extend beyond the clear zone limits.
- Embankments
- Fire hydrants
- Non-standard mailboxes

The clear zone width shall be per the AASHTO Roadside Design Guide. Where obstructions exist behind vertical curbs or curb and gutter sections, a minimum horizontal clearance of 1.5 ft shall be provided beyond the face of curb to the obstruction. All roadways shall maintain a minimum vertical clearance of 16 ft over the entire roadway.

C. ROADWAY LIGHTING

Continuous roadway lighting is typically not installed. However, at the beginning of each project, Cochise County will identify the intersections and roadway sections, if any, for which lighting is required.

Road lighting design shall meet or exceed average illuminance per Roadway Lighting Design Guide, published by AASHTO; pole locations per the Roadside Design Guide, published by AASHTO; and light distribution per applicable Cochise County regulations.

Equipment and material standards shall be per ADOT Standards.

D. TRAFFIC SIGNALS

Traffic signals shall be installed at all locations as warranted by a traffic study.

For new or upgraded signal installations, the number of signal indications and faces and their location shall conform to requirements in Part IV of the MUTCD. All signal lenses shall be 12 inches in diameter. Wiring for traffic signals in Cochise County is based on the use of multiconductor cables rather than individual conductors. Equipment and installation procedures shall conform to ADOT Standards.

E. CATTLE GUARDS

Cattle guards, with or without gates, may be required to prevent livestock from interfering with roadway traffic or to maintain range control. To prevent livestock from entering the right-of-way, the construction of cattle guards may be required at side roads or private entrances. The number of units required should be determined by the width of the roadway in which they are installed. See Details CC261-1 thru CC261-5.

7. ROADWAY DESIGN CRITERIA

This section provides additional specifications and requirements related to design criteria for designing roadways and other related improvements in Cochise County.

A. SURVEY AND ROAD MONUMENTS

Permanent survey monuments shall be installed to designate road centerline at all angle points, at points of curvature, and at all road intersections.

After all improvements have been installed, the developer shall be responsible for having a registered land surveyor set and stamp the monuments and certify as to their accuracy prior to final inspection. See Section D, Details CC121-1 and CC121-2.

B. DESIGN CONTROLS

The two primary roadway design controls are design speed and the design vehicle. Design speed is the selected speed used to determine the various geometric features of the roadway. The design vehicle is the largest vehicle likely to use the road with considerable frequency.

The design speed should be 10 mph over the posted speed limit. Design speeds may be increased based upon the road classification or as deemed necessary by the County Engineer.

The design vehicle for local streets shall be the single unit truck (SU), for collector streets the S-BUS-40, and on commercial/industrial roads or arterials streets the WB-40.

C. GEOMETRIC DESIGN: HORIZONTAL ALIGNMENT

Design of horizontal alignment must consider safety, vertical alignments, access, and intersection location. The two primary factors which provide the framework for horizontal alignment are design speed and stopping sight distance.

Stopping sight distance shall be provided on all roads per Tables 3-1 and 3-2 in the Green Book. The use of compound circular curves should be avoided. In special cases where topography or right-of-way constraints require the use of compound curves, the radius of the flatter curve should not exceed 1.5 times the radius of the sharper curve.

Where topographic or right-of-way constraints require the use of reverse simple curves, a minimum tangent separation between the curves shall be 100 feet or equal to at least 4/3 the super-elevation runoff length, whichever is greatest. When using reverse curves, special attention must be given to the roadway's drainage requirements. An angle point is acceptable for breaks in tangent alignments of less than 1°.

Local roads and two-lane residential collectors with design speeds at or less than 35 mph should generally not be super-elevated at curves. The normal two-way crown section (2 percent for asphaltic concrete [AC] or 3 percent for DBST) will be used. The minimum radius of curvature for given design speeds is shown in Table C-1 below:

TABLE C-1 MINIMUM RADII OF CURVATURE FOR SELECTED DESIGN SPEEDS

Design Speed (mph)	Max. E (%)	Min. R (ft)	Max. E (%)	Min. R (ft)
20	-0.02	107	-0.03	111
25	-0.02	198	-0.03	208
30	-0.02	333	-0.03	353
35	-0.02	510	-0.03	544

Source: A Policy on Geometric Design of Highways and Streets, as distributed by the American Association of State Highway and Transportation Officials (AASHTO), 2011, p.3-55

The maximum super-elevation permitted is 0.04 foot (ft)/ft for urban classifications and 0.06 ft/ft for rural classification roadways.

In super-elevated sections, the graded shoulder slope shall be a continuation of the pavement slope on the high side and 0.05 ft/ft downward on the low side, except when the super-elevation rate exceeds 0.05 ft/ft, in which case the low side graded shoulder slope shall equal the rate of super-elevation.

The design control at the crossover line between the pavement and the graded portion of the shoulder is the algebraic difference in the cross slope rates. The maximum algebraic difference at this point shall be 8.0%. For super-elevated pavements greater than 3% but less than 6%, the graded portion of the shoulder on the high side can vary from 5% to 2% to affect a maximum algebraic grade difference of 8%.

Super-elevation must be designed to show length, transition, crown runoff, and runout. See example sheet CC022 in Section D.

Sharp horizontal curves must not begin near the top of pronounced crest vertical curves or near the low point of pronounced sag vertical curves.

Knuckles may be approved on an exception basis for urban local streets with 200 vpd ADT or under, intersecting at angles between 60° and 90°.

When a proposed roadway will directly connect with an existing roadway of a different width, it is necessary to install a shifting transition taper between the two. The minimum taper lengths shall be based on the following:

On roads with a design speed less than or equal to 40 mph:

$$L = WS2 / 60$$

Where the design speed is greater than 40 mph:

$$L = W \cdot S$$

Where: W = Offset from drivable through lane in ft
S = Design speed
L = Taper length

Source: MUTCD for Streets and Highways, as distributed by the USDOT, FHWA; and as amended and approved by ADOT

The minimum taper length shall be 100 ft in urban and 200 ft in rural locations.

D. GEOMETRIC DESIGN: VERTICAL ALIGNMENT

Vertical curves should be designed to provide adequate sight distance, safety, comfortable driving, good drainage, and a pleasant appearance. They should be made as long as possible to provide greater stopping sight distance. Stopping sight distance shall be provided along the entire length of a curve.

Grade breaks with an algebraic difference of 1.0 percent or less do not require a vertical curve. The minimum length of vertical curve shall be determined by the greater of the following two criteria:

For comfort: Input the design speed into the following equations:

L= 3 • V where: L = length of vertical curve (ft)
V = design speed (mph)

For stopping sight distance:

L = K • A where L = length of vertical curve (ft)
K = rate of vertical curvature (ft/%)
A = algebraic difference in grades (%)

TABLE C-2 MINIMUM K FACTOR OF VERTICAL CURVES

Design Speed (mph)	25	30	35	40	45	50	55	60	65
Kmin (Crest Curves)	12	19	29	44	61	84	114	151	193
Kmin (Sag Curves)	26	37	49	64	79	96	115	136	157

Minimum rate of vertical curvature (K) for crest and sag vertical curves for stopping sight distance.
Source: A Policy on Geometric Design of Highways and Streets, as distributed by the American Association of State Highway and Transportation Officials (AASHTO), 2011.

To ensure proper drainage near the high point of a crest vertical curve, the rate of vertical curvature (K) should not exceed 167. If K is larger than 167, special attention is needed to ensure proper drainage to obtain a minimum grade of 0.25 percent.

There shall be a minimum grade of 0.25 percent on all roads; a maximum grade of 7 percent on arterial, major collector or section-line roads; and 10 percent on minor collector or local roads for a distance not to exceed 600 ft.

E. GEOTECHNICAL EVALUATION AND PAVEMENT SECTION

County roads shall have a pavement structural section based on the ADT and functional classification for the roadway. Some roadways receive pavements such as asphalt concrete (AC) over aggregate base, while others have a double bituminous surface treatment (DBST or chip seal) over aggregate base. Yet there are additional standards for stabilized AB, and standard AB sections, as well as compacted native material. Refer to County standard cross-sections CC010 thru CC016 and specifications. Pavement and base course design shall be in accordance with "Materials Preliminary Engineering and Design Manual" by ADOT, 1992 and as amended.
The pavement as designated on the typical cross-section shall be considered a preliminary requirement, not approved for construction, until substantiated by acceptable test results of the actual subgrade soil. Approval by the County Engineer of the final design shall be obtained prior to approval of the construction plans.

Field sampling of the existing subgrade soil shall be required to determine the actual depth of aggregate base required. Soil samples should be taken a minimum every 500 ft per lane (every 250 ft alternating lane) and within 0.5 ft from finished subgrade. More frequent testing may be required depending on the existing soil or as directed by the County Engineer to accurately determine the soil profile.

The testing and analysis of soils and materials shall be by a person who is authorized and certified under Title 32-142 of the Arizona Revised Statutes (ARS). Laboratory reports shall be submitted showing sieve analysis, Point of Inflection (PI), and minus 200 of all subgrade samples taken and of the findings of all other material and construction test made on or for the required public improvements. Sieve analysis shall be per ASTM D422, plasticity index per ASTM D4318 and #200 wash per ASTM D1140.

F. DRAINAGE

The drainage design report for the complete development shall comply with the current adopted version of the Floodplain Regulations for Cochise County, as amended and these standards.

Hydraulic calculation for pipe and box culverts should use the methodology of HDS No. 5, Hydraulic Design of Highway Culverts or other generally accepted programs or publications. Culvert outlets and overflow sections should also be designed in accordance with HEC-14, Hydraulic Design of Energy Dissipater for Culverts & Channels, or other applicable methodology approved by Cochise County. The potential for sedimentation within the culvert or overflow dip sections and/or at the inlet or outlet shall be considered. At a minimum, a self-cleaning velocity of 3 ft per second (fps) shall be provided for all culverts and dip crossings.

The following shows the design storm that shall pass under the road based on the road classification.

Road Class	**Qstorm under road**
Arterial & Major Collector	50 year
Minor Collector	25 year
Local	10 year

Drainage crossings and channels shall be designed to convey the above storm events under the roadway with the provision that the 100-year storm be contained in an overflow/dip section with the depth of flow crossing the roadway not to exceed 1 ft at any point within the paved section. The road surface shall be stabilized with AC or Portland Cement Concrete (PCC) depending on velocity. A minimum 6 inch x 18 inch cutoff wall shall be provided along the edges of the street pavement to prevent erosion and to maintain a stable roadbed under overflow conditions. Actual depth shall be verified by scour calculations. Cut-off walls shall be placed at least 4 ft from the upstream and downstream edge of pavement lines. The pavement shall be widened to the upstream and downstream cut-off walls. Cut-off walls shall extend to the developed 100-year flow width. Drainage crossings and channels shall be designed to convey Q100 within the right-of-way. Diversion of flow from one basin to another is prohibited.

At intersecting local roads for flows less than 10 cubic ft second (cfs) a 4-ft concrete valley gutter may be used per MAG Detail 240. Drainage crossings at intersections shall line up with gutters and/or roadside ditches entering and exiting the intersection.

Drainage channels, other than adjacent roadside ditches, shall be laid out in such a manner so that changes in flow direction do not exceed 45°.

Inverted crowns, or similar road designs, should only be used in extraordinary circumstances.

Channel flow velocities for the design storm shall not exceed that generally accepted as "non-erodible" for the type of soil and/or channel lining in drainage channels and overflow dip sections. Channel bank protection shall be provided for velocities of 4 fps or greater. Bank stabilization shall comply with ADWR State Standard 7–98 "Watercourse Bank Stabilization."

Banks, slopes of channels, and roadbeds are to be protected or stabilized at all locations where changes in direction of channel flows can result in excessive erosion or scour.

The minimum culvert diameter for roadway crossings shall be 24 inches and 18 inches for driveways. All culverts shall have flared-end sections or headwalls installed. Culverts 48 inches and greater shall have concrete headwalls.

A right-way-permit shall be obtained before installing culverts. A driveway on minor collector and above roads shall have the finished grade lower than the edge of pavement of the adjacent travel lane. This is to prevent any overflow drainage impacting the through travel lane. Driveway culvert maintenance is the responsibility of the home or business owner. Failure to maintain a driveway culvert that results in diverting water onto the travel way portion of a County road may result in removal of the culvert at the owner's expense and revocation of the permit.

The minimum height of box culverts shall be 4 ft above the natural streambed elevation. The minimum height of arch culvert shall be 4.5 ft. In desert wash areas, the preferred minimum height of box culverts is 5 ft and their inverts shall typically be set 6 inches below the existing streambed flow. Handrails shall be installed for headwalls located in areas where pedestrians may be present.

Culvert profile drawings shall be included within the construction plans. A note shall be included that defines the design storm frequency, flow, and velocity for all drainage features.

All drainage structures should extend beyond the clear zone limits for the roadway. If this is not feasible, they shall be suitably protected with traffic barriers.

All culverts shall be placed in the natural flow line of the channel. A detail showing the proposed culvert(s) will be required. The detail will include, but shall not be limited to, invert elevations, top-of-road elevations, headwalls, inflow and outflow channel geometry, erosion protection, other utilities, fill cover etc.

Minimum cover of fill over culverts must be provided to maintain the structural integrity of the pipe under anticipated loading conditions. Culvert manufacturers provide minimum cover requirements for prefabricated pipe.

G. LANDSCAPING

Landscaping on the right-of-way may be permitted, in compliance with the Roadside Design Guide, provided the landscaping does not impede recommended sight distance or cause visibility problems, introduce safety hazards, and does not introduce potential damage to the road and drainage system infrastructure. If installed within a roadside drainage channel, all material shall not impede the drainage flow or decrease the cross-sectional area of the channel. See Detail CC205-4 in Section D.

Plantings which bear fruit, nuts, or seeds that, when dropped, will interfere with or impede storm water drainage flow shall not be permitted.

Irrigation systems may be permitted to be installed on the right-of-way provided that under drains are installed to keep water from ponding or becoming trapped near or under the roadway. Plans and specific details outlining the proposed landscaping, irrigation system, and/or underdrains that are to be installed shall be approved by the CCH&FD. A Maintenance Agreement shall be entered into with the CCH&FD stipulating the developer's irrigation maintenance schedule and responsibility before work takes place in the public right-of-way.

The review and approval of landscaping plans that are part of an overall landscape plan for a development shall be coordinated with the Planning Department.

H. RAISED MEDIAN CURB, GUTTER, AND SIDEWALK

Raised medians may be placed at subdivision entrances or can be used to create a divided roadway through a subdivision. All medians greater than 6 ft in width shall have a desert landscape in accordance with the applicable Cochise County regulations and a maintenance agreement from a homeowners' association (HOA) or other group. Any median less than 6 ft shall be constructed of concrete.

Curb, gutter, and sidewalk shall be installed on urban roads per the Detail CC010 in Section D. Sidewalks and sidewalk ramps shall conform to the requirements of the Americans with Disabilities Act (ADA) of 2010 and current updates. Pedestrian curb ramps shall be designed per MAG Detail 235-1 thru 235-5.

I. GUARDRAIL

Guardrail shall be provided where necessary for the safety of the traveling public, as well as protection for adjacent properties. The need for guardrail should be determined at the early stages of design to ensure that road sections are designed with enough width to facilitate the guardrail installation and that drainage pipes have sufficient cover for the installation of posts and are extended to accommodate the necessary adjustments in the embankments and slopes.

The face of the guardrail shall be a minimum 3.5 ft in front of the obstacle. In fill section, the back of the guardrail post shall be 2 ft in front of the hinge point of the slope to ensure adequate lateral soil resistance for the posts during impact.

If a curb is used with a guardrail, the face of the curb should be no closer to the traveled way than the face of the guardrail.

The following minimum guidelines for guardrail installation are based on AASHTO Roadside Design Guide. However, it should be noted that guardrail may be required in some locations that do not necessarily meet these criteria based on the judgment of the County Engineer. Such factors as traffic volumes, speed of traffic, accident history, road curvature, slopes of recovery area, presence of curb and gutter, location of trees, utility poles, etc. must all be taken into consideration when determining if guardrail is warranted in a specific location.

Guardrail is typically required on sections of roadway when any of the following conditions exist within the clear zone:

- A roadside parallel embankment (fill slope) of 3:1 or steeper and a depth of 4 ft or more
- A water hazard with a depth of 2 ft or more (as measured from the near edge of pavement)
- A ditch section with a depth of 3 ft or more (as measured from the near edge of pavement)
- A fixed object (such as a culvert, pipe, headwall, retaining wall, bridge pier, or abutment)
- Other hazards as determined by the County Engineer

The County Engineer shall make the final determination as to whether guardrail is warranted along a section of roadway based on a review of the plans, a field inspection after rough grading has been completed, and/or prior to final acceptance. Guardrail shall generally not be placed within the shy line.

See the AASHTO Roadside Design Guide for discussion on all types of approved barriers and required length of need and end treatment. New roadside barriers shall meet the crash test requirements established by National Cooperative Highway Research Program (NCHRP) Report 350 and approved for use by FHWA.

J. PAVEMENT MARKINGS AND SIGNS

All required pavement markings, traffic control, and road name signs for new and/or existing roads shall be shown on the improvement plans and installed or paid by the developer.

Refer to Signing and Marking Specifications in Section E and the following documents:

- Arizona Department of Transportation (ADOT) Traffic Control Design Guidelines
- Arizona Manual of Approved Signs (MOAS) as distributed by ADOT
- Arizona Supplement to the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways 2009 Edition, ADOT
- MUTCD for Streets and Highways, as distributed by the USDOT, FHWA; and as amended and approved by ADOT
- Pavement Marking Design Manual, published by Pima County Department of Transportation and City of Tucson Department of Transportation

Signs indicating that a stub roadway will be extended in the future shall be installed at the end of stub roads as a part of the subdivision development. The sign shall have a message that indicates the following: "This Road is to be extended with Future Development. For More Information Contact the Cochise County Planning Department." This sign is to be provided by the developer and fabricated using a 0.080-inch gauge aluminum sign blank and fully reflective (minimum engineering grade material) sheeting and designed per MUTCD.

8. PUBLIC INFRASTRUTURE IMPROVEMENT PLANS

The developer shall be responsible for having a registered engineer, licensed in the State of Arizona, prepare a complete set of improvement plans to include typical sections, roadway plan and profiles, signing and striping plans, drainage details, roadway cross sections, Engineer's Estimate of Construction Cost, and special provisions for all public infrastructure improvements.

No construction shall commence until improvement plans are reviewed and approved by CCH&FD and a Right-of-Way permit is obtained. Such review and approval is intended to ensure general compliance with County Standards. This review is not intended to ensure completeness and/or accuracy of all plan details or assume any design responsibility from the Design Engineer. At the time of submittal of plans, plan check fees shall be paid based on current adopted fee schedules.

The following provides plan formatting so that significant design elements are clearly shown in a consistent manner and plan reviews are facilitated.

Plans shall be drawn on a 24-inch x 36-inch sheet at no smaller than a horizontal scale of 1 inch = 40 ft and a vertical scale of 1 inch = 4 ft. A larger scale may be required (such as 1 inch = 10 ft or 5 ft) where necessary to clearly show details. An index sheet to a set of detailed plans in excess of five sheets should be presented. Symbols to be used should conform to ADOT Drafting Guidelines or other widely accepted, clearly defined set of standards symbols.

The sheet(s) shall be oriented in such a way that north is to the top or to the right with roadway stationing increasing from left to right. Stationing shall be south to north and west to

east for roadway improvements, and in the "looking down station" orientation for drainage improvements. The initial stationing shall be large enough to preclude the possibility of negative station should the project limits be expanded. Provide match lines for plans and details that, due to size or scale, must be broken between sheets or different locations on a single sheet. Provide details, text, and other drawing components at a sufficient size and clarity to be legible when reduced to half size or microfilmed. Minimum lettering height shall be 0.10 inches. Stick-on materials, other than Standard Blue-Stake stickers, shall not be allowed on plan originals.

All existing culture (site features, typography, utilities) shall be shown including 1-ft contour lines. Horizontal limits shall extend a minimum of 25 ft beyond the right-of-way, left and right, with elevations given at average natural ground. All ditch flow lines, tops of banks, tops of linings, culverts, inverts, tops of headwalls, building slab elevations, and similar features shall be obtained and clearly noted. Existing culverts, washes, and ditches shall be profiled along their existing alignments and skew angles and angle points identified. The width of ditches, berms, and similar structures shall be identified.

Major drainage features shall require additional cross sections, both upstream and downstream of the project a minimum 300 ft beyond the project limits. Existing edge of pavements, major driveways, traffic signals, traffic striping, and traffic signs shall be surveyed a minimum of 300 ft beyond the end of the project. Existing grades shall be shown on 50-ft intervals and new grades on 100-ft intervals.

As a minimum, curve, geometric data and drainage features shall be shown per detail CC022 in Section D. Vertical control shall, as a minimum, consist of a single-line profile and add super-elevation profile for each direction of travel. Drainage features shall list design flow and velocity. Label street names, lateral dimensions of streets, and rights-of-way, curb return data, drainage structures, etc. Indicate finished elevations, including Point of Vertical Curve(PVC), PI, and Point of Vertical Tangency(PVT) of vertical curves, intersection points, and all other points needed for good vertical control of construction. Include any additional information needed to clarify profiles or deal with special conditions.

A typical section is needed for each condition encountered and should be clearly identified as to where it is applicable. Typical sections shall show both existing grade and proposed grades for the structural section and the proposed road template. Typical sections shall show materials, thickness, compaction and application for select material, aggregate base, prime coat, AC, DBST, curb and gutter, sidewalk, and drainage structures, as applicable.

Plan and profile sheets shall show the locations of street pavements including all features and structures for proper drainage. Provide adequate detail of all structures. Original ground and design grade shall be plainly labeled. Other plans shall show the location, size, type, construction, and material of the improvements. Plans should also contain a blue stake alert and reference any utility/improvement plans.

If applicable, water and sewer plans shall be submitted for reference. Water and sewer plans shall be submitted to and approved by the Arizona Department of Environmental Quality (ADEQ) and copies of the applications/approvals sent to CCH&FD.

Location, size, elevation, and other appropriate description of any existing facilities or utilities shall be shown on the drawings. Where crossing of underground utilities occur, vertical separations need to be shown. If any utility company imposes special conditions or precautions concerning their utility, notation of those instructions shall be included on the plans. Accurate elevation and alignment of all utilities shall be shown on the plans. Potholing shall be utilized in determining utility elevations and alignment if necessary.

Construction note(s) and details shall be provided to ensure clarity and prevent confusion or misunderstanding during construction. Notes shall be clearly worded and symbols consistent throughout the plan sheets(s). Intersection staking diagrams, culverts, and other items appearing on more than one sheet shall be cross-referenced. Standard Drawings shall be referred to by number and included as part of the plans.

Section corners, quarter corners, sixteenth corners, and other monuments that define existing alignments and rights-of-way and/or lie within the project limits shall be incorporated into the horizontal control network. Construction control lines shall be located by distance and angle measurements from section monumentation. All section monuments necessary to describe the adjacent right-of-way shall be located and shown on project plans. Any monuments disturbed during the construction phase must be relocated per A.R.S. §33-103 standards and a Corner Record filed with the Cochise County Recorder's Office as stipulated by A.R.S. §33-106. Such monuments shall conform to Detail CC121-1 or CC121-2.

North American Vertical Datum of 1988 (NVAD 88 –National Geodetic Survey) shall be used unless otherwise authorized by Cochise County. The horizontal and vertical datum shall be tied to one Cochise County geodetic monument.

Survey monument installation shall be indicated on the plans at street intersections, P.C.'s, P.I.'s, P.T.'s, etc.

The design engineer shall prepare Special Provisions for construction items not contained in or adequately covered by the MAG Uniform Standard Specifications and Cochise County Supplement to the MAG Specifications. Special provisions shall ensure each construction item is clearly defined and all material and construction requirements are identified. Special Provisions shall be written and arranged in the same format as the MAG Specifications. The design engineer shall prepare and submit sealed Special Provisions to be included with the construction documents submitted for review.

The design engineer shall provide Cochise County with a sealed and signed Engineer's Estimate of Construction Cost. The estimate shall contain a comprehensive itemized listing of individual components with quantities, estimated unit costs and extended total cost identified for each item.

For roadway projects, cross sections shall be provided showing the roadway section, existing ground, underground utilities, and new and existing drainage structures. Cross sections shall be at 50-ft intervals and at critical changes in the typical section such as the begin and end of roadway tapers, walls, medians or additional lanes. Earthwork requirements shall be provided and calculated based on end-area method from these cross sections and the quantities included at the front of the plan set or coversheet.

Title, name, address, stamp, registration seal, signatures of the engineer, and date, including revisions dates, shall be shown on the drawings. A vicinity map, project title, developer and engineering firm names and addresses shall be shown on the cover sheet.

Once the improvement plans are approved, the original reproducible plans shall be submitted to CCH&FD to date and stamp Reviewed for Compliance with Cochise County Standards. The developer shall then submit 5 complete full size sets and one ½ size set of the construction plans to CCH&FD.

9. CONSTRUCTION AND INSPECTION

All construction within the existing or proposed County right-of-way shall be constructed under the general inspection and approval of the CCH&FD. No construction shall be commenced until a right-of-way permit has been issued by the CCH&FD. Unless otherwise specified on the approved construction plans or right-of-way permit, all materials, testing, construction methods, installations, specifications, and standards shall conform to the Cochise County Road Construction Standards and Specifications for Public Improvements.

Existing roads that are incorporated into a subdivision circulation system and serve existing development shall be maintained to the current level of service during construction of the new subdivision roads. Existing street and traffic signs shall be maintained during construction and relocated by the developer/contractor as directed by the County Inspector.

Primary responsibility for control of the construction and quality of the improvements in subdivisions remains with the developer. Quality control of public improvements, for subdivisions and other developments, shall be made by the developer's design engineer, as agent for the developer. The design engineer is responsible for monitoring construction activities, document all field changes, and summarize all testing results, and inspections. It should not be expected that inspection by the CCH&FD will in any way eliminate need for regular inspection during the entire construction period by the Design Engineer.

The Design Engineer is responsible for the correctness and completeness of the plans and associated documents – the property owner and/or developer is responsible for the construction and implementation of the project. The County will not bear any responsibility for the cost of corrections to the plans or extra work resulting from changes which may be required during construction due to errors and/or omissions on the plans. Any difficulties encountered during construction will be resolved by the Developer and Design Engineer, at their sole expense.

Adequate construction inspections assure compliance to County standards and are the basis for the County Engineer's acceptance of public improvements for County maintenance. Plans and specifications describe in detail the work that is to be constructed including the materials to be used, the workmanship required, and certain construction procedures to be followed. Inspections by CCH&FD are to verify general conformance with the approved construction plans and specifications. The County Inspector, under the direction of the County Engineer, is authorized to inspect all work performed in connection with public improvements. Although inspectors are not required to inspect an item until it is complete they will periodically observe work in progress and assist the contractor in avoiding rework and stoppages.

Geometric control, survey, construction layout, construction procedures and installation of all improvements in conformance with the approved construction plans and specifications is the responsibility of the Developer and Design Engineer. It is the responsibility of the developer's Design Engineer to conduct the necessary inspections required to certify to the County that construction has proceeded according to his/her design and the approved plans.

All improvements shall be constructed in accordance with the approved construction plans and specifications. Any field revisions shall be issued by the Design Engineer, in writing, and approved, in writing, by the County Engineer. The revision shall be sent to the field by the Design Engineer as a plan revision. No work of any kind shall be allowed without approved construction plans and specifications.

The developer shall be responsible for having a person who is authorized and certified under ARS § 32-142 to perform and conduct all materials testing used in the design and construction of the improvements. The results of all tests shall be provided to the Design Engineer and County Inspector prior to applicable items being inspected. The developer is responsible for the cost of all sampling and testing necessary to substantiate the design or acceptability of construction quality of the improvements. The County Inspector shall be on site during testing and has the authority to select locations for tests to be made and to require additional tests of suspect areas or at apparent visible changes in soil types.

The pavement design determination process assumes that the properly compacted subgrade soil will produce a stable platform for pavement construction. If an unsuitable subgrade (wet, soft, unstable, or unsuitable material) is encountered, it must be removed down to a firm foundation and replaced with adequately compacted material of suitable quality. Prior to the placement of the sub-base/base layer, the subgrade must be inspected by the CCH&FD for grade, compaction, and wheel load tested. A wheel load test is to be performed with a full water truck. Additional inspections and wheel load tests shall be required on each subsequent base or pavement course. The base course shall be inspected for smoothness and wheel load tested before placement of pavement or DBST. Sub grade and base course shall be density tested a minimum of every 500 ft, per lane. The County Inspector shall be on site to observe pavement construction procedures in compliance with Section E.

All storm drainage facilities installed must be inspected and approved. No backfilling is permitted on any pipe installation until it has been inspected. A flow test shall be done prior to final backfill. All storm pipes shall be flushed and thoroughly cleaned prior to the final inspection.

The minimum inspections by the County Inspector will be performed, but not limited to, the following stages:

- Subgrade Completion – all utilities, culverts, ditches, shaping to finished subgrade, etc. complete in place
- ABC complete in place
- Pavement course, AC, DBST or PCC, complete in place
- Final

Pavement course shall not be placed before base course has been approved and base course shall not be placed until sub-grade has been approved by the County Inspector. No paving construction shall be started until all utility lines under the proposed paved area are completed.

It shall be the responsibility of the contractor and/or developer to notify the County Inspector a minimum of two working days in advance of required inspection. Cochise County will conduct the formal inspection on a total-stage completion basis and not on a partial-stage completion basis.

The Design Engineer shall document, verify, and report all pertinent information relative to quality control for all improvements being installed. All laboratory reports deemed necessary for quality control and testing, along with compaction test results, shall be submitted to the County Inspector by the inspecting firm as backup data to the Design Engineer's report. The responsibility for the construction of all projects shall lie with the developer. The cost for all required quality control shall be the sole responsblity by the developer. Any questions as to construction standards, interpretation of results, or methods of construction, shall be brought to the County Engineer's attention and interpretation.

The developer shall certify that all bills for labor and materials incorporated in the work have been paid and agree to indemnify and hold harmless the County against any and all liens, claims of liens, suits, actions, damages, charges, and expenses whatsoever, which the County may suffer arising out of the failure of the developer to pay for all labor performed and materials furnished in the construction of the required improvements.

The developer shall submit itemized construction costs of all dedicated public improvements.

The final inspection shall be scheduled at least five working days in advance. It is the responsibility of the developer to have all necessary persons in attendance at the final inspection, including the Design Engineer and Contractor. When the final inspection is complete, a written punch list will be sent to the developer, Design Engineer, and the Contractor. Once all punch list items are complete, CCH&FD will prepare the required documentation to accept the public improvements.

10. POST CONSTRUCTION DOCUMENTATION

After completion of the construction of any public roadway or related improvements it is the responsibility of the developer and/or contractor with the Design Engineer to prepare and provide all post-construction documents for the County records and reference. These include, but may not be limited to, Record Drawings, Survey Monument certifications and any work completed under warranty.

A. RECORD DRAWINGS (AS-BUILTS)

The developer shall have the Design Engineer submit final, stamped as-built plans, drawn on reproducible film, showing all streets, drainage structures, and other improvements as constructed/changed and copies of final as-built utility plans showing all utilities constructed within the public right-of-way. The Design Engineer shall submit a final report summarizing all field changes, test results, and inspections and a statement that the public improvements have been constructed in conformance with his/her design and the approved lines, grades, specifications, and standards. All documentation shall be submitted before a request for release of lots will be considered.

B. SURVEY DOCUMENTATION

After all improvements have been installed, the developer shall be responsible for having a registered land surveyor set and stamp the monuments and certify as to their accuracy prior to final inspection. See Section D, Details CC121-1 and CC121-2.

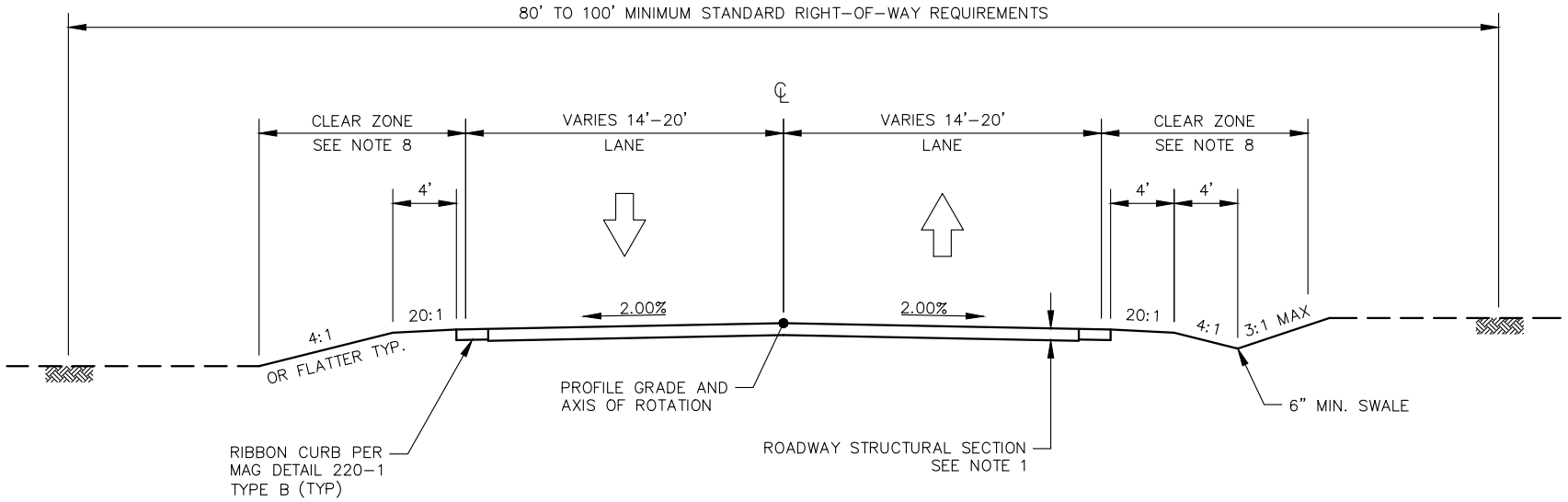
C. WARRANTY PERIOD

The one-year warranty period shall commence once the documentation to accept the constructed public improvements is signed by the County Engineer. The developer is responsible to maintain all Arizona Pollutant Discharge Elimination System (AZPDES) requirements during the one-year warranty period.

S T A N D A R D
D E T A I L S
f o r
C O N S T R U C T I O N

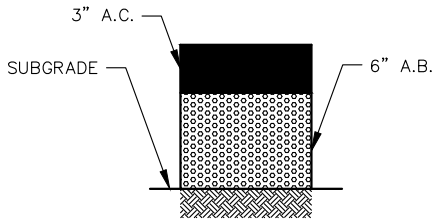
COCHISE COUNTY

SUPPLEMENT TO THE 2017 REVISION
OF THE 2015 EDITION OF THE MAG DETAILS



NOTES:

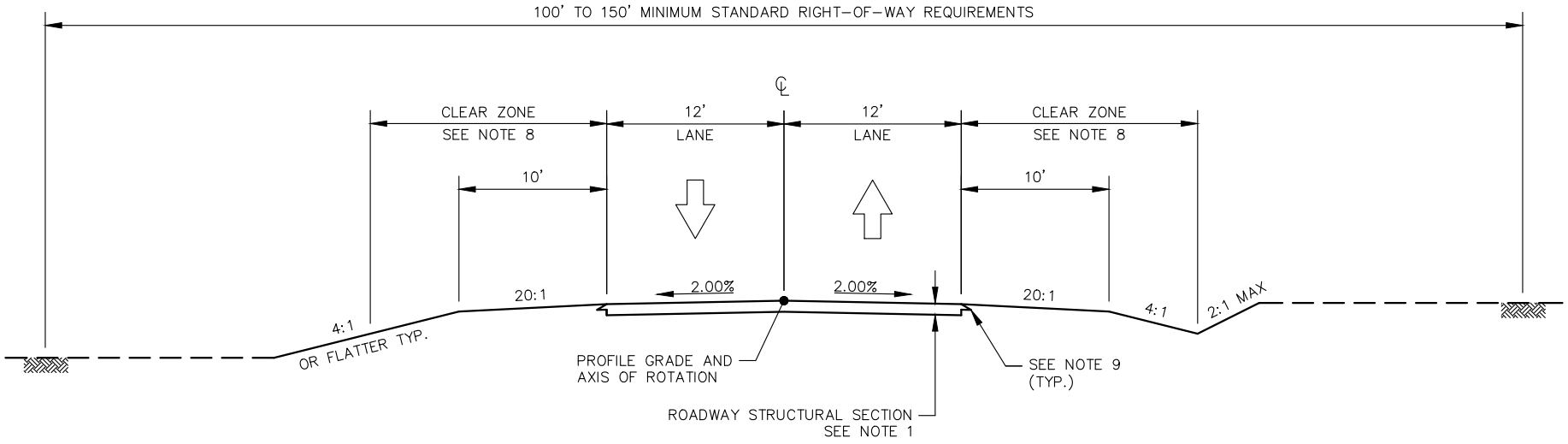
1. 3" MINIMUM ASPHALTIC CONCRETE (A.C.) OVER 6" MINIMUM AGGREGATE BASE (A.B.) OVER 6" COMPACTED NATIVE MATERIAL. ACTUAL ROADWAY STRUCTURAL SECTION TO BE DETERMINED BY GEOTECHNICAL EVALUATION, CONSISTENT WITH DETAIL CC208-1 OR SN ≥ 1.92.
2. AGGREGATE BASE COMPACTED TO 100% OF MAXIMUM DRY DENSITY.
3. SUBGRADE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY.
4. SLOPES COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY.
5. DRAINAGE DITCH AS REQUIRED.
6. MINIMUM R/W REQUIREMENTS 80'TO 100', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
7. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROAD IS TYPICALLY OVER 1,000 VEHICLES PER DAY, OR INTENSIVE INDUSTRIAL LAND USES WITH HIGHER VOLUMES OF TRUCK TRAFFIC.
8. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
9. LANE WIDTH AND MINIMUM DRIVEWAY RADII TO BE DETERMINED BY TRAFFIC ENGINEER IN STAMPED TRAFFIC REPORT AND APPROVED BY COUNTY ENGINEER.



ROADWAY STRUCTURAL SECTION

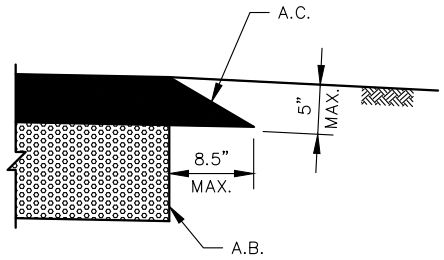
TOTAL THICKNESS = 9"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	COLLECTOR ROAD COMMERCIAL / INDUSTRIAL	DRAFT 06-06-2017	DETAIL NO. CC010

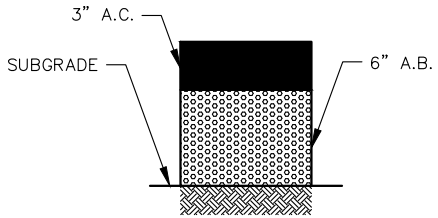


NOTES:

1. 3" MINIMUM ASPHALTIC CONCRETE (A.C.) OVER 6" MINIMUM AGGREGATE BASE (A.B.) OVER 6" COMPACTED NATIVE MATERIAL. ACTUAL ROADWAY STRUCTURAL SECTION TO BE DETERMINED BY GEOTECHNICAL EVALUATION, CONSISTENT WITH DETAIL CC208-1 OR SN ≥ 2.36.
2. AGGREGATE BASE COMPACTED TO 100% OF MAXIMUM DRY DENSITY.
3. SUBGRADE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY.
4. SLOPES COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY.
5. DRAINAGE DITCH AS REQUIRED.
6. MINIMUM R/W REQUIREMENTS 100' TO 150', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
7. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROADWAY IS OVER 2,600 VEHICLES PER DAY OR HAS BEEN DESIGNATED AS A MAJOR COLLECTOR IN THE FEDERAL FUNCTIONAL CLASSIFICATION SYSTEM.
8. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
9. SAFETY EDGE SLOPED AT 30° ± 5°, PLACED AT FULL DEPTH A.C. PAVEMENT LIFTS OR TOP 5", WHICHEVER IS LESS. SEE DETAIL THIS SHEET AND MAG SECT. 326. REQUIRED UNLESS OTHERWISE DIRECTED BY THE COUNTY ENGINEER.
10. IDENTIFYING BICYCLE LANES WITH APPROPRIATE STRIPING AND SIGNING SHOULD BE CONSIDERED, WHERE FEASIBLE.



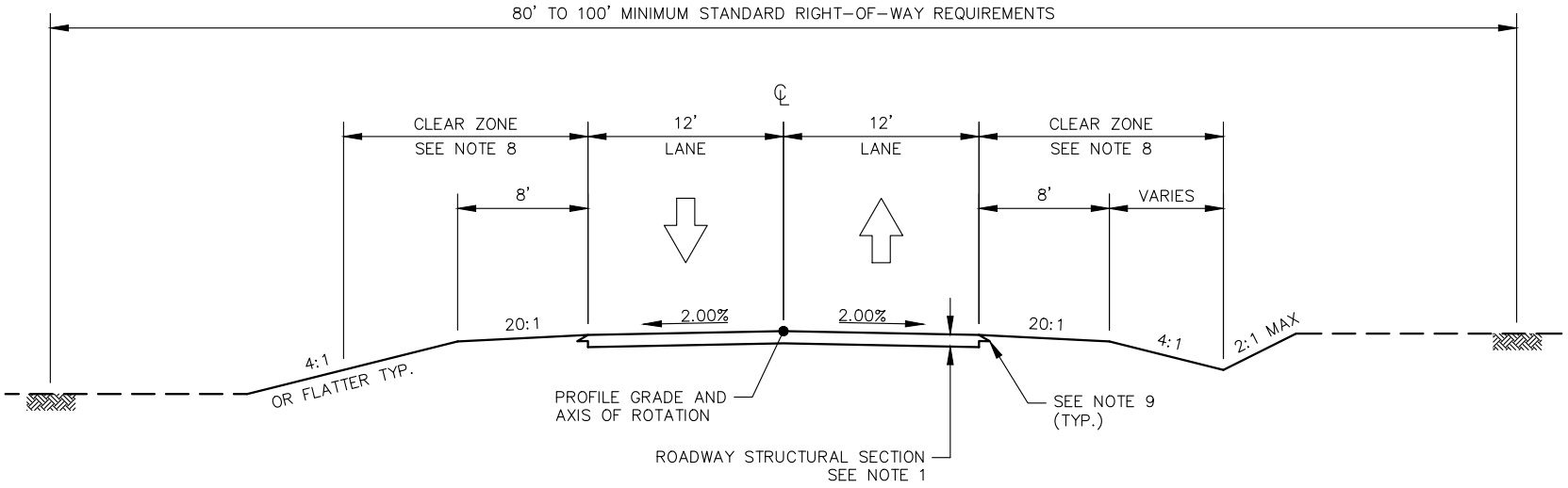
SAFETY EDGE DETAIL



ROADWAY STRUCTURAL SECTION

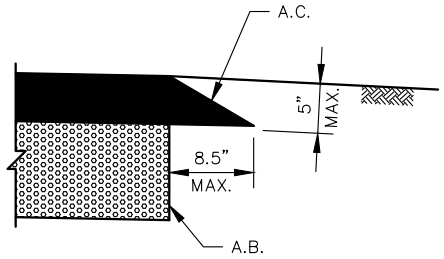
TOTAL THICKNESS = 9"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	MAJOR COLLECTOR ROAD	DRAFT 06-06-2017	DETAIL NO. CC011

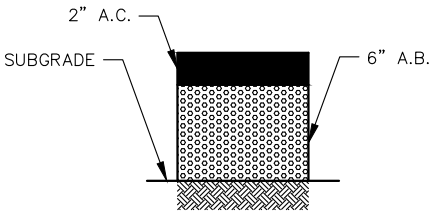


NOTES:

1. 2" MINIMUM ASPHALTIC CONCRETE (A.C.) OVER 6" MINIMUM AGGREGATE BASE (A.B.) OVER 6" COMPACTED NATIVE MATERIAL. ACTUAL ROADWAY STRUCTURAL SECTION TO BE DETERMINED BY GEOTECHNICAL EVALUATION, CONSISTENT WITH DETAIL CC208-1 OR SN ≥ 1.92.
2. AGGREGATE BASE COMPACTED TO 100% OF MAXIMUM DRY DENSITY.
3. SUBGRADE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY.
4. SLOPES COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY.
5. DRAINAGE DITCH AS REQUIRED.
6. MINIMUM R/W REQUIREMENTS 80'TO 100', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
7. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROADWAY IS BETWEEN 2,000 AND 2,600 VEHICLES PER DAY OR HAS BEEN DESIGNATED AS A MINOR COLLECTOR IN THE FEDERAL FUNCTIONAL CLASSIFICATION SYSTEM.
8. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
9. SAFETY EDGE SLOPED AT 30° ± 5°, PLACED AT FULL DEPTH A.C. PAVEMENT LIFTS OR TOP 5", WHICHEVER IS LESS. SEE DETAIL THIS SHEET AND MAG SECT. 326. REQUIRED UNLESS OTHERWISE DIRECTED BY THE COUNTY ENGINEER.



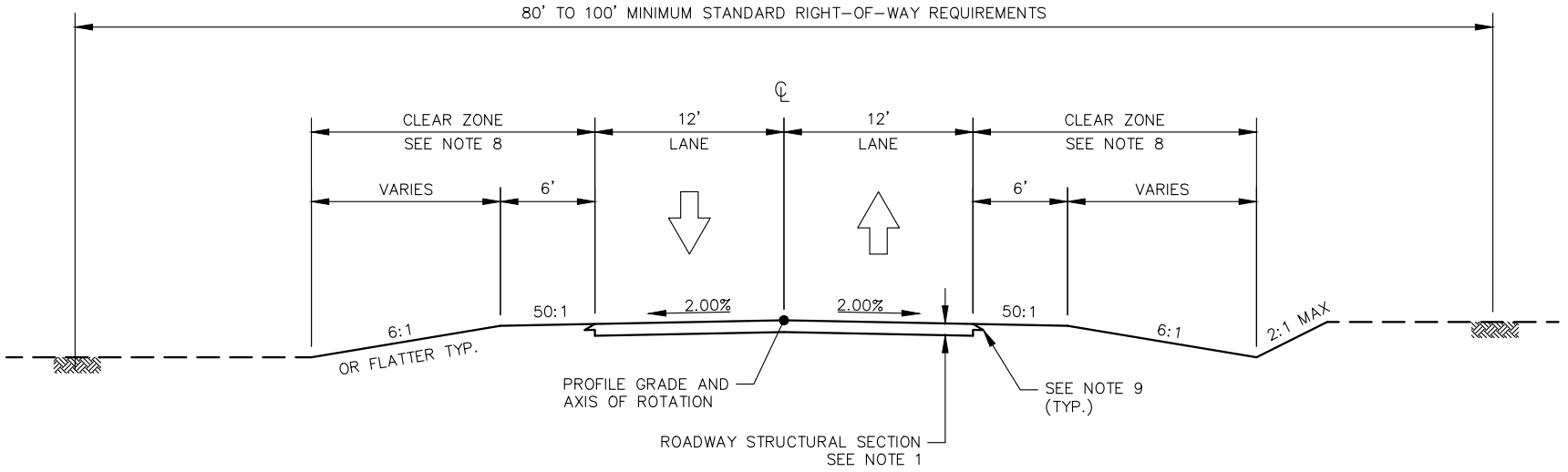
SAFETY EDGE DETAIL



ROADWAY STRUCTURAL SECTION

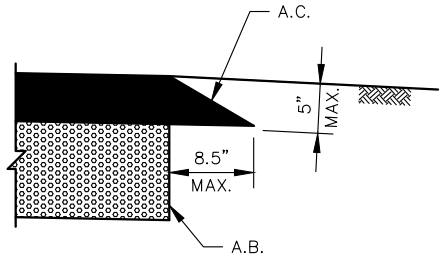
TOTAL THICKNESS = 8"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	MINOR COLLECTOR ROAD ADT > 2000	DRAFT 06-06-2017	DETAIL NO. CC012

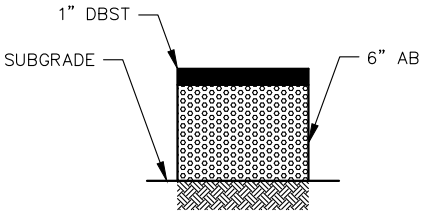


NOTES:

1. 1" MINIMUM DOUBLE BITUMINOUS SURFACE TREATMENT (DBST) OVER 6" MINIMUM AGGREGATE BASE (A.B.) OVER 6" COMPACTED NATIVE MATERIAL. ACTUAL ROADWAY STRUCTURAL SECTION TO BE DETERMINED BY GEOTECHNICAL EVALUATION, CONSISTENT WITH DETAIL CC208-2.
2. AGGREGATE BASE COMPACTED TO 100% OF MAXIMUM DRY DENSITY.
3. SUBGRADE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY.
4. SLOPES COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY.
5. DRAINAGE DITCH AS REQUIRED.
6. MINIMUM R/W REQUIREMENTS 80'TO 100', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
7. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROADWAY IS BETWEEN 1,000 AND 2,000 VEHICLES PER DAY.
8. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
9. SAFETY EDGE SLOPED AT 30° ± 5°, PLACED AT FULL DEPTH A.C. PAVEMENT LIFTS OR TOP 5", WHICHEVER IS LESS. SEE DETAIL THIS SHEET AND MAG SECT. 326. REQUIRED UNLESS OTHERWISE DIRECTED BY THE COUNTY ENGINEER.



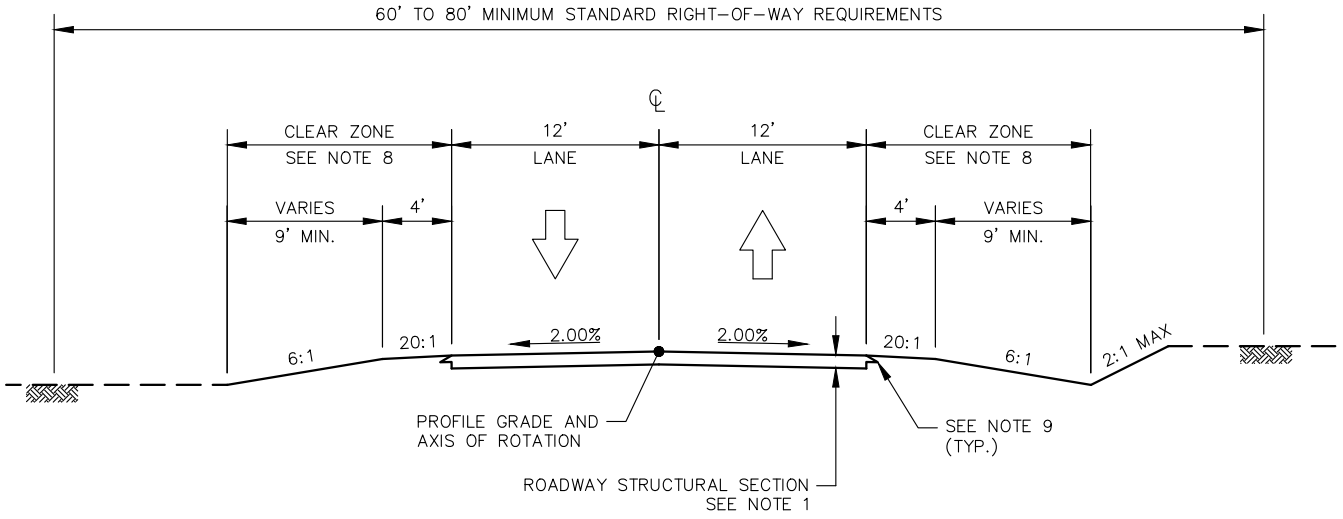
SAFETY EDGE DETAIL



ROADWAY STRUCTURAL SECTION

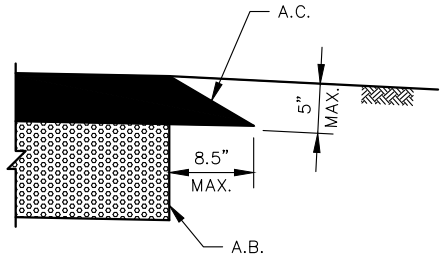
TOTAL THICKNESS = 7"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	COUNTY COLLECTOR ROAD ADT < 2000	DRAFT 06-06-2017	DETAIL NO. CC013



NOTES:

1. 1" MINIMUM DOUBLE BITUMINOUS SURFACE TREATMENT (DBST) OVER 6" MINIMUM AGGREGATE BASE (A.B.) OVER 6" COMPACTED NATIVE MATERIAL. ACTUAL ROADWAY STRUCTURAL SECTION TO BE DETERMINED BY GEOTECHNICAL EVALUATION, CONSISTENT WITH DETAIL CC208-2.
2. AGGREGATE BASE COMPACTED TO 100% OF MAXIMUM DRY DENSITY.
3. SUBGRADE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY.
4. SLOPES COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY.
5. DRAINAGE DITCH AS REQUIRED.
6. MINIMUM R/W REQUIREMENTS 60'TO 80', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
7. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROADWAY IS BETWEEN 400 AND 1,000 VEHICLES PER DAY.
8. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
9. SAFETY EDGE SLOPED AT 30° ± 5°, PLACED AT FULL DEPTH A.C. PAVEMENT LIFTS OR TOP 5", WHICHEVER IS LESS. SEE DETAIL THIS SHEET AND MAG SECT. 326. REQUIRED UNLESS OTHERWISE DIRECTED BY THE COUNTY ENGINEER



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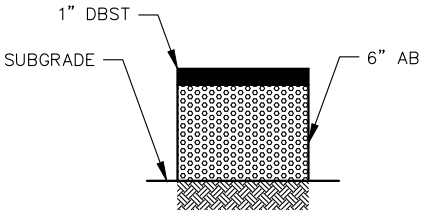
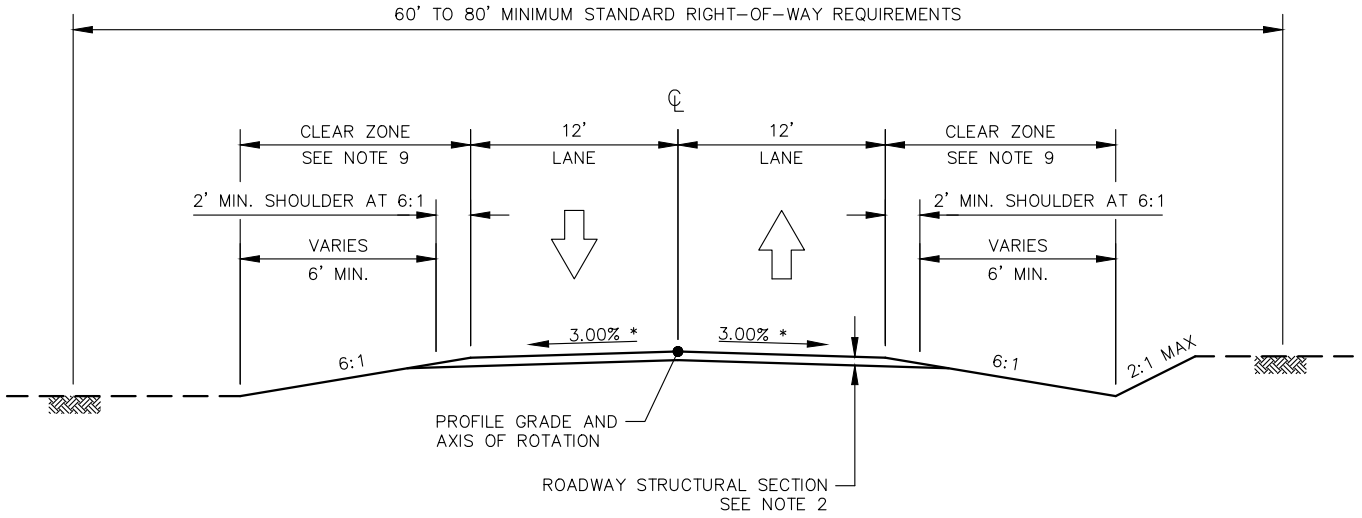


ROADWAY STRUCTURAL SECTION

TOTAL THICKNESS = 7"

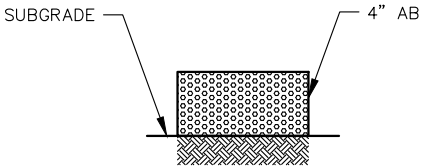
COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL DETAIL	MAJOR ACCESS LOCAL ROAD PAVED, LOW VOLUME	DRAFT 06-06-2017	DETAIL NO. CC014



* CROSS SLOPE: 3.00% MINIMUM, 4.00% MAXIMUM

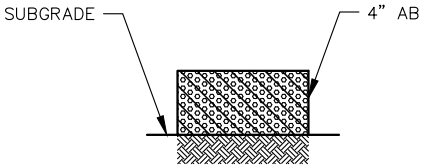
NOTES:

1. INTENDED FOR BUILDING AN IMPROVED ROAD SURFACE FOR LOW VOLUME ROADS SERVING ECOTOURISM SITES, ECONOMIC GENERATORS OR AS A PRECURSOR TO FUTURE PAVING (NOT FOR SUBDIVISION ROADS OR NEW ROADS INTENDED TO BE PUBLIC).
2. 4" STABILIZED AGGREGATE BASE (A.B.) OR 4" A.B. OVER COMPACTED NATIVE MATERIAL. ACTUAL ROADWAY STRUCTURAL SECTION TO BE DETERMINED BY GEOTECHNICAL EVALUATION, CONSISTENT WITH DETAILS CC208-1 AND CC208-2. SEE ROADWAY STRUCTURAL SECTIONS BELOW.
3. AGGREGATE BASE COMPACTED TO 100% OF MAXIMUM DRY DENSITY.
4. SCARIFICATION AND RE-COMPACTION OF NATIVE MATERIAL SUB-GRADE TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY REQUIRED.
5. SLOPES COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY.
6. DRAINAGE DITCH AS REQUIRED.
7. MINIMUM R/W REQUIREMENTS 60'TO 80', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
8. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROADWAY IS BETWEEN 250 AND 400 VEHICLES PER DAY.
9. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
10. SOIL CEMENT, BINDERS, POLYMERS, EMULSIFIERS OR OTHER SOIL ADDITIVES TO PROVIDE ENHANCED STABILIZATION AND DUST CONTROL OF ROADWAY SURFACE APPLIED WHEN FEASIBLE.



ROADWAY STRUCTURAL SECTION

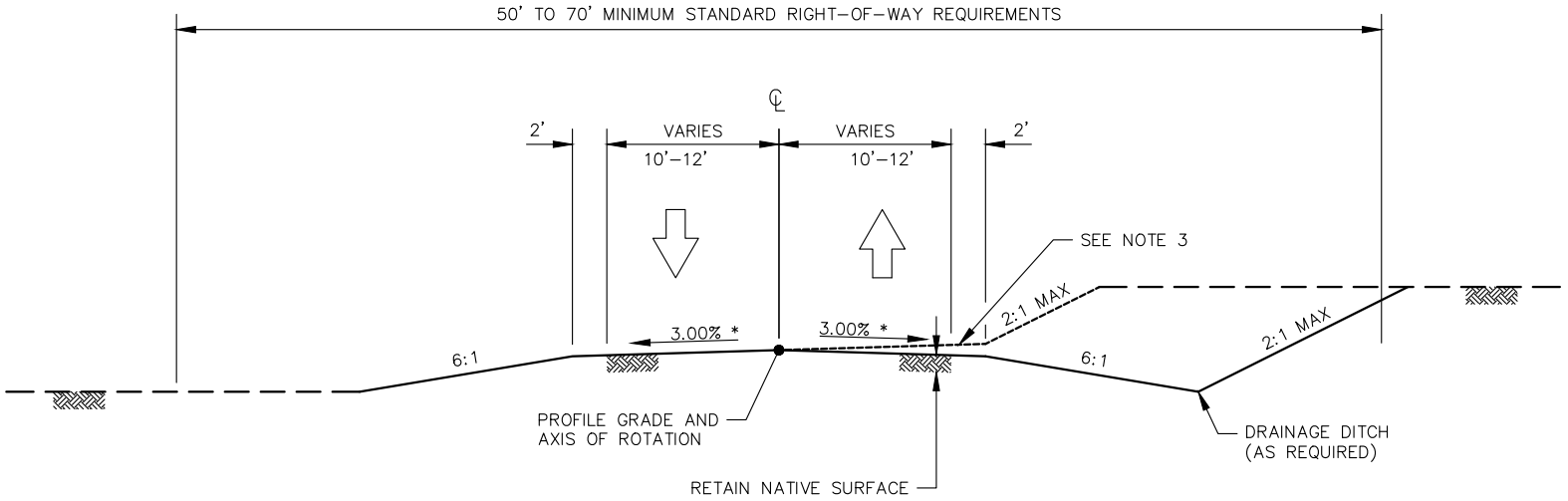
TOTAL THICKNESS = 4"



STABILIZED ROADWAY STRUCTURAL SECTION

TOTAL THICKNESS = 4"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL DETAIL	MINOR ACCESS LOCAL ROAD UNPAVED, LOW VOLUME	DRAFT 06-06-2017	DETAIL NO. CC015

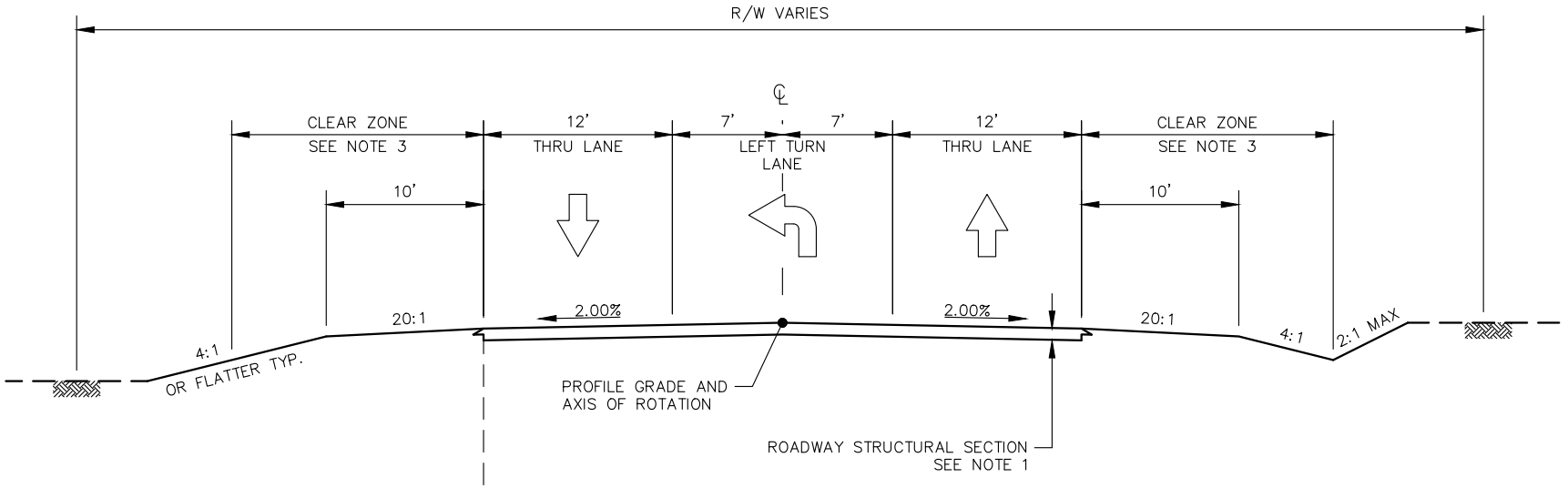


* CROSS SLOPE: 3.00% MINIMUM, 4.00% MAXIMUM

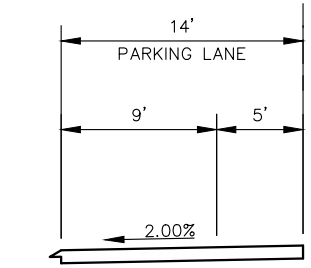
NOTES:

1. INTENDED FOR MAINTENANCE OF EXISTING UNIMPROVED PUBLIC ROADS, TYPICALLY PRE-1975 DESIGNATED PRIMITIVE ROADS OR VERY LOW VOLUME ROADS SERVING LESS THAN 20 RESIDENTIAL PARCELS (NOT FOR SUBDIVISION ROAD OR NEW ROADS INTENDED TO BE PUBLIC).
2. LANE WIDTH DETERMINED BY TOPOGRAPHY AND SITE CONDITIONS. LANE WIDTH MAY FOLLOW LAND CONTOURS AND VARY THROUGHOUT ITS LENGTH.
3. DRAINAGE DITCH AND/OR SWALES PLACED WHERE FEASIBLE.
4. MINIMUM R/W REQUIREMENTS 50'TO 70', TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
5. TYPICAL DESIGN ADT FOR THIS CLASSIFICATION OF ROADWAY IS LESS THAN 250 VEHICLES PER DAY.
6. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	CONTEXT SENSITIVE ROAD UNPAVED, VERY LOW VOLUME	DRAFT 06-06-2017	DETAIL NO. CC016



LEFT TURN LANE SECTION

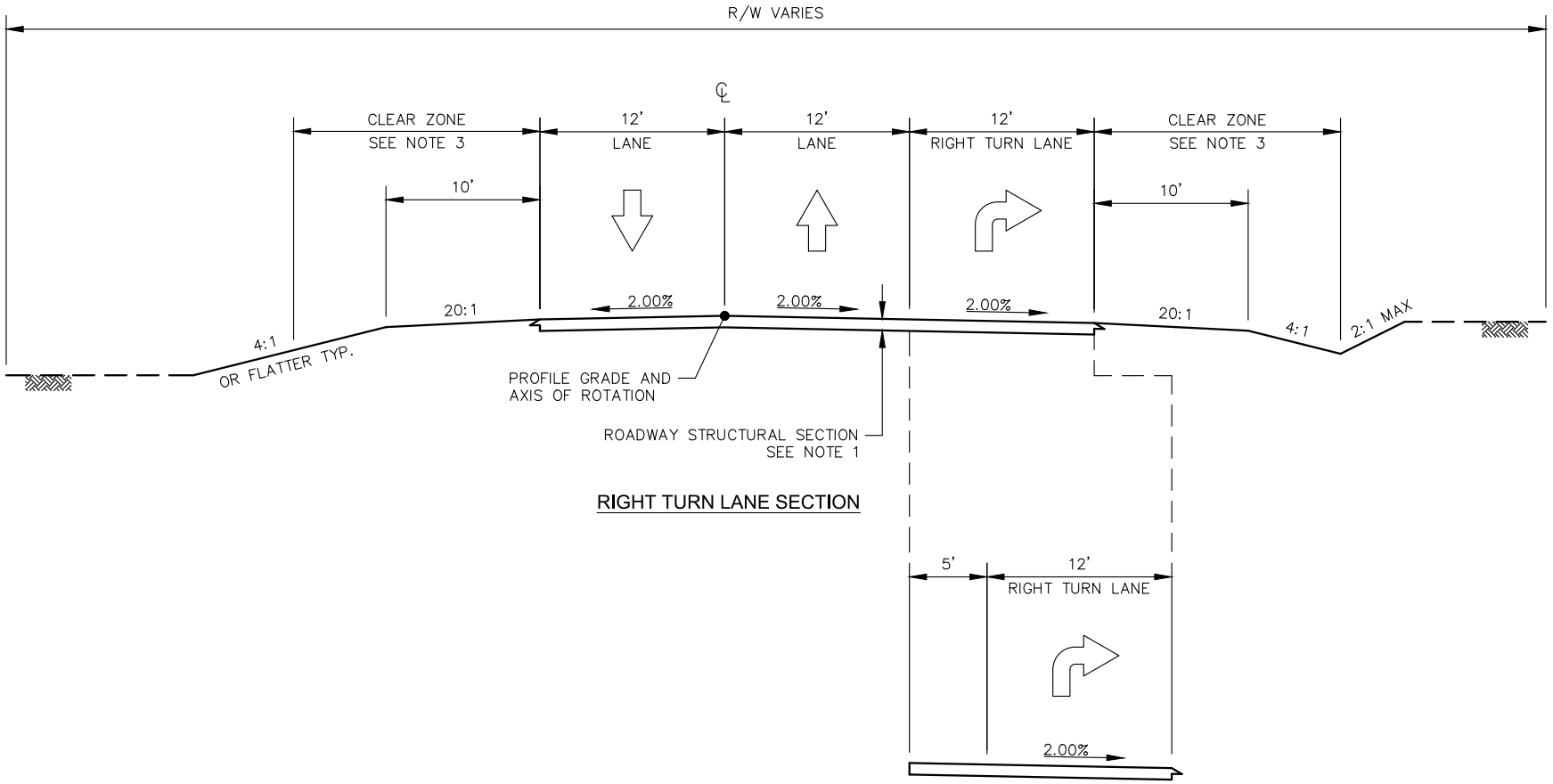


WIDENED SECTION FOR PARKING

NOTES:

1. PAVEMENT SECTION TO BE DETERMINED BY FUNCTIONAL CLASSIFICATION AND ADT. CONSISTENT WITH DETAILS CC010–CC016, CC208–1 AND CC208–2.
2. MINIMUM R/W REQUIREMENTS VARY, TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
3. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
4. IDENTIFYING TURN LANES, PARKING, AND BICYCLE LANES WITH APPROPRIATE STRIPING AND SIGNING SHOULD BE CONSIDERED, WHERE FEASIBLE.

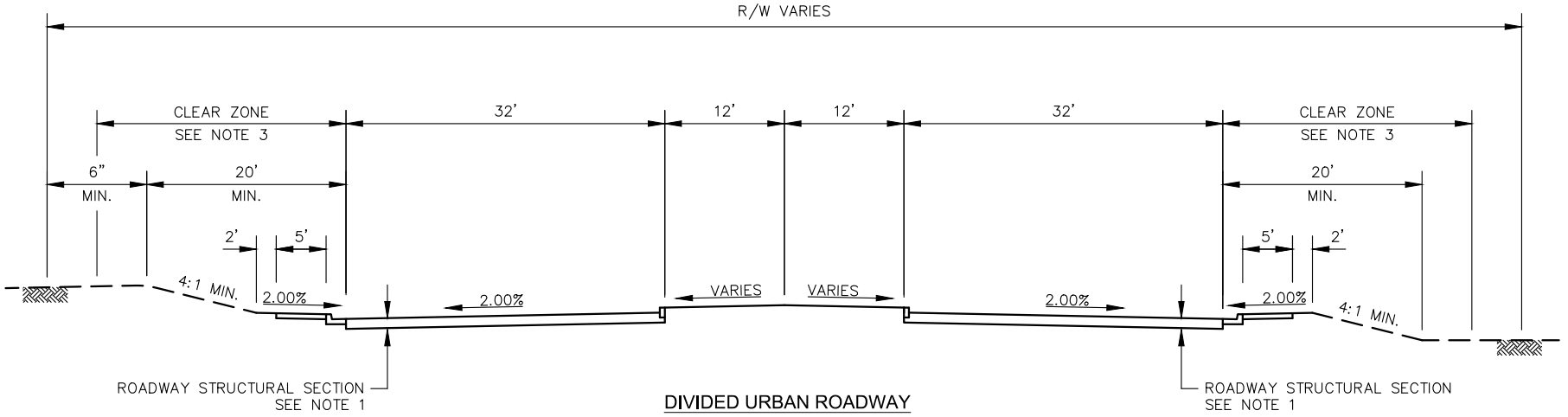
COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	TURNING LANES & MEDIANS (LEFT TURN LANES)	DRAFT 06–06–2017	DETAIL NO. CC017-1



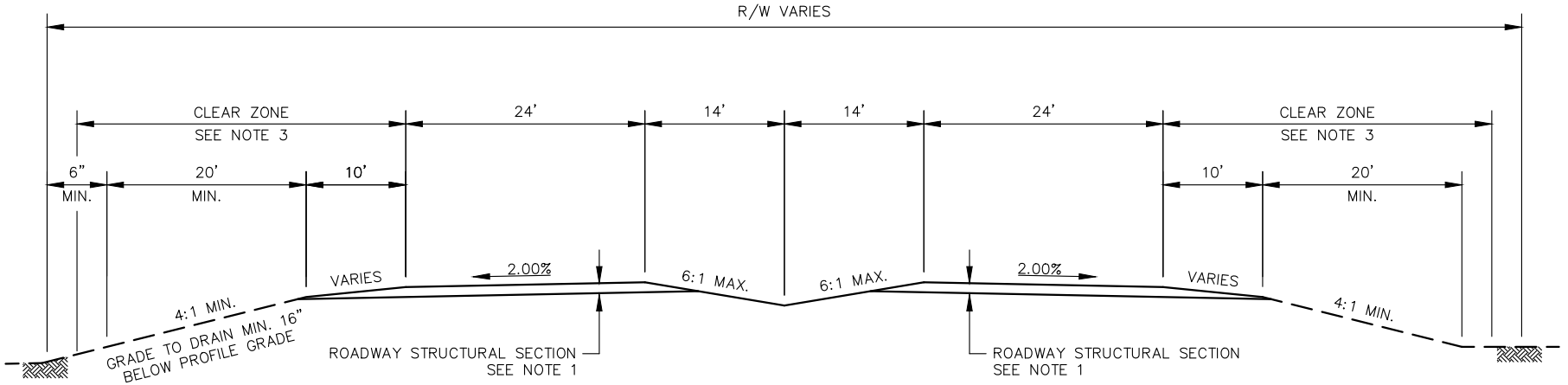
NOTES:

1. PAVEMENT SECTION TO BE DETERMINED BY FUNCTIONAL CLASSIFICATION AND ADT. CONSISTENT WITH DETAILS CC010–CC016, CC208–1 AND CC208–2.
2. MINIMUM R/W REQUIREMENTS VARY, TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
3. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
4. IDENTIFYING TURN LANES AND BICYCLE LANES WITH APPROPRIATE STRIPING AND SIGNING SHOULD BE CONSIDERED, WHERE FEASIBLE.

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	TURNING LANES & MEDIANS (RIGHT TURNING LANES)	DRAFT 06–06–2017	DETAIL NO. CC017-2



DIVIDED URBAN ROADWAY



DIVIDED RURAL ROADWAY

NOTES:

1. PAVEMENT SECTION TO BE DETERMINED BY FUNCTIONAL CLASSIFICATION AND ADT. CONSISTENT WITH DETAILS CC010–CC016, CC208–1 AND CC208–2.
2. MINIMUM R/W REQUIREMENTS VARY, TOTAL WIDTH DETERMINED BY DRAINAGE/TOPOGRAPHY.
3. FOR CLEAR ZONE REQUIREMENTS, REFER TO THE LATEST EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE (CHAPTER 3).
4. IDENTIFYING TURN LANES AND BICYCLE LANES WITH APPROPRIATE STRIPING AND SIGNING SHOULD BE CONSIDERED, WHERE FEASIBLE.

COCHISE COUNTY	HIGHWAY & FLOODPLAIN TYPICAL SECTION	TURNING LANES & MEDIANS (DIVIDED ROADWAY)	DRAFT 06–06–2017	DETAIL NO. CC017-3

COCHISE COUNTY	HIGHWAY & FLOODPLAIN EXAMPLE SHEET	ROADWAY PLAN AND PROFILE	DRAFT 05-26-2017	DETAIL NO. CC020

1. THESE DETAILS HAVE BEEN PREPARED IN EFFORT TO STANDARDIZE THE CONSTRUCTION DETAILS USED BY VARIOUS CONTRACTING AGENCIES IN COCHISE COUNTY. THEY ARE TO BE USED IN CONJUNCTION WITH THE CURRENT EDITION OF THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" SPONSORED AND DISTRIBUTED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS, AND THE COCHISE COUNTY SUPPLEMENT TO THOSE SPECIFICATIONS.

2. MANY NOTES WITHIN THESE DETAILS REFER TO VARIOUS SECTIONS OF THE COCHISE COUNTY SUPPLEMENT TO MAG UNIFORM STANDARD SPECIFICATIONS. WHERE THIS REFERENCE IS MADE, ONLY THE ABBREVIATION "SECT." IS USED. WHEN NOTES WITHIN THESE DETAILS REFER TO VARIOUS SECTIONS OF THE MAG UNIFORM STANDARD SPECIFICATIONS. THE ABBREVIATION "MAG SECT." IS USED. AN EXAMPLE OF THIS REFERENCE WOULD BE: "CLASS 'A' CONCRETE PER MAG SECT. 725".

3. MANY NOTES WITHIN THESE DETAILS REFER TO OTHER DETAILS WITHIN THIS BOOK. WHERE THIS REFERENCE IS MADE, THE ABBREVIATION "DETAIL" IS USED. AN EXAMPLE OF THIS WOULD BE: "SEE DETAIL CC232 FOR TYPICAL SHARED USE PATH". WHEN DETAILS ARE REFERENCED FROM THE MAG STANDARDS, THE ABBREVIATION "MAG DETAIL" IS USED.

4. SOME DETAILS COVER MORE THAN ONE SHEET. THESE SHEETS HAVE BEEN GIVEN THE SAME NUMBER WITH A SUFFIX NUMBER, EXAMPLE: 391–1 AND 391–2.

5. AN EFFORT HAS BEEN MADE TO INCLUDE THE MOST COMMONLY USED CONSTRUCTION DETAILS IN THIS BOOK. ITEMS WHICH REQUIRE DESIGN CONSIDERATION BY THE DESIGN ENGINEER HAVE NOT BEEN INCLUDED.

6. SOME OF THESE DETAILS PRINTED HEREIN MAY BE USED BY SOME OF THE AGENCIES WITHIN COCHISE COUNTY BUT NOT OTHERS. THE DESIGN ENGINEER SHOULD THEREFORE CONTACT THE AGENCY WITHIN WHOSE JURISDICTION HE IS WORKING FOR DIRECTION AS TO WHICH DETAIL OR PORTIONS OF DETAILS SHOULD BE USED.

7. DETAIL DRAWINGS ARE NOT TO SCALE.

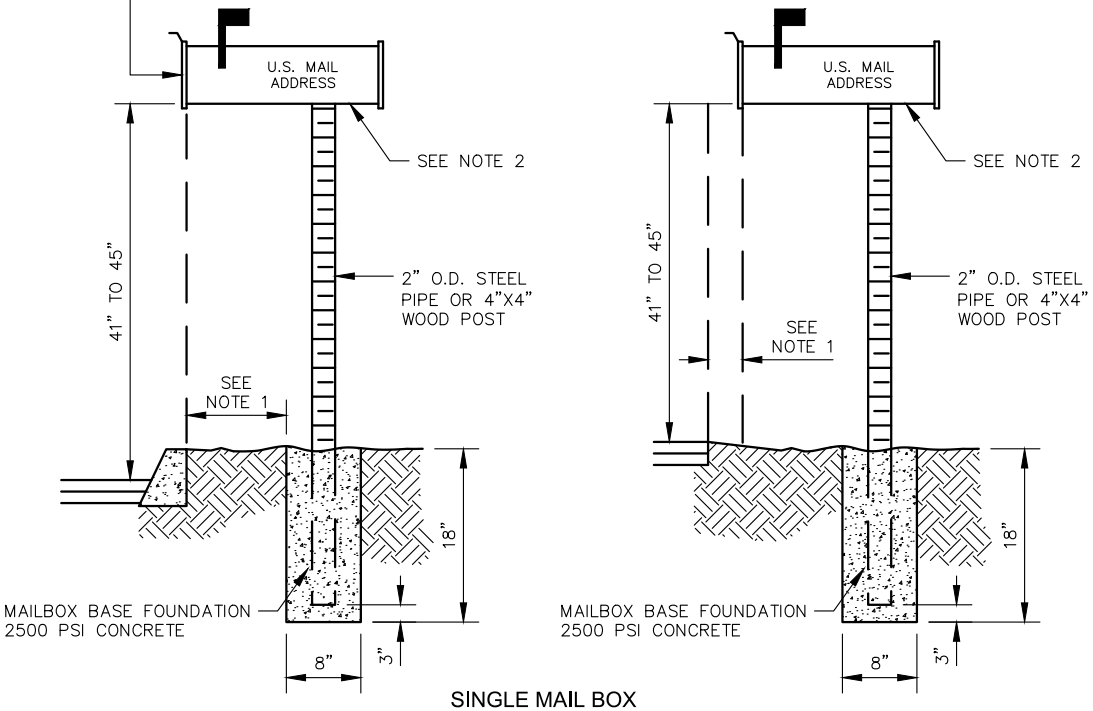
8. THE COCHISE COUNTY STANDARD DETAILS ARE SUPPLEMENT TO THE MARICOPA ASSOCIATION OF GOVERNMENT (MAG) STANDARD DETAILS. IN THE EVENT COCHISE COUNTY AND MAG DETAILS CONTAIN SIMILAR INFORMATION OR APPLICATION, THE COCHISE COUNTY DETAILS ARE INTENDED TO SUPERCEDE INFORMATION IN THE MAG DETAILS.

TRADITIONAL AND CONTEMPORARY BOX STYLES			
SIZE	INCHES (APPROXIMATE)		
	LENGTH	WIDTH	HEIGHT
1	19	6–½	8–½
1–A	21	8	10–½'
2	23–½	11–½	13–½
'OPTIONAL LETTER SLOT			

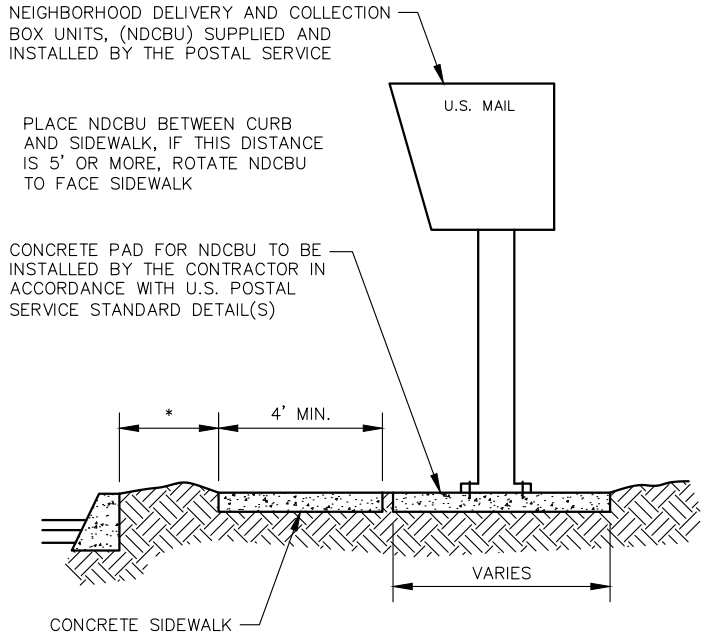
A LIST OF SUGGESTED MANUFACTURERS MAY BE OBTAINED FROM THE UNITED STATES POSTAL SERVICE.

NOTES:

1. WHERE CURB DOES NOT EXIST, FACE OF MAILBOX SHALL BE OFFSET 10' MIN. FROM EDGE OF PAVEMENT OR OR TRAVEL WAY. WHERE CURB EXISTS, FACE OF MAILBOX SHALL BE OFFSET BETWEEN 0" TO 6" FROM REAR OF CURB, WHEN FEASIBLE.
2. ADDRESS ON MAILBOX MUST FACE THE DELIVERY SIDE (ONCOMING TRAFFIC).
3. IF MAILBOX IS ON A CURVE OR IN A CUL–DE–SAC, PREFERRED PLACEMENT IS BEFORE AND AS CLOSE TO THE EDGE OF THE DRIVEWAY AS PRACTICAL.
4. APPROACH TO MAILBOX SHOULD BE CLEAR 10 FEET IN EACH DIRECTION, INCLUDING LANDSCAPING, VEHICLES, TRASH RECEPTACLES, HOLIDAY DECORATIONS, ETC.
5. NDCBU's SHALL BE LOCATED AND INSTALLED OUTSIDE OF SIGHT DISTANCE TRIANGLES (SEE DETAIL CC300). ON UNCURBED DRIVEWAYS, LOCATION OF NDCBU SHALL BE AS NOTED IN THE PLANS OR AS DIRECTED BY THE COUNTY ENGINEER.

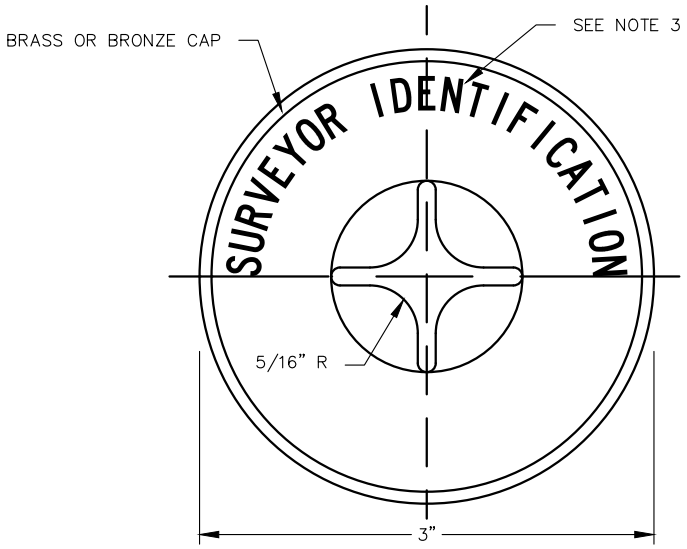


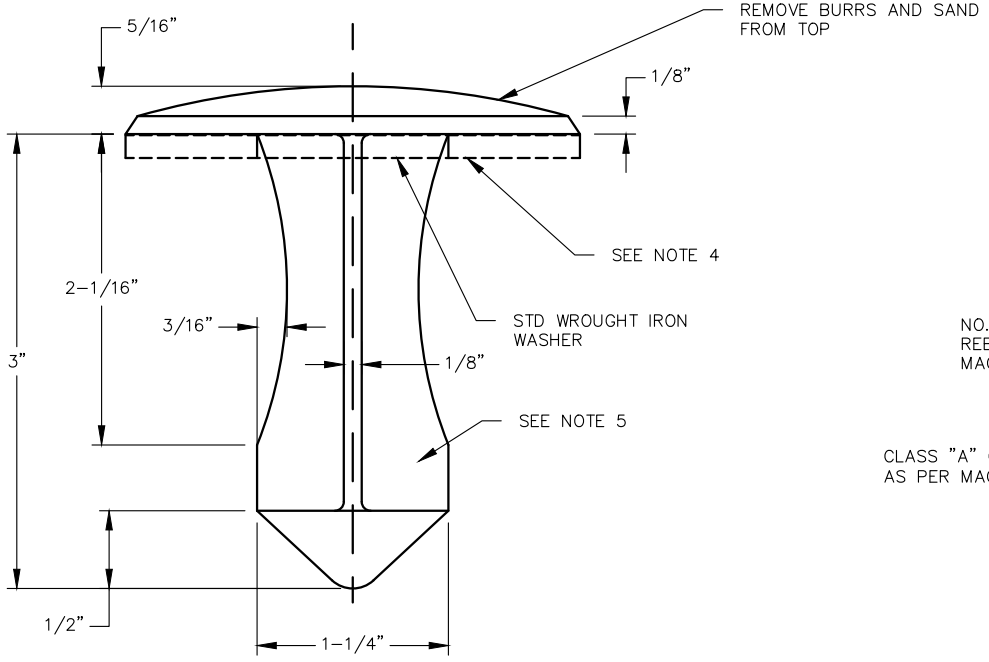
SINGLE MAIL BOX



NEIGHBORHOOD DELIVERY AND COLLECTION BOX

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	MAIL RECEPTACLES	DRAFT 05–26–2017	DETAIL NO. CC102

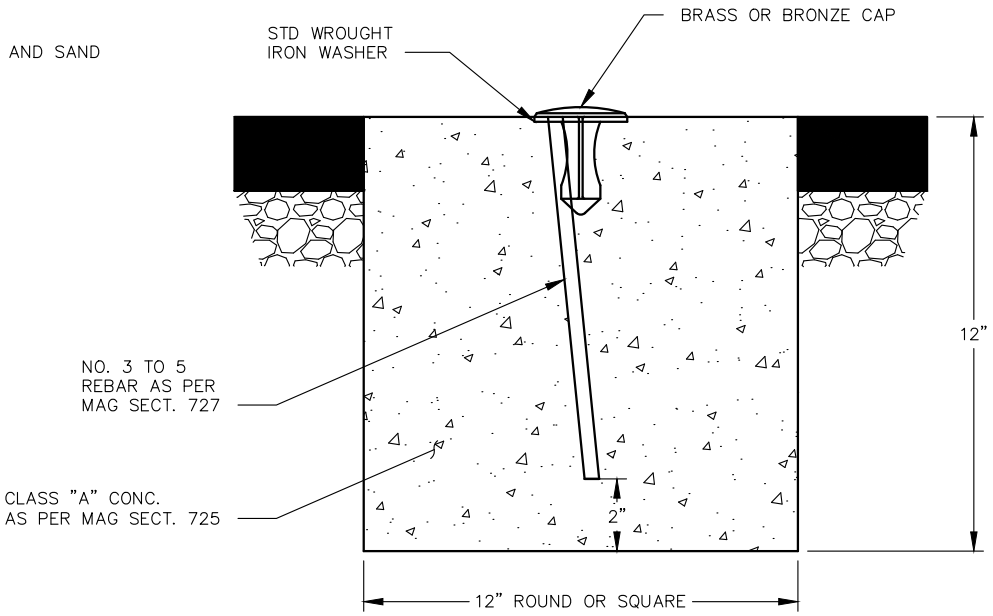




CAP DETAIL

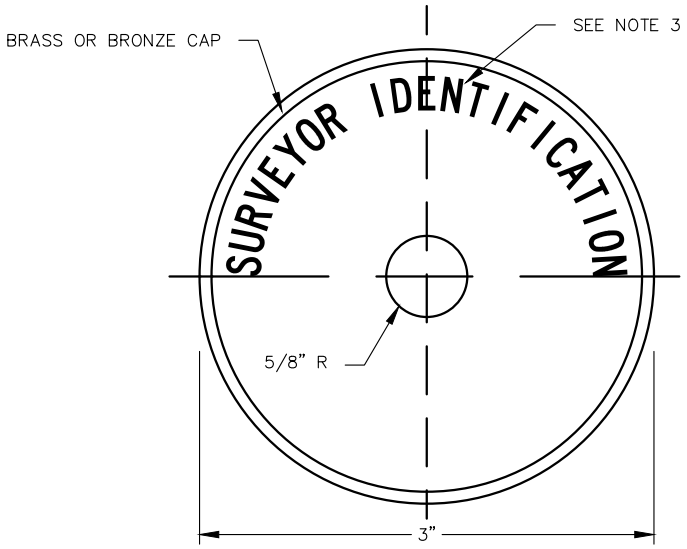
NOTES:

1. SURVEY MARKER WITH FRAME SHALL BE USED AT INTERSECTIONS OF MAJOR STREETS & COLLECTOR STREETS, AND AT OTHER SPECIAL POINTS AS SHOWN ON PLANS. SEE MAG DETAIL 120, TYPE "A".
2. SURVEY MARKER WITHOUT FRAME SHALL BE USED AT INTERSECTION OF LOCAL STREET CENTERLINES (EXCEPT WHERE TYPE "A" IS SPECIFIED), AT P.C.'s AND P.T.'s OF CURVES, AND AT OTHER POINTS AS SHOWN ON PLANS. SEE TYPE "B" BELOW, OR TYPE "D", DETAIL CC121-2..
3. LETTERS TO BE APPROX. $\frac{1}{32}$" WIDE & $\frac{1}{32}$" DEEP.
4. USE STANDARD WROUGHT IRON WASHER 3" O.D. X $\frac{1}{64}$" THICK WITH 1-3/8" HOLE.
5. CAP TO BE CONSTRUCTED OF RED BRASS OR BRONZE.



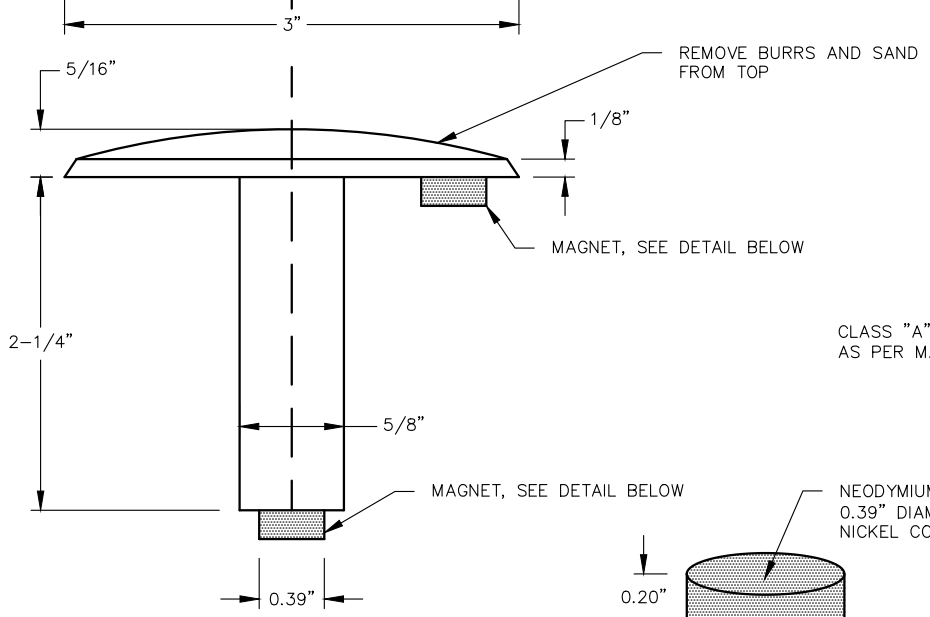
TYPE "B"
(WITHOUT FRAME)

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	SURVEY MARKER FOR LOCAL STREETS TYPE B	DRAFT 05-26-2017	DETAIL NO. CC121-1

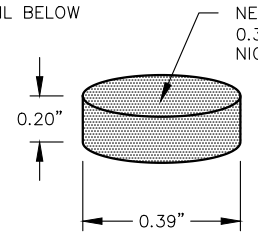


NOTES:

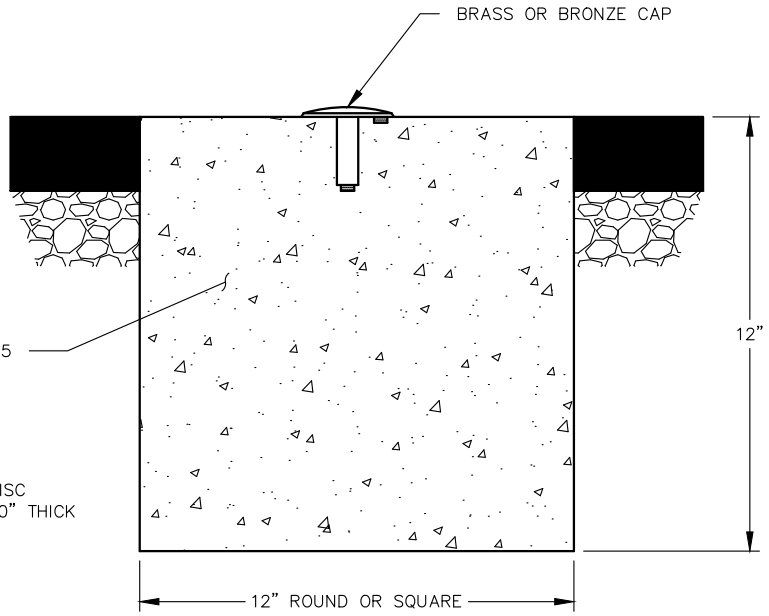
1. SURVEY MARKER WITH FRAME SHALL BE USED AT INTERSECTIONS OF MAJOR STREETS & COLLECTOR STREETS, AND AT OTHER SPECIAL POINTS AS SHOWN ON PLANS. SEE MAG DETAIL 120, TYPE "A".
2. SURVEY MARKER WITHOUT FRAME SHALL BE USED AT INTERSECTION OF LOCAL STREET CENTERLINES (EXCEPT WHERE TYPE "A" IS SPECIFIED), AT P.C.'s AND P.T.'s OF CURVES, AND AT OTHER POINTS AS SHOWN ON PLANS. SEE TYPE "B" BELOW, OR TYPE "D", DETAIL CC121–2..
3. LETTERS TO BE APPROX. 1/32" WIDE & 1/32" DEEP.
4. CAP TO BE CONSTRUCTED OF RED BRASS OR BRONZE.
5. SURVEY MARKER PLACEMENT SHALL PROVIDE MAGNETIC DETECTION LOCATORS.



CAP DETAIL



MAGNET DETAIL

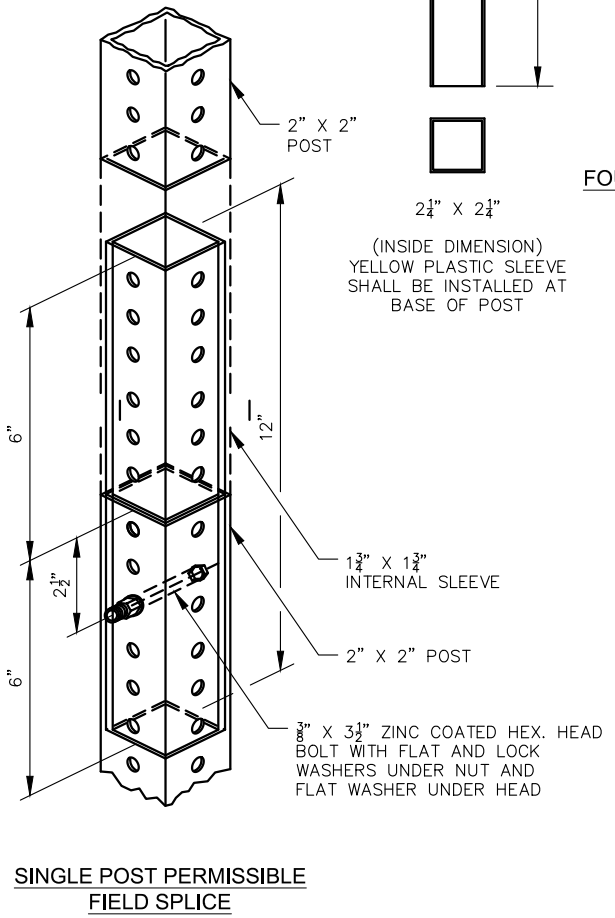


TYPE "D"
(WITHOUT FRAME)

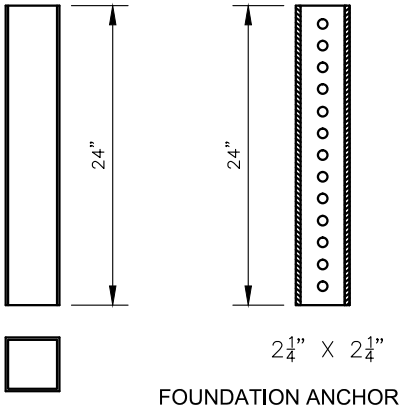
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	SURVEY MARKER FOR LOCAL STREETS TYPE D MAGNETIC DETECTION	DRAFT 05–26–2017	DETAIL NO. CC121-2

NOTES:

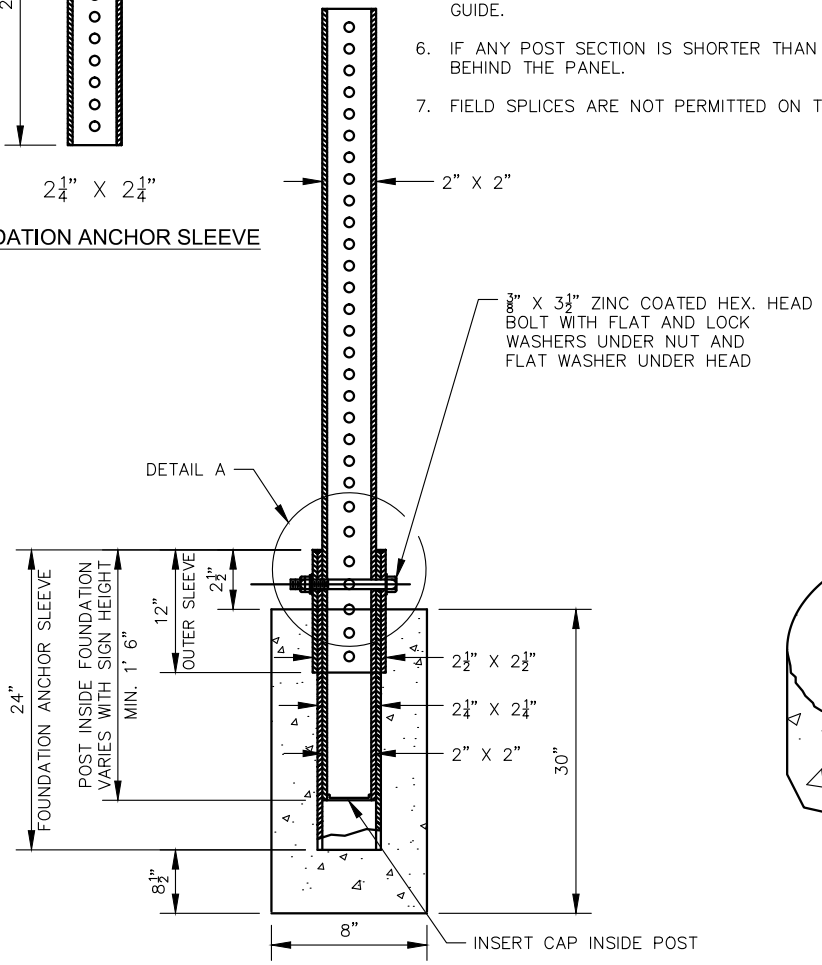
1. ALL DIMENSIONS ARE IN INCHES, EXCEPT AS NOTED.
2. SQUARE PERFORATED POST SIZE SHALL BE 2" X 2" OR AS APPROPRIATE FOR THE SIGN SIZE PER THE CURRENT ADOT SIGNING AND MARKING GUIDE.
3. FOR ESTIMATING PURPOSES, CONCRETE QUANTITY PER POST IS 1.0 CU/FT.
4. A YELLOW PLASTIC SLEEVE SHALL BE INSTALLED AT THE BASE OF ALL SIGN POSTS.
5. USE OF TELESCOPING AND/OR SLIP BASE SHALL BE DESIGNATED BY THE DESIGN ENGINEER AS NEEDED FOR THE SIGN SIZE AND LOCATION AS PER THE CURRENT ADOT SIGNING AND MARKING GUIDE.
6. IF ANY POST SECTION IS SHORTER THAN THE PANEL HEIGHT, THE FIELD SPLICE SHALL BE BEHIND THE PANEL.
7. FIELD SPLICES ARE NOT PERMITTED ON TELESCOPING POSTS.



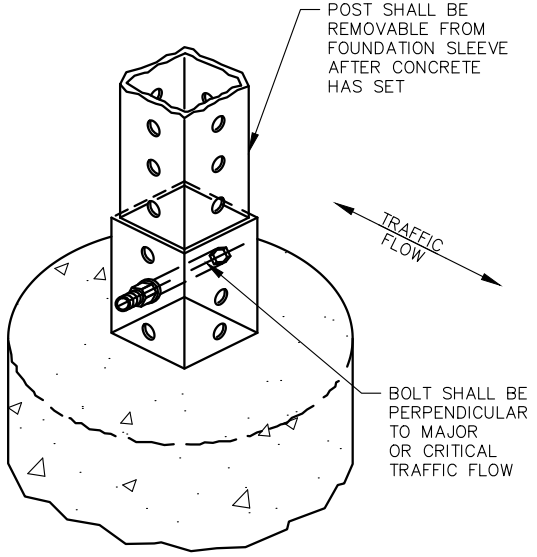
SINGLE POST PERMISSIBLE FIELD SPLICE



FOUNDATION ANCHOR SLEEVE

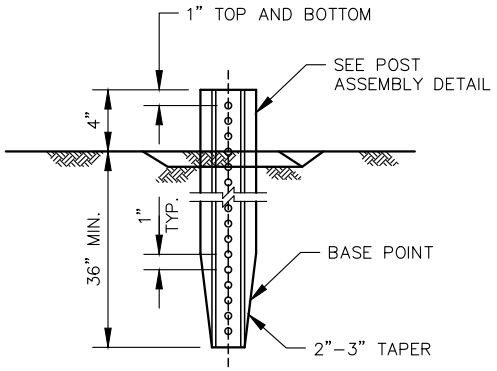


SIGN POST FOUNDATION DETAIL

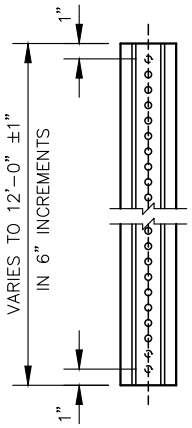


DETAIL A

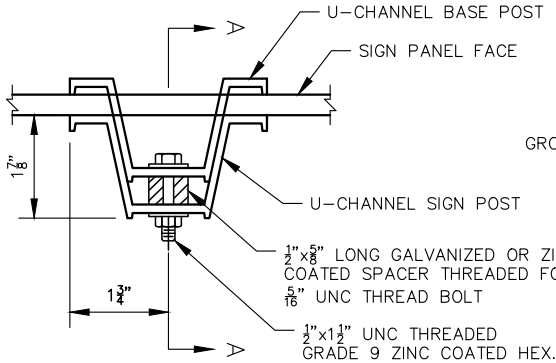
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	SQUARE PERFORATED SIGN POST, FOUNDATION & SPLICE DETAILS	DRAFT 05-26-2017	DETAIL NO. CC132

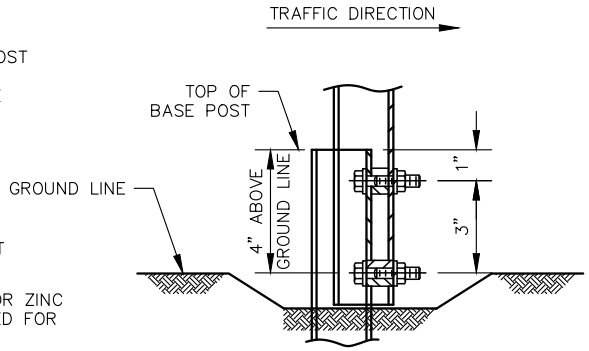


BASE POST AND INSTALLATION



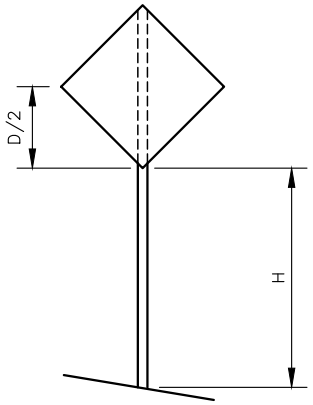
SIGN POST





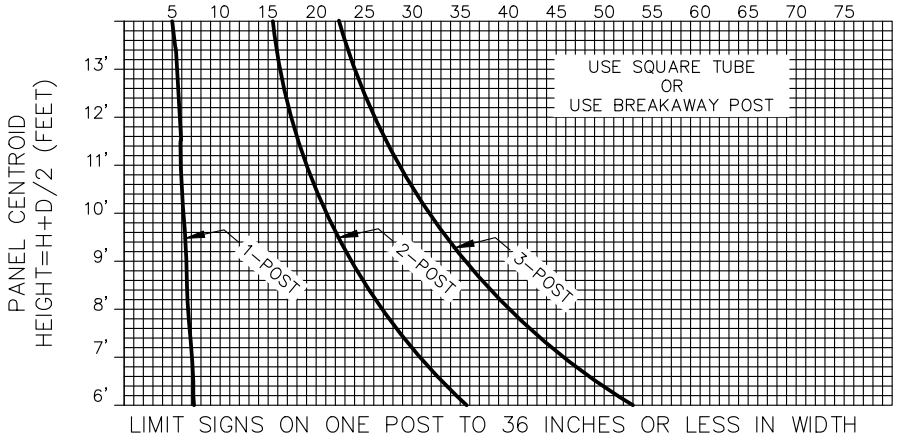
POST ASSEMBLY

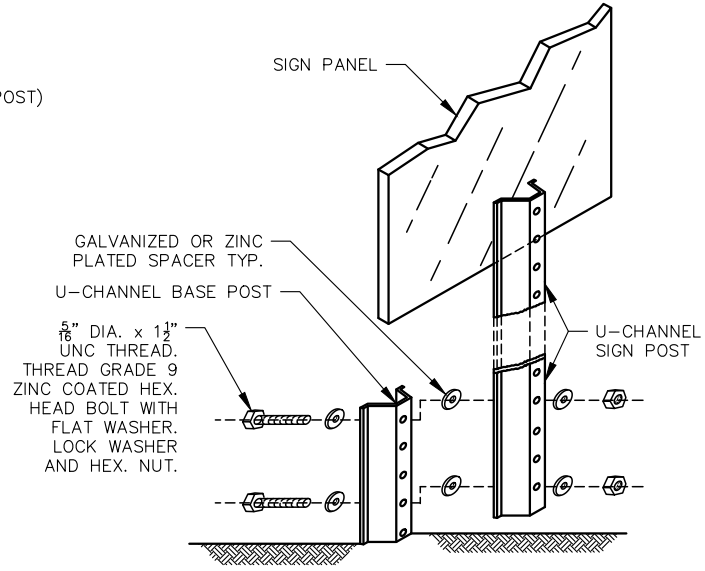
SECTION A–A



U–CHANNEL SELECTION

WIND SPEED = 70MPH (3 LBS. PER FT. POST)



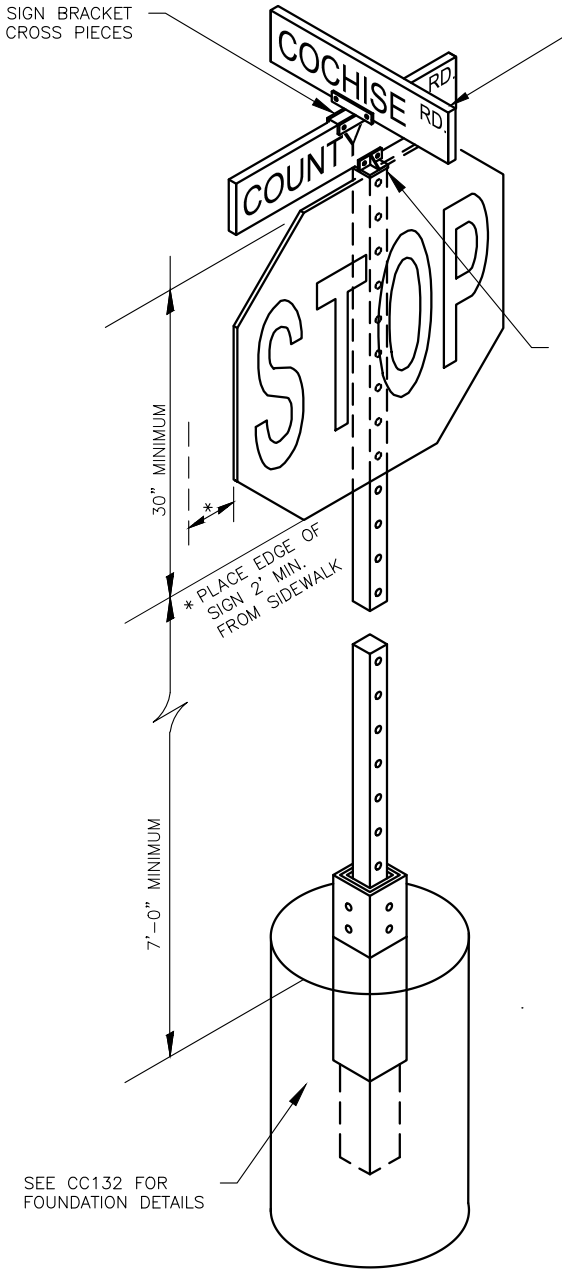


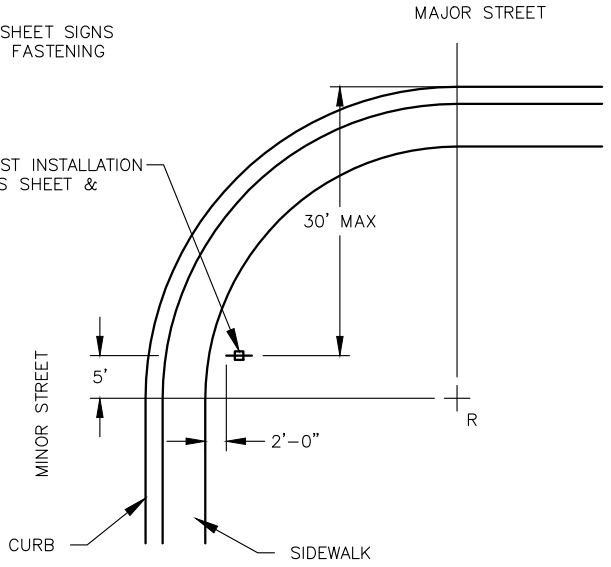
INSTALLATION PICTORIAL

NOTE:

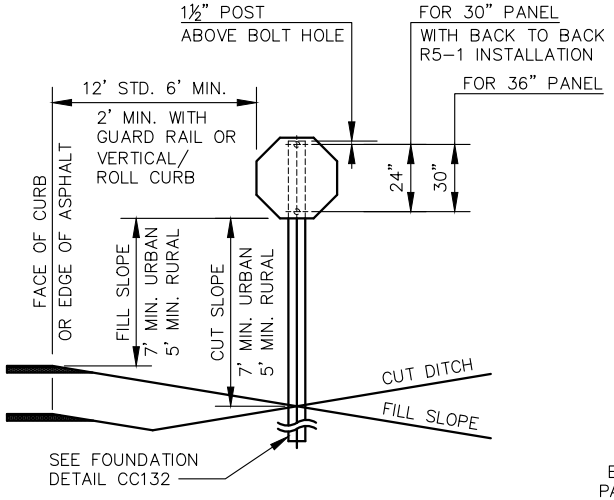
1. ALL DIMENSIONS ARE IN INCHES, EXCEPT AS NOTED.

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	U-CHANNEL POST SELECTION AND INSTALLATION DETAILS	DRAFT 05–26–2017	DETAIL NO. CC133

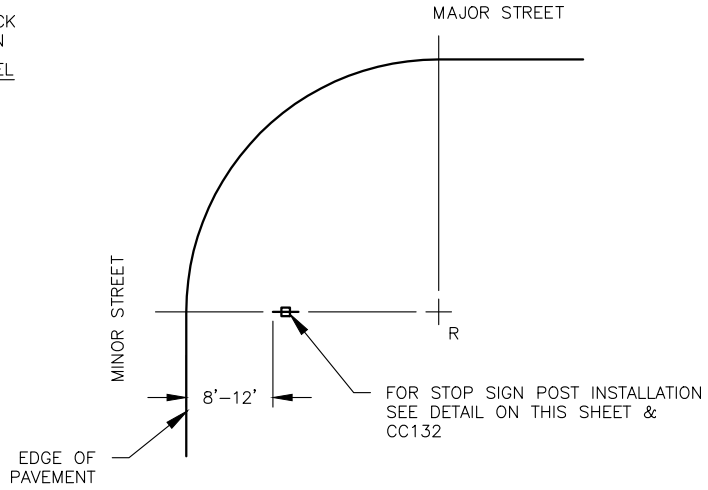




TYPICAL SUBDIVISION PLACEMENT DETAIL



STOP SIGN PLACEMENT DETAIL

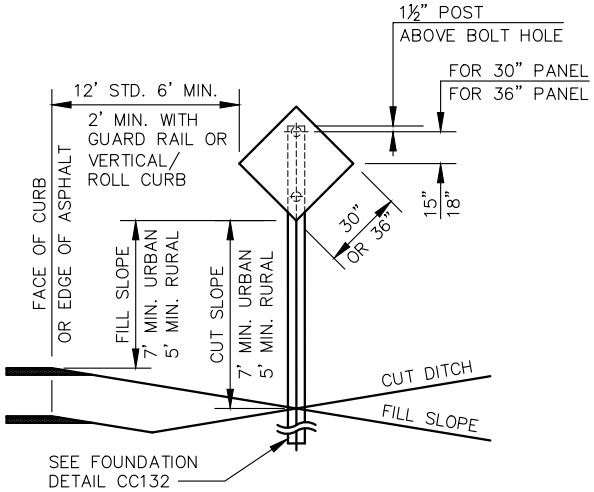


TYPICAL RURAL PLACEMENT DETAIL

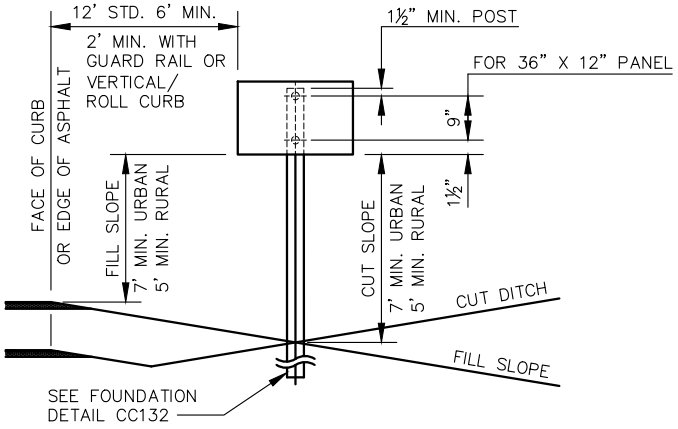
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	OFFSETS, CLEARANCES AND MOUNTING DETAILS FOR SIGNS ON COUNTY ROADWAYS	DRAFT 05-26-2017	DETAIL NO. CC134-1

NOTES:

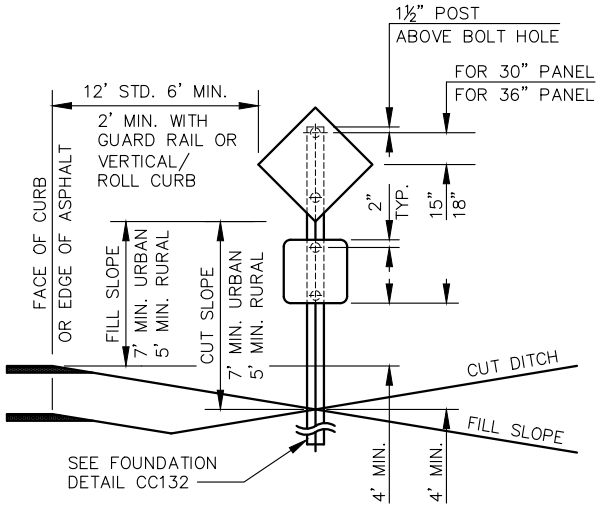
1. SEE FHWA STANDARD HIGHWAY SIGNS BOOKLET FOR PANEL BOLT HOLE. SPACING NOT SHOWN.
2. ALL DIMENSIONS IN INCHES EXCEPT AS NOTED.
3. USE GRADE #2, ZINC COATED, 18 NC THREAD, 3" X 5/16" BOLT WITH FLAT WASHER UNDER NUT AND FLAT WASHER UNDER HEAD TO ATTACH SIGN TO BRACKET.



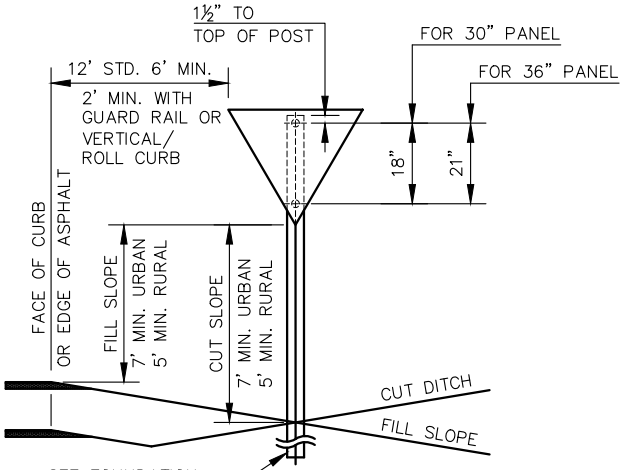
WARNING SIGN



REGULATORY SIGN
SINGLE POST

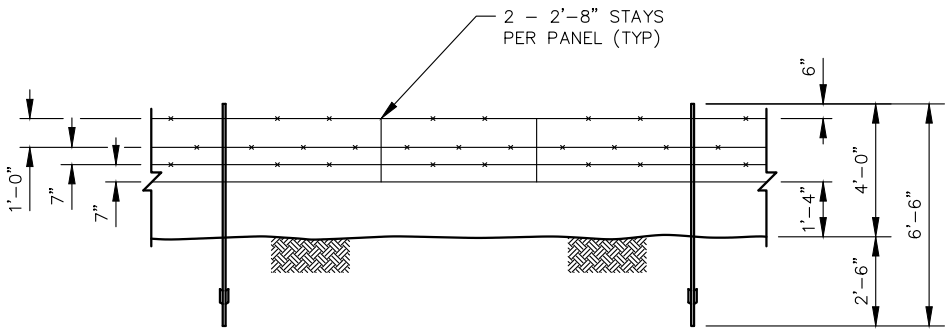


WARNING SIGN
WITH ADVISORY PLATE

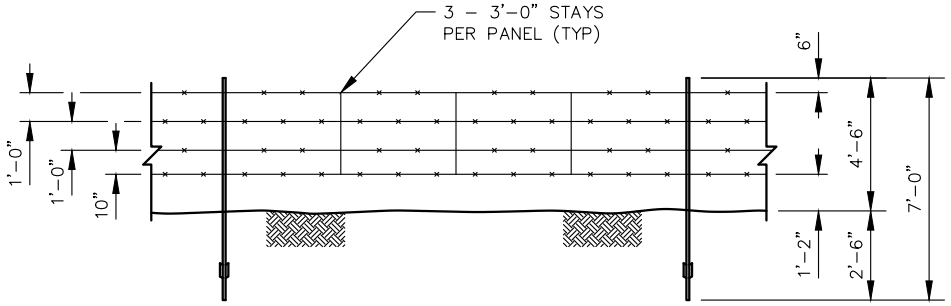


YIELD SIGN

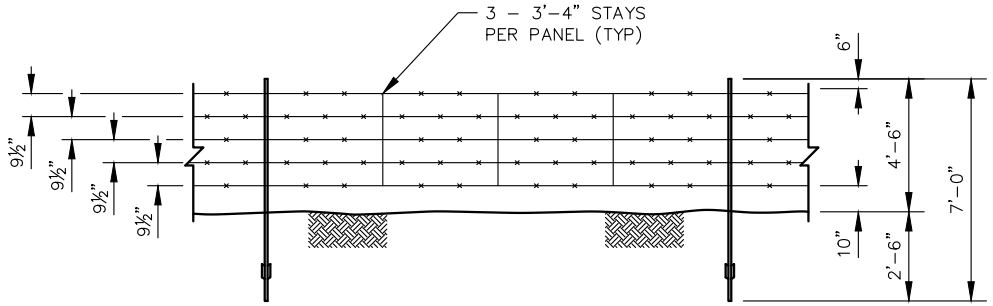
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	OFFSETS, CLEARANCES AND MOUNTING DETAILS FOR SIGNS ON COUNTY ROADWAYS	DRAFT 05-26-2017	DETAIL NO. CC134-2



GAME FENCE (GF)



BARBED WIRE (BW) (4 WIRE)

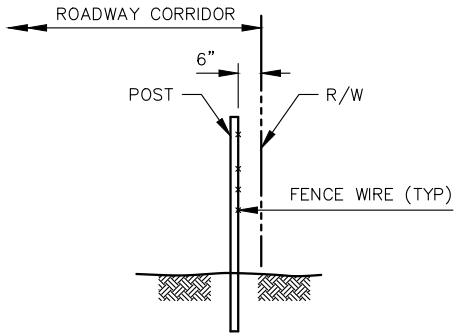


BARBED WIRE FENCE (BW) (5 WIRE)

NOTES:

1. FOR GAME FENCE THE BOTTOM WIRE SHALL BE BARBLESS.
2. STAYS SHALL BE EVENLY SPACED BETWEEN POSTS WITH SPACING NOT TO EXCEED 5 FEET – 4 INCHES FOR GAME FENCE OR 4 FEET FOR BARBED WIRE FENCE.
3. WIRE STAYS ON GAME FENCE (GF) SHALL HAVE THEIR ENDS TURNED UP TO PREVENT INJURIES TO GAME.
4. IN AREAS WITH HIGH CONCENTRATIONS OF UNGULATES (DEER, PRONGHORN, JAVALINA) CONSIDER USE OF THE BARBLESS BOTTOM WIRE PLACED NO LESS THAN 16" OFF THE GROUND, GAME FENCE HEIGHT SHOULD NOT EXCEED 42" AND BOTTOM SMOOTH WIRE PLACEMENT SHOULD NOT EXCEED 18".

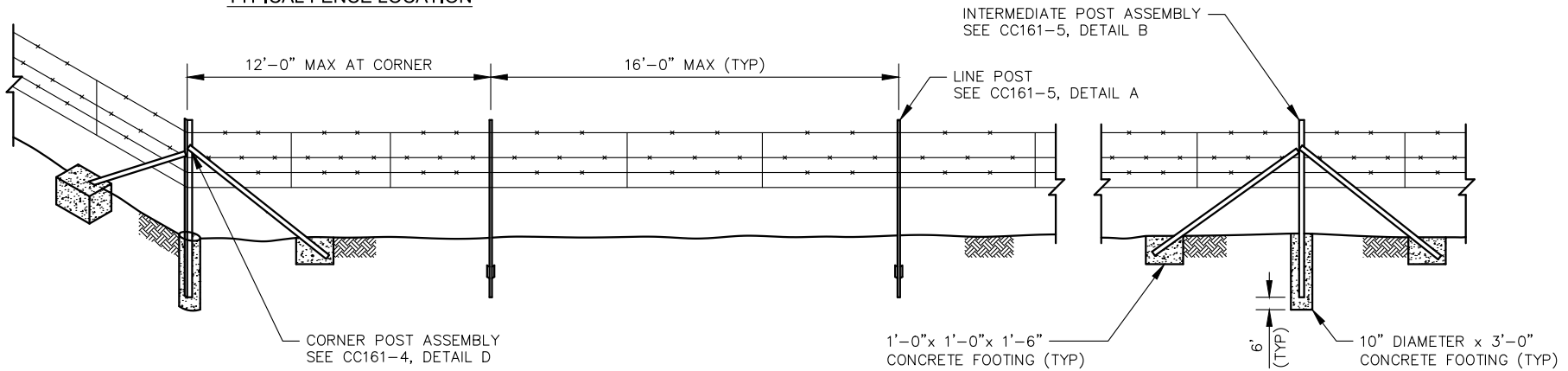
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	FENCE, BARBED WIRE	DRAFT 05–26–2017	DETAIL NO. CC161-1

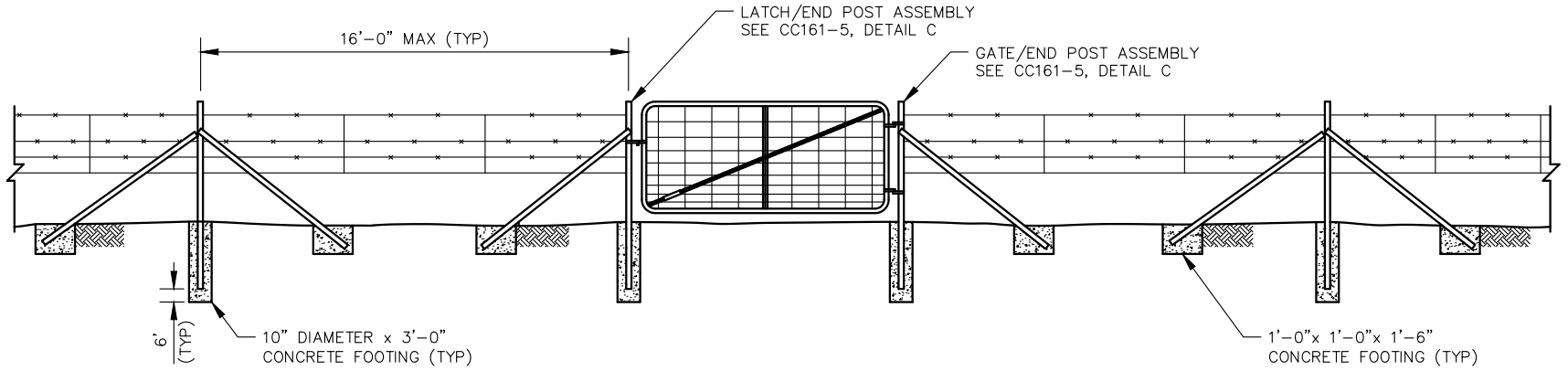


TYPICAL FENCE LOCATION

NOTES:

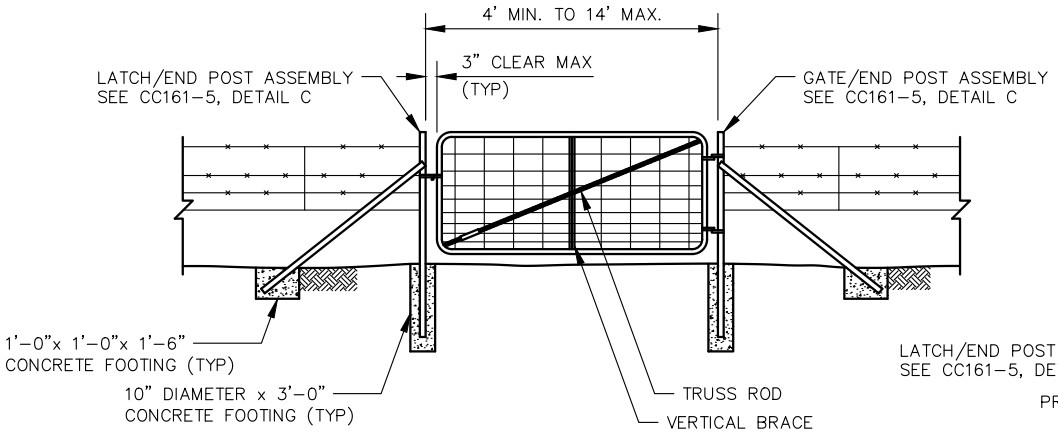
1. INTERMEDIATE POST ASSEMBLIES SHALL BE LOCATED AS SHOWN AND AT INTERVALS NOT TO EXCEED 650', OR MIDWAY BETWEEN ALL BRACED POSTS.
2. FENCE WIRE SHALL BE PLACED ON THE SIDE OF THE LINE POSTS AWAY FROM THE MAIN ROADWAY EXCEPT IN SHARPER CURVE AREAS WHERE IT SHOULD BE MOVED TO THE SIDE WITH TENSION AGAINST THE POSTS.



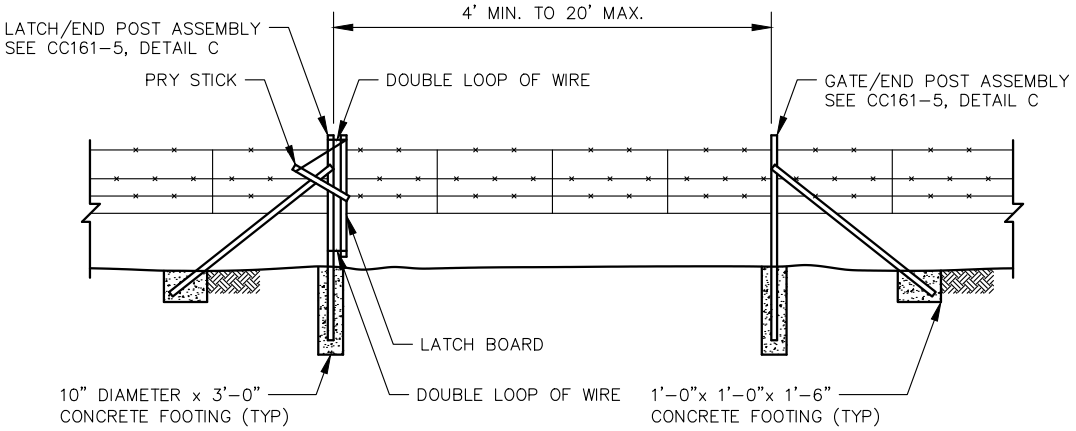


TYPICAL BARBED WIRE FENCE INSTALLATION

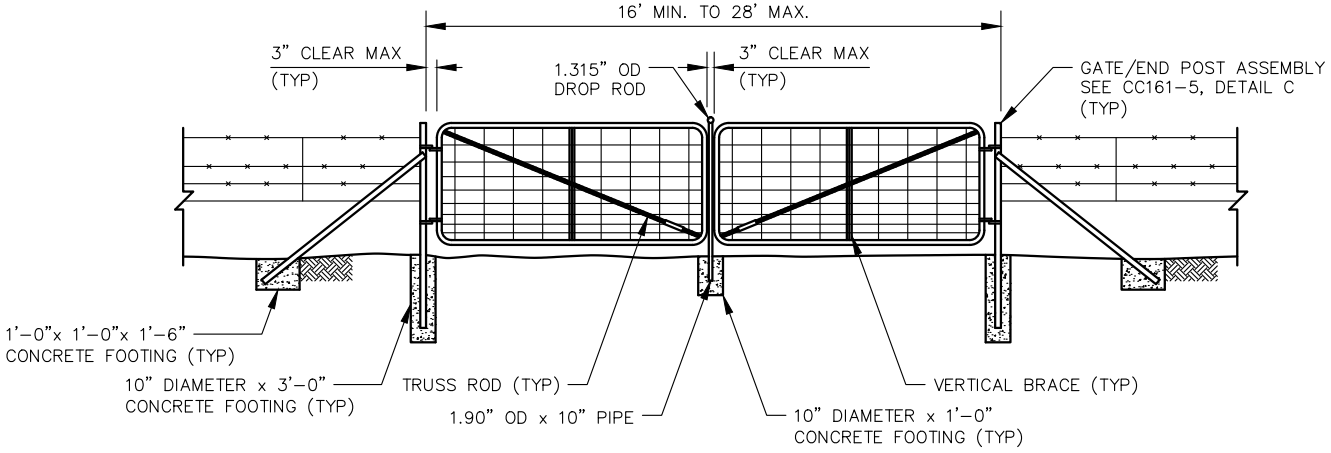
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	FENCE, BARBED WIRE TYPICAL FENCE INSTALLATION	DRAFT 05–26–2017	DETAIL NO. CC161-2



TYPE 1 SINGLE GATE

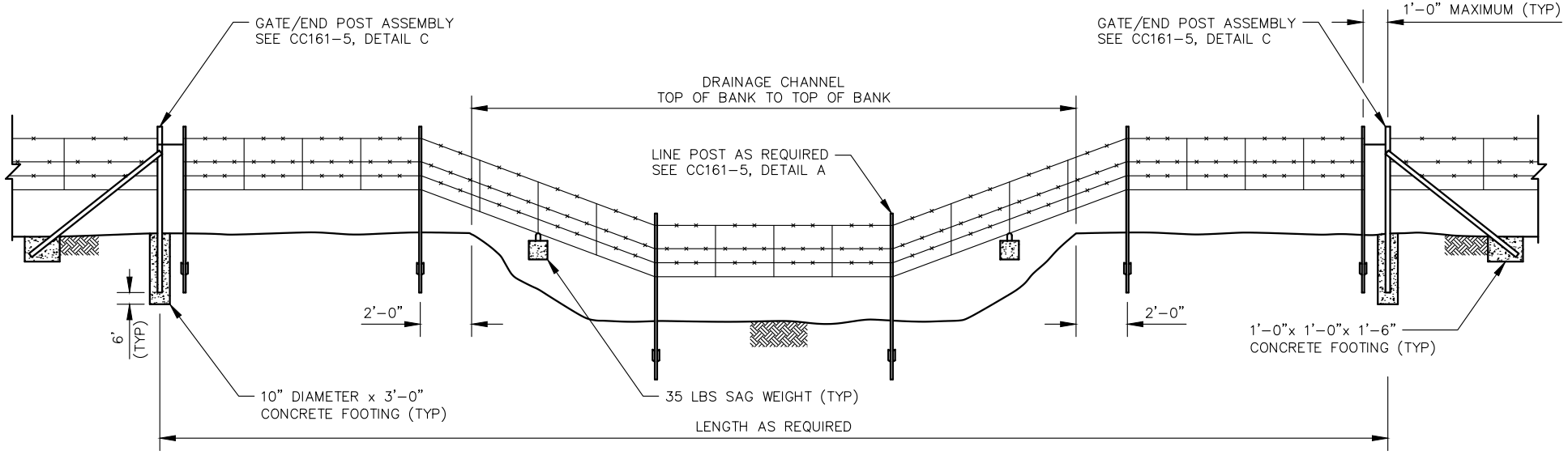


TYPE 2 GATE

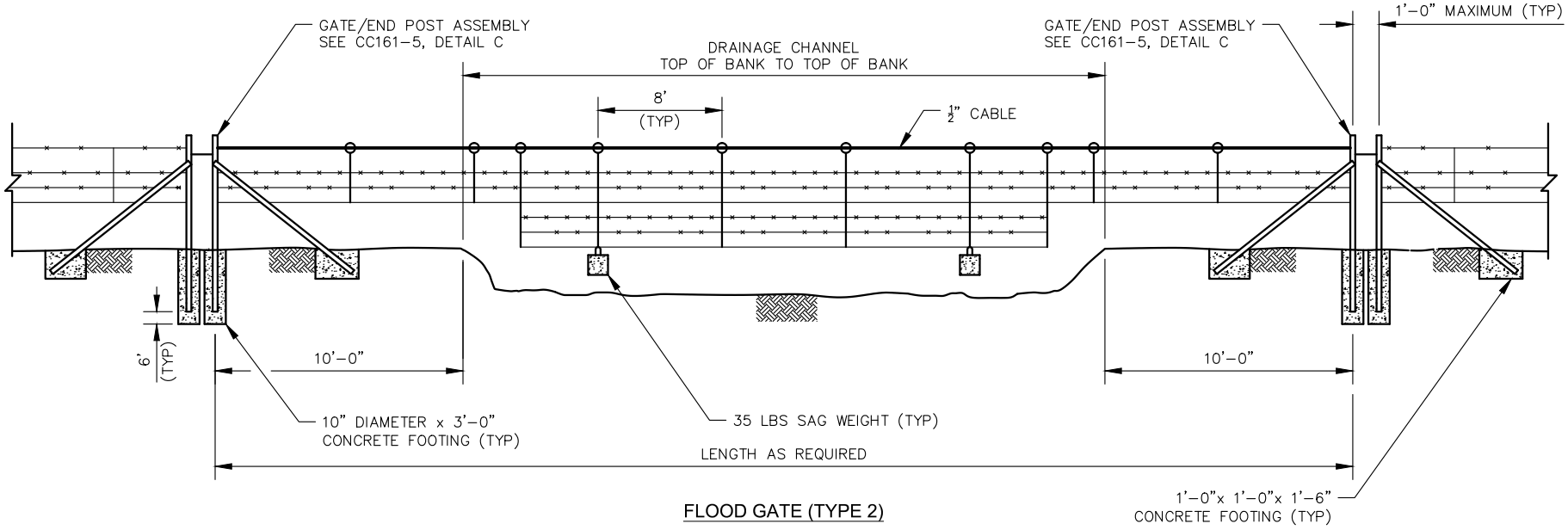


TYPE 1 DOUBLE GATE

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	FENCE, BARBED WIRE GATES - TYPE 1 AND 2	DRAFT 05-26-2017	DETAIL NO. CC161-3



FLOOD GATE (TYPE 1)

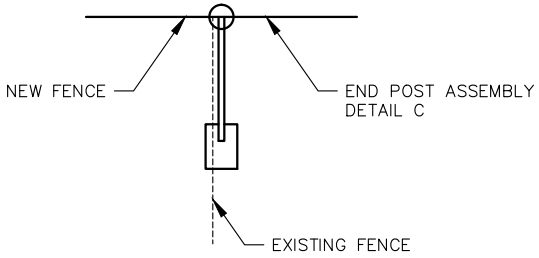


FLOOD GATE (TYPE 2)

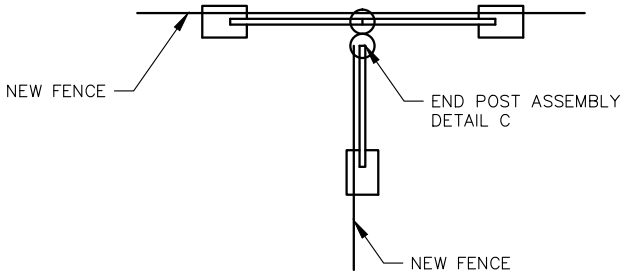
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	FENCE, BARBED WIRE FLOOD GATE	DRAFT 06-06-2017	DETAIL NO. CC161-4

NOTES:

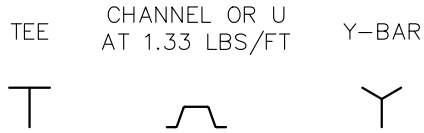
1. POST ASSEMBLIES SHALL CONSIST OF AN UPRIGHT ANGLE 2½"x2½"x¼" AT 4.10 LBS/FT, AND BRACE ANGLES 2"x2"x¼" AT 3.19 LBS/FT.



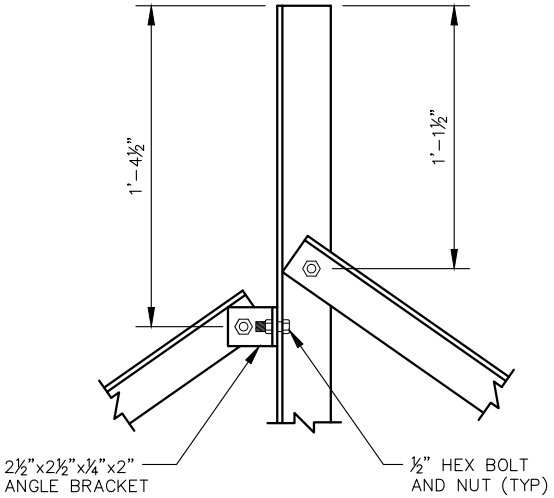
ABUTTING FENCE



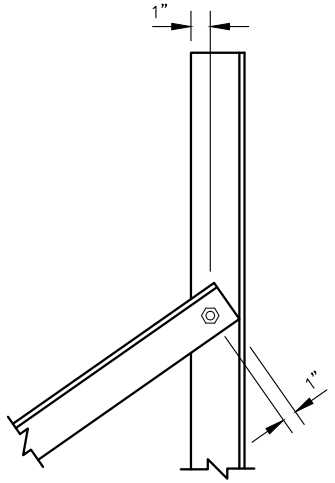
ABUTTING FENCE AT POST



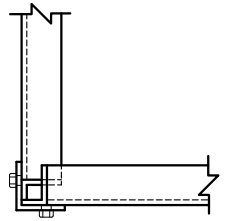
DETAIL A
TYPICAL CROSS SECTIONS
OF LINE POST SHAPES



DETAIL B
INTERMEDIATE POST ASSEMBLY

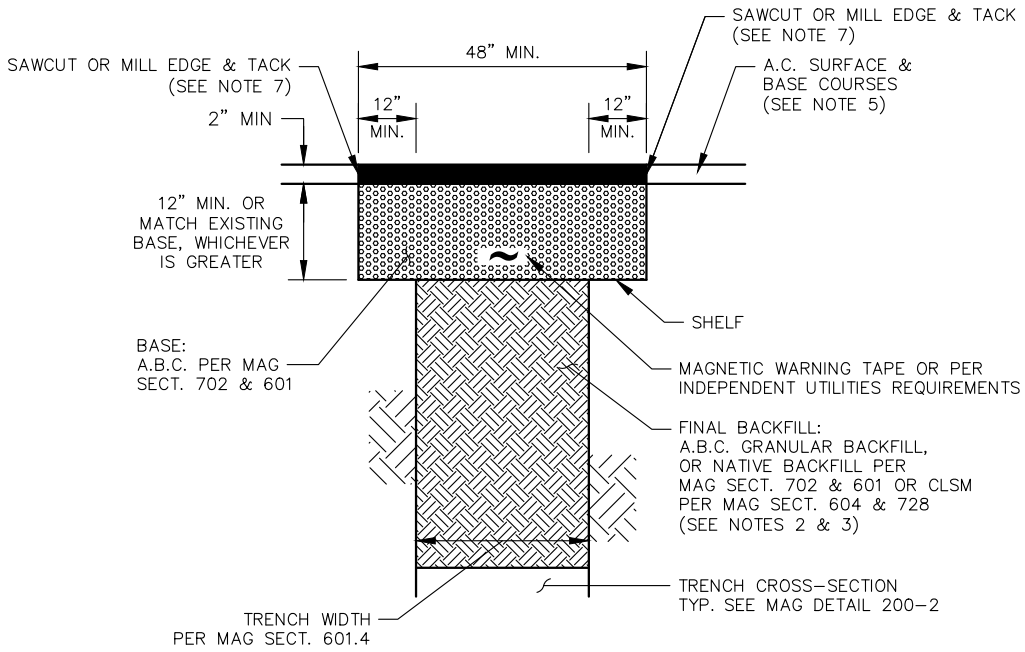


DETAIL C
END POST ASSEMBLY



DETAIL D
CORNER POST ASSEMBLY

COCHISE COUNTY / HIGHWAY & FLOODPLAIN STANDARD DETAIL	FENCE, BARBED WIRE MISCELLANEOUS DETAILS	DRAFT 05-26-2017	DETAIL NO. CC161-5



"T TOP" TRENCH REPAIR

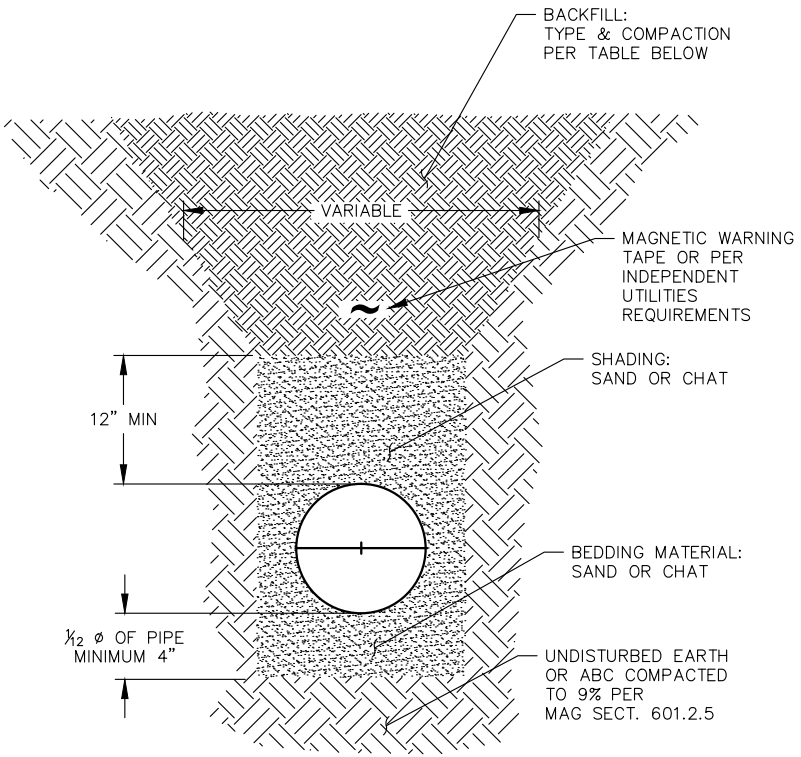
NOTES:

1. ALL TRENCHING ACROSS EXISTING PAVED STREETS OR IMPROVED DRIVEWAYS SHALL BE BORED, UNLESS OTHERWISE APPROVED BY THE COUNTY.
2. MATERIAL FOR FINAL BACKFILL AND BASE (IF APPLICABLE) SHALL BE AS NOTED HEREIN UNLESS OTHERWISE SPECIFIED IN CONTRACT DOCUMENTS. CONTROLLED LOW STRENGTH MATERIAL (CLSM) SHALL BE 2-SACK PER MAG SECT. 604 AND 728.
3. FINAL BACKFILL SHALL BE 2-SACK CLSM PER MAG SECT. 604 AND 728 FOR TRENCH DEPTHS GREATER THAN 4 FEET.
4. BASE, FINAL BACKFILL, AND PIPE EMBEDMENT ZONE COMPACTION SHALL BE IN ACCORDANCE WITH MAG SECT. 601.
5. ASPHALT CONCRETE SURFACE AND BASE COURSES SHALL COMPLY WITH MAG SECT. 336.2.4.1 UNLESS OTHERWISE SPECIFIED IN CONTRACT DOCUMENTS.
6. PROVIDE MINIMUM 12" WIDE SHELF AS SHOWN EXCEPT WHERE EDGE ABUTS EXISTING CONCRETE.
7. THE JOINT LOCATION OR JOINT CONFIGURATION MAY VARY FROM THAT SHOWN TO ELIMINATE REMNANTS, TO ELIMINATE FULL DEPTH SAWCUT JOINTS FROM BEING LOCATED WITHIN A WHEEL PATH AS REQUIRED BY MAG SECT. 336, OR WHEN AN OFFSET JOINT IS CONSTRUCTED.
8. WHEN MECHANICAL COMPACTION IS USED, BACKFILL SHALL BE PLACED IN LIFTS NO GREATER THAN 2 FEET, TO WITHIN 4 FEET OF FINISHED GRADE. FROM A DEPTH OF 4 FEET TO FINISHED GRADE, THE LIFTS SHALL NOT EXCEED 1 FOOT.
9. MATERIAL SPECIFICATIONS AND TESTING SHALL BE REQUIRED TO DEMONSTRATE CONFORMANCE WITH THIS DETAIL, UNLESS OTHERWISE DIRECTED BY THE COUNTY ENGINEER.

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	PAVED TRENCH BACKFILL AND SURFACE REPLACEMENT	DRAFT 05-26-2017	DETAIL NO. CC200-1

TRENCH REQUIREMENTS:

1. A WIDER TRENCH SHALL BE ALLOWED IF A PULLBOX IS USED AS MEANS FOR TRENCH SHORING.
2. FOR ALL EXCAVATION AND TRENCHES, THE CONTRACTOR SHALL ADHERE STRICTLY WITH OSHA CFR PART 1926 SUBPART P.
3. TRENCH EXCAVATIONS OVER 20-FEET IN DEPTH SHALL HAVE AN APPROVED SHORING PLAN, STAMPED BY AN AZ REGISTERED PROFESSIONAL ENGINEER, TO BE SUBMITTED BY THE CONTRACTOR FOR REVIEW BY COCHISE COUNTY.



TRENCH BACKFILL MATERIALS

NATIVE MATERIAL:

1. NATIVE MATERIAL MAY BE USED WHEN SUITABLE AND WITH APPROVAL OF COUNTY ENGINEER.
2. MATERIAL SPECIFICATIONS AND TESTING SHALL CONFORM TO MAG SECT. 601.4.
3. AT A MINIMUM, THE MATERIAL SHALL MEET THE FOLLOWING REQUIREMENTS:
   - A. MATERIAL IS FREE OF BROKEN CONCRETE, BROKEN PAVEMENT, RUBBISH, CHUNKS OF CLAY, WOOD, ORGANIC MATERIAL, OR OTHER DELETERIOUS MATERIAL.
   - B. MATERIAL DOES NOT CONTAIN ROCK OR STONES LARGER THAN THREE INCHES.
4. WHEN MECHANICAL COMPACTION IS USED, BACKFILL SHALL BE PLACED IN LIFTS NO GREATER THAN 2 FEET, TO WITHIN 4 FEET OF FINISHED GRADE. FROM A DEPTH OF 4 FEET TO FINISHED GRADE, THE LIFTS SHALL NOT EXCEED 1 FOOT.

AGGREGATE BASE

- AGGREGATE BASE PER DETAIL CC200-4
- RECLAIMED CONCRETE MATERIAL (RCM) IN ACCORDANCE WITH MAG SECT. 701.4 MAY BE SUBSTITUTED FOR AGGREGATE BASE

NON SHRINK SLURRY

- TWO SACK TYPE II PORTLAND CONCRETE CEMENT PER CUBIC YARD.
- TYPE B SELECT AGGREGATE PER MAG 702, OR AGGREGATE BASE COURSE, OR RECLAIMED CONCRETE MATERIAL PER DETAIL CC200-4.

ALLOWABLE BEDDING & SHADING SAND OR CHAT

- 100% PASSING 1/2" SIEVE.
- SUM OF PI PLUS 200 SIEVE SHALL BE LESS THAN 23.

TRENCH WIDTH CHART 1

SIZE OF PIPE (I.D.)	MAXIMUM WIDTH AT TOP OF PIPE GREATER THAN O.D. OF BARREL	MINIMUM WIDTH AT SPRINGLINE EA. SIDE OF PIPE
LESS THAN 18"	20"	8"
18" TO 24"	23"	9.5"
27" TO 39"	28"	12"
42" TO 60"	34"	14"
OVER 60"	PER MAG. TABLE 601-1, FLEX PIPES	

* 200 SIEVE TO BE DETERMINED BY ASTM. D4318, DRY PREP, OR AASHTO T-90.

BACKFILL REQUIREMENTS

	TRENCHING IN RIGHT OF WAY OUTSIDE ROADWAY PRISM OR IN UNPAVED ALLEY		TRENCHING IN EXISTING ROADWAY PRISM		TRENCHING IN PROPOSED ROADWAY PRISM	
	ALLOWABLE BACKFILL MATERIALS	COMPACTION REQUIREMENT	ALLOWABLE BACKFILL MATERIALS	COMPACTION REQUIREMENT	ALLOWABLE BACKFILL MATERIALS	COMPACTION REQUIREMENT
NATIVE MATERIAL WITHOUT FINES REQUIREMENT	X	95%				
NATIVE MATERIAL WITH FINES REQUIREMENT	X	95%			X	95%
AGGREGATE BASE	X	95%	X	*1 & *2	X	95%
NON SHRINK SLURRY	X	NA	X	NA	X	NA

*NOTES:
1. 95% EXCEPT FOR THE TOP 2' SHALL BE 100%.
2. PAVEMENT REPLACEMENT TO BE T-TOP PER DETAIL CC200-1

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	UNPAVED STORM DRAIN / SEWER / UTILITY TRENCH BACKFILL & BEDDING COMPACTION	DRAFT 05-26-2017	DETAIL NO. CC200-3

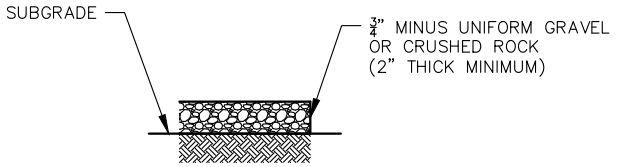
AGGREGATE BASE COURSE

702.2.1 REPLACE TABLE 702–1 OF THE MAG STANDARD CONSTRUCTION SPECIFICATIONS WITH THE FOLLOWING:

REVISED TABLE 702–1			
Sieve Analysis Test Methods AASHTO T–27, T–11			
Sieve Size	Accumulative Percentage Passing Sieve, by Weight		
	Select Material		Aggregate Base Course
	Type A	Type B	
3 IN.	100	–	–
1–1/2 IN.	–	100	100
1 IN.	–	–	90–100
NO. 4	30–75	30–70	32–65
NO. 8	20–60	20–60	20–60
NO. 30	10–40	10–40	10–40
NO. 200	0–12	0–12	3–12
Plasticity Index Test Methods AASHTO T–89 Method A, T–90, T146 Method A			
MAXIMUM ALLOWABLE VALUE	5	5	5
Fractured Face, One Face Test Method ARIZ 212, Percent by Weight of the Material Retained on a #4 Sieve			
MINIMUM REQUIRED VALUE	50	50	50
Resistance to Degradation and Abrasion by the Los Angeles Abrasion Machine Test Method AASHTO T–96, Percent Loss by Weight			
MAXIMUM ALLOWABLE VALUE AT 100 REVOLUTIONS	10	10	10
MAXIMUM ALLOWABLE VALUE AT 500 REVOLUTIONS	45	45	45

NOTES:

1. SIZE AND TYPE OF DRIVEWAY SHALL BE NOTED ON PLANS AS FOLLOWS:
   90° – NO RADIUS: WxL–SURFACE–TYPE; (12' X 30'–A.C.–TYPE "B" DRIVEWAY).
   90° – WITH A RADIUS: WxLxR–SURFACE–TYPE; (12' X 20' x 15'–A.C.–TYPE "C" DRIVEWAY).
   OTHER THAN 90° WITH 2 RADII–TYPE "S": WxLxR1xR2–SURFACE–TYPE;
   (12' X 20' X 15'–A.C.–TYPE "S" DRIVEWAY).
   OR IT MAY BE NOTED ON PLANS IN CONVENTIONAL TERMS
2. L – INDICATES LENGTH OF PAVED SURFACE OF DRIVEWAY.



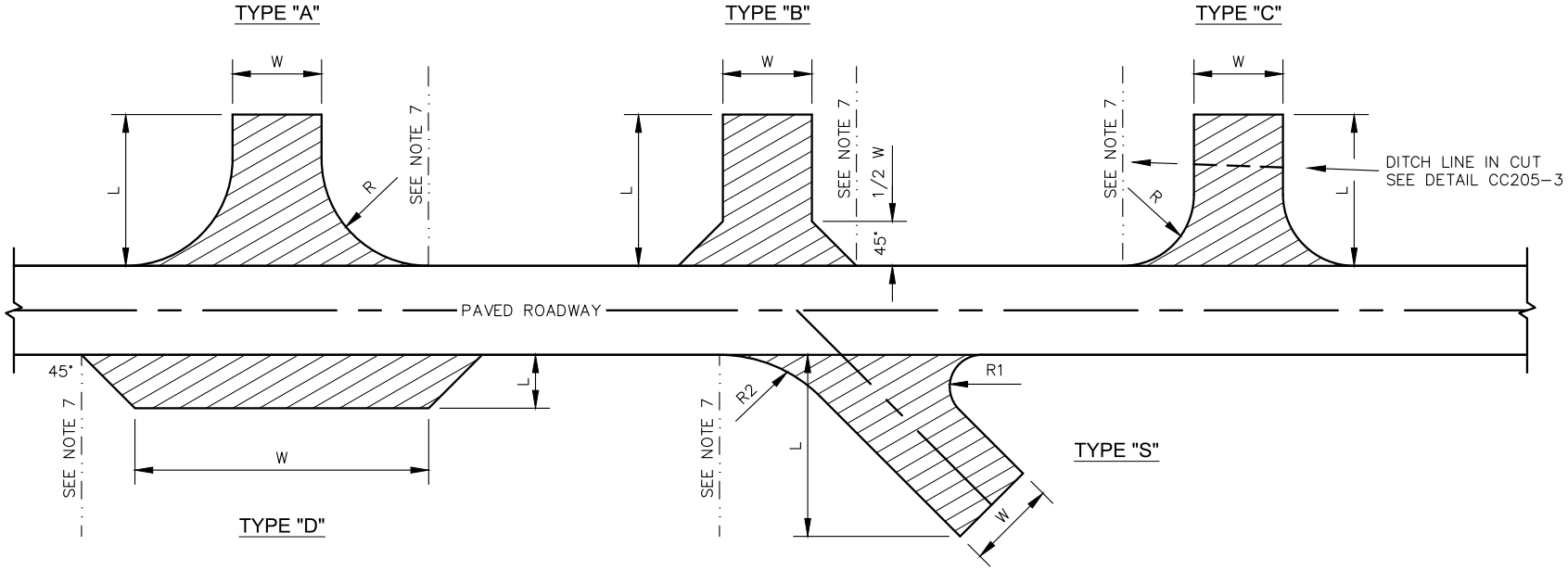
GRAVEL STRUCTURAL SECTION
TOTAL THICKNESS = 2"

NOTES (CONTINUED):

3. RESIDENTIAL DRIVEWAYS TYPICALLY PROVIDE ACCESS TO ONE SINGLE FAMILY RESIDENCE: ACCESS TO TWO OR MORE RESIDENTIAL PARCELS IS CONSIDERED A LOCAL ROAD CONNECTION (SEE CC205–3).
4. DRIVEWAYS TO BE STRAIGHT TYPE UNLESS OTHERWISE NOTED ON PLANS.
5. DRIVEWAY RADII OR CHAMFERS MUST REMAIN WITHIN THE PROJECTION OF THE SUBJECT PARCEL'S PROPERTY LINES AND SHALL NOT ENCROACH UPON ANY PART OF ADJACENT PROPERTIES.
6. DRIVEWAY STRUCTURAL SECTION MAY BE NATIVE–SURFACED OR AN IMPROVED SURFACE (GRAVEL, CONCRETE, DBST, ASPHALT).
7. DRAINAGE STRUCTURES SHALL BE PROVIDED UNDER DRIVEWAYS, WHERE NECESSARY.
8. CONSTRUCTION OF CURB, GUTTER, SIDEWALK OR PATHWAY MAY BE REQUIRED AS A CONDITION OF PERMIT APPROVAL.
9. DESIRABLE SIDESLOPES FOR DRIVEWAYS IS 6:1.

RESIDENTIAL		
POSTED SPEED (MPH)	RADIUS (R)	WIDTH (W)*
≤ 35	4'–10'	12'–30'
> 35	25'	12'–30'

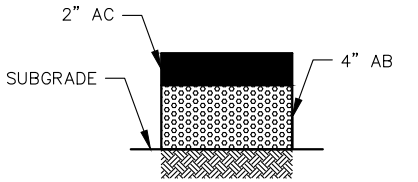
* THE PREFERRED DRIVEWAY WIDTH (W) IS 16'.



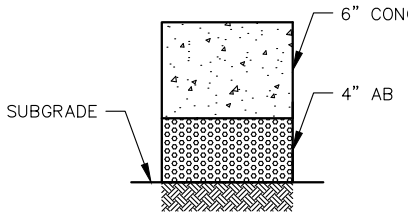
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	RESIDENTIAL DRIVEWAYS	DRAFT 05–26–2017	DETAIL NO. CC205-1

NOTES:

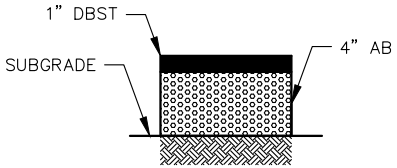
1. SIZE AND TYPE OF DRIVEWAY SHALL BE NOTED ON PLANS AS FOLLOWS:
   90° – NO RADIUS: WxL–SURFACE–TYPE; (12' X 30'–A.C.–TYPE "B" DRIVEWAY).
   90° – WITH A RADIUS: WxLxR–SURFACE–TYPE; (12' X 20' x 15'–A.C.–TYPE "C" DRIVEWAY).
   OTHER THAN 90° WITH 2 RADII–TYPE "S": WxLxR1xR2–SURFACE–TYPE;
   (12' X 20' X 15'–A.C.–TYPE "S" DRIVEWAY).
   OR IT MAY BE NOTED ON PLANS IN CONVENTIONAL TERMS



ASPHALT STRUCTURAL SECTION
TOTAL THICKNESS = 6"



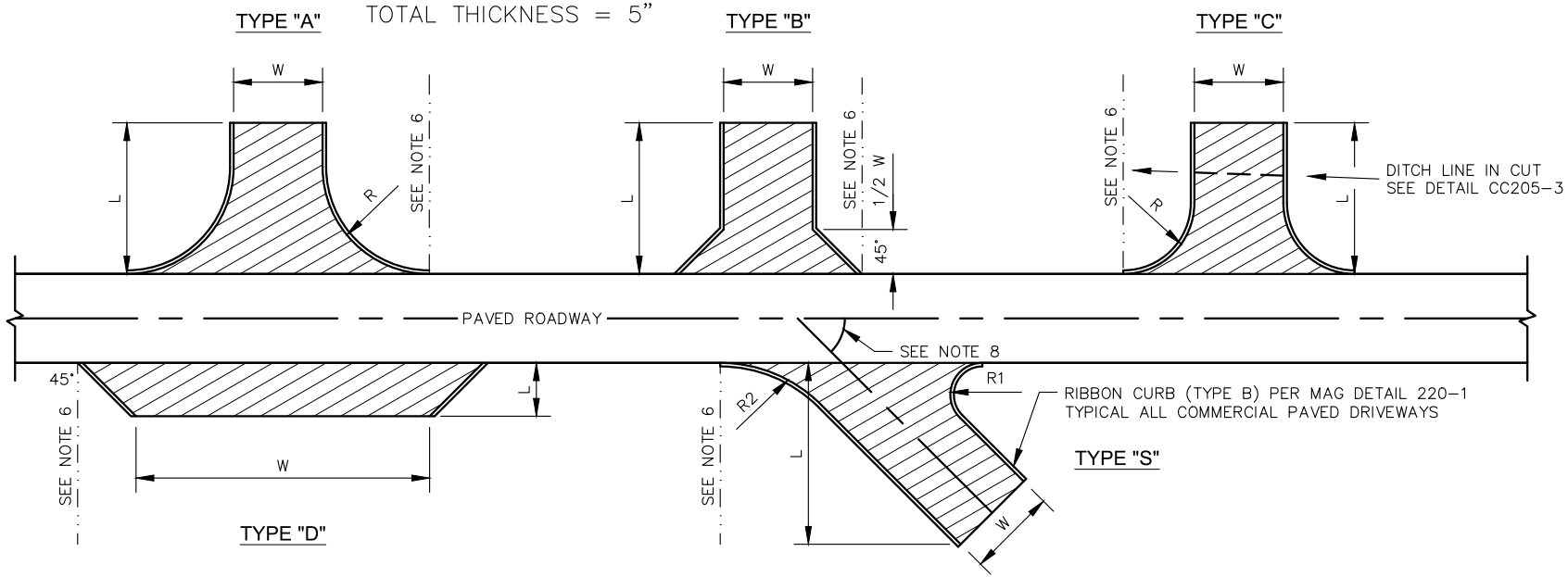
CONCRETE STRUCTURAL SECTION
TOTAL THICKNESS = 10"



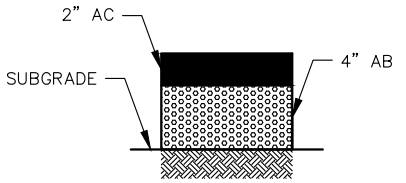
DBST STRUCTURAL SECTION
TOTAL THICKNESS = 5"

NOTES (CONTINUED):

2. L – INDICATES LENGTH OF PAVED SURFACE OF TURNOUT.
3. FOR COMMERCIAL PAVED DRIVEWAYS THE SURFACE COURSE MUST MATCH, OR BE MORE DURABLE, THAN THE CONNECTING ROADWAY.
4. COMMERCIAL DRIVEWAYS PROVIDE ACCESS TO AN OFFICE, RETAIL OR INSTITUTIONAL BUILDING OR TO AN APARTMENT BUILDING HAVING MORE THAN FIVE DWELLING UNITS.
5. DRIVEWAYS TO BE STRAIGHT TYPE UNLESS OTHERWISE NOTED ON PLANS.
6. DRIVEWAY RADII OR CHAMFERS MUST REMAIN WITHIN THE PROJECTION OF THE SUBJECT PARCEL'S PROPERTY LINES AND SHALL NOT ENCROACH UPON ANY PART OF ADJACENT PROPERTIES.
7. COMMERCIAL PAVED DRIVEWAYS SHALL HAVE A MINIMUM WIDTH OF 16', 24' MINIMUM FOR 2–WAY DRIVEWAYS, AND A MAXIMUM WIDTH OF 40'. THE MINIMUM RADIUS TO BE USED IS 35' AND MAXIMUM 50'.
8. TYPE "S" DRIVEWAY SHALL BE AS CLOSE TO 90° AS POSSIBLE AND SHALL BE NO LESS THAN 60° WITHOUT APPROVAL BY THE COUNTY ENGINEER OR THEIR DESIGNATED REPRESENTATIVE.
9. DRIVEWAYS FOR HIGH VOLUME TRAFFIC GENERATORS SHALL BE APPROVED INDIVIDUALLY BY THE COUNTY ENGINEER OR THEIR REPRESENTATIVE.
10. DRAINAGE STRUCTURES SHALL BE PROVIDED UNDER DRIVEWAYS, WHERE NECESSARY.
11. CONSTRUCTION OF CURB, GUTTER, SIDEWALK OR PATHWAY MAY BE REQUIRED AS A CONDITION OF PERMIT APPROVAL. RIBBON CURB IS TYPICALLY DESIRED FOR COMMERCIAL DRIVEWAYS TAKING ACCESS FROM MAJOR OR MINOR COLLECTOR ROADWAYS.
12. DESIRABLE SIDESLOPES FOR DRIVEWAYS IS 6:1.

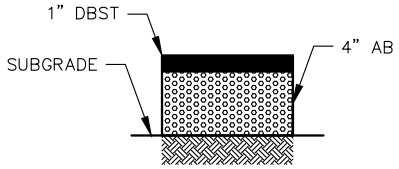


COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	COMMERCIAL PAVED DRIVEWAYS	DRAFT 05–26–2017	DETAIL NO. CC205-2



ASPHALT STRUCTURAL SECTION

TOTAL THICKNESS = 6"

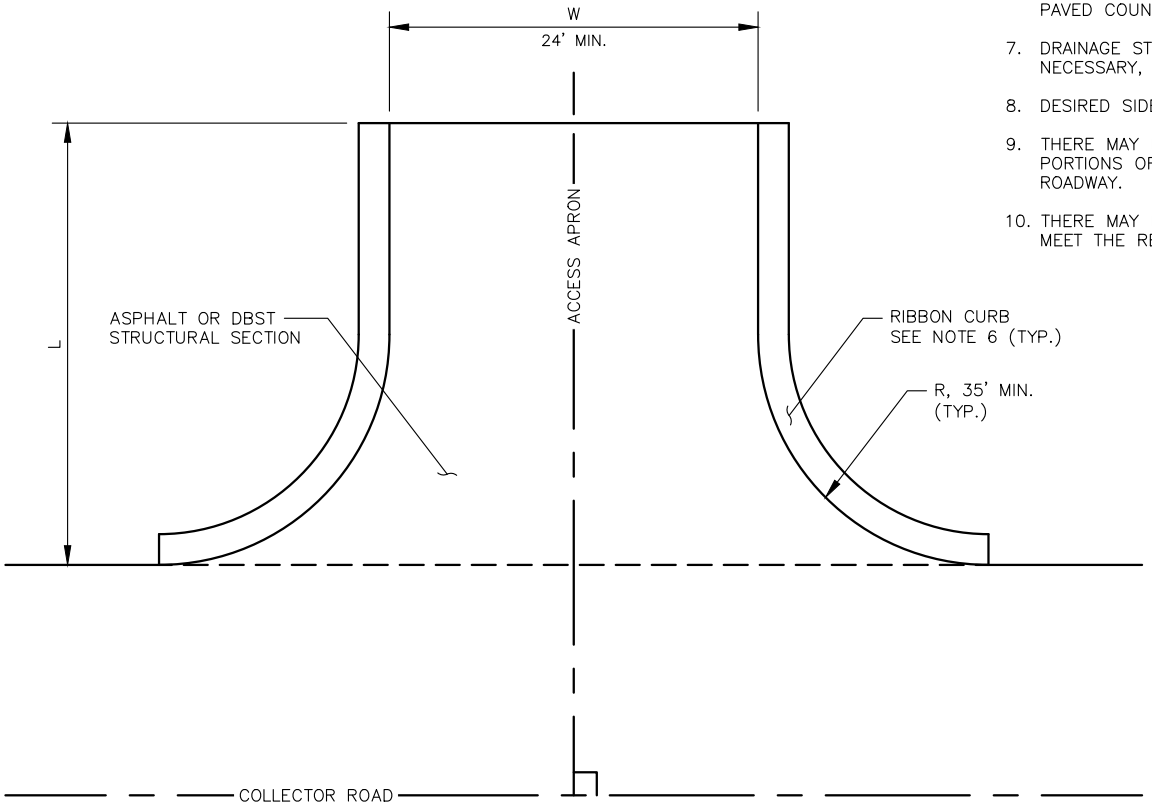


DBST STRUCTURAL SECTION

TOTAL THICKNESS = 5"

NOTES:

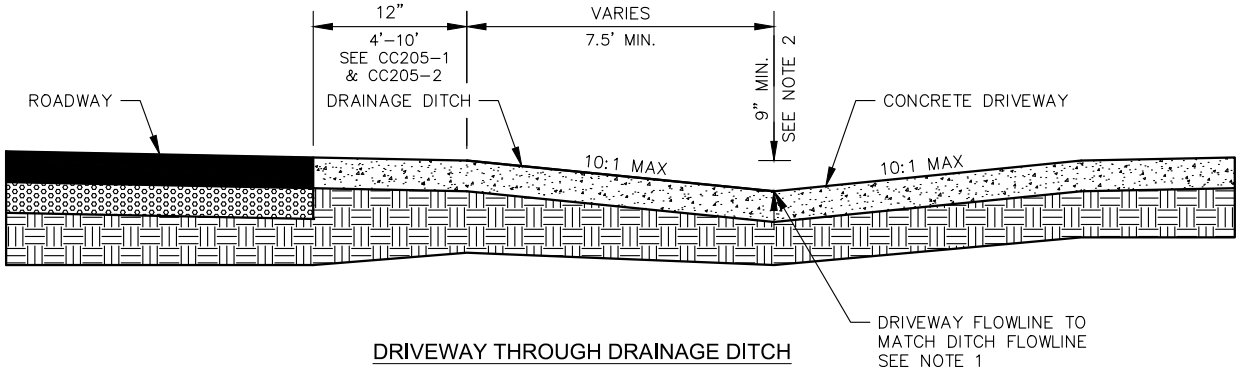
1. SIZE AND TYPE OF ACCESS APRON SHALL BE NOTED ON THE PLANS AS FOLLOWS:
   90° – NO RADIUS: WxL–SURFACE–TYPE; (12' X 30'–A.C.–TYPE "B" DRIVEWAY).
   90° – WITH A RADIUS: WxLxR–SURFACE–TYPE; (12' X 20' x 15'–A.C.–TYPE "C" DRIVEWAY).
   OTHER THAN 90° WITH 2 RADII–TYPE "S": WxLxR1xR2–SURFACE–TYPE;
   (12' X 20' X 15'–A.C.–TYPE "S" DRIVEWAY).
   OR IT MAY BE NOTED ON PLANS IN CONVENTIONAL TERMS
2. PRIVATE, LOCAL ROADWAYS CONNECT TWO OR MORE PARCELS TO THE ROADWAY NETWORK.
3. PRIVATE, LOCAL ROADS SHOULD BE ALIGNED WITH ROADWAYS OR DRIVEWAYS TAKING ACCESS FROM THE OTHER SIDE OF THE CONNECTING ROADWAY, WHEN POSSIBLE.
4. PRIVATE, LOCAL ROADS CONNECTION SHOULD HAVE A STRAIGHT CONNECTION, UNLESS OTHERWISE APPROVED BY THE COUNTY ENGINEER.
5. THE PRIVATE ROADWAY ACCESS APRON MUST MATCH, OR BE MORE DURABLE, THEN THE SURFACE OF THE CONNECTING ROADWAY.
6. RIBBON CURB, PER MAG DETAIL 220–1 TYPE B, SHALL BE PROVIDED FOR CONNECTIONS TO PAVED COUNTY–MAINTAINED ROADWAYS.
7. DRAINAGE STRUCTURES, OR AN AT GRADE WATER CROSSING, SHALL BE PROVIDED, WHERE NECESSARY, AND WHEN REQUIRED BY THE COUNTY ENGINEER.
8. DESIRED SIDESLOPES FOR ROADWAY ACCESS APRON IS 6:1.
9. THERE MAY BE A REQUIREMENT TO DEDICATE PUBLIC EASEMENTS OR RIGHT–OF–WAY FOR THOSE PORTIONS OF THE NEW ROADWAY ACCESS APRON CONNECTING TO A COUNTY–MAINTAINED ROADWAY.
10. THERE MAY BE A REQUIREMENT FOR REGULATORY SIGNS OR STREET NAMES SIGNS: THESE MUST MEET THE REQUIREMENTS OF CC134–1 AND 2.



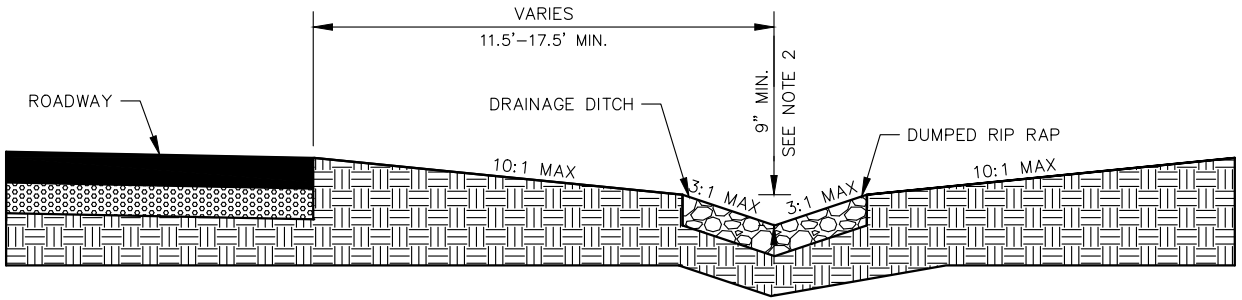
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	ROADWAY ACCESS APRON	DRAFT 05–26–2017	DETAIL NO. CC205-3

NOTES:

1. TOP OF DRIVEWAY PAVED OR CONCRETE SLAB AND ANY LANDSCAPE MATERIAL SHOULD BE AT GRADE WITH THE DRAINAGE DITCH.
2. DEPTH OF ROADSIDE SWALE AND DITCH SHALL BE DETERMINED BY THE DESIGN ENGINEER, WITH MINIMUM ALLOWABLE DEPTH OF 9".
3. TRANSITION 3:1 RIP RAP SLOPE TO 10:1 PLACED A MINIMUM OF 10' ON EACH SIDE OF DRIVEWAY.
4. DEPTH OF DRIVEWAY FLOWLINE IS INTENDED FOR ROADWAY DRAINAGE FOR SHORT DISTANCES. IF OFFSITE FLOWS AND FLOWS FROM PARCELS CONTRIBUTE TO THIS DITCH, THE DESIGN ENGINEER SHALL VERIFY DEPTH NEEDED TO KEEP FLOWS OFF THE ROADWAY.
5. LANDSCAPING (VEGETATION, DECORATIVE ROCK ETC.) MAY NOT INTERFERE WITH OR IMPEDE DRAINAGE FLOW OR DECREASE THE CROSS-SECTIONAL AREA OF THE CHANNEL OR BE PLACED IN SUCH A MANNER AS TO OBSTRUCT VISIBILITY WITHIN THE CLEAR ZONE, AS DEFINED BY THE SIGHT DISTANCE TRIANGLE.

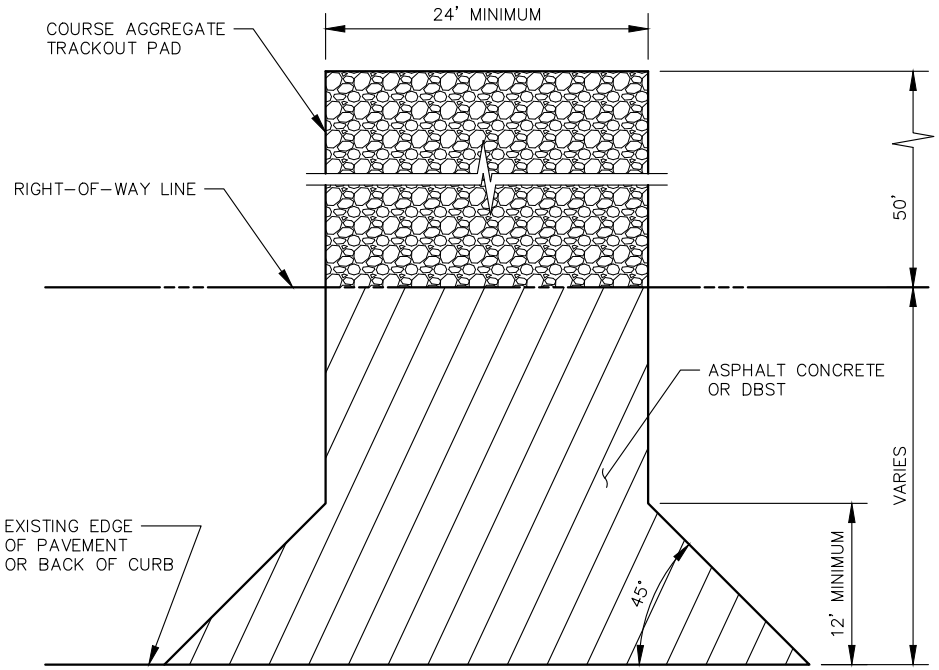


DRIVEWAY THROUGH DRAINAGE DITCH



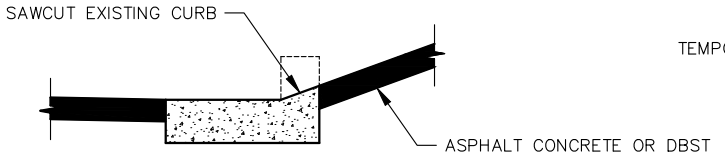
RIP RAP MATERIAL IN DRAINAGE DITCH

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	DRIVEWAY & LANDSCAPING WITHIN DRAINAGE DITCH	DRAFT 06-06-2017	DETAIL NO. CC205-4

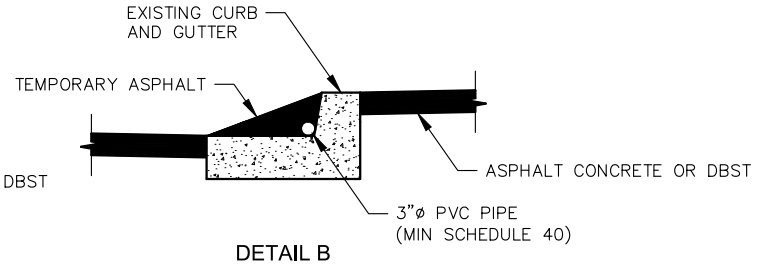


NOTES:

1. TEMPORARY SITE ACCESS WITHIN RIGHT-OF-WAY SHALL BE PAVED, MINIMUM STRUCTURAL SECTION SHALL MATCH OR BE MORE DURABLE THAN THE SURFACE OF THE CONNECTING ROADWAY.
2. SIDEWALKS, PATHWAYS AND TRAILS THAT CROSS THE TEMPORARY ACCESS ALIGNMENT SHALL BE MAINTAINED BY THE CONTRACTOR. RELOCATION OF THE FACILITIES REQUIRES COUNTY APPROVAL.
3. TEMPORARY SITE ACCESS SHALL NOT ALTER OR IMPEDE EXISTING DRAINAGE.
4. THE MINIMUM REQUIRED CLEAR DISTANCE FROM AN INTERSECTION IS 50 FEET.
5. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING TRACKOUT AND DUST CONTROL.
6. CONTRACTOR SHALL SWEEP ROADWAY AS NECESSARY.
7. CONTRACTOR IS RESPONSIBLE FOR RESTORING RIGHT-OF-WAY TO ORIGINAL CONDITION. THIS INCLUDES ROADWAY, SIDEWALK, PATHWAYS, TRAILS, AND LANDSCAPING.
8. CONTRACTOR IS RESPONSIBLE FOR OBTAINING AN APPROVED TRAFFIC CONTROL PLAN.
9. TEMPORARY SITE ACCESS SHALL BE REMOVED WHEN NO LONGER REQUIRED.



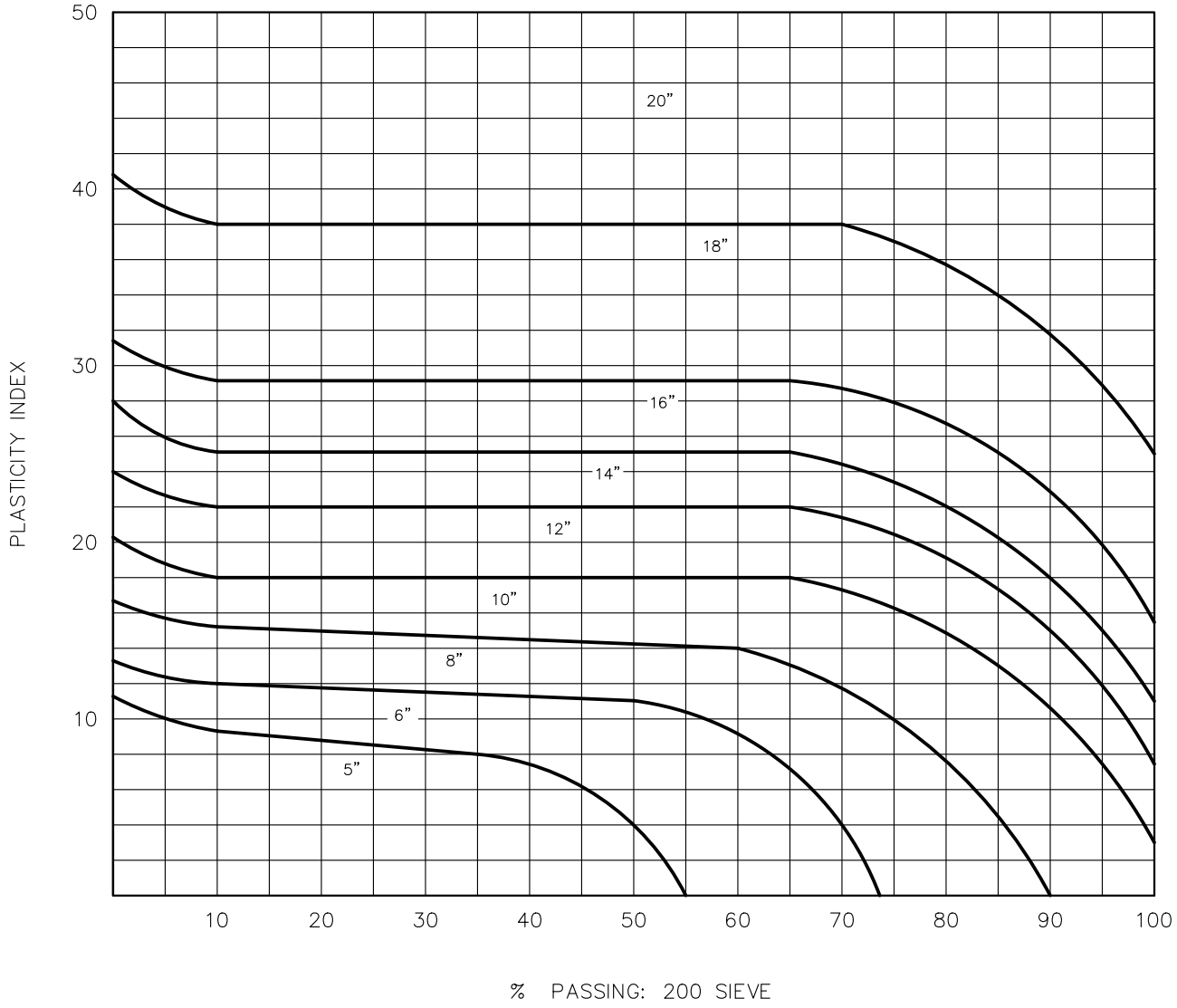
DETAIL A



DETAIL B

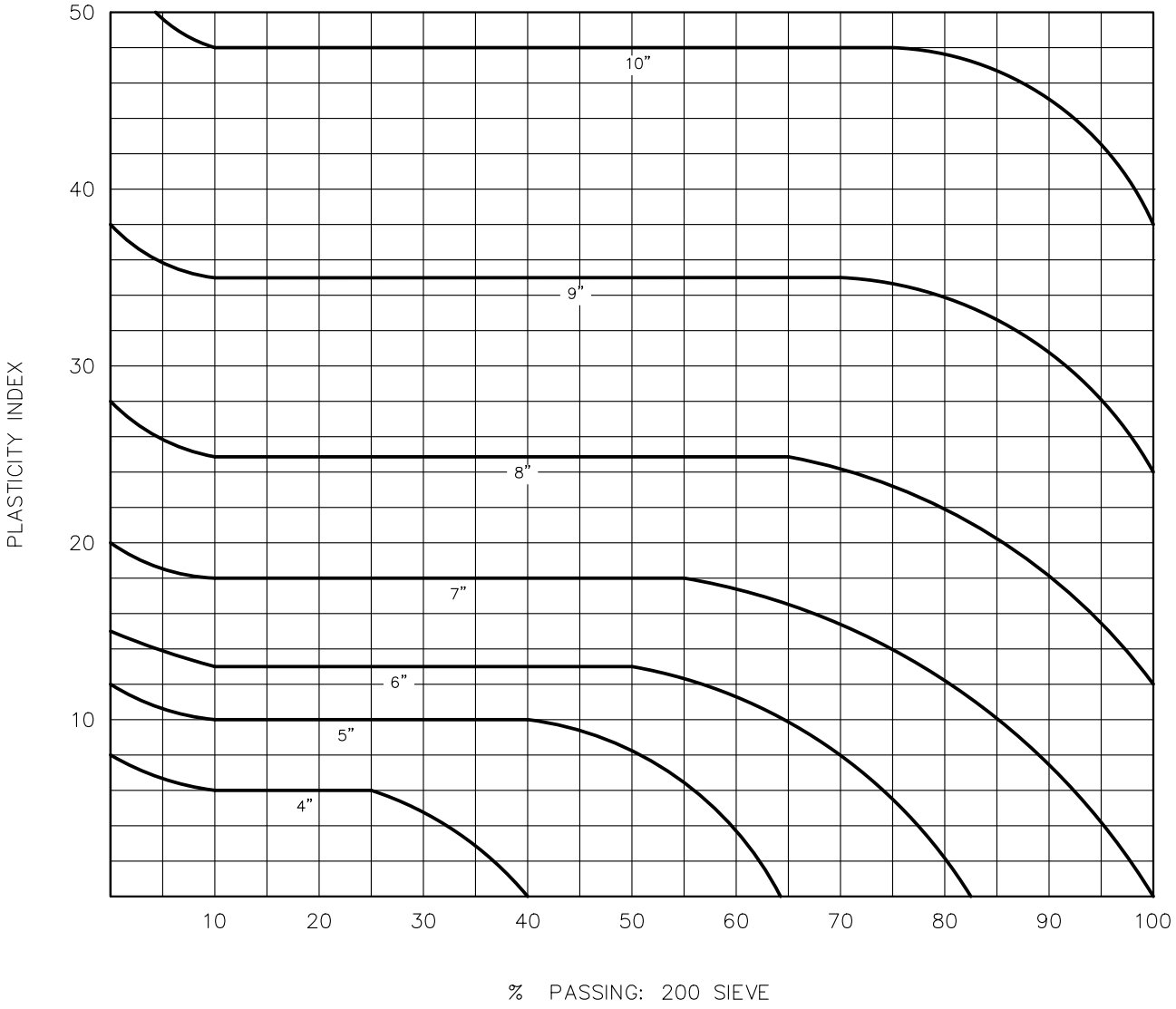
ALTERNATIVE SECTIONS FOR LOCATIONS WITH CURB & GUTTER

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	TEMPORARY SITE ACCESS WITH TRACKOUT PAD	DRAFT 06-06-2017	DETAIL NO. CC207



MINIMUM DEPTH OF FLEXIBLE BASE COURSE UNDER 3" (MIN.) ASPHALTIC CONCRETE PAVEMENT

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	DEPTH OF BASE COURSE ARTERIAL & COLLECTOR ROADS	DRAFT 05-26-2017	DETAIL NO. CC208-1

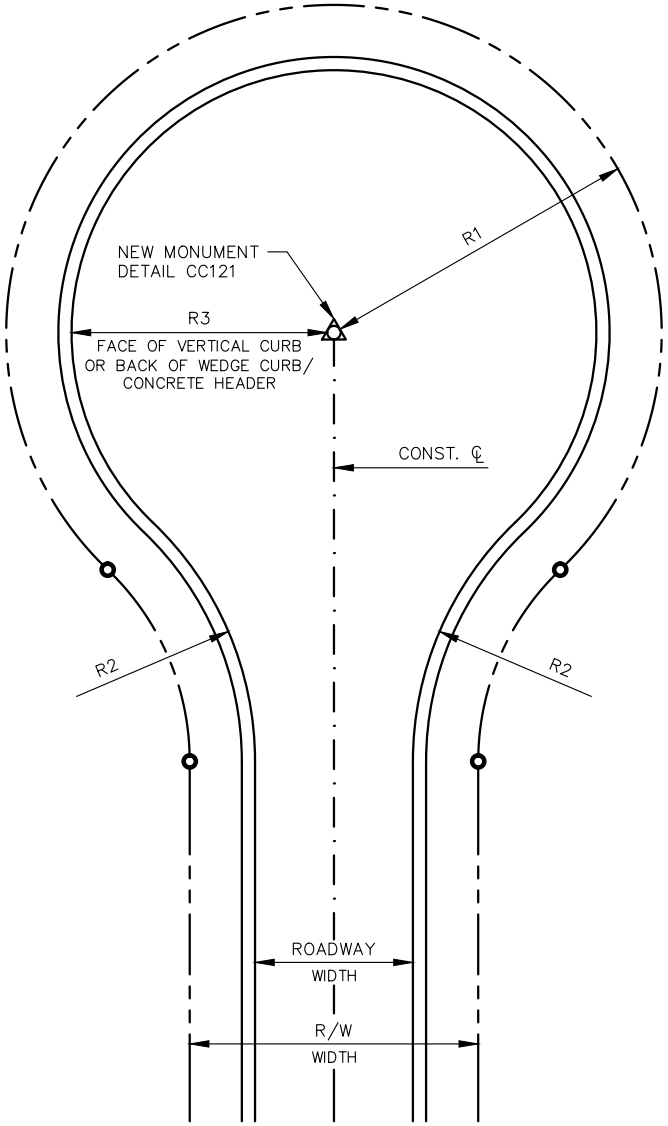


MINIMUM DEPTH OF FLEXIBLE BASE COURSE UNDER 2" (MIN.) ASPHALTIC CONCRETE PAVEMENT OR DOUBLE BITUMINOUS SURFACE TREATMENT

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	DEPTH OF BASE COURSE LOCAL STREETS	DRAFT 05-26-2017	DETAIL NO. CC208-2

NOTES:

1. FOR RURAL STREETS, INSTALL CONCRETE HEADER MAG DETAIL 220–1 ON R2 AND R3.
2. GRADES REQUIRED AT ⊙



MINIMUM RADII IN FEET		
	RESIDENTIAL	INDUSTRIAL/ COMMERCIAL
R1	50'	60'
R2	50'	60'
R3	42'	52'

COCHISE COUNTY

HIGHWAY & FLOODPLAIN
STANDARD DETAIL

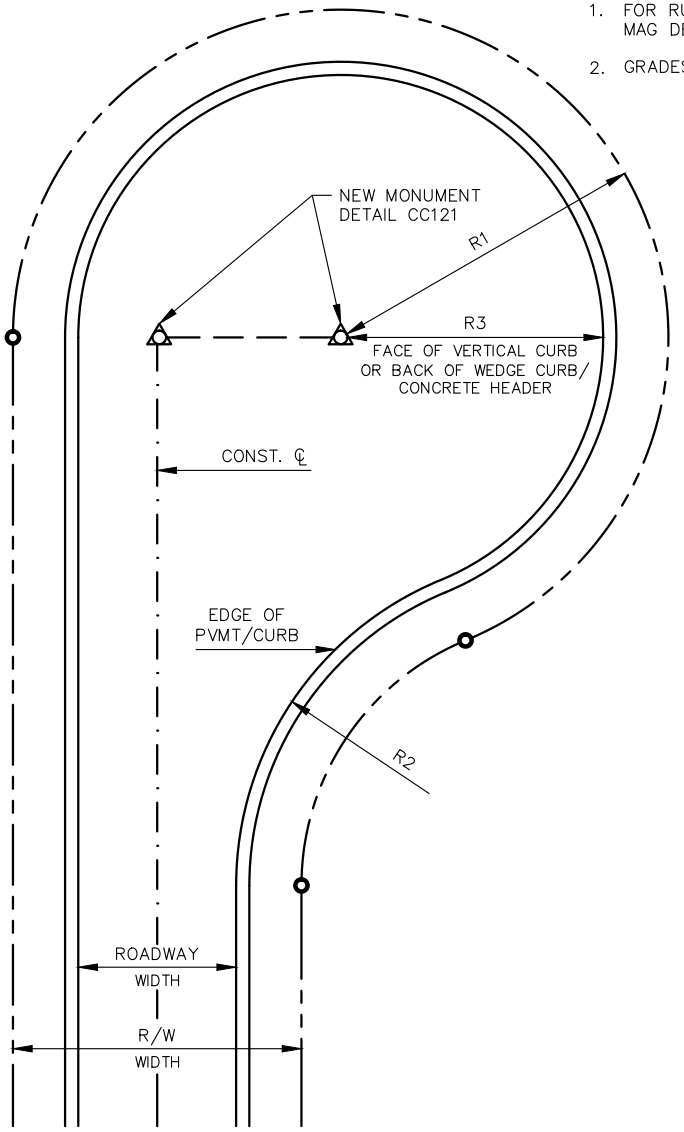
STANDARD CUL-DE-SAC

DRAFT
05–26–2017

DETAIL NO.
CC209-1

NOTES:

1. FOR RURAL STREETS, INSTALL CONCRETE HEADER MAG DETAIL 220–1 ON R2 AND R3.
2. GRADES REQUIRED AT ⊙

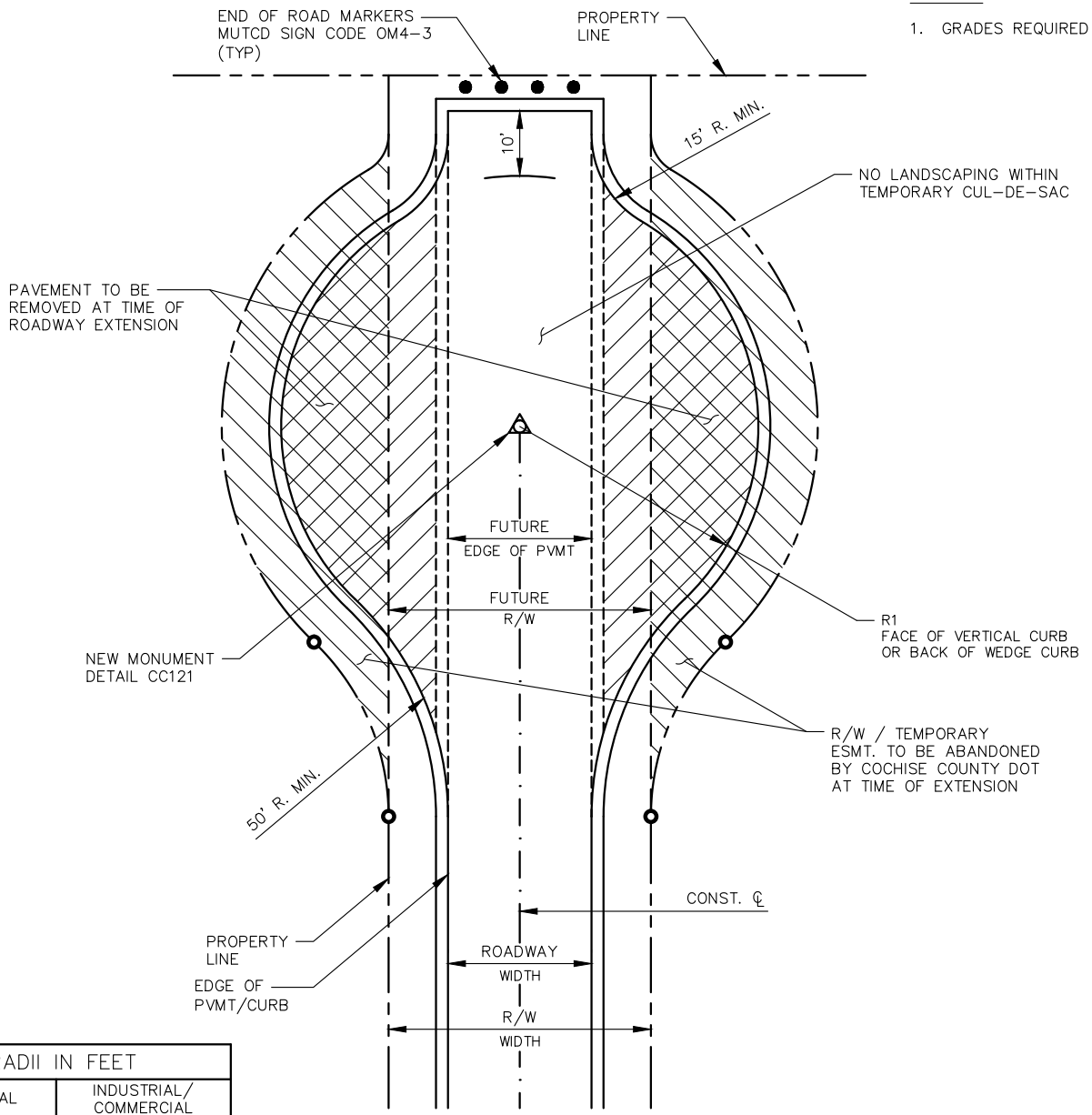


MINIMUM RADII IN FEET		
	RESIDENTIAL	INDUSTRIAL/ COMMERCIAL
R1	50'	60'
R2	50'	60'
R3	42'	52'

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	OFFSET CUL-DE-SAC	DRAFT 05–26–2017	DETAIL NO. CC209-2

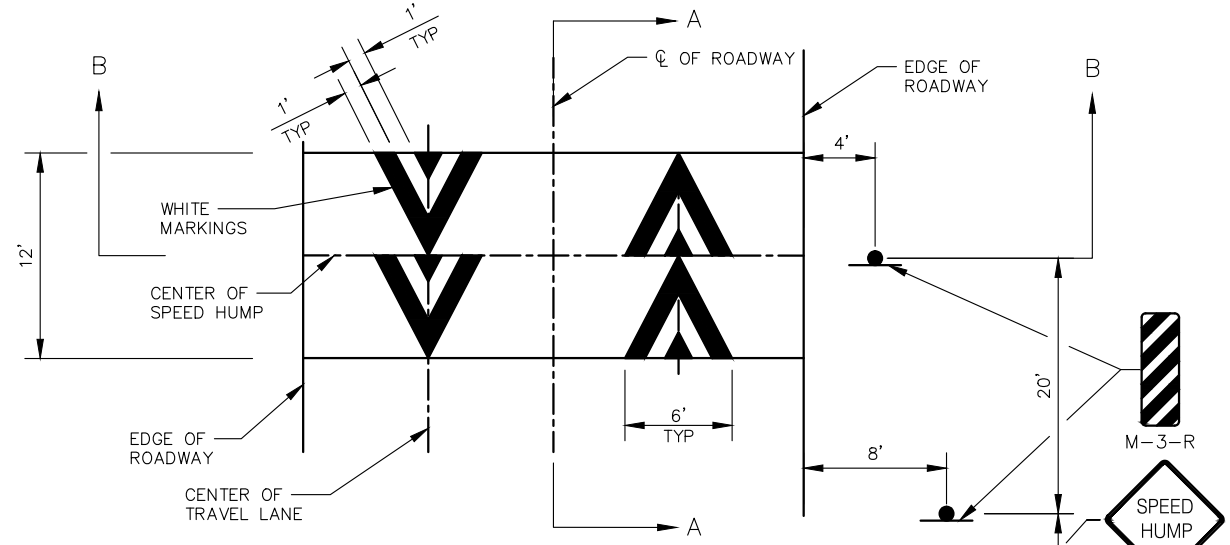
NOTES:

1. GRADES REQUIRED AT ⊙



MINIMUM RADII IN FEET		
	RESIDENTIAL	INDUSTRIAL/ COMMERCIAL
R1	42'	52'

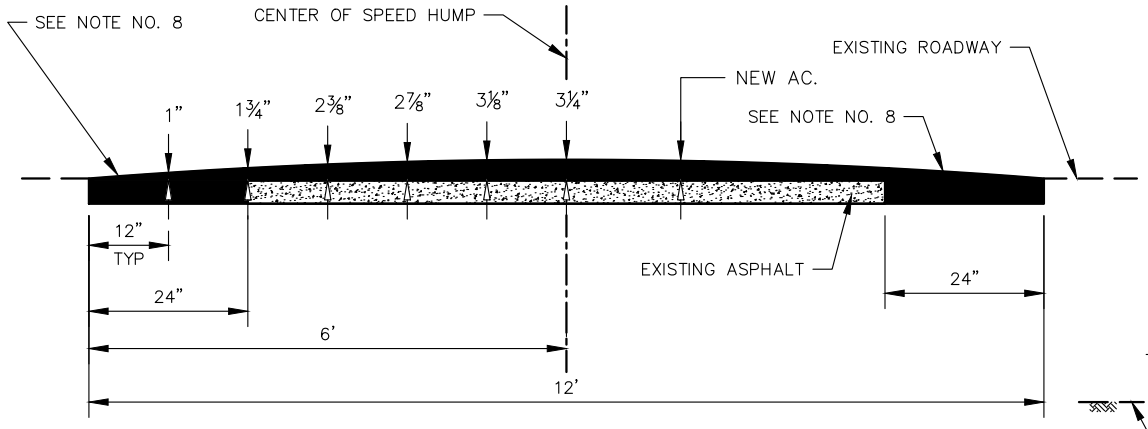
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	TEMPORARY CUL-DE-SAC	DRAFT 05-26-2017	DETAIL NO. CC209-3



PLAN VIEW

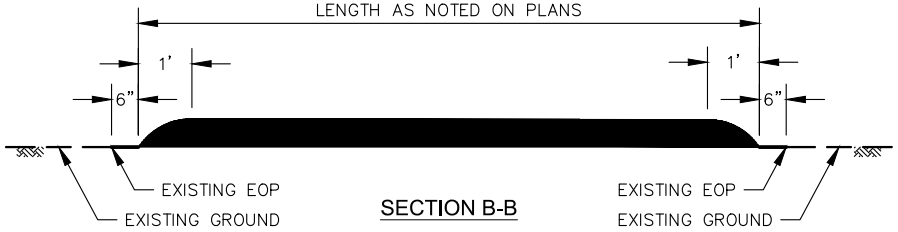
NOT TO SCALE

SIGNING TYPICAL AT EACH APPROACH OR AS DIRECTED



SECTION A-A

NOT TO SCALE



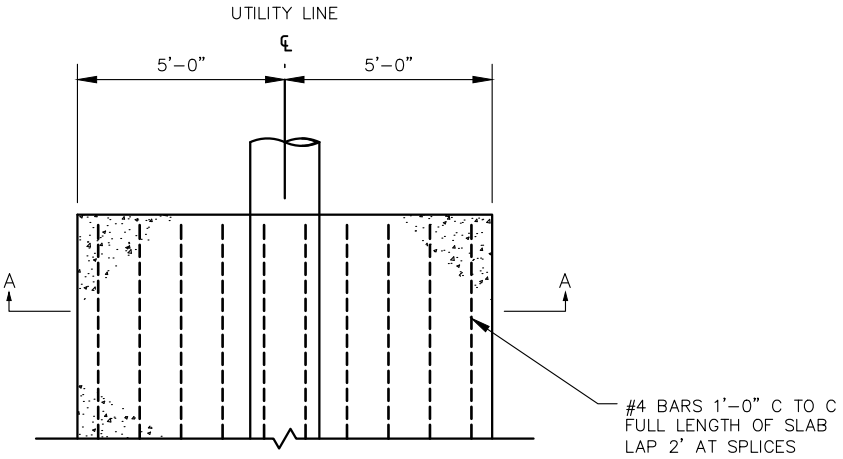
SECTION B-B

NOT TO SCALE

NOTES:

1. SECTION A–A FINISHED SURFACE DIMENSIONS ARE DISTANCES FROM THE SURFACE OF THE EXISTING ROADWAY. THE CONSTRUCTION TOLERANCE FOR THESE CROSS SECTION DIMENSIONS IS ± 0.25 INCHES.
2. SPEED HUMP THAT DO NOT COMPLY WITH CONSTRUCTION TOLERANCES SHALL BE REMOVED AND REPLACED AT CONTRACTOR'S EXPENSE.
3. SPEED HUMP SHALL NOT BE INSTALLED IN A LOCATION SUCH THAT DRAINAGE IS COMPROMISED.
4. SPEED HUMP SHALL NOT BE PLACED OVER MANHOLES, VALVE BOXES, SURVEY MONUMENTS, ETC. OR AT DRIVEWAYS.
5. SPEED HUMP SHALL ONLY BE PLACED AT LOCATIONS APPROVED BY COCHISE COUNTY.
6. SPEED HUMP SHALL BE CONSTRUCTED WITH ASPHALT MIX APPROVED BY THE AGENCY. COMPACTION SHALL BE PER SECTION 321. TACK COAT PER SECTION 713 SHALL BE APPLIED PRIOR TO PAVING.
7. STRIPING WILL BE (2) COATS OF WHITE PAINT WITH GLASS BEADS.
8. TRANSVERSE EDGE JOINTS (ACROSS ROADWAY)
   A. FOR EXISTING ASPHALT PAVEMENTS EQUAL TO OR GREATER THAN 2 INCHES IN THICKNESS: SAWCUT AND REMOVE A 24 INCH WIDTH AT THE MATCHING SPEED HUMP EDGE. REPLACE THE FULL DEPTH OF REMOVED ASPHALT WITH SPEED HUMP ASPHALT AS A SINGLE OPERATION DURING CONSTRUCTION OF THE SPEED HUMP.
   B. FOR EXISTING ASPHALT PAVEMENTS LESS THAN 2 INCHES IN THICKNESS: REMOVE PAVEMENT AND SUBGRADE TO A MINIMUM DEPTH OF 2 INCHES. INSTALL A NEW ASPHALT BASE PAD FOR THE SPEED HUMP.
9. IF A SERIES OF SPEED HUMPS EXIST IN CLOSE PROXIMITY, AN ADVISORY SPEED PLAQUE AND SPEED HUMP SIGN MAY BE ELIMINATED ON ALL BUT THE FIRST SPEED HUMP IN THE SERIES.
10. SPEED LIMIT AT SPEED HUMP(S) WILL BE SIGNED FOR 15 MPH IN SCHOOL ZONES AND 20 MPH ON RESIDENTIAL STREETS.
11. THE STREET IS NOT A TRUCK ROUTE, OR PRILIMINARY/ROUTINE ACCESS FOR EMERGENCY VEHICLES.

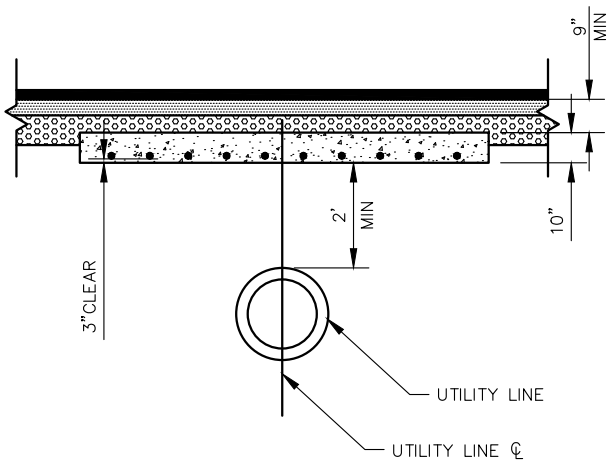
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	RESIDENTIAL SPEED HUMP WITHOUT CURB AND GUTTER	DRAFT 05–26–2017	DETAIL NO. CC210



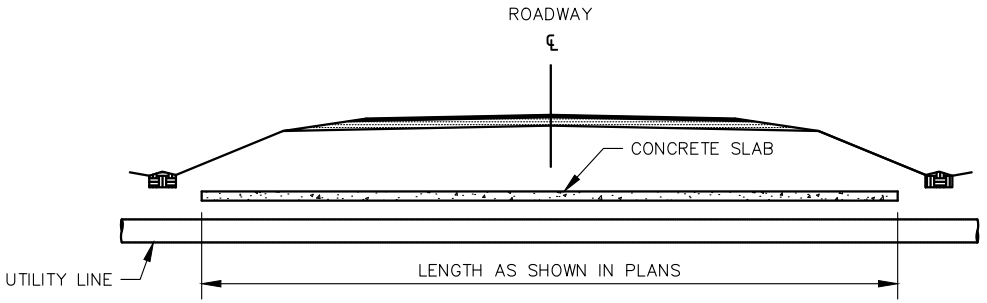
NOTES:

1. ALL CONCRETE SHALL BE CLASS 'B' AS PER MAG SECT. 505 AND 725.

FOR SINGLE INSTALLATION	
QUANTITIES PER FT OF SLAB LENGTH	
CONCRETE	REINFORCING STEEL
0.31 CY	6.68 LBS

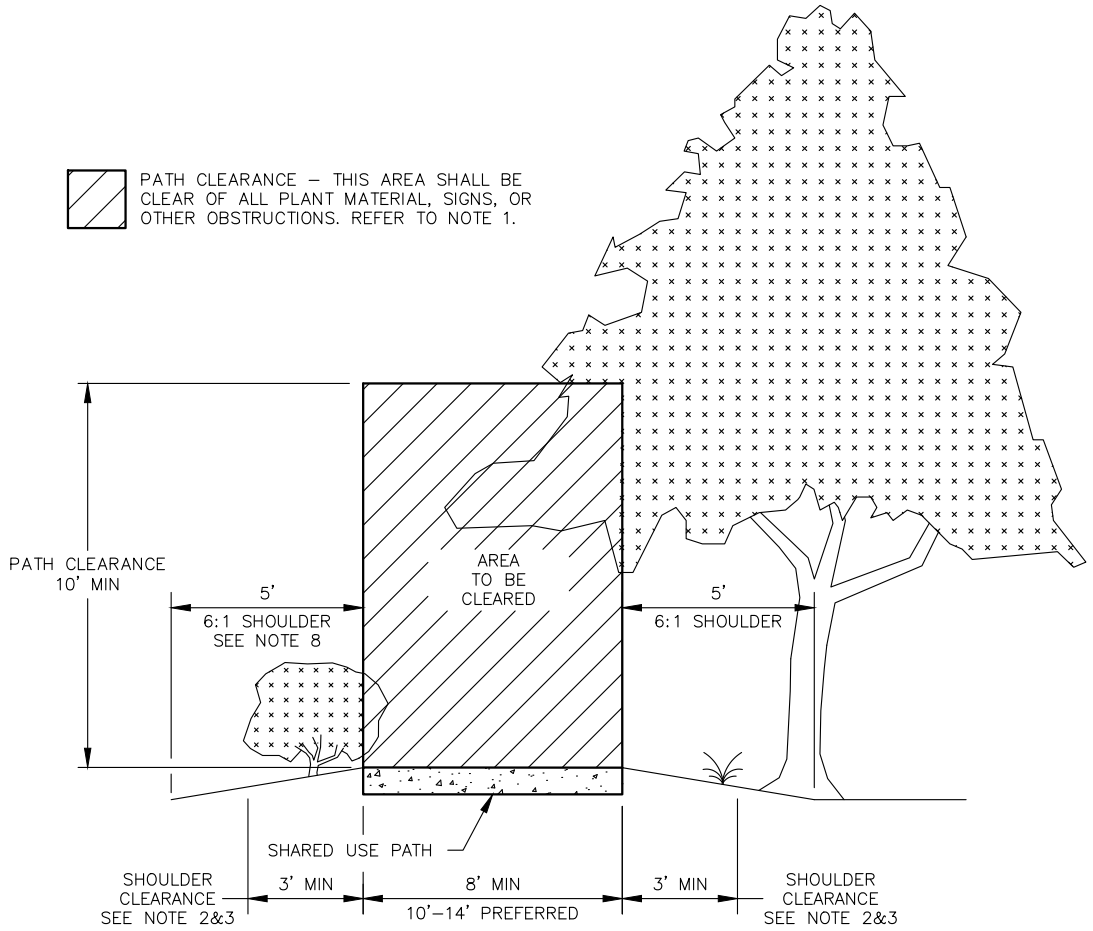


SECTION A-A



CROSS SECTION

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	UTILITY LINE PROTECTIVE CONCRETE SLAB	DRAFT 05–26–2017	DETAIL NO. CC213

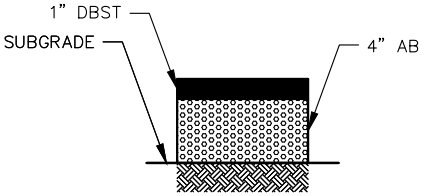


NOTES:

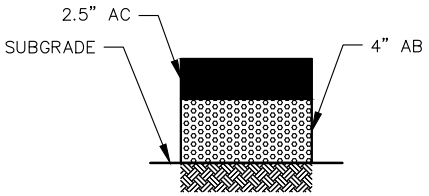
1. TREE/SHRUBS/PLANTS SHALL BE TRIMMED TO NEAREST INTERSECTING BRANCH.
2. NO TREES OR SHRUBS WITH A TRUNK DIAMETER 4 INCHES OR GREATER SHALL REMAIN WITHIN THE 3 FOOT MINIMUM SHOULDER CLEARANCE AREA.
3. ALL ORGANIC MATERIAL SHALL BE REMOVED WITHIN THE SHOULDER CLEARING LIMITS FOR NECESSARY GRADING TO A DEPTH OF SIX INCHES AND HAULED FROM THE SITE PRIOR TO GRADING.
4. COMPACTION OF ALL AREAS SHALL BE TO THE PERCENT SHOWN ON THE PLANS OF THE MAXIMUM DENSITY AS DETERMINED B A.S.T.M. D698. NATIVE SUBGRADE IS TO BE SCARIFIED TO A DEPTH OF SIX INCHES, BROUGHT TO THE PROPER MOISTURE CONTENT AND COMPACTED TO THE REQUIRED 95% DENSITY. THE SOURCE OF FILL MATERIAL SHALL BE APPROVED BY THE COUNTY ENGINEER PRIOR TO COMMENCEMENT OF WORK.
5. AGGREGATE BASE COURSE SHALL CONFORM TO MAG 310, AS AMENDED BY COCHISE COUNTY:
   310.1 DESCRIPTION:
   AGGREGATE BASE SHALL CONFORM TO MAG UNIFORM SPECIFICATION SECTION 702 WITH THE EXCEPTION THAT THE GRADATION OF SIEVE SIZE NO. 200 SHALL BE FROM 5% TO 15% WITH A PLASTICITY INDEX FROM 3% TO 6%.
6. DOUBLE CHIP SEAL SHALL CONFORM TO MAG SECTION 330, AS AMENDED BY COCHISE COUNTY:
   330.2.1 ASPHALT:
   THE TYPE OF BITUMINOUS MATERIAL SHALL BE CRS–2, CRS–2P, OR PASS. APPLICATION SHALL BE AT THE RATE OF 0.40 TO 0.45 GALLONS PER SQUARE YARD UNLESS OTHERWISE SPECIFIED BY THE COUNTY ENGINEER.

   330.2.2 AGGREGATE
   THE STONE CHIPS SHALL FULLY COMPLY WITH SECTION 716 EXCEPT PRE–COATING IS NOT REQUIRED. THE FIRST LAYER OF CHIPS SHALL COMPLY WITH TABLE 716–2 AND THE SECOND LAYER OF CHIPS SHALL COMPLY WITH TABLE 716–1. THE CHIPS SHALL BE CLEAN. APPLICATION SHALL BE AT THE RATE OF APPROXIMATELY 20 POUNDS PER SQUARE YARD FOR FIRST LAYER AND 26 POUNDS PER SQUARE YARD FOR THE SECOND LAYER.

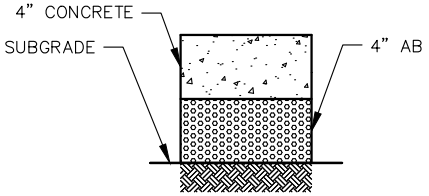
   IF MOIST CHIPS ARE USED, THE TOTAL MOISTURE CONTENT SHALL NOT EXCEED 1.5%.
7. FOR PATHWAY SIGNAGE REFER TO THE CURRENT VERSION OF THE MANUAL FOR UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART 9: TRAFFIC CONTROL FOR BICYCLE FACILITIES.
8. THE MINIMUM RECOMMENDED DISTANCE BETWEEN A PATH AND THE ROADWAY FACE OF CURB OR EDGE OF TRAVELED WAY (WHERE THERE IS NO CURB) IS 5 FEET (1.5 M). WHERE A SHOULDER IS PRESENT, THE SEPARATION DISTANCE BEGINS AT THE OUTSIDE EDGE OF THE SHOULDER.
9. PATHWAY DESIGN SHALL COMPLY WITH ADA ACCESSIBILITY REQUIREMENTS OF A MAXIMUM 2% CROSS–SLOPE AND CURB RAMPS PER ADA ACCESSIBILITY GUIDELINES. REFER TO CURRENT ADA STANDARDS AT WWW.ADA.GOV AND WWW.ACCESS–BOARD.GOV.



PATH STRUCTURAL SECTION #1
TOTAL THICKNESS = 5"

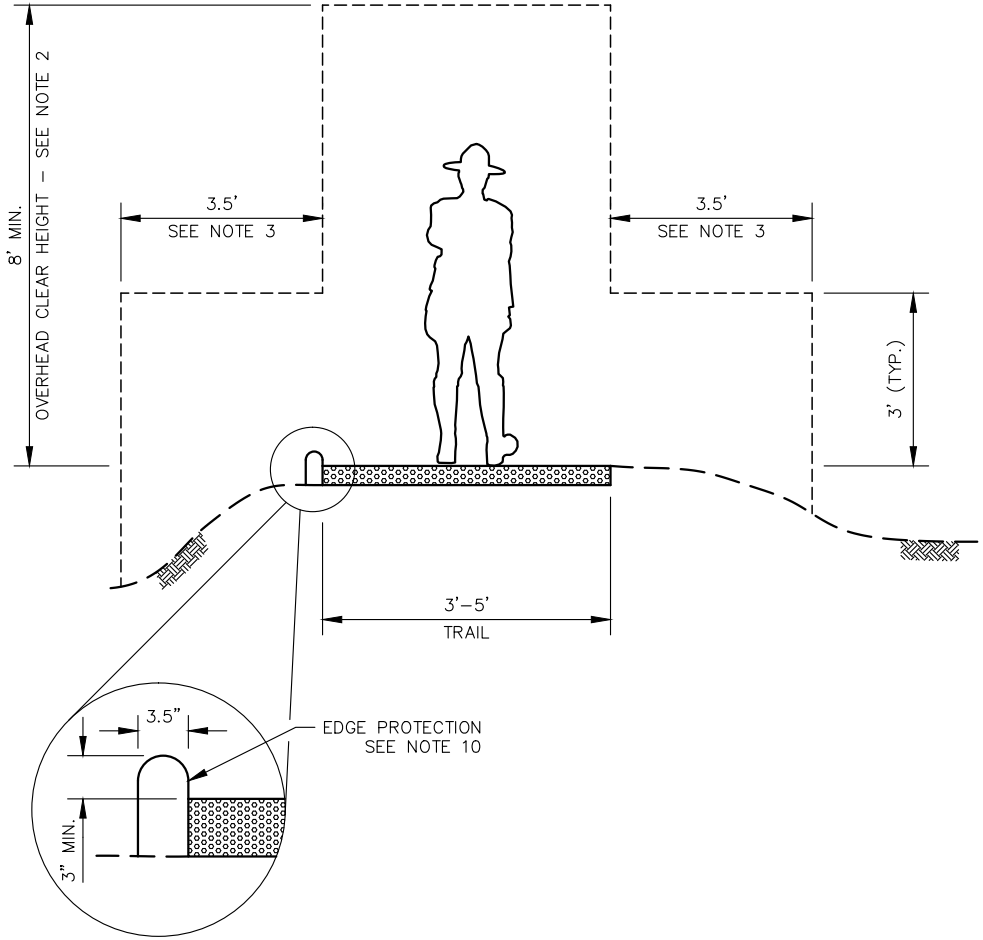


PATH STRUCTURAL SECTION #2
TOTAL THICKNESS = 6.5"



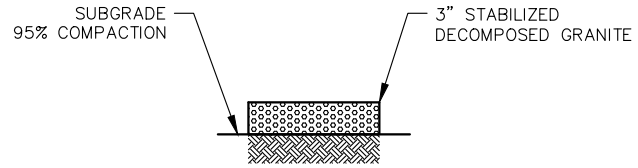
PATH STRUCTURAL SECTION #3
TOTAL THICKNESS = 8"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	TYPICAL SHARED USE PATH	DRAFT 06–06–2017	DETAIL NO. CC232



NOTES:

1. PATHWAY WIDTH IS 3' MINIMUM, 5' PREFERRED, AND 8' MAXIMUM.
2. AN OVERHEAD CLEAR HEIGHT SHOULD BE PROVIDED OF A MINIMUM OF 8 FEET, 10 FEET PREFERRED. FOR RECREATIONAL TRAILS WITH EQUESTRIAN ACTIVITY OVERHEAD CLEAR HEIGHT SHOULD BE INCREASED TO 10 FEET MINIMUM, 12 FEET PREFERRED.
3. NO VEGETATION OR OBSTACLES WITHIN A 3' HIGH BY 3.5' WIDE SPACE EACH SIDE. THREE–FOOT MINIMUM TO SIGNS, BENCHES OR ANY OTHER VERTICAL ELEMENT.
4. MINIMUM 10–FOOT CLEARANCE BETWEEN TRAIL EDGE AND NEWLY PLANTED THORNY PLANTS. ALIGN TRAIL TO AVOID EXISTING THORNY PLANTS WHEREVER POSSIBLE TO MINIMIZE THEIR REMOVAL.
5. CARE SHOULD BE GIVEN DURING TRAIL CONSTRUCTION TO PRESERVE EXISTING VEGETATION IN PLACE.
6. PASSING SPACES OF AN ADDITIONAL 5' WIDE BY 5' LONG IN NATURAL OPENINGS IN THE LANDSCAPE SHOULD BE PROVIDED AT A MINIMUM EVERY 1,000 FEET, AS ALLOWED BY TERRAIN.
7. STRIVE TO MAINTAIN 6' BETWEEN TRAIL EDGE AND TREE TRUNK. CUT TREES AND SHRUBS BACK TO THE TRUNK. TO CREATE MORE VISUAL INTEREST, AVOID CUTTING ALL VEGETATION BACK THE SAME OFFSET DISTANCE ALONG THE CORRIDOR.
8. RECREATIONAL TRAILS DESIGNED PRIMARILY FOR PEDESTRIAN ACTIVITY SHOULD MEET THE SLOPE AND SLIP RESISTANT CRITERIA OF THE ACCESSIBILITY GUIDELINES FOR OUTDOOR DEVELOPED AREAS (U.S. ACCESS BOARD).
9. FOR RECREATIONAL TRAIL SIGNAGE REFER TO THE CURRENT VERSION OF THE MANUAL FOR UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND FHWA RECREATION TRAIL MANUAL, CHAPTER 15.
10. EDGE PROTECTION SHALL BE INSTALLED AT LOCATIONS WITH DROP OFFS OR HAZARDOUS SITUATIONS, MINIMUM 3" HIGH. IF BICYCLISTS WILL BE USERS OF THE TRAIL, THE EDGE PROTECTION SHALL BE A MINIMUM OF 42" HIGH. ROCKS, SHRUBS AND/OR MAN MADE BARRIERS CAN BE USED AS EDGE PROTECTION.



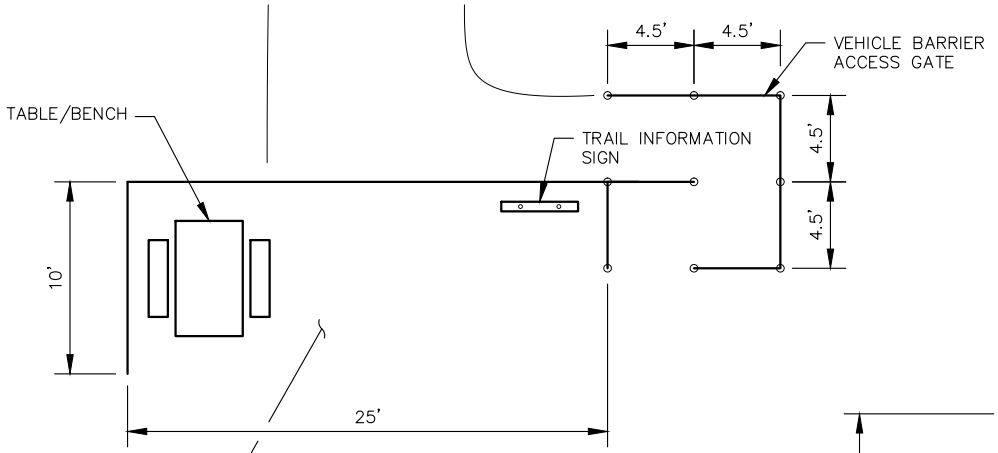
TRAIL STRUCTURAL SECTION

TOTAL THICKNESS = 3"

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	TYPICAL RECREATIONAL TRAIL	DRAFT 06–06–2017	DETAIL NO. CC233-1

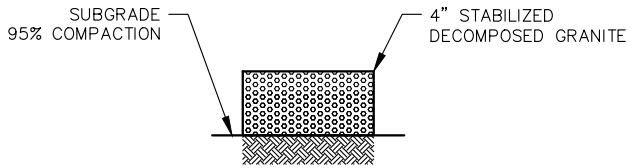
NOTE:

1. RIBBON CURB IS REQUIRED IF CONNECTION ROADWAY IS ASPHALT OR DBST.



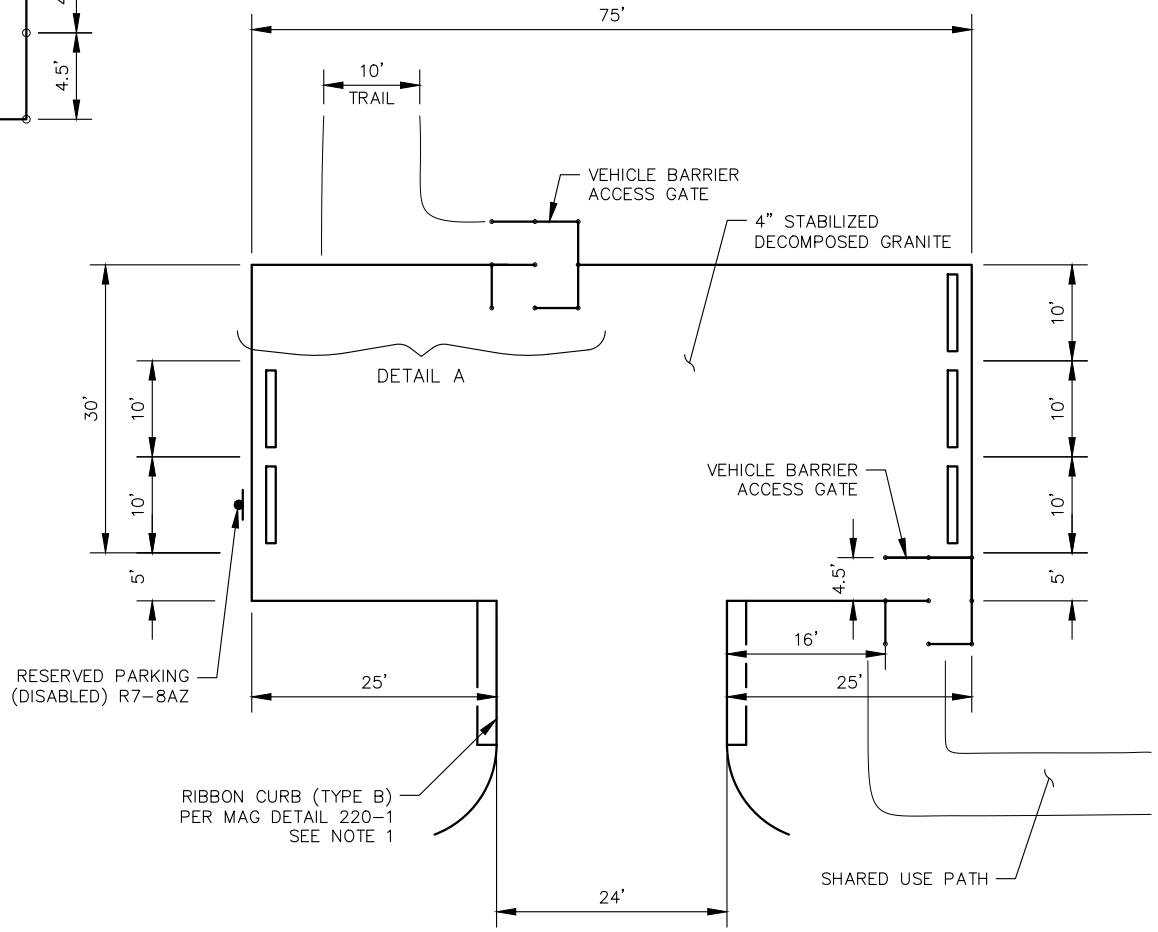
DETAIL A

TRAILHEAD



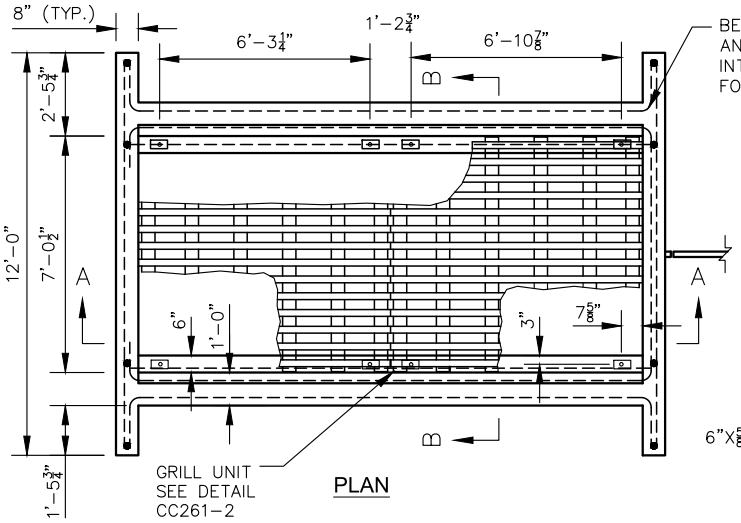
PARKING LOT STRUCTURAL SECTION

TOTAL THICKNESS = 4"

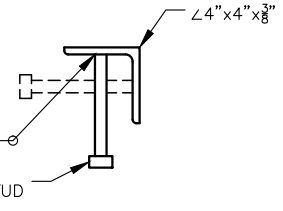


TRAILHEAD AND TRAIL PARKING AREA

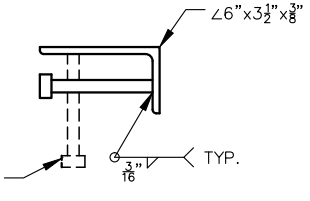
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	RECREATIONAL TRAILHEAD AND TRAIL PARKING AREA	DRAFT 05-26-2017	DETAIL NO. CC233-2



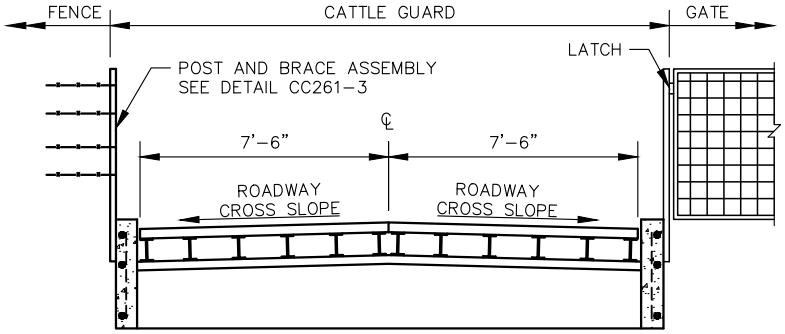
PLAN



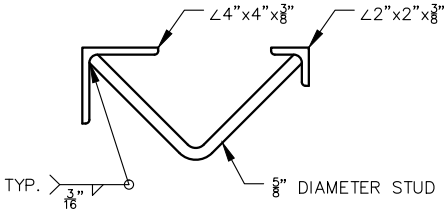
ANGLE ASSEMBLY DETAIL 1



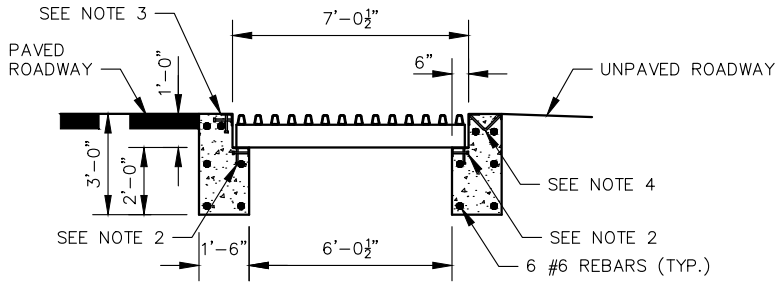
ANGLE ASSEMBLY DETAIL 2



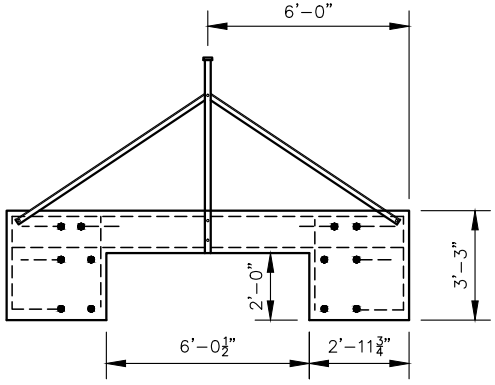
SECTION A-A



ANGLE ASSEMBLY DETAIL 3



SECTION B-B



END VIEW

NOTES:

1. CATTLE GUARD SHALL INCLUDE TWO (2) CLAMPS PER DETAIL CC261-4 AT EACH GAP BETWEEN TWO (2) GRILL UNITS, ONE AT EACH END. CLAMPS SHALL BE ADJUSTED TO PROVIDE A 1/4-INCH, PLUS OR MINUS 1/16-INCH GAP BETWEEN ADJACENT GRILL UNITS.
2. GRILL UNITS SHALL BE SET ON AN ANGLE IRON ASSEMBLY CONSISTING OF ONE PIECE OF 6"X3½"X⅜" ANGLE IRON AND STUDS WITH A HEAD. THE STUDS SHALL BE PLACED ON 1'-0" ALTERNATE CENTERS. SEE ANGLE ASSEMBLY DETAIL 2.
3. CATTLE GUARD SHALL BE SLOPED TO CONFORM TO THE ROADWAY GRADE AND CROSS-SECTION, EXCEPT THAT WHERE AN ODD NUMBER OF GRILL UNITS IS SPECIFIED IN A CROWNED ROADWAY, THE CENTER GRILL UNIT SHALL HAVE A LEVEL CROSS SLOPE.
4. WHERE THE ADJACENT ROADWAY IS PAVED, AN ANGLE IRON ASSEMBLY SHALL CONSIST OF ONE PIECE OF 4"X4"X⅜" ANGLE IRON AND STUDS WITH A HEAD. THE STUDS SHALL BE PLACED ON 1'-0" ALTERNATE CENTERS. SEE ANGLE ASSEMBLY DETAIL 1.
5. WHERE THE ADJACENT ROADWAY IS UNPAVED, AN ANGLE IRON ASSEMBLY SHALL CONSIST OF ONE 4"X4"X⅜" ANGLE IRON, ONE 2"X2"X⅜" ANGLE IRON, AND CONNECTED WITH STUDS. THE ASSEMBLY SHALL BE CROWNED AT THE CENTERLINE AND CONSTRUCTED WITH A BEVEL CUT AND WELDED. THE STUDS SHALL BE BENT 90° AND PLACED ON 1'-0" CENTERS. SEE ANGLE ASSEMBLY DETAIL 3.
6. EACH ANGLE IRON AND ANGLE IRON ASSEMBLY SHALL BE FABRICATED TO FORM A SINGLE PIECE FOR THE FULL LENGTH OF THE CATTLE GUARD.
7. QUANTITIES SHOWN FOR CONCRETE AND REBAR ARE APPROXIMATIONS FOR INFORMATIONAL PURPOSES ONLY.
8. WHEN A GATE IS TO BE INSTALLED, IT SHALL BE CALLED OUT ON THE PLANS.
9. ALL REBAR SHALL HAVE A MINIMUM COVER OF 3", OR AS SHOWN ON THE PLANS.
10. CATTLE GUARD BEAMS SHALL BE HS-20 LOADING UNLESS OTHERWISE SHOWN ON THE PLANS.

UNIT TABLE

ROADWAY WIDTH (FT)	GRILL UNITS REQUIRED	CONCRETE (CU YD)	REBAR (LBS)
12	2	5.8	175
16	3	8.0	240
20	4	10.3	310
28	5	12.5	375
34	6	14.7	445
36	6	14.7	445
38	7	16.9	510
40	7	16.9	510

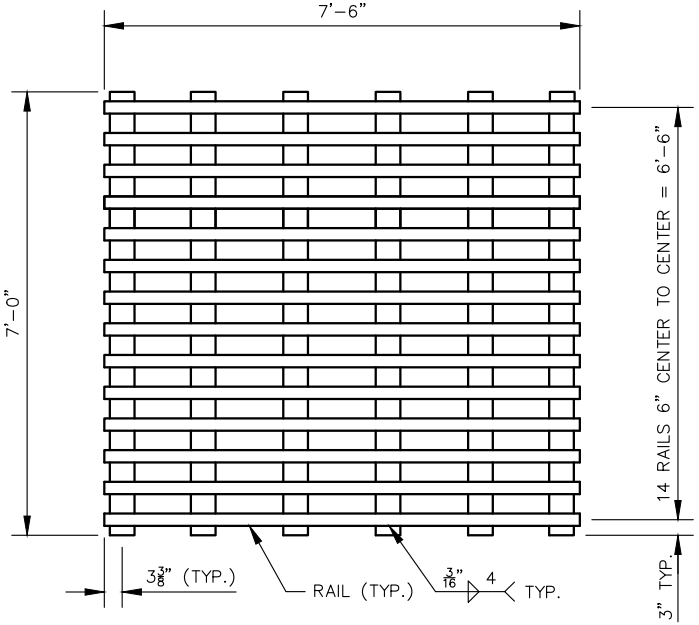
COCHISE COUNTY

HIGHWAY & FLOODPLAIN STANDARD DETAIL

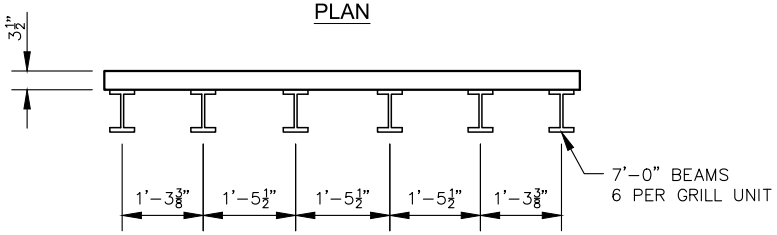
ROADWAY CATTLE GUARD

DRAFT 05-26-2017

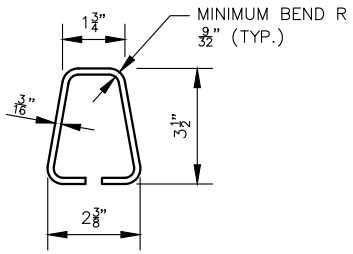
DETAIL NO. CC261-1



PLAN

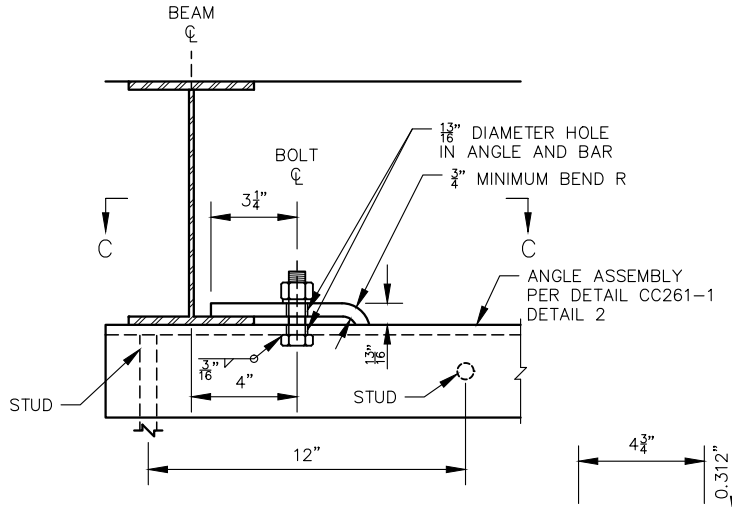


ELEVATION

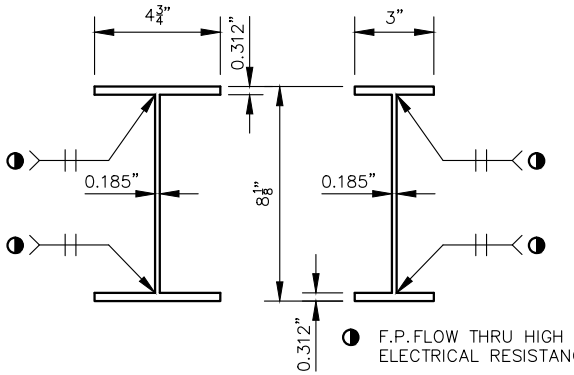


RAIL GRILL UNIT

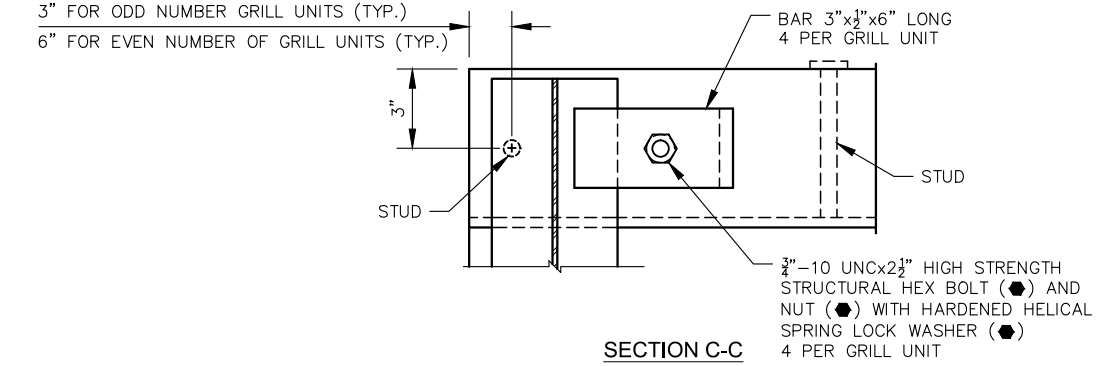
⬣ – INDICATES AASHTO, AGC & ARTBA TASK FORCE 13 DESIGNATION



GRILL CLAMP



BEAMS



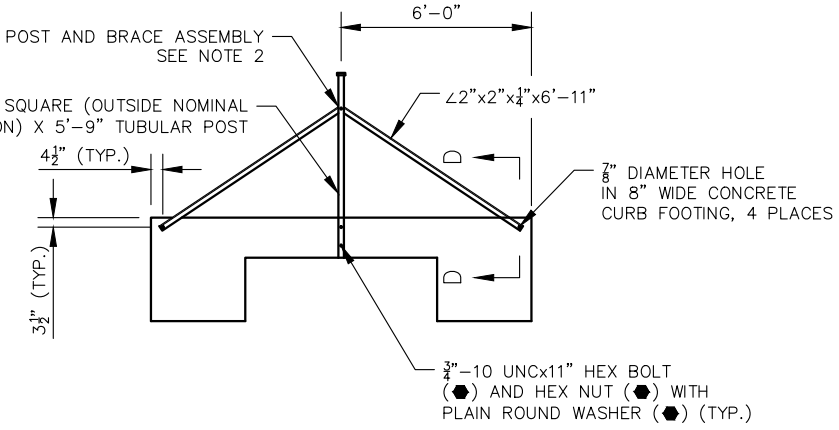
SECTION C-C

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	ROADWAY CATTLE GUARD	DRAFT 05-26-2017	DETAIL NO. CC261-2

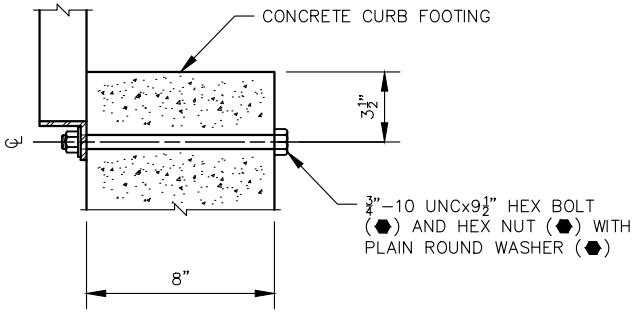
NOTES:

1. MATERIAL FOR SHOULDER TRANSITION SHALL BE PLACED TO THE FINISHED ROADWAY ELEVATION FOR THE ENTIRE LENGTH OF THE TRANSITION. WHEN THE ROADWAY IS PAVED, AGGREGATE SUBBASE OR AB SHALL BE USED. WHEN THE ROADWAY IS UNPAVED, A MATERIAL EQUIVALENT TO THE EXISTING ROADWAY SHALL BE USED.
2. ON STEEPER GRADES, THE POST SHALL BE INSTALLED PLUMB TO ALIGN WITH ADJACENT FENCING. THE BRACE ASSEMBLY MAY BE MODIFIED AS NECESSARY TO SUPPORT THE POST.

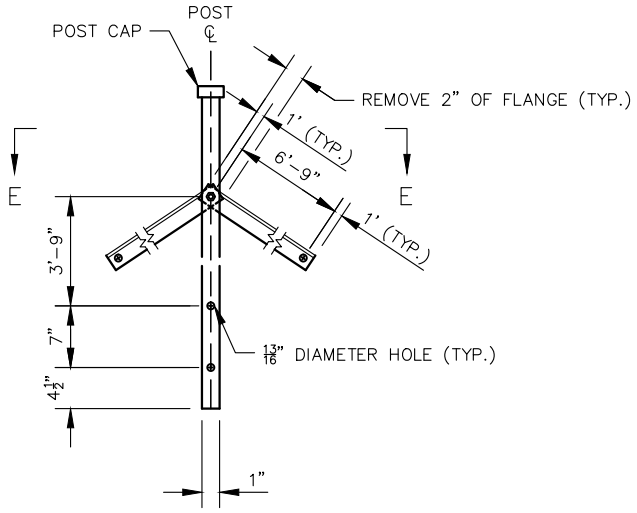
⬣ – INDICATES AASHTO, AGC & ARTBA TASK FORCE 13 DESIGNATION



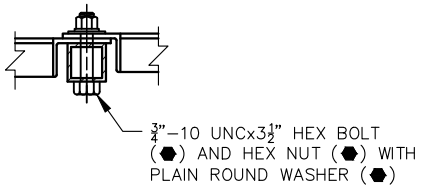
END VIEW



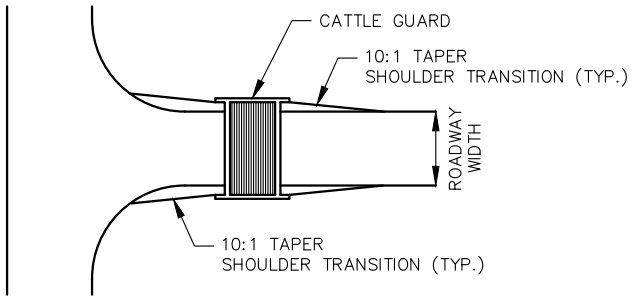
SECTION D-D



POST AND BRACE ASSEMBLY



SECTION E-E

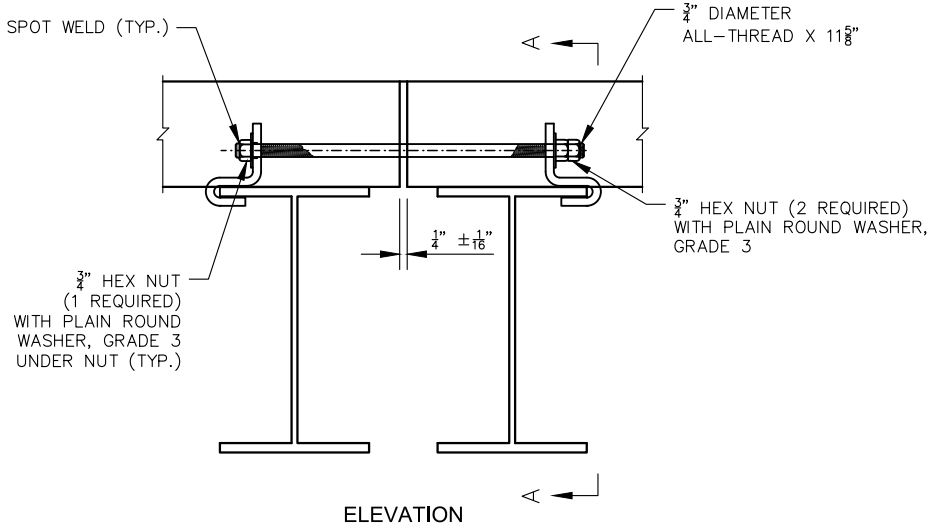


SHOULDER TRANSITION AT CATTLE GUARDS

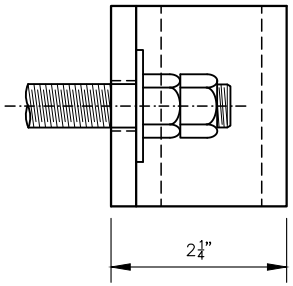
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	ROADWAY CATTLE GUARD	DRAFT 05–26–2017	DETAIL NO. CC261-3

NOTE:

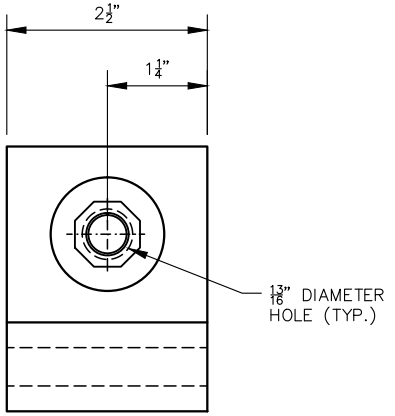
1. APPLY A HEAVY DUTY, HIGH-STRENGTH ANAEROBIC THREAD-LOCKING COMPOUND TO THE THREADS BEFORE INSTALLING THE DOUBLE NUTS.



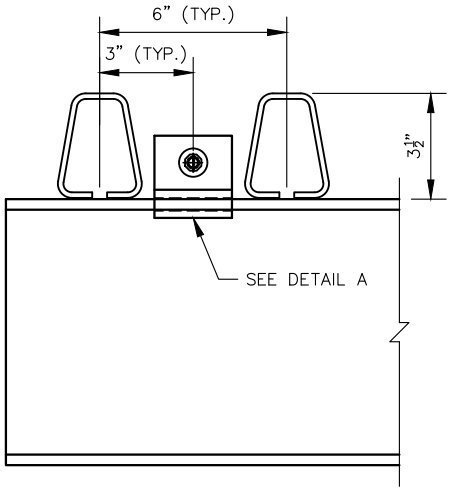
ELEVATION



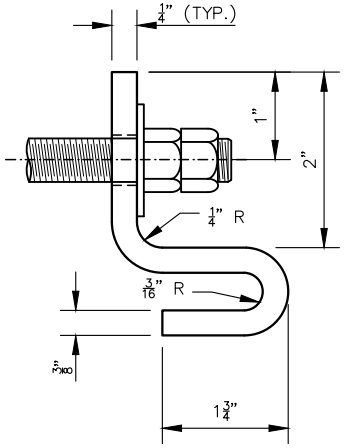
PLAN



DETAIL A



SECTION A-A

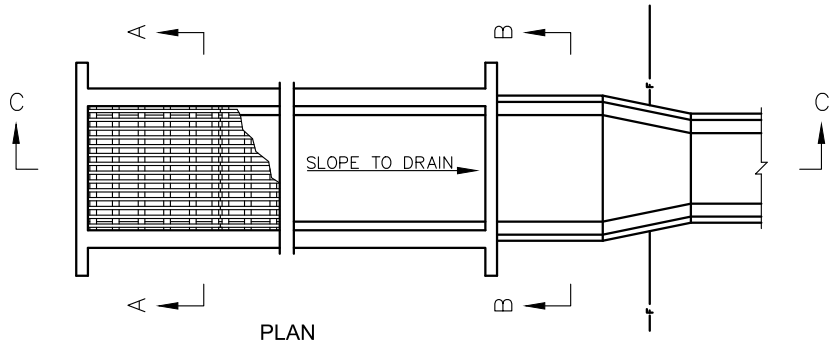


ELEVATION

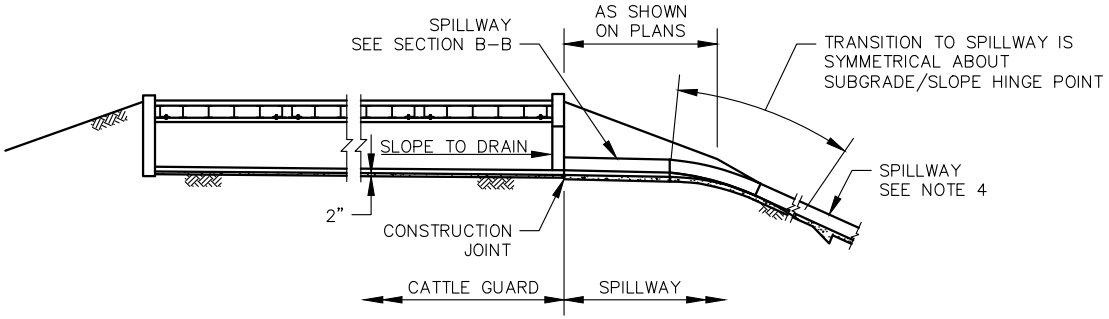
COCHISE COUNTY / HIGHWAY & FLOODPLAIN STANDARD DETAIL	ROADWAY CATTLE GUARD	DRAFT 05-26-2017	DETAIL NO. CC261-4

NOTES:

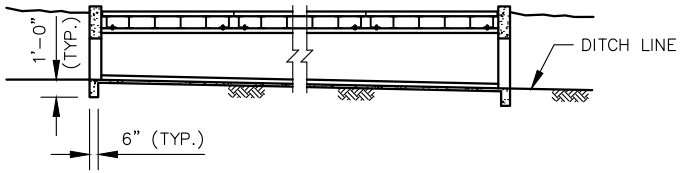
1. SEE DETAILS CC261-1 THROUGH CC261-4 FOR ALL OTHER CATTLE GUARD DETAILS.
2. THIS STANDARD SHALL BE USED IN EMBANKMENT OR WHERE HIGHLY ERODABLE SOIL IS FOUND.
3. ALL CONCRETE SHALL BE CLASS B.
4. SPILLWAY SHALL BE PER PLANS, AS DETAILED BY THE DESIGN ENGINEER.



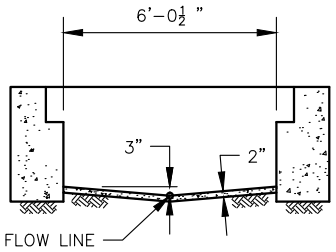
PLAN



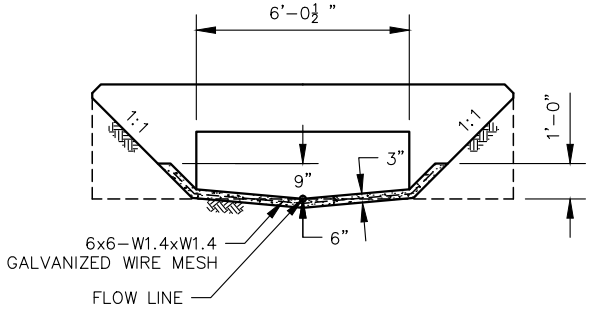
SECTION C-C
IN EMBANKMENT



SECTION C-C
WHERE USED FOR THROUGH DRAINAGE
CATTLE GUARD OPEN BOTH ENDS

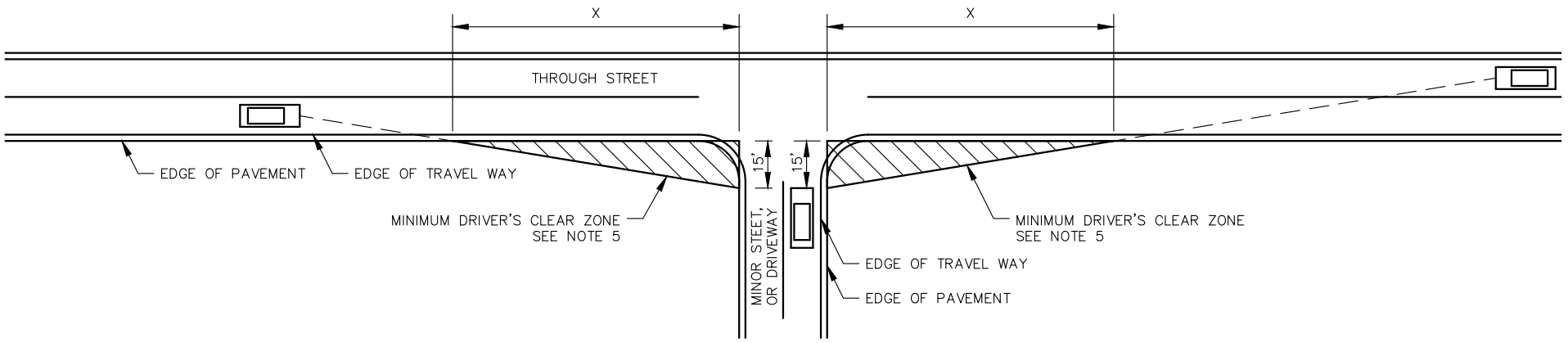


SECTION A-A



SECTION B-B

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	CATTLE GUARD, DRAINAGE	DRAFT 05-26-2017	DETAIL NO. CC261-5

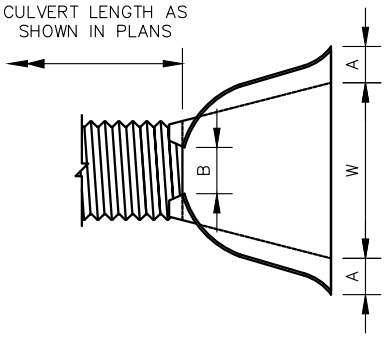


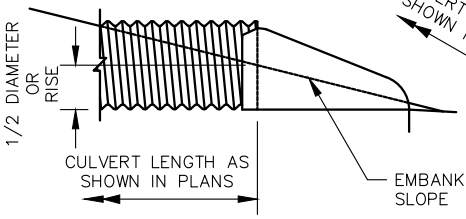
POSTED THROUGH SPEED	X DISTANCE
25 MPH	280 FEET
35 MPH	390 FEET
45 MPH	500 FEET
55 MPH	550 FEET
65 MPH	650 FEET

NOTE:

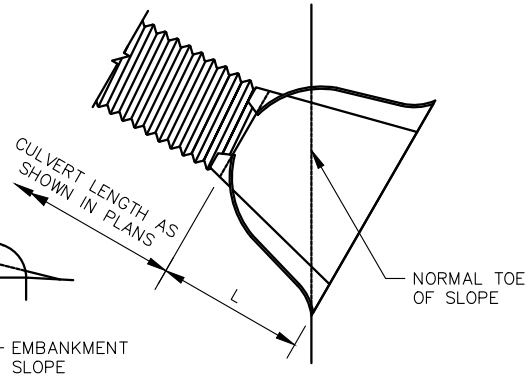
1. A SIGHT DISTANCE TRIANGLE SHALL BE DETERMINED FOR EACH CONTROLLED STREET OR DRIVEWAY THAT INTERSECTS A THROUGH OR UNCONTROLLED STREET.
2. THE SIGHT DISTANCE TRIANGLE IS MEASURED FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT OR, IF AN UNPAVED ROADWAY, FROM THE EDGE OF TRAVELWAY.
3. DETERMINATION OF SIGHT DISTANCE TRIANGLES MAY BE CALCULATED BY A TRAFFIC OR CIVIL ENGINEER, CONSISTENT WITH AASHTO GREEN BOOK, TO PROVIDE AN UNOBSTRUCTED VIEW OF THE ROADWAY VISIBLE TO THE DRIVER.
4. IF FREQUENT OR HIGH LEVELS OF LARGE TRUCK TRAFFIC IS ANTICIPATED AT THE APPROACH, INCREASED INTERSECTION SIGHT DISTANCE MAY BE WARRANTED AND SHOULD BE CALCULATED CONSISTENT WITH AASHTO GREEN BOOK.
5. NO SCREENING, LANDSCAPING, VEGETATION, STRUCTURES, PARKING AREAS OR OTHER OBSTRUCTION TO VISIBILITY BETWEEN THE HEIGHTS OF 3 AND 10 FEET ABOVE THE TOP OF CURB OR CENTERLINE GRADE OF THE STREET SHALL BE PERMITTED WITHIN THE CLEAR ZONE, AS DEFINED BY THE SIGHT DISTANCE TRIANGULAR AREA. DEVELOPMENT SHALL BE SET BACK OR RESTRICTED IN ORDER TO PROVIDE A CLEAR SIGHT DISTANCE.

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	SIGHT DISTANCE TRIANGLE	DRAFT 05-26-2017	DETAIL NO. CC300





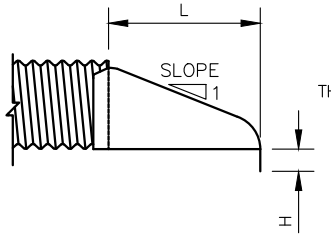
RIGHT ANGLE CULVERT

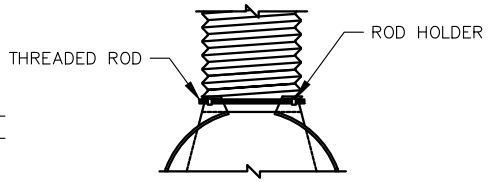


SKEWED CULVERT

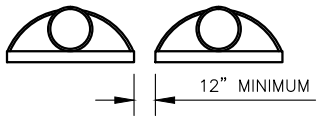
NOTES:

1. THE END SECTION MAY BE JOINED TO THE PIPE OR CONNECTOR SECTION BY BOLTS, RIVETS, DIMPLED BANDS, SLIP–SEAM BANDS OR THREADED ROD TYPE FASTENERS. FOR ALLOWABLE CONNECTOR TYPES, SEE TABLE.
2. THE TYPE 1 CONNECTOR IS BOLTED OR RIVETED. MAXIMUM CIRCUMFERENTIAL FASTENER SPACING SHALL BE 12" AND WITH A MINIMUM OF 8 FASTENERS PER JOINT. THE TYPE 1 JOINT MAY BE USED WITH EITHER ANNULAR OR HELICAL CORRUGATIONS.
3. TYPE 2 AND 3 CONNECTORS SHALL ONLY BE USED WITH ANNULAR HELICAL PIPE WITH A REQUISITE NUMBER OF ANNULAR CORRUGATIONS.
4. TYPE 4 CONNECTOR SHALL ONLY BE USED WITH HELICAL PIPE.
5. ALL STEEL END SECTION COMPONENTS SHALL BE GALVANIZED.
6. TOE OF EMBANKMENT SHALL BE WARPED TO MATCH TOE OF SKEWED END SECTION.
7. A BERM SHALL BE ADDED TO ABNORMAL PROJECTIONS PER STD DWG C–13.10.
8. THE FOREGOING APPLIES TO ALL CROSS–SECTION CONFIGURATIONS.



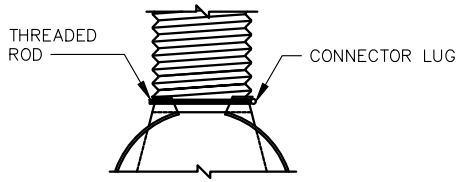


TYPE 2
THREADED ROD
CONNECTIONS

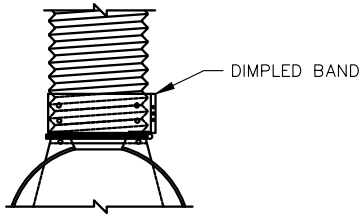


SPACING FOR MULTIPLE INSTALLATION

CIRCULAR PIPE		DIMENSIONS (IN)						
DIAMETER (IN)	GAUGE	A±1	B MAX	H±1	L±1½	W±2	APPROXIMATE SLOPE	CONNECTION TYPE
18	16	8	8	6	31	36	2 ½	2, 3, 4
24	16	10	13	6	41	48	2 ½	2, 3, 4
30	14	12 ½	12 ½	8	51	57	2 ½	2, 4
36	14	14 ½	12	9	60	72	2 ½	2, 4
42	12	17	11	10 ½	69	84	2 ½	3



TYPE 4
THREADED ROD
CONNECTIONS



TYPE 4
DIMPLED BAND
CONNECTIONS

PIPE ARCH			DIMENSIONS (IN)						
SPAN (IN)	RISE (IN)	GAUGE	A±1	B MAX	H±1	L±1½	W±2	APPROXIMATE SLOPE	CONNECTION TYPE
21	15	16	7 ½	11	6	24	36	2 ½	2, 3, 4
28	20	16	8	16	6	32	48	2 ½	2, 3, 4
35	24	14	10	16	6	39	60	2 ½	2, 4
42	29	14	12	12	7 ½	46	75	2 ½	2, 4
49	33	12	13 ½	20	9	53	84	2 ½	3

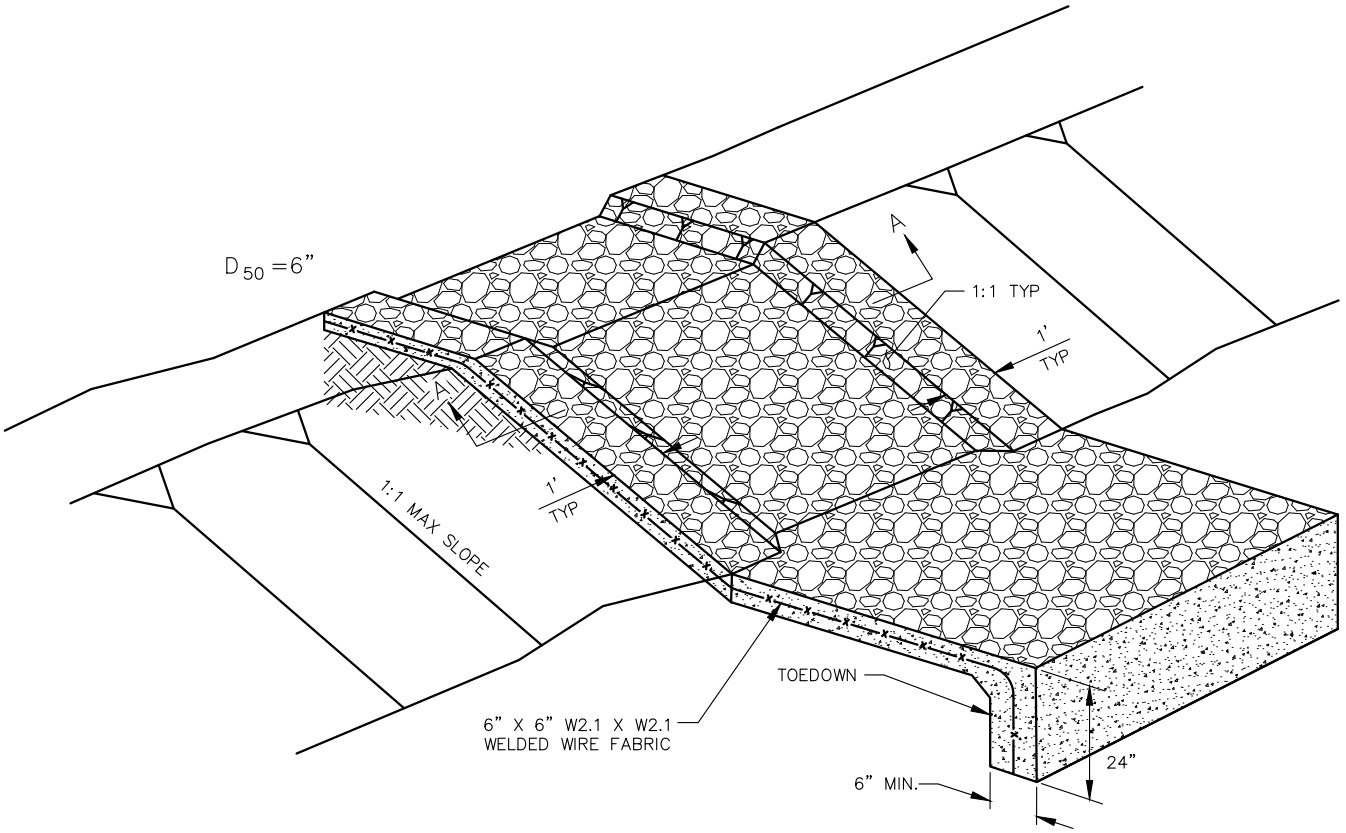
COCHISE COUNTY

HIGHWAY & FLOODPLAIN
STANDARD DETAIL

CORRUGATED METAL PIPE END SECTION

DRAFT
05–26–2017

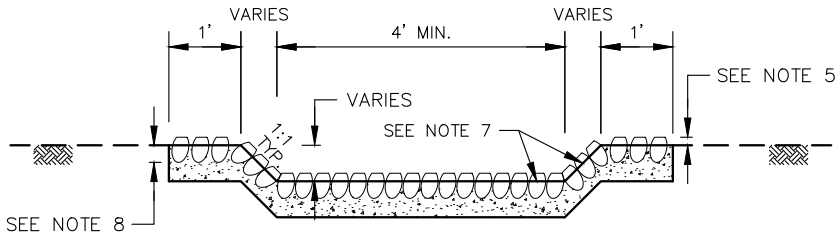
DETAIL NO.
CC511



NOTES:

1. PREPARE THE BED FOR THE RIP RAP BY EXCAVATING AND SHAPING THE SLOPES AS WELL AS CONSTRUCTING THE TOE FOR RIP RAP INSTALLATION.
2. ALL STONES SHALL BE ANGULAR WITH ROUGH FLAT SURFACE TEXTURE. STONES SHALL BE APPROVED BY THE COUNTY ENGINEER.
3. STONE SIZE (D_{50}) SHALL BE 6" OR IN ACCORDANCE TO WHAT IS SHOWN ON THE PLANS.
4. THICKNESS OF ANY RIP RAP LAYER SHALL BE AT LEAST 12" OR TWICE THE D_{50} SHOWN ON THE PLANS.
5. STONE TOLERANCE SHALL NOT EXCEED 1 INCH IN HEIGHT.
6. GAP TOLERANCE BETWEEN STONES SHALL NOT EXCEED 1 INCH.
7. LAY THE MAJORITY PLANE OR FACE OF STONE PERPENDICULAR TO THE SLOPE.
8. EMBED RIP RAP MINIMUM 3" INTO CONCRETE.

DESIGN GRADATION FOR RIP RAP D_{50}=6"	
% PASSING	SIZE (INCHES)
100	10
85	8
50	6
15	3

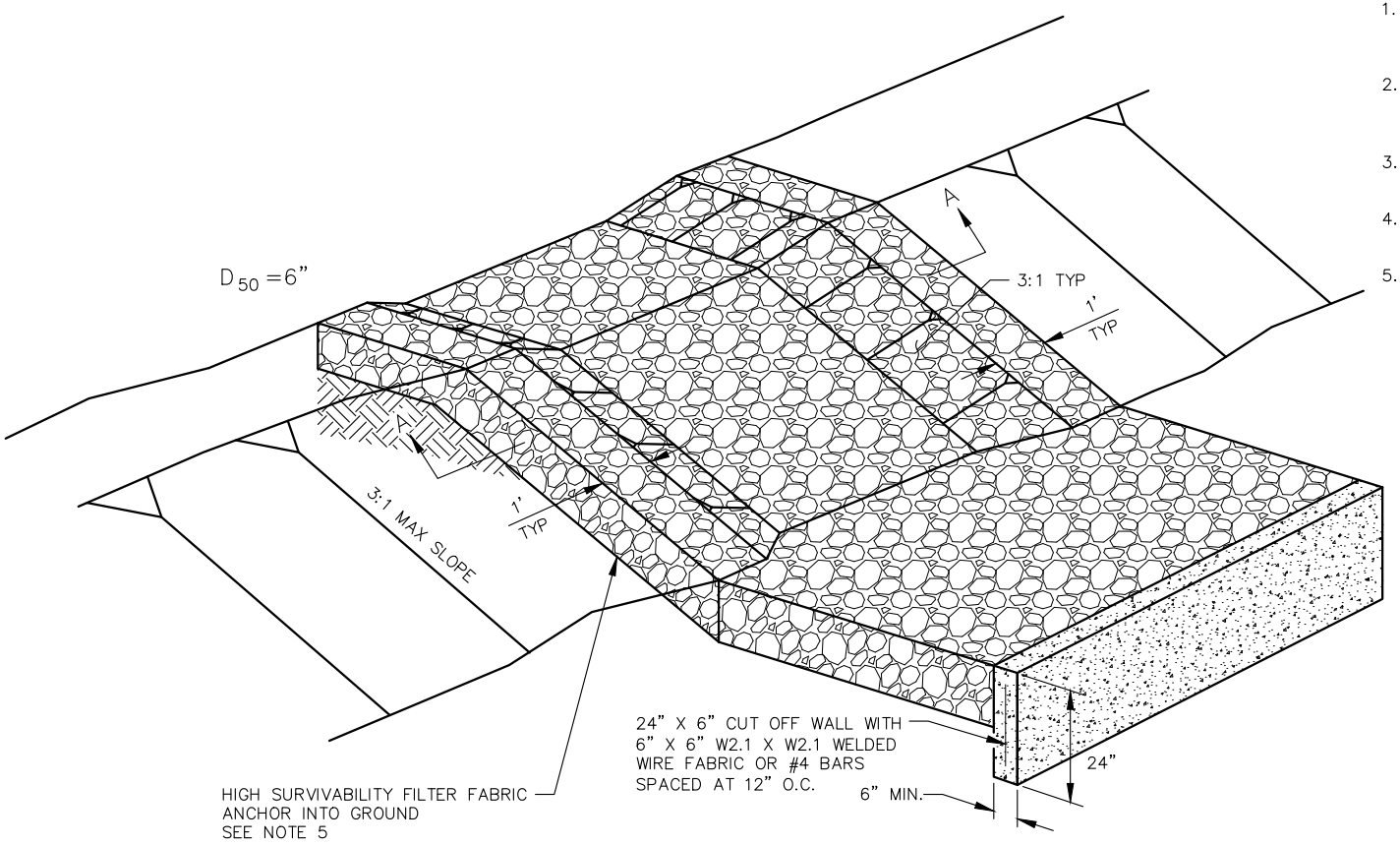


SECTION A-A

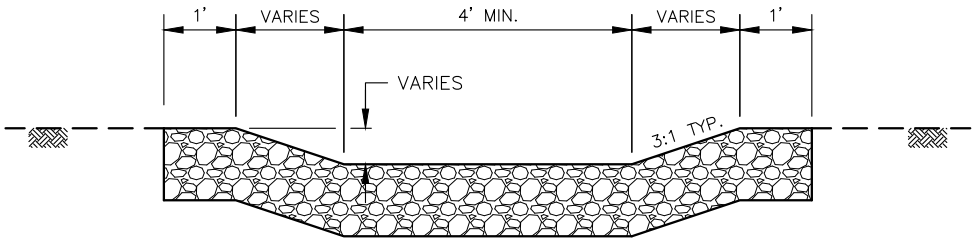
COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	HANDPLACED GROUTED RIP RAP EMBANKMENT PROTECTION SPILLWAY	DRAFT 05-26-2017	DETAIL NO. CC560-1

NOTES:

1. PREPARE THE BED FOR THE RIP RAP BY EXCAVATING AND SHAPING THE SLOPES AS WELL AS CONSTRUCTING THE TOE FOR RIP RAP INSTALLATION.
2. ALL STONES SHALL BE ANGULAR WITH ROUGH FLAT SURFACE TEXTURE. STONES SHALL BE APPROVED BY THE COUNTY ENGINEER.
3. STONE SIZE (D_{50}) SHALL BE IN ACCORDANCE TO WHAT IS SHOWN ON THE PLANS.
4. THICKNESS OF ANY RIP RAP LAYER SHALL BE AT LEAST TWICE THE D_{50} SHOWN ON THE PLANS.
5. FILTER FABRIC SHALL CONFORM TO SECT. 224.3.1.



DESIGN GRADATION FOR RIP RAP D_{50}=6"	
% PASSING	SIZE (INCHES)
100	10
85	8
50	6
15	3



SECTION A-A

COCHISE COUNTY	HIGHWAY & FLOODPLAIN STANDARD DETAIL	DUMPED RIP RAP EMBANKMENT PROTECTION SPILLWAY	DRAFT 05-26-2017	DETAIL NO. CC560-2

COCHISE COUNTY

HIGHWAY AND FLOODPLAIN DEPARTMENT

SUPPLEMENT TO THE

MARICOPA ASSOCIATION OF GOVERNMENTS'

UNIFORM STANDARD SPECIFICATIONS

FOR PUBLIC WORKS CONSTRUCTION

June 2017

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COCHISE COUNTY
HIGHWAY AND FLOODPLAIN DEPARTMENT

SUPPLEMENT TO THE MARICOPA ASSOCIATION OF GOVERNMENTS' UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

The Cochise County Standard Specifications for Public Improvement consists of the Uniform Standard Specifications and Details for Public Works Construction (1998 version as of the date of this document), as sponsored by the Maricopa Association of Governments (MAG) and all revisions **– except as provided in this Cochise County supplement to those MAG standards.** Specifications for work not contained within this standard or MAG standard shall comply with applicable section of the Arizona Department of Transportation, *Standards Specifications for Road and Bridge Construction.*

Work performed within Cochise County right-of-way shall comply with these standards. The method of measurement and/or basis of payment for work performed under a County right-of-way permit is at the digression of the applicant and/or developer and their selected contractor. However, the method of measurement and basis of payment, as stated in these supplemental specifications, will be used for all County contract work.

The requirements contained herein supersede, and take precedence, over any conflicting requirements in the MAG Uniform Standard Specifications. Identification is by corresponding Uniform Standard Specification paragraph, section, or part number.

SECTION 101
ABBREVIATIONS AND DEFINITIONS

101.2 DEFINITIONS AND TERMS:

Add the following:

Certified Laboratory: An AASHTO accredited laboratory, certified in the relevant engineering materials and testing specialty areas(s) referenced in the Contract Documents.

County: The Cochise County Highway & Floodplain Department, acting through its legally constituted officials, officers, or designated employees.

Mailbox: The mail receptacle and its supporting post or structure.

Maximum Density: The maximum dry density of soil obtained from the procedures defined in MAG Section 301.3.

Portland Cement Concrete Pavement: Concrete pavement that complies with MAG specification section 324

Professional Geologist: A person who has a current registration as a geologist granted by the Arizona State Board of Technical Registration.

Force Account Work: Work performed in accordance with MAG Section 109.

SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

102.2 CONTENTS OF PROPOSAL PAMPHLET, add the following:

Each pay item in the bid schedule contains an item number. The integer portion of the item number references the specification section related to the pay item. The decimal portion of the item number is established by the agency and is for agency use.

102.5 PREPARATION OF PROPOSAL:

Add the following to Section 102.5:

It shall be the responsibility of the prospective bidder to determine, prior to the submittal of its bid, if any addenda to the project have been issued by Cochise County. All addenda issued, if not already bound in the Special Provisions, shall be submitted by bidder with its bid and noted in the proposal section. All quantity adjustments, when required as the result of the addendum, shall be reflected on the bidding schedule in pen and ink.

Bids which do not reflect the appropriate changes on the bidding schedule or do not have all issued addenda attached and noted in the proposal section of the Contract will be rejected by the County.

Prospective bidders may call Cochise County to ascertain if addenda have been issued for this project.

102.6 SUBCONTRACTORS' LIST, add the following:

The Contractor shall submit to the County with the Bid documents a listing of all major Subcontractors and Material Suppliers the Contractor intends to use in the performance of the work specified in this contract. In determining the amount of work assigned to each Subcontractor, the Contractor shall adhere to the mandates set forth in Section 108.2, Subsection E, of the MAG Uniform Standard Specifications.

SECTION 104
SCOPE OF WORK

104.1 WORK TO BE DONE:

104.1.4 Cleanup and Dust Control, replace the 3rd paragraph with the following:

The Contractor shall take whatever steps, procedures or means required preventing any dust nuisance due to his construction operations. The dust control measures shall be maintained at all times to the satisfaction of the Engineer and in accordance with the requirements of the Arizona Department of Environmental Quality (ADEQ) of Air Pollution Control Rules and Regulations.

104.1.4 Cleanup and Dust Control, add the following:

Contractor shall dispose of excess material or construction debris on an as-needed basis in order to keep the site safe to Contractor's personnel and the general public. Construction debris shall be disposed of only in a manner or in a location approved by the Engineer. The Contractor shall upon

request file with the Engineer the written consent of the owner of any off-site location designated to receive excess material or debris.

Contractor shall be responsible for the safe and clean condition of the site during the entire period the site is under Contractor's care, custody and control.

104.3 VALUE ENGINEERING

Section 104, add the following:

104.3.1 Purpose:

This clause defines a Construction Incentive Change Order Proposal ("CICOP") and establishes the policy and procedure for the application of CICOP's in the Cochise County construction process.

104.3.2 Definition:

A CICOP is a defined, written proposal for a change order during construction and shall be initiated, developed and identified by Contractor. The CICOP shall result in gross capital savings and a net capital improvement cost reduction, shall not increase the total maintenance cost of the project and shall meet the following requirements:

104.3.2.1 All Time Extensions for the project shall be agreed upon by both parties at the time the CICOP is approved. The County's determination shall be binding upon the Contractor and shall not be subject to challenge.

104.3.2.2 The CICOP shall not alter the initially intended function, quality and safety standards of the project.

104.3.2.3 The CICOP shall not change the overall scope of the work, which would require a re-bidding of the project.

104.3.2.4 The CICOP shall not conflict with any contract provisions regarding proprietary and restrictive specifications for bids in connection with Uniform Standard Specifications and details, or any other applicable specifications.

104.3.2.5 The CICOP shall not cause undue interruption of the contract work schedule.

104.3.2.6 The proposed changes in connection with the CICOP shall comply with all federal, state and local regulations, mandates and permits.

104.3.2.7 If the Contractor wishes to submit a CICOP, he shall submit a preliminary CICOP in writing, which shall address all components required for a final CICOP, in summary form. The County will review the preliminary CICOP and inform the Contractor in writing if the County wishes to implement the CICOP. The Contractor would then be requested to prepare a detailed final CICOP.

104.3.3 Applicability:

All Cochise County construction contracts.

104.3.4 Content:

The CICOP shall contain pertinent information and support documentation to allow comprehensive review by the appropriate contracting agency. At a minimum, the CICOP shall include the following

information:

104.3.4.1 Name and title of individuals associated with the design and preparation of the CICOP.

104.3.4.2 Detailed scope description with sealed plans and specifications. A comparison summary of present design, proposed changes and detailed description of the advantages and disadvantages for each change proposed. The CICOP shall be sealed and signed by a Professional Engineer.

104.3.4.3 Comprehensive procedure and schedule outlining implementation of CICOP, including all required contract amendments and the absolute latest approval date for the CICOP.

104.3.4.4 Estimated cost summary which shall include but not necessarily be limited to the following:

104.3.4.4.1 Project cost with and without CICOP, which shall include the following items:

104.3.4.4.1.1 Quantities of materials and equipment.

104.3.4.4.1.2 Unit prices for materials and equipment.

104.3.4.4.1.3 Hourly rates and total labor hours required for installation.

104.3.4.4.1.4 Overhead and fee percentage of Contractor and all subcontractors of any tier involved in the performance of the work outlined in the CICOP.

104.3.4.4.2 Operations and maintenance cost prior to and after implementation of CICOP.

104.3.4.4.3 Implementation cost of the CICOP not covered in Section 104.3.4.4.1.4, above.

104.3.4.4.4 Contractor's cost of the savings, based on the formula specified below.

104.3.4.4.5 Other pertinent data, as may be required by the County to prepare and execute a change order to the Contract.

104.3.4.4.6 If Contractor fails to notify the County of all required changes for the CICOP during the initial CICOP approval stage, Contractor shall absorb all costs connected with the implementation of changes of which the County was not made aware of. If c o n d i t i o n s occur, which could not be foreseen by any prudent Contractor, the County may enter into negotiations with Contractor and make the necessary cost adjustments to the Contract.

104.3.4.4.7 All CICOP's become public record when submitted to the County for review and approval. Propriety information may be protected by Contractor.

104.3.4.4.8 For CICOP's accepted by the County, processing procedure for change orders shall be used.

104.3.4.4.9 If a CICOP is rejected by the County, Contractor may not appeal such a rejection.

104.3.5 Sharing Provisions:

Upon acceptance and implementation of a CICOP, Contractor will share the net capital savings derived from the implementation of the CICOP, in accordance with the formula outlined below:

104.3.5.1 Initial construction cost minus revised construction cost minus CICOP development cost and CICOP implementation cost equals Net Capital Savings.

104.3.5.1.1 The CICOP implementation cost shall include Contractor's actual cost and fee for reviewing and redesigning the CICOP, documented to the satisfaction of the County.

104.3.5.1.2 CICOP development cost shall include Contractor's cost directly associated with the preparation of the CICOP package, documented to the satisfaction of the County.

104.3.5.1.3 CICOP implementation and development costs shall include COUNTY costs for review and approval of the CICOP package.

104.3.5.2 Sharing Formula: Net Capital Savings, calculated in accordance with the formula outlined in Section 104.3.5.1, above, shall be shared with Contractor on an equal 50/50 percentage basis.

SECTION 105
CONTROL OF WORK

105.1 AUTHORITY OF THE ENGINEER, add the following:

The Engineer may adjust design grades or adjust the location of structures (especially drainage structures) prior to construction. Such adjustments are considered minor changes in the work and do not constitute extra work.

105.2 PLANS AND SHOP DRAWINGS, add the following:

Initial submittal for review – five copies, of which one copy will be returned to the Contractor within five working days. Final submittal for approval – five copies, of which two copies will be returned to the Contractor within five working days.

105.4 COORDINATION OF PLANS AND SPECIFICATIONS:

Section 105.4 is replaced with the following:

Contractor shall perform the work under this Contract in accordance with the intent of the Plans and Specifications and shall not take advantage of any error or omission in the Plans and/or specifications. In the event Contractor discovers an error or omission in the Plans and/or specifications, Contractor shall promptly advise the Engineer of such an error or omission.

If Contractor fails to notify the Engineer of an error or omission in the Plans and/or specifications, which Contractor has discovered or should have discovered through the exercise of reasonable diligence, any additional work required as the result of such errors or omissions, shall be compensated by the County on a force account basis and such compensation shall be the exclusive compensation to Contractor for any costs, expenses or damages resulting directly or indirectly from the correction of such errors and omissions.

105.6 COOPERATION WITH UTILITIES, add the following:

Contractor is solely responsible for any damage to existing utilities resulting from Contractor's operations at the site. The use of hand tools to expose a marked facility is required when proposed excavation is within the 2.0-foot tolerance zone of a marked facility, or if uncertainty exists as to the exact location of a facility.

An attempt has been made by the County to identify the location of all underground utilities located within the perimeter of the site and to design the location and elevation of all irrigation

and drainage pipes, culverts and structures to avoid interference with existing utilities. It shall be the Contractor's responsibility to cooperate with the appropriate utility companies in order to facilitate requested adjustments of obstructing utilities. (Please refer to the Special Provisions for specific telephone numbers and contact persons of utilities within the project area).

Contractor's installation of conduits, brackets, piping, valve adjustments or other material at the request and for the convenience of the utility shall be paid by the utility unless specifically identified otherwise in the plans or the Special Provisions. Contractor shall make all required arrangements for such construction and payment with the utility. The County will not extend the performance period of the contract to accommodate construction performed for the convenience of the utility.

105.8 CONSTRUCTION STAKES, LINES AND GRADES:

The first paragraph of Section 105.8 of the Uniform Standard Specifications is revised to read:

Cochise County will furnish one time the necessary survey control for the Contractor's guidance. Staking shall consist of the following:

(A) Right-of-Way lines at 100 ft. intervals for clearing, fencing, and control of Contractor's operations.

(B) Slope stakes shall be offset from the edge of the embankment at 100 ft. intervals.

(C) Blue tops in subgrade at centerline and edge of pavement at 100 ft. intervals except on curves. Contractor shall have all material in place and compacted within 2.5 inches prior to requesting the survey crew.

(D) Blue tops on aggregate base course at centerline, edge of pavement, and 1/4 points at 50 ft. intervals. Contractor shall have all material in place and compacted within 2.5 inches ± prior to requesting the survey crew.

(E) Catch basin stakes shall be offset at 10 ft. and 15 ft. to the center of the structure with cuts or fills shown to the top of grate.

(F) Grade and line stakes for all structures, pipe lines, culverts, and ditches.

(G) Straddle points for permanent monuments.

105.12 MAINTENANCE DURING CONSTRUCTION, add the following:

The Contractor shall be responsible to protect the construction site, construction activities, and new construction from the detrimental effects of weather, including flooding, until acceptance by the Engineer.

105.15 ACCEPTANCE, add the following:

The Contractor may request an inspection to establish substantial completion when all of the following have occurred:

- All pavement, pavement markings and signing are complete and accepted and traffic can move unimpeded through the project at the posted speed;
- All pedestrian pathways are completed and accepted and pedestrians are not restricted by any construction activity;

- All guardrails, drainage devices, ditches, excavation and embankment have been accepted;
- The only work left for completion is incidental, away from vehicle and pedestrian traffic, and does not affect the safety or convenience of the traveling public.

A notice of substantial completion shall be issued when the Engineer determines after an inspection that all conditions for substantial completion have been met. The decision whether the project is substantially complete is within the sole discretion of the Engineer. The inspection date requested by the Contractor for the substantial completion inspection shall be the date of substantial completion if the Engineer determines the conditions for substantial completion have been met. Liquidated damages shall not be assessed after the substantial completion date.

SECTION 107
LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

107.1 COMPLIANCE WITH LAWS, add the following:

Contractor, in connection with any activity under this Contract, shall not discriminate against any person on the grounds of race, color, religion, sex, national origin, age, disability, political affiliation or belief. Contractor shall include a clause to this effect in all subcontracts. Contractor shall also comply with all applicable provisions of the Americans with Disabilities Act of 1990.

Contractor and its subcontractors and their respective employees, agents, and representatives, when performing the work described in the Construction Specifications, shall comply with all rules and regulations set forth by the County, pertaining to the safety, loss control and environmental regulations, and shall perform the work in compliance with governmental laws and regulations pertaining to occupational health, and environmental protection, including any local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract.

Contractor is solely responsible for jobsite ("site") conditions during all phases of construction, beginning with Contractor's mobilization of equipment and/or personnel until the work has been accepted by the Engineer and a certificate of completion has been issued by the County. Contractor's responsibility for the site during the period specified above shall not be limited to Contractor's working hours and shall include but not necessarily be limited to the following:

- Physical condition of the site;
- Safety of Contractor's personnel at the site and all
    - other persons entering the site or areas adjacent to the site;
- Security of Contractor's equipment and material; and
- Reasonable aesthetic appearance of the site.

Contractor shall ensure that internal combustion equipment is operated with a muffler of a type recommended by the manufacturer.

The Contractor shall ensure that contract operations are in compliance with procedures and requirements of the State of Arizona Air Pollution Control Rules and Ordinances with special attention given to the fugitive dust requirements. The Contractor shall pay any penalties imposed upon Cochise County where the violation is a direct result of actions or inactions by the Contractor, the contractor's employees or subcontractors.

107.2.1 AZPDES (NPDES) Construction General Permit Requirements:

The Contractor shall comply with the Arizona Pollutant Discharge Elimination System (AZPDES) requirements and conditions administered by the Arizona Department of Environmental Quality (ADEQ). Compliance with AZPDES also includes compliance with the requirements of all municipal separate storm sewer systems (MS4) that are within the project limits.

107.2.1.1 Regulation Compliance: The Contractor, contractor employees, and subcontractors shall not discharge stormwater or non-stormwater from the construction site that is not in compliance with requirements and conditions of the AZPDES Construction General Permit for Arizona (AZCGP) as well as all other applicable federal, state and local laws, ordinances, statutes, rules and regulations pertaining to stormwater discharge and air, ground water and surface water quality.

The Contractor shall be designated as the Operator, having day-to-day operational control of those activities at a project which are necessary to ensure compliance with a Stormwater Pollution Prevention Plan (SWPPP) for the site and other permit conditions. The Contractor is responsible for preparing, in a manner acceptable to the ADEQ and the EPA, all documents required by regulation, which shall include but not necessarily be limited to the following:

- Notice of Intent (NOI).
- Stormwater Pollution Prevention Plan (SWPPP).
- Notice of Termination (NOT).

107.2.1.2 NOI Submittal: The Contractor shall submit a Notice of Intent in accordance with the AZCGP. The Contractor shall identify on the NOI all non-stormwater discharges that are expected to be associated with the project's construction activities as required by the AZCGP.

Preliminary copies of the NOI and the SWPPP shall be available to the County during the pre-construction conference.

The Contractor shall ensure the completed and duly signed NOI form(s) are submitted in a timely manner to prevent a delay to project construction.

The AZPDES form shall be submitted to ADEQ's Phoenix office by certified mail or hand delivered to the address below:

Arizona Department of Environmental Quality
Surface Water Section - Stormwater and General Permits Unit 1110
West Washington Street, 5415A-1
Phoenix, AZ 85007

The form may also be faxed to ADEQ at 602-771-4528 or submitted via "smart NOI" accessible from the ADEQ's website:

http://www.azdeq.gov/environ/water/permits/stormwater.html

If the construction is near an impaired or unique water (a.k.a. an Outstanding Arizona Water), the SWPPP shall be submitted with the NOI. Permit activation may require 32 business days or more for construction sites near impaired or unique waters, as well as for construction sites with special concerns, therefore documentation is to be submitted to ADEQ as early as possible.

If the construction site is located in an urbanized area of Cochise County, the Contractor shall

send a copy of the ADEQ certificate authorizing permit coverage to the local MS4 authority(s).

107.2.1.3 Time Extension: Failure by the Contractor or subcontractor of any tier to submit a NOI within the mandated time frame shall result in delay of the construction start date and no claims for extension of time will be granted for such a delay.

107.2.1.4 SWPPP: The Contractor shall develop, sign and certify, implement, update, amend, and revise the SWPPP, as necessary, to assure compliance with permit requirements. The Contractor shall address in the SWPPP, all non-stormwater discharges that are expected to be associated with the project's construction activities as required by the AZCGP.
The Contractor shall ensure that:

- The SWPPP indicates the areas of the project where the County or other entity has operational control over the project specifications, including the ability to make modifications in specifications.
- All other operators implementing portions of the SWPPP impacted by changes made to the SWPPP are notified of such modifications in a timely manner.
- The SWPPP indicates the parties with day-to-day operational control and parties responsible for implementation of the BMPs identified in the SWPPP.

The Contractor and subcontractors shall ensure that construction activities do not render another party's BMP(s) ineffective.

The Contractor shall post the SWPPP authorization number(s) in a conspicuous location near the entrance where most of the construction activity is occurring. A copy of the ADEQ authorization certificate shall be retained with the SWPPP. The SWPPP and a copy of the ADEQ authorization certificate shall be retained on the project site at all times during construction. A "Construction SWPPP Checklist" can be obtained from ADEQ for assisting in the preparation of the SWPPP.

107.2.1.5 Inspections: Contractor shall perform inspections, by qualified personnel, of all stormwater pollution control devices on the project at least once every fourteen (14) days and within twenty-four (24) hours of each 0.5-inch or greater storm event, as required under the provisions of the AZCGP. Contractor shall prepare reports, in accordance with the AZCGP, on such inspections and shall retain the reports for a period of at least three (3) years following the completion of the project. The Contractor shall maintain all stormwater pollution control devices on the project in proper working order, which shall include cleaning and/or repair during the duration of the project.

107.2.1.6 NOT Submittal: Upon project completion, acceptance and demobilization, Contractor shall submit to ADEQ a completed, duly executed Notice of Termination form for each NOI issued, with a copy of the NOT acknowledgement letter to appropriate MS4 authority(s), thereby terminating all AZPDES permit coverage for the project. Contractor shall then provide to the County copies of the SWPPP, inspection information and all other documents prepared and maintained by the Contractor in compliance with the AZPDES Construction General Permit, including records of all data used to complete the NOI to be covered by the AZCGP. Contractor shall retain the originals of such documents for a period of at least three (3) years following the completion of the project and make such documents available for inspection by representatives of the Environmental Protection Agency, the Arizona Department of Environmental Quality, the County, and any municipality having jurisdiction, upon request.

107.2.1.7 Fines and Penalties: Fines and penalties imposed by the ADEQ, MS4 authority, or the EPA for Contractor's failure to comply with any of the AZPDES permit requirements and conditions shall be borne by the Contractor. Until paid by the Contractor said fines and penalties may be withheld from monies due or becoming due the Contractor.

107.2.1.8 Payment: The lump sum price for AZPDES shall include all material, labor, and costs relating to the NOI, NOT, and the SWPPP. This includes but is not limited to the preparation, installation, maintenance, and removal of temporary SWPPP elements, assuring proper operation of the pollution control devices installed, and all maintenance, cleaning, and disposal costs associated with clean-up and repair following storm events, runoff or releases on the project. The lump sum price for AZPDES shall be inclusive of all related costs, and no additional claims shall be made by the Contractor under any other specification provision, including changed conditions. Contractor shall be compensated for this item at a rate of 25% of the total contract price paid with the first progress payment, the remaining 75% will be prorated over the entire length of the project.

107.4 ARCHAEOLOGICAL REPORTS, add the following:

If previously unidentified archaeological, historical, or paleontological features are encountered during any activity related to construction of a County project, the Contractor shall stop work immediately at that location and shall notify the Engineer.

107.5 SAFETY, HEALTH AND SANITATION PROVISIONS:

Section 107.5 add the following:

All water for Contractor's own use, drinking water, temporary electric power, heat, and telephone services shall be provided by the Contractor, at the Contractor's sole expense.

107.6 PUBLIC CONVENIENCE AND SAFETY, add the following:

107.6.3 Control of Airborne Pollutants and Sediment Tracking: Contractor shall cover dump trucks while transporting materials that may become airborne during transit. After dumping of such materials, Contractor shall either cover truck bed or take measures to remove all residues that may become airborne.

Contractor shall minimize off-site tracking of sediments by brushing or blowing off construction vehicles, or any other method deemed appropriate by Contractor, prior to exiting the construction site.

107.6.4 Protective Fencing: The Contractor shall furnish and install 6-foot high temporary chain link fencing, or approved equal, satisfactory to the Engineer, around all major structure construction areas (i.e., bridges, pump houses, drop structures, retaining walls, etc.) and around any unattended excavations with slopes steeper than 2:1. Temporary fencing shall completely enclose the construction activity and shall be secured after normal working hours to prevent unauthorized access.

SECTION 108
COMMENCEMENT, PROSECUTION AND PROGRESS

108.1 NOTICE TO PROCEED:
Add section 108.1.1 as follows:

108.1.1 Pre-Construction Conference: After execution of the Contract by both parties and prior to the commencement of the work, the Engineer will schedule a pre-construction conference at the facilities of Cochise County. Contractor shall be represented at a minimum by a company official with signature authority on behalf of its organization.

(A) Contractor shall submit to the Engineer during the pre-construction conference the following documents: List of all subcontractors

(B) List of all material sources

(C) Assumptions and calculations used to determine each of the unit prices

(D) Preliminary work schedule

(E) Traffic control plans

(F) Emergency telephone numbers

(G) Signing authority letter

(H) Name and telephone number of the certified safety professional

(I) Copies of all Permits required for project Construction

(J) Preliminary SWPPP and NOI

The following items shall be submitted at the preconstruction conference when reasonably feasible. When not submitted at the preconstruction conference, the submittal(s) shall be specifically shown in the work schedule. The submittals shall be scheduled at least 45 days prior to intended use and/or material transport to the project site.

(K) Material safety data sheets

(L) Mix designs

(M) Manufacturer's certification for all materials

(N) Shop drawings

The pre-construction conference will cover topics such as critical elements of the work schedule, payment application and the processing of invoices. Additionally, a scheduled start date for the work will be determined.

108.2 SUBLETTING OF CONTRACT, add the following:

The Engineer will not consent to subletting of any portion of the contract if a copy of the subcontract or lower tier subcontract is not received. The Engineer's consent shall in no way be construed to be an endorsement of the subcontractor or its ability to complete the work in a satisfactory manner.

The subcontract, purchase order, or lease agreement shall be evidenced in writing and contain all pertinent provisions and requirements of the prime contract. The following data shall be submitted seven calendar days prior to the start of each subcontractor's work.

(A) A complete copy of each subcontractor agreement and each second-tier subcontractor agreement.

(B) Verification that all required Federal Provisions; i.e., Federal Form 1273, Executive Order, and Wage Determination Decisions are attached to each subcontract in any federal-aid funded contract.

(C) Subcontracts must show the total price subcontracted. The items of work, and quantities of

each item subcontracted shall be shown. Unit Prices or Extended Prices may be deleted except in the case of DBE subcontractors.

(D) DBE subcontracts shall include full extensions of all unit prices.

(E) Partial items shall be explained in detail and show the amount of each contract item being subcontracted. Non-contract item work shall be fully explained.

(F) The contractor shall certify to the County that all of its subcontractors have all required registrations.

108.4 CONTRACTOR'S CONSTRUCTION SCHEDULE, replace with the following:

Contractor shall be solely responsible for the planning, scheduling and execution of the work to assure timely completion of the project.

108.4.1 The initial schedule shall be submitted to the County in triplicate for review at the pre-construction conference. The schedule shall be a schematic (arrow) or precedence diagram, reflecting the work stages and all activities required for the successful completion of the project. The schedule shall show enough detail to allow day to day monitoring of Contractor's operation and shall include major milestone dates for the work.

108.4.2 The schedule shall include a complete critical path schedule and shall include a detailed network diagram with the following elements:

108.4.2.1 Contractor's schedule shall be time scaled in calendar days and all activities shall be recorded from the initial start dates to their completion dates. Unless specific approval was given by the Engineer, the individual activities shall not exceed fifteen (15) calendar days in length. The plot size and scale shall be acceptable to the Engineer.

108.4.2.2 The schedule shall reflect the order and the individual categories for each activity described in section 108.4.2.7, below. Critical activities shall be highlighted by use of color or any other method acceptable to the Engineer.

108.4.2.3 The schedule shall include, in addition to all construction activities, such tasks as mobilization, demobilization, submittal and approval of material samples and shop drawings, procurement of major material and equipment items, fabrication of special items and the installation and testing of such items. The schedule shall also reflect coordination activities with other projects.

108.4.2.4 Activities shall show sufficient detail to allow the reviewer to easily follow the sequence of the work, for example, forming, reinforcing and placement of concrete on the specific calendar days such activities are scheduled.

108.4.2.5 The diagram shall show each activity, the preceding and the following activity, the activity description, the total float time, and the duration of the activity in working days.

108.4.2.6 Activity descriptions on the diagram shall be job-specific and not of a generic nature.

108.4.2.7 In addition to the diagram, Contractor shall submit a schedule report of the network outlining the following data for each activity:

(A) preceding and following event and activity numbers

(B) activity description

(C) activity duration

(D) earliest commencement date

(E) earliest completion date

(F) latest commencement date

(G) latest completion date

(H) total float times

(I) responsible party for specific activity

108.4.3 Contractor shall update its schedule as mandated by the following events or as requested by the Engineer.

108.4.3.1 Contractor shall submit to the County on the tenth (10th) working day of each month a construction progress report (three originals and three copies) describing all completed or in progress activities and the level of completion of all activities to date in connection with this project. Detailed information shall be given for all negative float time. If the Engineer determines that any or all parts of the network diagram requires revision, Contractor shall furnish the County with the requested revisions within ten (10) calendar days of such request.

108.4.3.2 The monthly report shall be accompanied by a brief description of the job progress, problems encountered, current and anticipated delaying factors and the potential impact on the project schedule, and a description of corrective measures taken or proposed. It shall also include any departures from earlier schedules, including but not limited to, logical sequence or logical ties, constraints, changes in scheduled activities and the duration of such changes, addition or deletion of event numbers, activity numbers and activity descriptions. Contractor shall outline the reason for the departure from the original schedule.

108.4.3.3 All costs and expenses incurred by the Contractor for the preparation of schedules and/or reports and all revisions thereto, are considered an overhead item and therefore not reimbursable as a separate pay item.

108.4.3.4 In addition to allowances for various activities in connection with the work, Contractor shall base the schedule on normal weather conditions and shall incorporate the following factors:

(A) procurement and shipping times for material
(B) concrete curing time
(C) reasonable allowances for relocation of utilities

108.4.3.5 The Engineer's review of the schedule shall not constitute an acceptance of responsibility by the County for the content of the schedule and shall not relieve Contractor of its obligations to commit all its resources to meet the schedule set forth in the specifications. Free float time within the project's stated contract time limit shall remain available for use by the project. The County or the Contractor may use as needed the available project free float time. The Engineer's review of the schedule shall not constitute a basis for additional time to complete the work specified in the scope of work nor shall it serve as basis for additional compensation.

108.5 LIMITATION OF OPERATIONS, add the following:

Regular work hours vary depending on time of year, the Contractor shall submit proposed weekday regular work hours at the pre-construction meeting (pre-job conference) for approval. The Contractor shall be subject to additional inspection fees for overtime work when work is

performed on weekends, legal holidays, or at times other than the approved regular work hours.

The Contractor shall comply with all local noise ordinances. For unincorporated areas, the Contractor shall not conduct any work during the hours 7:00 p.m. to 6:00 a.m. without the written approval of the Engineer. Special noise abatement conditions and procedures may be required if nighttime work is approved.

Part 200 add the following new Section:

SECTION 202
REMOVAL OF STRUCTURES

202.1 DESCRIPTION:

The work under this Section shall consist of the removal, wholly or in part, and satisfactory disposal of all structures within the right-of-way which have not been designated on the project Plans or specified in the Special Provisions to remain, except for those structures which are to be removed and disposed of under other items of work in the contract. The work shall also include salvaging of designated materials and backfilling the resulting cavities.

Existing structures and other existing improvements which are to become an integral part of the planned improvements shall remain even though not specifically noted.

Materials removed and not designated to be salvaged or incorporated into the work shall become the property of the Contractor.

202.2 BLANK

202.3 CONSTRUCTION:

202.3.1 General: Bridges, culverts, retaining walls, and other structures in use by or facilitating traffic shall not be removed until satisfactory arrangements have been made to accommodate the traffic.

Blasting or other operations necessary for the removal of an existing structure, which may damage new construction, shall be completed prior to commencing the new work.

Items designated to be salvaged shall be carefully stockpiled or stored by the Contractor at locations designated in the Special Provisions or as requested by the Engineer.

Items which are to be salvaged or reused in the new construction, that are damaged or destroyed as a result of the Contractor's operations, shall be repaired or replaced by the Contractor at no additional cost to the County.

Holes, cavities, trenches and depressions resulting from the removal of major structures, except in areas to be excavated, shall be backfilled with suitable material which shall be compacted to a density of not less than 95 percent of maximum density, as requested and approved by the Engineer.

202.3.2 Removal of Bridges: The removal of existing bridges, either wholly or in part, shall be as shown on the project plans or as described in the Special Provisions. Bridge removal operations shall be conducted in such a manner as to cause the least interference to public traffic.

At least ten days before beginning bridge removal over or adjacent to public traffic or railroad

property, the Contractor shall submit to the Engineer details of the removal operations showing the methods and sequence of removal and equipment to be used.

When total bridge removal is specified, all materials designated for salvage, such as structural steel, structural steel members, timber and other reusable materials shall be carefully dismantled, removed and salvaged in accordance with the requirements of Section 202.3.1. Steel members shall be match marked as requested by the Engineer.

Piling, piers, abutments, footings and pedestals shall be removed to at least 1.0 foot below ground line or 5 feet below finished subgrade elevation unless specified otherwise in the Special Provisions or on the project Plans.

When partial bridge removal is specified or alteration of an existing bridge requires removal of portions of the existing structure, such removal shall be performed with sufficient care as to leave the remaining portion of the structure undamaged.

In case of damage to the existing bridge structure, the Contractor shall make necessary repairs at no additional cost to the County. Reinforcing steel extending from the remaining portion of the structure shall be protected, cleaned and incorporated in the new portion of the structure in accordance with the details shown on the project plans or as requested by the Engineer.

Flame cutting and saw cutting may be used for removing, widening, or modifying bridges, provided the Contractor complies with all protection, safety and damage requirements.

Explosives shall not be used in bridge removal operations unless approved by the Engineer.

Before beginning concrete removal operations involving the removal of a portion of a monolithic concrete element, a saw cut a minimum of 1 inch deep shall be made to a true line along the limits of removal on all faces of the element which will be visible in the completed work.

Removed concrete and other debris shall be disposed of as provided in Section 104.1.4.

202.3.3 Removal of Minor Structures and Miscellaneous Structural Concrete: Minor structures and miscellaneous structural concrete shall be defined as all or portions of minor retaining walls, spillways, drainage structures, concrete box culverts,foundations, footings and all other Portland cement concrete construction, except bridges. All existing miscellaneous concrete shall be removed to a depth of at least 5 feet below finished subgrade elevation, unless otherwise specified in the Special Provisions or on the project plans.

Where new concrete is to join existing concrete, the existing concrete shall be saw cut to a true line with straight planar edges free from irregularities.

Concrete removal operations shall be performed without damage to any portion that is to remain in place. All damage to the existing concrete which is to remain in place shall be repaired to a condition equal to that existing concrete damaged by the Contractor's operations shall be at no additional cost to the County.

Existing reinforcement that is to be incorporated in new work shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.

Removed concrete and other debris shall be disposed of as provided in Section 104.1.4.

The floors of concrete basements, pits, and structures not required to be removed, and which are located within the roadway, shall be broken in a manner that will prevent the entrapment of water.

202.4 MEASUREMENT:

Removal of structures will be measured on a lump sum basis except when the fee schedule contains specific items under this section on a unit basis, measurement will be made by the units designated in the fee schedule.

202.5 PAYMENT:

Payment for the accepted quantities of removal of structures will be made by lump sum, or by specific removal items, or by a combination of both. Payment for removal of structures and obstructions not listed in the fee schedule, but necessary to perform the construction operations designated on the project plans or specified in the Special Provisions, shall be considered as included in the prices of contract items.

The prices shall include all excavation and subsequent backfill related to the removals, and the salvaging, hauling, storing and disposing of all materials as provided herein.

SECTION 205
ROADWAY EXCAVATION

205.1 DESCRIPTION, add the following:

Roadway excavation shall also consist of the placement and compaction of excavated material in embankments as provided under Section 211 Fill Construction.

Part 200 add the following new Section:

SECTION 212
ROADWAY OBLITERATION

212.1 DESCRIPTION:

Roadway obliteration shall consist of removing abandoned roadway elements and grading the area to blend in with the surrounding terrain. In undeveloped areas, the grading is to restore the natural contours.

212.2 CONSTRUCTION:

The Contractor shall remove existing pavement and base materials. The Contractor shall dispose of materials in fill areas or as approved by the Engineer. Grading and shaping operations shall consist of excavating prior filled areas and the placing of fill material as needed for terrain restoration. The roadway's native subgrade shall be scarified prior to placement of any fill. Fill material in excess of project construction requirements shall be placed in the area of the old roadway and shaped to blend with natural contours according to the obliteration detail or specified grades, to the satisfaction of the Engineer. Compaction of fill in the restored areas shall range between 85% and 90% when tested with methods defined in section 211.4. Care shall be taken to ensure proper drainage. The area shall be seeded in accordance with Section 430 Landscaping and Planting.

212.3 MEASUREMENT:

Measurement of Roadway Obliteration will be the square yards of pavement designated to be removed within roadway obliteration limits.

212.4 PAYMENT:

Payment for Roadway Obliteration will be at the contract unit price. Payment shall be full compensation for removal of all asphalt pavement and base materials together with the grading and shaping operations, complete in place.

Part 200 add the following new Section:

SECTION 222
CEMENT STABILIZED ALLUVIUM BANK PROTECTION

222.1 DESCRIPTION:

The work under this section consists of constructing cement stabilized alluvium (CSA) bank protection at the locations shown on the plans and in accordance with these specifications, including excavating, backfilling and grading the river bed and banks to the lines, grades and cross sections shown on the plans or established by the Engineer; furnishing, processing and mixing aggregate, cement, fly ash and water; spreading and compacting the mixture; and placement of curing seal.

222.2 MATERIALS:

222.2.1 Aggregate shall be clean, sound, durable, uniform in quality and free of any soft, friable material, organic matter, oil, alkali or other deleterious substances. Aggregate shall conform to the following requirements.

Aggregate Size	Percent Passing
3 inch	100
No. 4	30-65
No. 200	0-8

Sampling and sieve analysis shall be performed in accordance with ASTM D75 and ASTM C136.

The plasticity index shall be no greater than 10 in accordance with the requirements of AASHTO T-90. Clay lumps larger than one inch shall be screened out of the raw soil prior to mixing.

Before placing aggregates upon the stockpile site, the site shall be cleared of vegetation, trees, stumps, brush, rocks and other debris, and the ground leveled to a smooth, firm, uniform surface.

Stockpiles shall be constructed upon prepared sites. The piles when completed shall be neat and regular in shape. The stockpile height shall be limited to a maximum of 13 feet.

Stockpiles in excess of 200 cubic yards shall be built up in layers not more than 4 feet in depth. Stockpile layers shall be constructed by trucks, "clamshells", or other methods approved by the Engineer. Pushing aggregates into a pile by a bulldozer will not be permitted. Each layer shall be completed over the entire layer of the pile before depositing aggregates in the next layer.

The aggregate shall not be dumped so that any part of it runs down and over the lower layers in

the stockpile. The method of dropping from a bucket or spout in one location so as to form a cone shaped pile will not be permitted. Any method of placing aggregates in stockpiles, which, in the opinion of the Engineer, segregates, breaks, degrades or otherwise damages the aggregates will not be permitted.

Only pneumatic tired equipment shall be used on the processed or manufactured aggregates in constructing the stockpiles. When removing materials from the face of the stockpile, the equipment shall be operated in such a manner as to face-load from the floor to the top of the stockpile to obtain maximum homogeneity of materials.

Stockpiles shall not be constructed where traffic, vehicles or Contractor's equipment will either run over or through the stockpile, or cause foreign matter to be mixed with the aggregates.

222.2.2 Cement shall conform to the requirements for low alkali, Type II Portland Cement of Section 725.2.

222.2.3 Fly ash shall conform to the requirements of Section 725.2.1 for pozzolonic materials.

222.2.4 Water used for mixing shall be potable and free from oil, vegetable matter and any other deleterious matter; and shall conform to Section 725.4.

222.2.5 CSA shall have a minimum compressive strength of 0.75 ksi at seven days, determined in accordance with the requirements of Arizona Test Method 241

(Modification of AASHTO T-134). At least one test (two cylinders) shall be made for each 1,300 cubic yards of CSA placed.

222.2.6 Bedding Mortar shall consist of broomable, high portland cement/fly ash content, heavily sanded mortar, with a compressive strength of 2.9 ksi at 28 days, and shall have a slump of approximately 8.0 to 9.0 inches. The sand (fine aggregate) shall satisfy Sections 701.3, 776.3 and the following gradation:

Aggregate Size	Percent Passing
3/8 inch	100
No. 4	95-100
No. 16	45-80
No. 50	0-30
No. 140	0-10
No. 200	0-4

222.2.7 Exterior Concrete shall be Class B, conforming to Section 725.1.

222.2.8 Forms shall be mortar tight and designed, constructed, braced and maintained so that the finished concrete will be true to line and elevation; and will conform to the required dimensions and contours. They shall be designed to withstand the pressure of concrete, use of set-retarding admixtures or pozzolonic materials in the concrete, effects of vibration as the concrete is being placed and all loads related to the construction operations, without distortion or displacement.

All forms shall be treated with an approved release agent before concrete is placed. Any material that will adhere to or discolor the concrete shall not be used.

222.3 CONSTRUCTION:

222.3.1 Mix Design: Contractor shall determine the mix proportions of the aggregate, cement, fly ash and water; and shall furnish CSA conforming to the requirements specified herein. The job-mix design with supporting test results shall be submitted to the Engineer for review. The Engineers approval shall be obtained prior to incorporating any material into the work.

The mix design objective is to provide the minimum cement plus fly ash content (C+P), W/C ratio and mix proportions to meet the specified strength, plus 2% additional cementitious materials (same C+P content) for durability and material variations. At the same time, the mix shall be dry (stiff) enough to support heavy placement and compaction equipment, yet wet enough to permit effective consolidation by adequate distribution of the paste binder throughout the CSA mass, during the mixing and placing process. The C+P content during CSA production shall not be decreased nor increased from that of the approved job-mix design unless approved by the Engineer. Actual mix designs, used on this project, shall be determined from the Contractor's laboratory tests from material stockpiled after construction of the stockpiles is completed.

The mix design shall be performed in accordance with Arizona Test Method 220 (Determination of Cement Content Required for Cement Treated Mixtures, a modification of AASHTO T-144) to determine the cementitious (C+P) content necessary for the strength required for CSA.
Determination of the optimum moisture content for compaction of the CSA mixture, including the additional 2% cementitious material for durability, shall be in accordance with AASHTO T-134, Method B. The additional 2% cementitious materials shall be a mixture of cement and fly ash in the same proportions as used in the mix design to meet the strength requirement. The total weight of cement replaced by fly ash shall not exceed 15%.

The Contractor shall follow the general provisions in accordance with Arizona Test Method 220 and AASHTO T-99, Method D, with the following exceptions:

The AASHTO T-99, Method D, shall be used in determining maximum dry density, modified to the extent that a rock correction will be calculated to correct for aggregate passing the 3.0-inch and retained on the 5/8 inch sieves. No correction will be used in determining the optimum moisture content.

Included in the job-mix design data shall be the grade of cement, brand of fly ash, and source of aggregate. A new mix design shall be submitted for approval at least two weeks prior to use, any time the Contractor requests a change in materials or proportioning of the materials from that given in the approved mix design.

222.3.2 Preparation of Subgrade: CSA shall be placed on a prepared subgrade shaped to the lines and grades shown on the plans, or be placed on existing CSA. The subgrade shall be compacted to a minimum of 95% of the maximum density in accordance with Section 301.3. When the embankment material is composed predominately of rock such that these compaction procedures will not achieve the required density, the Engineer will determine the amount of compaction required and the adequacy of equipment used to obtain the required compaction.

Immediately prior to placement of the CSA, the subgrade shall be uniformly moistened and maintained in an acceptable condition throughout the placement operation. Soft or yielding subgrade shall be corrected and made stable before construction proceeds. Saturated or submerged subgrade shall remain dewatered a minimum of 48 hours after placement of the CSA.

When CSA is to rest on rock, the rock shall be fully uncovered. The surface of the rock shall be removed to a depth sufficient to expose sound rock. Bedrock shall be roughly leveled or cut to approximate horizontal and vertical steps. Seams in the rock shall be grouted where determined

by the Engineer.

When placed on existing CSA, the surface receiving the new CSA shall be cleaned to the satisfaction of the Engineer in the following manner:

After exposing the CSA structure, the surface shall be thoroughly cleaned of all loose materials foreign to the CSA. The surface shall be cleaned by sand-blast or hydro-blast (2.0 ksi maximum) to remove all foreign or loosened particles and hand scaled, if necessary, to provide a clean rough surface, free of loose materials, satisfactory to the Engineer.

The old CSA surface shall be moist at the time of placement and a ¼ inch layer of broomable bedding mortar (2.9 ksi) shall be used between the old and new CSA. A set retarding admixture shall be used in the mortar during hot weather placement.

222.3.3 Mixing, General Requirements: Aggregate, fly ash and cement shall be proportioned and mixed in a central mixing plant, unless otherwise permitted by the Engineer. The plant shall be either the batch mixing type (using revolving blade or rotary drum), or the continuous mixing type. The aggregate fly ash and cement shall be proportioned by weight. Certification for each shipment of cement or fly ash shall be provided to the Engineer.

The fly ash and cement shall be added in such a manner so that they are uniformly distributed throughout the mixing operation.

There shall be safe, convenient facilities for sampling the cement and fly ash in the supply line to the weight hopper or pugmill. The charge in the batch mixer or continuous mixer shall not exceed that which will permit complete mixing of the materials.

The water shall be proportioned by weight or volume and there shall be some means to enable the Engineer to verify the amount of water in each batch or the rate of water flow for continuous mixing. The time of the addition of water or the points where it is introduced into the mixer shall be as approved by the Engineer.

Control of water content in the field shall be accomplished in two ways:

(1) The moisture-density relationship for the CSA shall be determined in accordance with AASHTO T-134, Method B, on a routine basis, or when any significant shift in the gradation or rock content occurs.

(2) The actual moisture content of the mixture at the time of compaction, or shortly thereafter, shall be determined in accordance with ASTM D2216 (oven dry) or AASHTO T 310 (nuclear method), to determine if the optimum moisture content as determined by AASHTO T 134, Method B, is being maintained. Water content in the aggregates is to be continuously monitored and the mixing water shall be adjusted as necessary to maintain proper moisture.

222.3.4 Batch Mixing: The mixer shall be equipped with a sufficient number of paddles of a type and arrangement to produce a uniformly mixed batch. The mixer shall be equipped with a timing device which will indicate, by a definite audible or visual signal, the expiration of the mixing period. The device shall be accurate to within two seconds. The time of mixing shall begin after all the ingredients are in the mixer and shall end when the mixer is half emptied. The allowable tolerance for weight batching of aggregates and cementitious material will be 2.0% and 0.5%, respectively, for each batch.

The batch mixing plant shall provide sampling facilities that are satisfactory to the Engineer and which will allow representative samples of the CSA to be obtained easily and safely.

222.3.5 Continuous Mixing: A control system shall be provided that will automatically close down the plant when the material in any storage facility approaches the strike-off capacity of the feed gate. The plant will not be permitted to operate unless this automatic control system is in good working condition.

The feeder for the aggregate shall be mechanically or electrically driven.

Aggregate shall be drawn from the stockpile by a feeder or feeders that will continuously supply the correct amount of aggregate.

The cement/fly ash and aggregate feeders shall be equipped with devices that can accurately determine the rate of feed while the plant is in full operation.

Continuous mix plants shall provide sampling facilities which are satisfactory to the Engineer, and that allow representative samples of the aggregate and CSA mixture to be obtained easily and safely.

222.3.6 Transporting/Spreading: Mixed materials shall be transported from the plant to the construction site in vehicles and spread on the prepared subgrade or previously completed CSA. Spreading shall be accomplished by the use of approved motor graders or crawler type equipment. The compacted lifts of CSA shall not exceed 8.0 inch or be less than 4.0 inch in thickness.

Aggregate shall not be mixed or placed when the air temperature is below 45° F in the shade, unless the air temperature is at least 45° F in the next 24 hours. CSA shall not be mixed or placed when the air temperature is greater than 109° F in the shade.

222.3.7 Compacting/Finishing: All completed CSA surfaces that will be covered with succeeding layers of CSA shall be kept continuously moist by fog spraying until placement of next lift.

CSA shall be uniformly compacted to a minimum of 98%, with an average of 100%, of maximum density as monitored by nuclear density tests in accordance with AASHTO T 238 and T 310. Maximum density shall be determined in the lab in accordance with the requirements of AASHTO T 99, Method D, for minus 0.75-inch material only, with rock correction at each density test location according to AASHTO T 224, Section 2.2.2. At least one density test shall be taken for each 460 cubic yards of CSA.

At the start of compaction of each lift, the mixture shall be in uniform, loose condition throughout its full depth. The moisture content shall be as previously specified herein. No section shall be left undisturbed for longer than thirty minutes during compaction operations. Compaction of each lift shall be accomplished in such a manner as to produce a dense surface, free of compaction planes, and shall be completed within one (1) hour from the time water is added to the mixture. After compaction, CSA shall be shaped to the required grades, cross sections and rolled to a reasonably smooth surface. Whenever the Contractor's operation is interrupted for more than two hours, the top surface of the completed layer, if smooth, shall be scarified to a depth of at least 1 inch with a spike-tooth instrument prior to placement of the next lift. The surface, after scarifying, shall be swept using a power broom or other method approved by the Engineer, to completely free the surface of all loose material prior to the placement of the next lift.

At the time of compaction, the moisture content shall not be more than one percent (1%) below optimum and shall not be more than one percent (1%) above optimum when the mean air

temperature during construction hours does not exceed 90° F.

When the mean air temperature does exceed 90° F, or there is a breeze or wind which promotes rapid drying of the CSA mixture, the moisture content shall be increased as needed, at the direction of the Engineer, but shall be less than the amount that will cause the CSA to become unstable during compaction and finishing operations.

Backfill shall not be placed within 40 inches of the top of the CSA surface. Construction joints shall be provided at the end of each day's work or when work is halted for two hours or more. The joints shall be trimmed to a straight line and vertical to the full depth of the lift. Before resuming placement of new material, the joints shall be roughened and loose material removed by power broom or compressed air.

Compaction equipment shall be capable of obtaining specified requirements without detrimentally affecting the compacted material. The equipment shall be modern, efficient compacting units approved by the Engineer. The units shall be of a type that is capable of compacting each lift of material as specified, and meet the minimum requirements as contained herein:

Self-propelled drum drive vibratory roller shall be of a type that will transmit dynamic impact to the surface to be compacted through a steel drum by means of revolving weights, eccentric shaft or other methods. The compactor shall have a gross mass of not less than 23,000 lbs. and shall produce a dynamic force of at least 13 lbs. per inch of drum width when operated at 2,400 cycles per minute (cpm). The dynamic force is defined as the force developed by revolving the eccentric weight at 2,400 cpm. The roller shall have a smooth drum or drums and the drum diameter shall be between 48 inches and 70 inches, and the width shall be between 28 inches and 100 inches. The frequency of vibration during operation shall be 2,400 cpm. The roller shall be operated at speeds not to exceed 15 mph in the forward direction. The engine driving the eccentric mass shall have a rating of not less than 90 kilowatts. Variation in speed, frequency and method of operation will be determined when found necessary to secure maximum compaction of materials.

Heavier compacting units may be required to achieve the required density.

222.3.8 Bedding Mortar: Bedding Mortar shall be used between CSA that has been in place more than seven (7) days and the new CSA after the existing CSA has been properly cleaned. The bedding mortar is to be used for achieving bond between the old and new CSA layers and to eliminate and prevent segregation or voids along the margins of CSA placements. Adjustment to the mix design may be required by the Engineer.

222.3.9 Control Strips: A control strip shall be constructed at the beginning of work on the CSA to be compacted. The control strip construction will be required to establish procedures necessary to obtain densities for the specific course plus use of portable nuclear moisture/density testing equipment to determine in-place densities.

Each control strip, constructed to acceptable density and surface tolerances shall remain in place and become a section of the completed CSA. Unacceptable control strips shall be corrected or removed and replaced at the Contractor's expense. A control strip shall cover an area of approximately 420 square yards and be of the same dimensions specified for the CSA course.

The materials used in construction of the control strip shall conform to the specification requirements. They shall be furnished from the same source and be of the same type as used in the CSA. The underlying surface for the control strip shall have prior approval of the Engineer.

The equipment used in the control strip shall be of the same type and weight as used for the CSA.

Compaction of control strips shall start immediately after the course has been placed to the specified thickness, and shall be continuous and uniform over the entire surface. Compaction of the strip shall continue until no discernible increase in density can be obtained by additional effort.

Upon completion of compaction, the mean density of the control strip will be determined by averaging the results of ten density tests taken at random sites within the strip. If the mean density of the control strip is less than 98% of the laboratory compacted specimens as determined by testing procedures appropriate for the material being placed, the Engineer may order the construction of another control strip.

A new control strip may be ordered by the Engineer, or requested by the Contractor when:

(1) A change in material or mix design.

(2) There is reason to believe that the control strip density is not representative for the material being placed.

(3) Ten days of production have passed without a new control strip.

222.3.10 Power Tampers and Small Vibratory Rollers: Small vibratory rollers that are capable of operating within a few millimeters of a vertical face shall be used for compaction adjacent to guide banks, next to utilities and drainage conduit, at transitions to previously constructed levee protection and at other areas where larger vibratory rollers cannot maneuver. The dynamic force produced by the small vibratory rollers shall be at least 140 lbs. per inch of drum width.
Tampers shall be a type capable of developing a force per blow of at least 1390 lbs. The amount of rolling and tamping required shall be whatever is necessary for the particular equipment to provide the same degree of compaction as would be obtained by four passes of the large self-propelled vibratory roller. Standby replacement equipment shall be available within one hour if needed.

222.3.11 Curing: Temporarily exposed surfaces shall be kept continuously moist. Care must be exercised to ensure that no curing material other than water is applied to the surface that will be in contact with succeeding layers.

Permanently exposed surfaces shall be kept in a moist condition for seven days, or they may be covered with bituminous or other suitable curing material, subject to the Engineer's approval. Any damage to the protective covering within the seven days shall be repaired to the satisfaction of the Engineer.

Regardless of the curing material used, any permanently exposed surface shall be kept moist until the protective cover is applied. This protective cover is to be applied as soon as practical, with a maximum time limit of twenty-four hours between the finishing of the surface and the application of the protective cover.

222.3.12 Maintenance: The Contractor will be required, within the limits of the contract, to maintain the CSA and curing seal in good condition until the work is completed and accepted. Maintenance shall include repairs to any defects that may occur. This work will be done at the Contractor's expense and repeated as often as necessary. Faulty work shall be replaced for the full depth of the layer.

222.4 MEASUREMENT:

The work will be measured by the cubic yard of completed CSA bank protection constructed to the lines, grades and cross-sections shown on the plans.

The maximum limit for the placement of CSA due to over excavation or sloughing of existing soils shall be 4 inches. Any placement beyond these limits will not be included in the pay quantity.

222.5 PAYMENT:

The accepted quantities of CSA will be paid for at the contract price per cubic yard for CSA Bank Protection, subject to the following penalties for failure to achieve the required strength requirements:

Percent of Specified Strength	Percent of Contract Unit Price
□100	100
97-99	92
94-96	85
90-94	77
85-89	68
80-84	60
75-79	50
□75	See Note

Note: Material represented by lots attaining seven day compressive strengths with a mean value less than 75% of the specified compressive strength will be evaluated as to acceptance. The Engineer will determine if the material can be left in place or removed and replaced at the Contractor's expense.

Part 300 add the following new Section:

SECTION 308
STABILIZATION USING LIME SLURRY WITH FLY ASH

308.1 DESCRIPTION:
This section shall consist of constructing a mixture of soil, lime slurry, fly ash and water for the stabilization of soils or base materials. The work shall be performed in conformity with the lines, grades, thickness, and typical cross sections shown on the plans.

308.2 MATERIALS:

308.2.1 Soil or Subgrade: The soil or subgrade material used for this work shall consist of materials on the site or imported and shall be free of roots, sod, weeds, and stones larger than 3 inches.

308.2.2 Quicklime and Hydrated Lime: Lime used to manufacture the Commercial Lime Slurry specified herein, shall be either Quicklime or Hydrated lime and shall conform to the requirements of ASTM C977. Lime may only be used in the production of lime slurry. The direct use of dry hydrated lime or quicklime to the soil material is strictly prohibited. All lime shall come from a single source. If a source change is requested, a new mix design shall be submitted using lime from the proposed new source. The new design must be approved by the Engineer prior to use.

308.2.3 Commercial Lime Slurry: Commercial lime slurry shall be a pumpable

suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of solids content, shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

(A) Chemical Composition: The solids content of the lime slurry shall consist of a minimum of 90 percent by weight, of calcium and magnesium oxides (CaO and MgO), as determined by ASTM C25.

(B) Residue: The percent by weight of residue retained in the solids content of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 sieve	Max. 0.2%
Residue retained on a No. 30 sieve	Max. 4.0%

(C) Grade: Commercial lime slurry shall conform to a dry solids content as approved by the Engineer.

A certificate of compliance and a field summary of lime slurry produced shall be provided to the Engineer for each load of slurry.

308.2.4 Water: Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. The pH (hydrogen ion concentration) of water to be used during construction for mixing or curing shall be within the range of 6.0 to 8.5. The procedure for determining pH values shall be based on the test apparatus used, the test apparatus may use either an electrometric or colorimetric method. The testing procedure shall be in accordance with the methods and instructions furnished by the manufacturer of the test apparatus. Water known to be of potable quality may be used without testing.

308.2.5 Fly Ash: Fly ash shall meet the requirements of AASHTO M-295, Class C.

308.3 MIX DESIGN:

Before commencing lime / fly ash treatment work, the Contractor shall submit for approval by the Engineer, a proposed mix design. A testing laboratory under the direction and control of an Arizona registered Professional Engineer shall prepare the proposed mix design. The mix design shall be determined using the soils or subgrade material to be stabilized, water from the source to be used during construction, and lime and fly ash from the proposed suppliers. The mix design shall identify the water source to be used during construction and, if not from a potable source, the water's pH value.

The mix design shall determine the following:

- Percent of fly ash and rate of application.
- Percent of lime and rate of application of lime slurry in the treated soil or subgrade material.
- Optimum water content during mixing, curing and compaction. Gradation of in-situ mixture after treatment.
- Additional mixing or equipment requirements. Mellowing time requirements, if needed.

The mix design shall comply with the following requirements:

- Plasticity Index: Less than 3, per AASHTO T-89 & 90.
- Swell Potential: One (1) percent or less vertical expansion of an air dried soil when inundated with water and allowed to swell at a confined pressure of 60 psi.
- Unconfined Compressive Strength: Minimum 300 psi in five days curing at 100□ F when tested in accordance with ASTM D1633 Method A.
-

308.4 CONSTRUCTION:

308.4.1 General: The completed subgrade shall consist of a uniform lime / fly ash mixture, free from loose segregated areas, have a uniform density and moisture content, and be well bound for its full depth. A smooth surface suitable for placing subsequent courses is required if pavement is to be placed directly on the treated subgrade.

Prior to beginning stabilization, the subgrade shall be constructed and brought to grade and shall be shaped to conform to the typical sections, lines, and grades as shown on the plans.

When the design requires treatment to a depth greater than 12 inches, the subgrade soil shall be treated in equal layers. The top layer(s) of soil shall be removed and stockpiled. The lower layer of soil to be treated shall then be treated and allowed to cure in place. After final mixing, the lower layer shall be compacted in maximum 12 inch compacted lifts. The stockpiled soil shall then be placed, treated, mixed and compacted in successive maximum 12 inch compacted lifts.

308.4.2 Weather Limitation: Lime slurry / fly ash treated subgrade shall not be constructed if the atmospheric temperature is below 40□ F or when conditions indicate that temperatures may fall below 40□ F within 24 hours.

308.4.3 Equipment: Contractor shall provide all equipment necessary to complete the work, including grading and scarifying equipment, lime slurry spreader (gravity feed spreaders will not be permitted), fly ash spreader, mixing and pulverizing equipment, sheepsfoot and pneumatic rollers, sprinkling equipment, and trucks. When using dry hydrate to make slurry, agitators are mandatory in spreader. All equipment used for this work shall be subject to approval by the Engineer.

308.4.4 Application: Lime slurry and fly ash slurry shall be spread only on that area where the mixing operations can be completed during the same working day. The application and mixing of lime and fly ash with the soil shall be accomplished by the methods hereinafter described as Slurry Placing.

Slurry Placing: Fly ash shall be spread with trucks equipped with an approved distribution system on the prepared subgrade at the rate specified by the job mix design in a single pass, just prior to the application of the lime slurry. The fly ash may be added to the lime slurry and placed together, if approved by the Engineer. Lime slurry / Lime slurry fly ash, shall be mixed in a portable mixing unit and spread with trucks equipped with an approved distribution system as a slurry. Commercial lime slurry shall be applied with a lime percentage not less than specified herein. The distribution of lime slurry shall be attained by successive passes over a measured section of subgrade until the proper amount of lime has been spread, as determined in the job mix design. The rate of application shall be verified using ASTM D3155methods.

Thickness: The thickness of the lime slurry treated subgrade shall be determined by visual inspection and/or by depth tests taken at intervals so that each test shall represent no more than

1000 square yards per layer, if more than one layer. The method used to remove material to determine depth of lime treatment may be by shovel and/or pick, coring or other method approved by the Engineer. Phenolphthalein solution shall be used to detect the presence of lime. When the grade deficiency is more than 1 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. Contractor shall replace, at no cost to the Agency, the material where depth tests are taken.

No traffic other than the mixing equipment will be allowed to pass over the spread of lime slurry until after completion of mixing.

308.4.5 Mixing: The full depth of the treated subgrade shall be mixed with an approved mixing machine. The use of disc plows or blades are prohibited except in areas specified by the engineer. To ensure a complete chemical reaction of the lime, fly ash and soil or subgrade, water shall be used as required to maintain a moisture content at or above the optimum prior to beginning compaction and held above optimum during compaction. During the interval of time between application and mixing, lime that has been applied, unmixed and exposed to the open air for 10 hours or more will not be accepted.

After mixing and prior to compaction, clay lumps shall meet the following criteria:

	Percent (by Weight)
Minimum of clay lumps passing 1½ inch sieve	100
Minimum of clay lumps passing No. 4 sieve	60

308.4.6 Compaction: Compaction of the mixture shall begin after final mixing. Sheepsfoot or segmented steel rollers shall be used during initial compaction. Steel wheel or pneumatic tired rollers shall be used only during final compaction, if pavement is to be placed directly on the treated subgrade. Areas inaccessible to rollers shall be compacted to the required density by methods approved by the Engineer.

The material shall be aerated or watered as necessary to provide and maintain required moisture content. The field density of the compacted mixture shall be a least 95 percent of the maximum density at 0-4 percent above optimum moisture. A composite of treated soil or subgrade materials from a minimum of five (5) random locations, per soil type, within the area to be stabilized shall be used to determine the maximum density and optimum moisture content in accordance with ASTM D558. The in-place field density shall be determined in accordance with ASTM D1556, ASTM D2167 or ASTM D2922.

After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet requirements.

If pumping subgrade should become evident at any time prior to paving, the Engineer may require proof rolling with a pneumatic-tire roller or other approved equipment in order to identify the limits of the unacceptable area. The proof rolling will be performed at no additional cost to the Contracting Agency.

All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and compacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts. Compaction and finishing shall be done in such a manner as to produce a smooth dense surface free of compaction planes, cracks, ridges, or loose materials.

Throughout this entire operation, the shape of the course shall be maintained by blading, and the

surface upon completion, shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at no cost to the County.

308.4.6.1 Tolerances: At final compaction, the lime, fly ash and water content for each course of subgrade treatment shall conform to the approved mix design with the following tolerances.

Material	**Tolerance**
Lime	+0.5% of design, (ASTM C114)
Fly Ash	±1.0% of design, (ASTM C114)
Water	+4%, -0% of optimum, (ASTM D698)

308.4.7 Finishing and Curing: After the final layer or course of lime slurry / fly ash treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the plans. The completed section shall then be finished by rolling with a pneumatic or other suitable roller.

The final layer of lime slurry / fly ash treated subgrade shall be maintained in a moist condition until the next layer of pavement structure is placed. If required, a fog seal for curing, in compliance with Section 333, shall be furnished and applied to the surface of the final layer of the lime stabilized material as soon as possible after the completion of final rolling and before the temperature falls below 40□ F. Curing seal shall be applied at a rate between 0.10 and 0.20 gallons per square yard of surface. The exact rate will be determined by the Engineer.

After curing begins, all traffic, except necessary construction equipment shall be kept off the lime slurry / fly ash stabilized subgrade for a minimum of 7 days or until the final pavement structure layer(s) are placed.

308.4.8 Maintenance: The Contractor shall maintain, at his / her own expense, the entire lime slurry treated subgrade in good condition from the start of work until all the work has been completed, cured, and accepted by the Engineer.

308.5 MEASUREMENT:

The quantity of lime slurry / fly ash treated soils shall be measured by the square yard, measured in place, treated, compacted, to the proper depth, and accepted.

The quantity of curing seal shall be measured by the ton, diluted.

308.6 PAYMENT:

The lime slurry / fly ash treated soils measured as provided above will be paid for at the contract price per square yard, which price shall be full compensation for the item complete in place, as herein described and specified.

Payment for curing seal will be made at the contract price per ton for Fog Seal (Contingent Item) based on the rate of application as requested by the Engineer.

SECTION 310
PLACEMENT AND CONSTRUCTION OF AGGREGATE BASE COURSE

310.5 PAYMENT, replace with the following Payment for aggregate base course will be paid at the contract unit price per cubic yard for the type involved, complete in place.

SECTION 317
ASPHALT MILLING

317.2 CONSTRUCTION REQUIREMENTS, add the following:

Asphalt milling adjacent to valley gutters or curb and gutter shall include removal and disposal of built-up asphalt concrete, slurry seal, microsurfacing and similar materials from adjacent concrete valley gutters or concrete gutter pans.

317.3 MEASUREMENT AND PAYMENT, add the following:

Removal and disposal of built-up materials from adjacent portland cement concrete surfaces shall not be measured; the associated cost shall be included in the contract unit price for Asphalt Milling.

SECTION 321
PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

321.8.2 Joints, add the following:

Longitudinal joints shall be located to maintain a minimum 6-inch clear distance from the edge of any proposed longitudinal pavement stripe.

321.8.6 Asphalt Concrete Overlay, replace paragraphs (a) and (b) with the following:

(a) Areas designated for pavement repair or surface replacement by the contract documents (which may include localized pavement failures, severely raveled areas, severely cracked areas, over-asphalted areas, and other defects) shall be cut out and replaced. Pavement repairs and surface replacements shall be completed and approved before placing asphalt concrete overlay.

(b) Before placing asphalt concrete overlay, thermoplastic pavement markings and raised pavement markers shall be removed and milling shall be completed. Milling shall be as shown on the plans or specified in the special provisions in accordance with Section 317.

321.10.1 Acceptance Criteria, replace the third sentence with the following:

When the quantity of asphalt concrete placed in a day exceeds 1000 tons but is less than 2000 tons, the day's production will be divided into two (2) approximately equal sublots. Where the quantity of asphalt concrete placed in a day exceeds 2000 tons, the day's production will be divided into three (3) approximately equal sublots. A minimum of one sample will be obtained from each lot.

321.13 PAYMENT, add the following:

Payment for removal of thermoplastic markings and raised pavement markers prior to roadway overlay operations will be as specified in Section 460.

Payment for asphalt pavement replacement and asphalt pavement repair required prior to roadway overlay operations will be as specified in Section 336.

SECTION 325
PLACEMENT AND CONSTRUCTION OF ASPHALT-RUBBER ASPHALT CONCRETE

325.7 PLACEMENT:

325.7.2 Placing and Construction Methods, add the following:

Longitudinal joints shall be located to maintain a minimum 6-inch clear distance from the edge of any proposed longitudinal pavement stripe.

325.7.3 Compaction:

Delete the phrase "any desired" from the first sentence.

325.7.5 Adjustments, add the following:

When the Engineer determines an insufficient amount of material is available for shoulder adjustment, the Engineer may require the Contractor to provide additional material.

325.8 QUALITY CONTROL, add the following:

Requests for an Engineering Analysis or Referee Testing as described in 325.9.4 and 325.10 will not be considered unless based on quality control test results by an AMRL and CCRL accredited laboratory using properly certified technicians in accordance with ASTM D3666, Section 7 (Personnel Qualifications).

325.9 ACCEPTANCE:

325.9.1 Acceptance Criteria, replace the third sentence with the following:

When the quantity of ARAC placed in a day does not exceed 1000 tons, the day's total production shall be considered as a single sublot. When the quantity of ARAC placed in a day exceeds 1000 tons but is less than 2000 tons, the day's production shall be divided into two (2) approximately equal sublots. Where the quantity of ARAC placed in a day exceeds 2000 tons, the day's production shall be divided into three (3) approximately equal sublots.

325.9.2 Gradation and Binder Content, replace the first paragraph with the following:

Acceptance testing for gradation and binder content will be performed in accordance with section 325.9.2.2 End Product Sampling and Testing.

325.9.2.2.1 Mineral Aggregate Gradation and Binder Content, add the following:

The Engineer may run tests to determine the correction factor to be used with AASHTO test procedure T 308. When requested by the Engineer, the contractor shall provide calibration

materials to the Engineer.

325.9.6 Engineering Analysis (EA), replace Table 325-4 with the following:

TABLE 325-4		
ENGINEERING ANALYSIS PENALTIES for REMOVAL* LOTS/SUBLOTS LEFT IN-PLACE		
Acceptance Criteria	**Acceptance Limits**	**Penalty When Contracting Agency is the Owner ($/Ton)**
Asphalt-Rubber Binder Content	Over 0.2% points from that Permitted	$9.00
Laboratory Air Voids (Measured at 75 blows)	Deviation from Target Greater Than ± 4.0%	$7.50

325.12 PAYMENT, add the following

Payment for removal of thermoplastic markings and raised pavement markers will be as specified in Section 460.

Payment for asphalt pavement replacement and asphalt pavement repair will be as specified in Section 336.

SECTION 329
TACK COAT

329.1 DESCRIPTION, add the following:

Emulsified asphalt for tack coat shall be grade SS-1h.

SECTION 333
FOG SEAL COATS

333.1 DESCRIPTION, add the following:

Fog seal coats for curing seal purposes as specified in Section 308 or Section 309 shall consist of the application of emulsified asphalt.

333.6 APPLICATION OF ASPHALT EMULSION, add the following:

For curing seal applications over Lime Slurry Stabilization or Lime Slurry with Fly Ash Stabilization the application rate shall be between 0.10 to 0.20 gallons per square yard.

SECTION 336
PAVEMENT MATCHING AND SURFACE REPLACEMENT

336.2 MATERIALS AND CONSTRUCTION METHODS

336.2.3 Temporary Pavement Replacement, add the following:

Temporary pavement replacement that uses cold-mix asphalt concrete shall be replaced no later than seven (7) calendar days after initial placement.

336.2.4 Permanent Pavement Replacement and Adjustments, add the following:

336.2.4.3 Pavement Repair: Areas designated for pavement repair are suspected subgrade failure areas within asphalt pavement. Pavement repair consist of removal of the existing pavement structural section (asphalt pavement and the underlying aggregate base), exposing and then removal of subgrade material to a depth of eight inches (8"), backfill and compact subgrade and aggregate base materials to depths as directed by the Engineer, and replacement of the asphalt pavement. The Engineer may revise the removal boundary limits at any time during this work. The Engineer shall be notified and given the opportunity to inspect the soil conditions when the subgrade is exposed prior to excavating subgrade material and again at the completion of subgrade excavation.

After approval of the excavation by the Engineer, the Contractor shall proceed with placement of subgrade and aggregate base materials to elevations directed by the Engineer. Compaction of subgrade and aggregate base shall comply with requirements of Table 601-2. The aggregate base material placed shall be compliant with section 702 requirements; the removed aggregate base may or may not be compliant. After placement of the aggregate base course to the bottom of the adjacent pavement, sawcut and remove asphalt pavement to one foot back of the newly placed aggregate base and then construct new asphalt pavement matching the adjacent existing grades and slopes. Asphalt pavement shall be constructed in accordance with the Section 336.2.4.1 Permanent Asphalt Pavement Replacement, except application of a seal coat is not required.

336.3 TYPES AND LOCATIONS OF TRENCH SURFACE REPLACEMENT, add the following:

Type B trench repair is not approved for use within County right of way.

336.5 PAYMENT, add the following:

Payment for asphalt pavement repair shall be full compensation for all labor, equipment, and materials required for the complete in place repair including but not limited to pavement removal, excavation, aggregate base coarse placement, and asphalt pavement replacement.

SECTION 337
CRACK SEALING

Replace **SECTION 337 CRACK SEALING** with the following:

SECTION 337 CRACK SEALING AND FILLING

337.1 DESCRIPTION:

This work consists of furnishing and placing sealant or filler material in Contractor prepared cracks and joints of asphalt concrete or portland cement concrete pavements. All cracks and joints, including the space between asphalt concrete pavement and concrete curb and gutter, which have a clear opening of one-quarter inch (¼") or greater, shall be sealed for the length of the crack that equals or exceeds one-eighth inch (⅛") in width.

337.2 MATERIALS:

337.2.1 Material for Category 1 Cracks: Cracks and joints which have a clear opening ranging from one-quarter inch (¼") to one and one-half inches (1½") shall be classified as category 1 cracks. Sealant materials for category 1 cracks shall be a premixed, single component mixture of asphalt cement, aromatic extender oils, polymers, and granulized rubber in a closely controlled manufacturing process. Materials shall conform to the following specifications when heated in accordance with ASTM D5078 and the manufacturer's maximum safe heating temperature.

TEST	REQUIREMENT
Cone Penetration (ASTM D5329)	20-40
Resilience (ASTM D5329)	30% Minimum
Softening Point (ASTM D113)	210°F (99°C) Minimum
Ductility, 77°F (25°C) (ASTM D113)	30 cm Minimum
Flexibility (ASTM D3111 *Modified)	Pass at 30°F (-1°C)
Flow 140°F (60°C) (ASTM D5329)	3 mm Maximum
Brookfield Viscosity 380°F (193°C) (ASTM D2669)	90 Poise Maximum
Asphalt Compatibility (ASTM D5329)	Pass
Bitumen Content (ASTM D4)	60% Minimum
Tensile Adhesion (ASTM D5329)	400% Minimum
Maximum Heating Temperature	400°F (204°C)
Minimum Heating Temperature	380°F (193°C)
Flash Point (ASTM D92)	450°F Minimum

*Specimen bent 90° over a 1-inch mandrel within 10 seconds.

337.2.2 Material for Category 2 Cracks: Cracks and joints which have a clear opening ranging from one and one-half inches (1½") to three inches (3") shall be classified as category 2 cracks. Filler material for category 2 cracks shall be hot applied, pourable, high bonding mastic for application in unconfined areas and for vertical-side recessed configurations. Upon curing the material shall provide a flexible waterproof seal. The material shall be traffic ready in thirty minutes or less when installed in accordance with the manufacturer's instructions. Material for sealing category 2 cracks shall be Deery brand Level & Go Repair Mastic or approved equal.

337.2.3 Material for Category 3 Cracks: Cracks and joints which have a clear opening greater than three inches (>3") shall be classified as category 3 cracks. Material for filling category 3 cracks shall be asphalt concrete 3/8" marshal mix compliant with Section 710 and have 100% of the aggregate passing the 3/8" sieve.

337.2.4 Product Submittals: Prior to application of category 1 crack sealant and category 2 crack filler material, the Contractor shall submit the material manufacturer's product specifications together with installation recommendations which shall include surface preparation, product installation, and curing requirements. Certification of compliance for

sealant material shall be submitted. Asphalt mix design for category 3 crack filler material shall be submitted to the Engineer for approval.

The Engineer may request material samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

337.3 CLEANING AND PREPARING CRACKS OR JOINTS:

Immediately prior to application of sealant, all cracks and joints shall be cleaned of debris and dust. Cracks and joints shall be vacuumed during final cleaning.

337.3.1 Routing: When specified, narrow cracks shall be routed to create a sealant reservoir. Cutting shall remove at least ⅛" from each side and produce vertical, intact surfaces with no loosely bonded aggregate. Routing of joints and cracks shall produce a reservoir having a nominal size of ¾" wide by ¾" deep. Variations from the nominal size are subject to acceptance or rejection at the engineer's discretion

337.3.2 Vacuuming: Final cleaning shall thoroughly clean cracks and joints to a minimum depth of 1" for cracks that are ¾" or narrower and to the full asphalt depth for cracks that are wider than ¾". Surfaces are to be inspected to assure adequate cleanliness and dryness.

High pressure 90 psi minimum, dry oil free compressed air shall be used for final cleaning and dust removal from cracks. The high pressure tool shall be integral with a vacuum unit to collect the dust and residue. Both sides of the crack or joint shall be cleaned.

337.4 APPLICATION OF CATEGORY 1 CRACK SEALANTS:

337.4.1 Weather: In no case shall sealant be placed during damp roadway conditions such as wet roadway surfaces or damp material inside the cracks. Operations stopped by the Engineer, due to weather, shall be at no additional cost to the contracting Agency. If installing at night, ensure that dew is not forming on the pavement surface.

Sealant material shall only be applied when pavement temperature exceeds 40°F (4°C). If pavement temperature is lower than 40°F (4°C), it may be warmed using a heat lance that puts no direct flame on the pavement.

337.4.2 Temperature: Sealant temperatures are to be maintained at the maximum heating temperature recommended by the manufacture.

337.4.3 Equipment: The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through heat transfer oil. It shall be equipped with an on board automatic heat controlling device to permit the attainment of a predetermined temperature, and then maintain that temperature as long as required. The unit shall also have a means to vigorously and continuously agitate the sealant to meet the requirements of Appendix X1.1 of ASTM D6690. The sealant shall be applied to the pavement under pressure supplied by a gear pump with a hose and wand and direct connecting applicator tip. The pump shall have sufficient pressure to apply designated sealant at a rate of at least three (3) gallons (11.4 L) per minute. Melter applicators shall be approved for use by the sealant manufacturer.

337.4.4 Placement of Sealant: The sealant shall be applied in cracks, joints, and sealant reservoirs uniformly from bottom to top and shall be filled without formation of entrapped air or

voids.

Cracks and joints shall be slightly overfilled then leveled with a 3" sealing disk or v-shaped squeegee to create a neat band extending approximately 1" on each side of the crack or joint for surface waterproofing. The band shall be as thin as possible and shall not extend more than ⅛ inch above the pavement surface.

If the pavement is to be overlaid with Hot Mix Asphalt within six months of sealant application, cracks shall be routed, and sealant placement shall be recessed ¼" in the crack or joint reservoir with no over band. If routing is not used, the sealant over band thickness and width shall be kept as narrow and thin as possible.

During and after placement of the sealant, the Contractor shall protect against harm to persons or animals that may be exposed to the hot material.

337.4.5 Opening to Traffic: Sealant material shall not be exposed to traffic until fully cured. If the sealed area must be opened to traffic, blotter material shall be applied to the surface of all uncured sealant material.

All sealed cracks that have a clear opening of 1½ inches or greater shall have blotter material applied prior to opening to traffic.

On two lane roads or where traffic may come in contact with the hot sealant before it cures, a blotter or specialized bond breaking material shall be used to prevent asphalt bleeding and/or pickup of sealant by vehicular traffic. Blotter material shall be compatible with the crack sealant and any surface treatment being used.

337.5 APPLICATION OF FILLER MATERIAL FOR CATEGORY 2 CRACKS:

The Contractor shall comply with the material manufacturer's installation recommendations including but not limited to surface preparation, application equipment, and application procedures. No filler material shall be installed until all cracks to be filled have been inspected and approved by the Engineer. Filler material shall not be opened to traffic until fully cured.

337.6 APPLICATION OF FILLER MATERIAL FOR CATEGORY 3 CRACKS:

No filler material shall be installed until all cracks to be filled have been inspected and approved by the Engineer.

All machines, tools, and equipment used to install filler material will be subject to the Engineer's approval.

Hand tamp, vibratory plate compactor and rollers are acceptable for final compaction of filler material. Depending on depth of crack, lower lifts shall be compacted using a steel rod with a 1½" diameter head.

337.7 UNACCEPTABLE WORK:

The Contractor, at no additional cost to the contracting Agency, shall correct unacceptable work.

Unacceptable work shall include, but not be limited to, unsealed or unfilled cracks, material wastage on the sides of the roadway, and excess quantities of material on the roadway that adversely affects driving.

The Contractor shall not progress to a new area until the unacceptable work is corrected to the satisfaction of the Engineer. Correction of unacceptable work shall be accomplished within five working days after notification from the Engineer of the unacceptable work.

337.8 MEASUREMENT:

The Contractor shall meet with the Engineer or the Engineer's designated representative on a daily basis and supply a signed daily report indicating the date and identifying for each road segment:

- The amount of category 1 crack sealant material applied in total pounds and the total square yards of pavement sealed.
- The amount in pounds of category 2 crack filler material installed.
- The linear feet of category 3 cracks filled.

Payment for crack sealing and crack sealing shall be based on accepted quantities of Category 1 Crack Sealing, Category 2 Crack Filling, and Category 3 Crack Filling.

Accepted Category 1 Crack Sealing shall be measured by the square yards of pavement surface area sealed.

Accepted Category 2 Crack Filling shall be measured by the pounds of filler material placed.

Accepted Category 3 Crack Filling shall be the measured linear feet of cracks filled.

337.8 PAYMENT:

Payment for pavement crack sealing and crack filling will be at the contracted unit prices. Payment shall be full compensation for furnishing all labor, materials, equipment, tools, and incidentals used for surface preparation, placement of materials, and cleanup.

SECTION 350
REMOVAL OF EXISTING IMPROVEMENTS

350.1 DESCRIPTION, add the following:

The work under this Section shall consist of the disposal of any obstacle to construction, unless specifically noted on the Plans for removal or relocation by other entities.

Arrangements for disposal of all waste material shall be the responsibility of Contractor. All usable pipe culvert, as determined by the Engineer, shall be stockpiled within the right-of-way for salvage by the County. Removal and storage of traffic signs and other traffic control devices shall comply with section 401.2.5. Delivery of salvaged traffic signal and lighting equipment shall comply with section 470.6.

Removal of existing improvements shall be performed in a safe manner avoiding damage to improvements not designated for removal.

350.2 CONSTRUCTION METHODS

350.2.2 Others, add the following:

Removal of traffic signal pole foundations unless otherwise indicated shall be to a depth of at least 18 inches below finished grade.

Remove and Salvage Traffic Sign Assembly shall consist of salvaging existing sign panels and posts, removing and disposing of the existing foundations, backfilling and compacting all voids, and restoring the existing surface to match previous existing conditions. The sign panels and posts shall be dismantled in a manner that will prevent damage. Concrete sign foundations shall be disposed of by the contractor. Contractor shall pre-arrange delivery of sign panels and posts by calling (602) 506-8662. The sign panels and posts shall be transported to and unloaded at 2909 W. Durango Street by the contractor in a manner that will prevent damage. The quantity measured for Remove and Salvage Traffic Sign Assembly includes all sign panels and posts that are a part of the assembly.

Part 300 add the following new Section:

SECTION 351
RELOCATION AND ADJUSTMENT OF EXISTING IMPROVEMENTS

351.1 DESCRIPTION:

This work shall consist of the movement of existing improvements and specialty items to accommodate project construction. Relocation is the horizontal movement or change in location of an existing improvement or item, as shown or described on the Project Plans. Adjustment is a change in the vertical position of an existing improvement or item, typically required to accommodate a change in grade at the location of the existing improvement.

351.2 MATERIALS:

All relocations and adjustments requiring reseating, replacement, or the use of additional materials shall be accomplished using materials of the same or better quality than found in the existing improvements, as approved by the Engineer.

For mailbox relocations, the Contractor shall supply a replacement support post for any mailbox installation deemed hazardous by the Engineer. Hazardous mailbox installations may include but are not limited to support posts that act as fixed objects (i.e. rigid or non-deflecting posts that exceed the stiffness or breakaway characteristics of a nominal 4"x4" wood post buried 36 inches into the ground) and installations of multiple mailbox receptacles mounted on a horizontal beam.

351.3 CONSTRUCTION:

The work shall include the removal of posts, foundations, and other associated items directly related to the relocation or adjustment of the existing improvement; filling and compacting all holes left by such removals; and installing, adjusting, or reconstructing moved items in their new location.

Improvements shall be moved in such a manner that the moved elements and all remaining unmoved portions of previously attached improvements are not damaged. All portions of moved and remaining unmoved improvements that are damaged during the relocation or adjustment shall be repaired, or shall be replaced in kind by the Contractor, as approved by the Engineer, at the Contractor's expense.

All relocated or adjusted improvements shall exhibit the same quality, integrity, function, and appearance as the improvements exhibited prior to relocation or adjustment. The unmoved portion of the moved improvement shall be repaired or restored to the same type, quality, appearance, and strength as existed prior to relocation or adjustment.

If for any reason the improvement cannot be removed, relocated, and adjusted within the same working day, the disturbed/removed portion shall be secured from theft and damage until such time that it can be permanently installed in its final location. Also, where the move cannot be accomplished within the same working day, a temporary substitute facility shall be provided to accomplish the required function, as approved by the Engineer. Example: security fencing is to be relocated and the relocation is incomplete at the end of a work day, the contractor is to provide appropriate temporary fencing or approved alternative measures to secure the fenced area.

When the materials of the existing facility are insufficient in quantity to meet the relocation or adjustment requirement, then the Contractor shall provide additional new materials of like kind as needed to complete the relocation or adjustment.

When materials in the existing facility cannot be moved without deterioration in quality, appearance, strength, or function then the Contractor shall provide new replacement materials of like kind as needed for the relocation or adjustment.

Relocate Traffic Sign consists of salvaging the existing sign panel and post, removing the existing foundations, backfilling and compacting all voids, restoring the existing surface to match previous existing conditions and installing the traffic sign panel on a post or posts of appropriate length mounted on new post foundations. New post foundations shall be measured separately and not included as part of the Relocate Traffic Sign pay item.

351.4 MEASUREMENT:

Relocated or adjusted items will be measured by the number of improvements and/or the number of linear feet as designated in the fee proposal.
For linear items, such as relocated fencing, the length measured shall be the installed length; no measurement of the removal length shall be made.

The measurement of relocated mailboxes will be the number of mailboxes relocated to a new permanent location as indicated by the project plans or directed by the Engineer and shall include replacement posts to correct conditions deemed hazardous, as required for an acceptable complete in place installation. No measurement will be made for temporary relocations made to maintain mail delivery during construction.

351.5 PAYMENT:

Payment will be made at the contract unit price for each relocated or adjusted improvement. Payment shall be full compensation for all tools, equipment, labor, materials, services, transportation, and incidentals necessary for relocation or adjustment of the improvement including additional new materials or replacement material and repairs or adjustments to the unmoved remainder of fences and other facilities.

SECTION 401
TRAFFIC CONTROL

401.2 TRAFFIC CONTROL DEVICES, add the following:

All traffic control devices and their application shall conform to the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD - United States Department of Transportation, Federal Highway Administration) as modified by the Arizona Department of Transportation's Supplement, the Cochise County Department of Transportation's Traffic Control Manual, the special provisions, and any field modifications made by the Engineer.

All traffic control devices shall meet the guidelines of NCHRP 350 or the AASHTO 2009 Manual for Assessing Safety Hardware.

If at any time the Engineer is unable to contact the Traffic Control Technician, the Engineer reserves the right to make contact with the traffic control subcontractor to request any materials or services deemed appropriate by a demonstrated or apparent need in accordance with the standards and guidelines established by the MUTCD as supplemented by the Arizona Department of Transportation and the Cochise County Department of Transportation's Traffic Control Manual for the safety of the public or workers. The cost of these materials or services shall be part of the cost of Traffic Control.

401.2.1 Installation of Temporary Traffic Control Devices: It shall be the responsibility of the Contractor to provide, erect, maintain, remove and/or relocate all temporary and existing traffic control devices and signal indications necessary to properly mark and control the construction area(s) for the safe and efficient movement of all roadway users.

The contractor shall maintain all traffic control devices 24 hours a day, 7 days a week (including weekend and holidays) for the entire duration of the construction or maintenance project. It shall be the contractor's or permittee's responsibility to have all traffic control devices inspected at least once during each workday, once per week during nighttime hours and immediately after a wind or rain storm. Any traffic control device not properly located shall be immediately adjusted or reinstalled.

The Contractor shall install temporary traffic control warning signs and devices prior to the start of any work in accordance with the approved Traffic Control Plan (TCP). All existing signs in conflict with the construction signs shall be covered, removed, or relocated.

The Contractor shall provide additional devices as determined by the Engineer, to safely control traffic.

All advanced warning construction signs shall be mounted on channels driven into the ground or be mounted on temporary spring stands. Each approach at one mile and at one half-mile point prior to the project shall be signed with "Road Work Ahead" and with speed limit signs, mounted on channels driven into the ground or mounted on temporary spring stands and placed at locations where the need for relocation during construction is minimized.

All temporary traffic control devices shall be ballasted with sandbags or other approved ballast. The amount of sandbags used shall be enough to provide adequate safety for the traveling public.

Ground mounted temporary traffic control signs for rural areas shall be mounted with the bottom of the sign at least five feet and not more than six feet above the near edge of the pavement and

for urban areas shall be mounted with the bottom of the sign at least seven feet and not more than eight feet above the near edge of the pavement.

The Contractor shall mount signs on wind resistant, spring-type bases when conditions warrant or as requested by the Engineer.

The Contractor shall place flags above all signs.

The Contractor shall use warning lights to mark traffic control devices at night.

The Contractor shall mount Type B high-intensity flashing warning lights on all stop signs within the work zone.

All construction warning signs (black on orange) shall use retroreflective sheeting with fluorescent orange Type VIII, IX or XI and all regulatory signs (black on white) shall use retroreflective sheeting with a minimum of Type IV retroreflective sheeting.

The Contractor shall use an arrow board for all stationary or moving lane closures.

The Contractor is responsible for all costs incurred in replacing lost or damaged traffic control devices and traffic control warning signs.

401.2.2 Traffic Cones: Are effective for daytime channelization of traffic and to delineate minor maintenance areas. Traffic cones are versatile because they are portable and if struck, they will minimize damage to vehicles. They can be set up and removed quickly. When traffic cones are approved by the Engineer for use, it is necessary to check them often because vehicles frequently move them. The minimum height for cones is 28" high and minimum weight is 10 pounds on arterials/collectors and 7 pounds on local roadways. When used at night, cones must have retroreflective bands as called for in the MUTCD.

401.2.3 Temporary Longitudinal Traffic Barriers: Temporary longitudinal traffic barrier installations shall be portable concrete barrier (PCB) or other segmented longitudinal barrier. The barrier and installation shall be in accordance with Chapter 9 of the AASHTO Roadside Design Guide. PCB shall use F-shape faces. Each barrier section shall be properly connected to the adjacent section to provide barrier continuity to resist movement, snagging, and/or instability of impacting vehicles. Panels and connections shall meet NCHRP 350 Test Level 3 or an approved test level of the AASHTO 2009 Manual for Assessing Safety Hardware.

401.2.4 Pavement Markings: Pavement markings used as an integral part of the traffic control plan shall be kept distinct and visible during their use. Temporary pavement markings shall match and meet the markings in place at both ends of their usage.

401.2.5 Removal of Permanent Traffic Control Devices: The Contractor shall notify the Engineer and obtain the Engineer's approval prior to the removal of any permanent traffic control device.

The Contractor shall remove (without damage) all permanent signs including sign posts that are no longer applicable. The sign panels and posts shall be dismantled and transported to the **Cochise County_sign shop** in a manner that will prevent damage. Concrete sign foundations shall be removed and disposed of by the Contractor. The Contractor shall coordinate with the **Cochise County_sign shop** (602) 506-8662 to establish an acceptable delivery time during normal working hours. The sign panels and posts shall be delivered to: 1229 Hereford Road, Bld B, Bisbee, Arizona 86503

401.4 TRAFFIC CONTROL MEASURES, add the following:

401.4.1 Traffic Control Plan: Construction shall not commence without an approved Traffic Control Plan (TCP). At the time of the pre-construction meeting, the Contractor shall submit preliminary traffic control plans for each phase of the work for review. Plans shall be of an appropriate size and legible, plans found to be deficient by the Engineer shall be returned. The Contractor shall design the traffic control plan using the posted speed limit existing prior to commencement of work as the design speed. The TCP shall show all striping, signing, barricading and distances for all devices for all movements of roadway users during each phase of construction. The TCP shall show existing traffic control signs and temporary construction signs; shall identify conflicting signs to be covered/removed or relocated; and shall identify other features that may conflict with the placement of temporary signage. The TCP shall also show the duration with the start and end date of each phase. When requested by Cochise County, the Contractor shall supply a copy of the manufacturer's certification of compliance with NCHRP 350 test requirements (or compliance with a designated approved test level of the AASHTO Manual for Assessing Safety Hardware) for any of the Contractor proposed traffic control devices. The manufacturer's certification shall identify the NCHRP 350 or AASHTO test number. The County will within 10 working days review the plan and notify the Contractor of approval or note items to be revised.

401.4.2 Traffic Control Technician: The Contractor shall appoint a Traffic Control Technician (other than the superintendent/foreman), who has been properly trained and certified in the application of work zone traffic control, to maintain all necessary traffic control devices. At the beginning and end of each workday and at a minimum of once during nighttime hours during the work week, and periodically throughout the day, the Traffic Control Technician shall inspect the construction work site. The Traffic Control Technician shall ensure that all construction signs and barricades are standing upright in accordance with the approved traffic control plan, free of dirt and debris and visible to intended traffic. At the end of the workday all non-essential traffic control devices will be removed. The Traffic Control Technician shall also inspect the construction work site at least once during weekends. The Contractor shall immediately correct deficiencies noted by the Engineer. The Contractor shall provide an after-hours pager and telephone number for the Traffic Control Technician at the pre-construction meeting.

401.4.3 Intersection Restriction: Off-duty uniformed police officers are required at all signalized intersections when restrictions are present, and may be required at other locations as requested by the Engineer. Any work performed in the right of way within 300 feet of signalized intersections and intersections formed by two multilane roadways shall require an off-duty uniformed police officer.

401.4.4 Traffic Control Devices: The Contractor shall provide and maintain all necessary traffic control devices until acceptance of the project by the County.

Pavement markings used as an integral part of the traffic control plan shall be kept distinct and visible during their use. Temporary pavement markings shall match and meet the markings in place at both ends of their usage.

401.4.5 Flaggers: All flaggers shall be properly trained and certified by a recognized source, such as the American Traffic Safety Services Association (ATSSA) or the International Municipal Signal Association (IMSA) and shall carry with them at all times a current certification as proof that all training requirements have been completed.

401.4.6 Failure to Provide Adequate Traffic Control Measures: If the Contractor fails to provide adequate traffic control measures, the Engineer may have the work accomplished by other sources. The cost of having this work accomplished by other sources will be computed in

accordance with Section 109.5. The total cost will be deducted from monies due or to become due to the Contractor.

401.5 GENERAL TRAFFIC REGULATIONS, add the following:

The Sheriff's Department shall be provided with the name and phone number of the person responsible for 24-hour maintenance of all traffic control devices.

The Contractor shall notify all affected emergency services such as fire departments, police stations, and emergency management system by handbill a maximum of 48 hours and minimum of 24 hours in advance of any street restrictions.

401.5.1 Road Closure and Road Restrictions: A road closure for the convenience of the Contractor is not authorized. Traffic restrictions are not permitted on arterial or collector streets during peak traffic hours of 6:00 a.m. to 8:30 a.m. and 4:00 p.m. to 7:00
p.m. unless authorized by the traffic or project engineer or their designated representatives.

401.5.2 Minimum Lane Requirements: At signalized intersections, during peak hours, four lanes shall be open on roads with five or more lanes, and three lanes shall be open on roads with four or less lanes with a center lane. During off-peak traffic hours, the minimum number of lanes shall be two lanes (one in each direction) on streets with four lanes or less, and four lanes (two lanes in each direction on streets with five or more lanes.

401.5.3 Temporary Lane Diversions: For construction or trenching that requires movement of traffic from the normal travel lanes, temporary lane diversions may be used only during daylight hours and the normal traffic lanes shall be restored prior to the end of daylight hours. Traffic plates and temporary pavement shall be used to restore traffic lanes. The Engineer, under unusual conditions, may authorize exceptions.

401.5.4 Regulatory Speed Limit Signs: An appropriate regulatory speed limit sign shall be used where traffic is maintained on temporary detour roads, diversions, or on traffic lanes that are severely restricted.

401.5.5 Access to Adjacent Property: Access to all adjacent properties shall be maintained whenever possible. When access cannot be maintained, Contractor shall notify the adjacent residents at least two working days in advance of the access closure. In no case shall the access be closed for more than four hours. Access to fire stations, hospitals, sheriff stations and schools shall be maintained at all times.

401.5.6 Signal Equipment Repair: If existing signal equipment is damaged the Contractor shall notify the County Traffic Signals Branch Manager at (602) 506-8660, in order to facilitate the prompt restoration of the traffic signal operation. All costs associated with the repair of damaged traffic signals, caused by Contractor construction activity, shall be borne by the Contractor.

401.5.7 Temporary Longitudinal Traffic Barriers / Steel Plating: Open excavations and trenches within 10 feet of an active traffic lane shall be protected at night and during non-working hours from vehicle traffic by steel plating or the use of temporary longitudinal traffic barriers complying with requirements of section 401.2.3. Open excavations as may occur with reinforced concrete box culvert construction and other work shall require temporary longitudinal traffic barriers to separate vehicle traffic from the work site. The Contractor shall use temporary longitudinal traffic barriers when construction hazards warrant, or as requested by the Engineer. Impact attenuation devices shall be provided by the Contractor commensurate with barrier end treatment requirements.

401.5.8 Changeable Message Boards for Public Information:

Changeable Message Boards for Public Notification are for informing the motoring public of project information, traffic restrictions, road closure, or other public awareness items deemed necessary for the project. Changeable message boards shall comply with the requirements of section 701-3.08 of the Arizona Department of Transportation 2008 Standard Specifications for Road and Bridge Construction. The Contractor shall furnish, install, and operate the changeable message boards as requested by the Engineer. Message board locations shall be shown on the Traffic Control Plans.

401.6 MEASUREMENT, Section 401.6 is replaced with the following:

Measurement for Traffic Control shall be made on a Lump Sum basis. This lump sum measurement shall include all materials, equipment and labor necessary to facilitate traffic control per the contract documents. Traffic Control includes but is not limited to the application and removal of temporary pavement markings including related modification of existing pavement markings, pilot cars, flagmen, barricades, sign panels, sign stands, warning lights, and related temporary pavements.

No direct measurement of individual traffic control elements or devices will be made. All traffic control devices, unless otherwise noted, shall be considered as included in the lump sum measurement for the Traffic Control pay item.

No direct measurement for the installation or removal of temporary pavements will be made. All sawcutting, grading, aggregate base course materials, asphaltic concrete pavement, labor, and equipment shall be considered as included in the lump sum measurement for the Traffic Control pay item.

Uniformed Off-duty Law Enforcement Officers including vehicle and equipment will be measured by the hour for each hour required to perform traffic control duties. When an officer is used less than the agency's minimum number of hours and the Contractor is charged for the agency's minimum number of hours, the minimum hours charged will be approved for payment. Time over the agency's minimum number of hours will be measured by the hour.

Changeable Message Boards for Public Notification shall be measured by the day for each calendar day for each sign authorized and operating as directed by the Engineer. Measurement will only be made for actual days-in-use.

When included as a separate pay item within the fee schedule, Portable Concrete Barrier (PCB) shall be measured by the foot. Otherwise, portable concrete barrier shall not be measured and shall be considered a traffic control device.

401.7 PAYMENT, Section 401.7 is replaced with the following:

Payment for Traffic Control other than Uniformed Off-duty Law Enforcement Officers shall be made at the lump sum contract price in equal payments distributed over the entire duration of the project. Payment for Traffic Control shall be full compensation for all labor, pilot cars, flagmen, materials, traffic control devices, and miscellaneous items necessary to complete the work.

Payment for Uniformed Off-Duty Officer will be based on approved time sheets or invoices for all actual hours Contractor provided a Uniformed Off-Duty Law Enforcement Officer for traffic control purposes at the request and with the approval of the County. Expenses, eligible for

reimbursement, are labor costs, supported by approved time sheets or invoices and directly related documented expenses such as taxes, bond cost charges to Contractor in connection with the Uniformed Off-Duty Law Enforcement Officer assignment, and special jurisdictional requirements. No additional mark-up for profit and/or fee for Contractor will be eligible for reimbursement.

Approved quantities for Changeable Message Board for Public Notification shall be paid at the contract unit price. Payment will be compensation in full for furnishing, transportation, installation, programming, adjustment, maintenance, and removal of the changeable message boards.

Separate payment for Portable Concrete Barrier will only be made when Portable Concrete Barrier is included as a separate pay item within the fee schedule. Payment will be full compensation for the furnishing, transportation, installation, adjustment, maintenance, and removal of the temporary barrier system.

Part 400 add the following new Section:

SECTION 416
GUARDRAIL END TREATMENTS

416.1 DESCRIPTION:

The work under this section shall consist of furnishing all materials and constructing new guardrail end treatments at the locations shown on the project plans and in accordance with specified details and the requirements of these specifications.

This work shall also include all the work and materials to delineate guardrail end treatments.

416.2 MATERIALS:

End treatment materials shall conform to Section 415.2 Materials. Adhesive materials for applying reflective sheeting to guardrail terminals shall be in accordance with the sheeting manufacturer's recommendations.

All guardrail terminal sections and guardrail transition sections shall be NCHRP 350 Test Level 3 compliant or compliant with an equivalent test level of the AASHTO Manual for Assessing Safety Hardware (MASH) and have a published acceptance letter by the Federal Highway Administration. Guardrail terminal sections compliant with test level 2 may be used when specifically approved for a specific location by the Cochise County Traffic Engineer or authorized representative. Manufacturer's specifications and installation instructions for guardrail end treatments shall be submitted to the Engineer when requested.

Guardrail leading approach terminals subject to head-on impact shall be tangential energy absorbing terminals listed on the Cochise County Approved Materials List. The Cochise County Approved Materials List is available on the Cochise County website:

http://www.cochise.az.gov

All materials shall be new except as otherwise indicated by the contract specifications or plans.

416.3 CONSTRUCTION:

The construction of the various types or lengths of guardrail end treatments shall include the assembly and erection of all component parts, complete in place in accordance with the manufacturer's specifications and installation instructions at the locations shown on the project plans or as requested by the Engineer. Manufacturer's specifications and installation instructions shall be available at the worksite during installation and inspection.

Workmanship shall be equivalent to good commercial practice and all edges; bolt holes and surfaces shall be free of torn metal, burrs, sharp edges and protrusions.

Foundation tubes shall be installed with an approved driving head. The tubes shall not be driven with the wood post in place. If approved by the Engineer, foundation tubes may also be installed in drilled holes. When foundation tubes are placed in drilled holes, the space around and under the tubes shall be backfilled with ½ sack CLSM or backfilled with selected earth, free of rock, placed in layers approximately 4-inches thick and each layer shall be moistened and thoroughly compacted to the density of the surrounding soil.

Foundation tubes shall not protrude more than 4-inches above the ground as measured along a 5-foot cord.

Damaged components of end treatments shall be repaired or replaced immediately.

416.3.1 Approach Terminals: Guardrail leading approach terminals shall be installed at the locations shown on the project plans and in compliance with the manufacturer's details.

The approach surface in front of all guardrail terminals shall be leveled as shown on the project plans and Cochise County Standard Details. The approach surface slope shall not exceed 1:10 (vertical: horizontal).

A MASH compliant Midwest Guardrail System tangential approach terminal may be connected to a 28" high strong post W-beam system provided an approved 31" to 28" guardrail transition is installed between the two guardrail systems.

416.3.2 Delineation: Delineation for end terminals shall consist of one reflector tab installed at each W-beam splice. The reflector tab shall face approaching traffic of the adjacent traffic lane and be installed at a splice bolt on the top of the bottom rib of the W-beam at every odd numbered post starting at post number three. Reflector tabs shall conform to Section 415.2 requirements.

416.3.3 Departure End Terminals: Installation of departure end terminals shall conform to Cochise County Standard Details.

416.4 MEASUREMENT

416.4.1 Approach Terminals: Accepted installations of guardrail approach terminals will be measured as a unit for each type and length furnished and installed, complete in place, including but not limited to guardrail impact head, ground strut, anchor assembly, steel tubes, posts, steel w-beam, hardware, delineation, excavation, backfill, and disposal of surplus material.

Delineation is considered part of the installation of guardrail end terminals and will not be measured.

416.4.2 Departure End Terminals: Accepted installations of departure end terminals will be measured as a unit, complete in place, including but not limited to excavation, backfill, and disposal of surplus material.

416.5 PAYMENT:

416.5.1 Approach Terminals: The accepted quantities of guardrail approach terminals will be paid for at the contract unit price.

416.5.2 Departure End Terminals: The accepted quantities of departure end terminals will be paid for at the contract unit price.

SECTION 461
PAINTED PAVEMENT MARKINGS

SECTION 461 PERMANENT PAVEMENT MARKINGS:

461-1 Description:

The work under this section shall consist of cleaning and preparing the pavement surface, furnishing all materials and applying white or yellow, water-borne, lead-free, rapid-dry traffic paint and reflective glass beads at the locations and in accordance with the details shown on the plans, MUTCD, and associated ADOT Supplement, the requirements of these specifications, or as directed by the Engineer.

461-2 Materials:

461-2.01 Pavement Marking Paint:

(A) General:

All material used in the formulation of the pavement marking paint shall meet the requirements herein specified. Any materials not specifically covered shall meet the approval of the Engineer. Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted for each lot or batch of paint prior to its use.

(B) Composition Requirements:

The pavement marking paint shall be a ready-mixed, one component, water-borne lead-free traffic line paint, of the correct color, to be applied to either asphaltic or Portland cement concrete pavement. The composition of the paint shall be determined by the manufacturer. It will be the manufacturer's responsibility to produce a pigmented water-borne paint containing all the necessary co-solvents, dispersant, wetting agents, preservatives and all other additives, so that the paint shall retain its viscosity, stability and all of the properties as specified herein. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, toluene, chlorinated solvents, hydrolyzable chlorine derivatives, ethylene-based glycol ethers and their acetates, and not any carcinogen, as defined in 29 CFR 1910.1200. Lead content shall not exceed 0.06 percent of weight of the dry film, and the test for chromium content shall be negative.

No glass beads will be allowed in the pavement marking paint. Glass beads will be applied after the paint has been applied.

(C) Manufacturing Formulations:

The manufacturer shall formulate the pavement marking paint in a consistent manner and notify the Engineer of any change of formulation. The formulation of the paint shall be determined by the manufacturer. It will be the manufacturer's responsibility to formulate paint which will meet the quantitative and qualitative requirements of this specification. Any change in the formulation of the paint must be approved by the Engineer.

(D) Quantitative Requirements of Mixed Paints:

		White	Yellow
Pigment:			
Percent by weight, ASTM D 3723, allowable variation from qualifying sample	± 2.0	± 2.0	
Non-Volatile Content:			
Percent by weight, ASTM D 2369, allowable variation from qualifying sample	± 2.0	± 2.0	
Viscosity: Krebs Units at 77 ± 1 oF, ASTM D 562	70 - 85	70 - 85	
Weight per Gallon:			
pounds per gallon 77 ± 1 oF, ASTM D 1475P, allowable variation from qualifying sample	± 0.3	± 0.3	
Vehicle Composition:			
Vehicle Infrared Spectra, ASTM D 2621, allowable variation from qualifying sample		None	None
PH: ASTM E 70, allowable variation from qualifying sample	± 1.0	± 1.0	
Fineness of Dispersion:			
HEGMAN, minimum, ASTM D 1210	3.0	3.0	
Volatile Organic Compounds:			
pounds per gallon of paint, maximum, ASTM D 3960 according to 7.1.2.		2.1	2.1
Flash Point:			
Degrees F., minimum, ASTM D 93, Method A	100	100	
Dry Time to No Pick Up:			
with no beads: minutes, maximum, ASTM D 711 Dry Through Time:	10	10	
Dry Through Time			
Minutes, ASTM D 1640 except no thumb pressure is used when thumb is rotated 90o on paint film	20	20	
Flexibility: TT-P-1952D	Pass	Pass	

(E) Qualitative Requirements:

(1) Color of Yellow Paint:

The color of the yellow paint shall closely match Federal Standard 595b, Color No. 33538. The color shall be checked visually, and will be checked against Tristimulus Values for the color according to Federal Test Method Standard No. 141.

(2) Dry Opacity:

Dry opacity for the paint will be determined using a black-white Leneta Chart, Form 2C Opacity and a Photovolt 577 Reflectance Meter or equal. Using a 10-mil gap doctor blade, a film of paint is drawn down, covering both black and white portions of the chart. The film shall be allowed to dry 24 hours. After calibrating the Reflectance Meter according to the manufacturer's instructions, measure the reflectance over the white and black portions with the green Tristimulus filter. Dry Opacity is calculated as follows:

$$\text{Dry Opacity} = \frac{\text{Reflectance over black}}{\text{Reflectance over white}}$$

Dry Opacity for both white and yellow paint shall be a minimum 0.90.

(3) Yellowness Index:

Yellowness Index for white paint will be determined as described for dry opacity, only use a 15-mil gap doctor blade to draw down the paint. After 24 hours for drying, measure the reflectance of the paint film, using the green, blue, and amber Tristimulus filters. Calculate the Yellowness Index as follows:

$$\text{Yellowness Index} = \frac{\text{Amber Blue}}{\text{Green}} \times 100$$

Yellowness Index for the white paint shall be a maximum of 10.

(4) Reflectance:

Reflectance for both white and yellow paint will be determined using the same 15-mil draw-down film as for the Yellowness Index. For white paint the same sample may be utilized for both the Yellowness Index and Reflectance. Measure the reflectance of the paint film using the green Tristimulus filter. Reflectance for the white paint shall be a minimum of 85. Reflectance for the yellow paint may range from 42 to 59, inclusive.

(5) UV Color Durability:

UV Color Durability shall be determined using a QUV Weatherometer, with Ultra Violet Light and Condensate Exposure according to ASTM G 53, for 300 hours total. The repeating cycle shall be four hours UV exposure at 60 oC followed by four hours condensate exposure at 40 oC. After 300 hours of exposure, the Yellowness Index for white paint shall not exceed 12, and yellow paint must still match Federal Standard 595b, Color No. 33538.

(6) Static Heat Stability:

To determine static heat stability for the paint, place one pint of paint in a sealed can and heat in an air circulation oven at 120 ± one degrees F for a period of one week. Remove the paint from the oven and check the viscosity in Krebs Units at 77 ± one degrees F according to ASTM D 562. The viscosity measured must be in the range from 68 to 90, inclusive. Also, check for any signs of instability.

(7) Heat-Shear Stability:

To determine heat-shear stability for the paint, one pint of the paint is sheared in a Waring Blender at high speed to 150 degrees F. The blender should have a tight-fitting lid taped onto it to minimize volatile loss. When the paint reaches 150 degrees F, stop the blender, immediately pour the paint into a sample can, and apply a cover to seal

the can. Let the paint cool overnight and examine for jelling or other signs of instability. Measure viscosity in Krebs Units at 77 ± one degrees F according to ASTM D 562. The viscosity measured must be in the range from 68 to 95 inclusive. If not within the upper limit, run total solids on the sheared paint and adjust solids, if necessary, by adding water to reach the original solids content. If the solids content required adjustment, again check the viscosity of the paint. The viscosity must be in the range from 68 to 95 inclusive.

(8) Scrub Resistance:

Scrub Resistance will be determined according to ASTM D 2486. Use an appropriate doctor blade to provide a dry film thickness of three to four mils. Allow the paint to cure for 24 hours. Perform the scrub resistance test at 77 ± one degrees F and 50 ± five percent humidity. Record the number of cycles to remove the paint film. The number of

cycles recorded must be a minimum of 800.

(9) Spraying Properties:

The paint shall be applied at a 15 mils wet film thickness in the field. The paint shall show the following properties at ambient temperatures of 50 to 100 degrees F with a paint spray temperature of 150 degrees F, maximum, and six to eight pounds of post-applied glass beads per gallon of paint. Beads shall conform to subsection 461-2.02 of these specifications.

(a) Dry to a no-track condition in five minutes or less when the line is crossed over in a passing maneuver with a standard-sized automobile.

(b) Produce a clean-cut, smooth line with no overspray or puddling.

(c) Paint immediately after application shall accept glass beads so that the spheres shall be embedded into the paint film to a depth of 50 percent of their diameter.

(d) Paint when heated to the temperature necessary to obtain the specified dry time, shall show no evidence of instability such as viscosity increase, jelling, or poor spray application.

(10) Freeze-Thaw Properties:

The paint viscosity or consistency shall not change significantly when the paint is tested for resistance to five cycles of freeze-thaw according to ASTM D 2243.

(11) Road Service Rating:

Test stripes of the paint shall be applied transversely across the road, four inches in width and approximately 12 feet long at a location approved by the Engineer.

Wet film thickness of the test stripes shall be approximately 15 mils as determined according to ASTM D 4414 and ASTM D 713 prior to test stripe application. To aid in obtaining the correct film thickness, a length of roofing paper placed by the side of the road can be used. Place a rigid metal test panel on the roofing paper in the path of a test line. Immediately after the test line is applied by the striper, measure the wet film thickness. If not satisfactory, adjust the spray pressure and repeat until the target wet film thickness is attained. It is important that no glass beads be present that would

give a false wet film thickness. When the wet film thickness is correct, apply a test line across a tared metal test panel. After this, apply another test line across a different tared metal test panel, this time also adding the beads. These samples are necessary to determine the initial bead retention.

Glass beads conforming to the requirements of Subsection 461-2.02 of these specifications (moisture proof type) will be applied after the paint has been applied, but during the same striping operation at a rate such that the initial bead retention on the test line is a minimum of six pounds of beads per gallon of wet paint. The initial bead retention will be determined analytically by the ADOT Materials Group concurrently with the determination of the dry paint thickness utilizing tared metal test panels. The paint shall accept the glass beads so that the spheres are embedded into the paint film to a depth of 50 percent of their diameter. Test stripes will be observed for a period of 180 days from date of application. Paints will be evaluated for wear according to ASTM D 913.

After 180 days of service, on a visual rating scale of 0 to 100 percent, paints must have a rating of 92 percent or better to be acceptable. All ratings will be taken in the wheel track area. Glass beads shall show no more than a 30 percent loss after 180 days of test. This will be determined by taking close-up photographs of the paint film and by count determining the average bead loss.

The road service test may be waived at the option of the Engineer or evaluated for a period of time less than 180 days.

(12) Workmanship:

Paint shall be free from foreign materials, such as dirt, sand, fibers from bags, or other material capable of clogging screens, valves, pumps, and other equipment used in a paint striping apparatus.

The paint pigment shall be well ground and properly dispersed in the vehicle. The pigment shall not cake or thicken in the container, and shall not become granular or curdled. Any settlement of pigment in the paint shall result in a thoroughly wetted, soft mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sidewise manual motion of a paddle across the bottom of the container, to form a smooth uniform product of the proper consistency. If the paint cannot be easily redispersed, due to excessive pigment settlement as described above or due to any other cause, the paint shall be considered unfit for use.

The paint shall retain all specified properties under normal storage conditions for 12 months after acceptance and delivery. The contractor shall be responsible for all costs and transportation charges incurred in replacing paint that is unfit for use. The properties of any replacement paint, as specified herein, shall remain satisfactory for eight months from the date of acceptance and delivery.

(F) Manufacturing Requirements:

(1) Inspection:

The manufacturer of the paint shall advise the Engineer when paint is to be manufactured, shall furnish the Engineer free access to all parts of the plant involved in the paint manufacture, and shall furnish every reasonable facility for sampling both the paint and the raw materials during the process of manufacturing.

All materials used in formulation shall meet the requirements herein specified. Any materials not specifically covered shall meet the approval of the Engineer.

All manufactured paint shall be prepared at the factory ready for application.

When paint is shipped to a distributor or paint applicator who will store the paint prior to its use, the distributor or paint applicator shall furnish the Engineer free access to all parts of the facility where paint is stored and shall furnish every reasonable facility for sampling the paint.

Paint shall normally be sampled at the place of storage either at a warehouse or on the site prior to application of the paint. Application of the paint will not be permitted until the paint has been approved by the Engineer. It is the contractor's responsibility to notify the Engineer a minimum of 14 working days prior to any traffic painting operation and to allow access at that time for paint sampling at the storage location.

A minimum of one paint sample shall be obtained from each lot of paint.

Check-samples of finished paint while being applied will be taken at intervals as determined by the Engineer.

(2) Testing:

All tests will be conducted in accordance with the latest test methods of the American Society for Testing and Materials, Federal Test Method Standard No. 141, and methods in use by the Materials Group, Highways Division, and the Arizona Department of Transportation as specified herein.

Evidence of adulteration or improper formulation shall be cause for rejection.

(3) Packaging:

All shipping containers for paint must comply with the Department of Transportation Code of Federal Regulations, Hazardous Materials and Regulation Board, Reference 49 CFR. The container and lids must be lined with a suitable coating so as to prevent attack by the paint or by agents in the air space above the paint. The lining must not come off the container or lid as skins.

Containers shall be colored white, including lids, and containers shall have an identifying band of the appropriate color around and within the top one third of the container.

All containers shall be properly sealed with suitable gaskets, shall show no evidence of leakage, and shall remain in satisfactory condition for a period of 12 months after delivery to a distributor or paint applicator. The contractor shall be responsible for all costs and transportation charges incurred in replacing paint and containers.

(4) Marking:

All containers of paint shall be labeled showing the manufacturer's name, date of manufacture, paint color, product code, manufacturer's batch number, and quantity or weight of paint on both the side of the container and also the lid. Containers shall be clearly marked or labeled Rapid or Fast Dry lead-free Water-Borne Traffic Paints.

All containers of paint shall be labeled to indicate that the contents fully comply with all rules and regulations concerning air pollution control in the State of Arizona, Maricopa County.

The manufacturer of the paint shall be responsible for proper shipping labels with reference to whether the contents are toxic, corrosive, flammable, etc., as outlined in the U.S. Department of Transportation, Hazardous Materials Regulations, Reference 49 CFR.

(5) Unused Paint:

Disposal of unused quantities of traffic paint shall be the responsibility of the contractor and must meet all applicable Federal regulations for waste disposal. Paint which is saved to be used later shall

be packaged as specified previously and shipped to a storage location. Unused paint must be identified on the container. Unused paint may be utilized on a future project provided the paint still conforms to all specifications contained herein.

461-2.02 Reflective Glass Beads (Spheres):

(A) General:

The term "glass bead" shall be synonymous with the term "glass sphere" as used herein.

The beads shall be manufactured from glass of a composition designated to be highly resistant to traffic wear and to the effects of weathering.

The glass beads shall be moisture-proof; contain less than 0.25 percent moisture by weight; and be free of trash, dirt, or other deleterious materials.

Beads shall be essentially free of sharp angular particles showing milkiness or surface scoring or scratching. Beads shall be water white in color.

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

(B) Physical Requirements:

(1) Gradation:

When tested by the method provided in ASTM D 1214, the grade sizes of the beads shall be as follows:

Size of Sieve	Percent Passing
No. 30	100
No. 50	15 - 35
No. 70	0 - 15
No. 100	0 - 5

(2) Roundness:

When tested by the method provided in ASTM D 1155 (Procedure B), beads retained on any screen specified in the gradation requirements shall contain a minimum of 75 percent true spheres.

(3) Index of Refraction:

When tested by a liquid immersion method at a temperature of 25 oC,

the beads shall have an index of refraction of 1.50 to 1.57.

(4) Specific Gravity:

The specific gravity of the beads shall be in the range 2.40-2.60 when tested in accordance with the following procedures:

Place 100 grams in an oven at 110 oC for one hour.

Remove beads and place in a desiccator until the sample is cool.

Remove approximately 60 grams of beads from the desiccator and weigh the sample accurately.

Pour the beads slowly into a clean 100-milliliter graduated cylinder containing 50 milliliters of isopropyl alcohol. Make certain that air is not entrapped among the beads.

The total volume, minus 50, will give the volume of the beads.

Calculate the specific gravity as follows:

$$\text{Specific Gravity} = \frac{\text{Weight of the sample}}{\text{Volume of the sample}}$$

(5) Chemical Stability:

Beads which show any tendency toward decomposition, including surface etching, when exposed to atmospheric conditions, moisture, dilute acids, or alkalis or paint film constituents, may be required to demonstrate satisfactory reflectance behavior, prior to acceptance, under such tests as may be prescribed.

(C) Moisture Proofing:

All glass beads shall have a moisture-proof overlay consisting of water repellent material applied during the process of bead manufacture. The beads so treated shall not absorb moisture in storage and shall remain free of clusters and lumps and shall flow freely from dispensing and testing equipment.

The beads shall pass the test for water repellency and free flow using the following equipment:

(1) Test bag:

The bag used is approximately 10-1/2 by 17-1/2 inches after sewing. The material used in the construction of the bag is unbleached cotton sheeting with a thread count of 48 by 48. The material before sewing is approximately 18 by 22 inches. The cloth is folded in half lengthwise and stitched in the shape of an "L" with the short side left open at the top. The material can be obtained from selected manufacturers of cloth and paper packaging. The finished bag may also be obtained from the manufacturer of the glass beads.

Newly fabricated bags must be thoroughly washed with hot water and detergent and rinsed before use to remove the sizing which may be present in the cloth. Subsequent to the initial washing, the bags need only be rinsed clean of beads from previous tests and dried thoroughly before use.

(2) Funnel:

The funnel used is a standard laboratory funnel with a top opening diameter of 125 millimeters and a 150-millimeter stem length. The inside diameter of the stem is between nine and 10 millimeters. This funnel is available from most laboratory glassware supply houses, Corning No. 6100 or equal.

(3) Ring Stand and Clamp.

(4) Balance accurate to 0.1 grams.

(5) Distilled water.

MOISTURE TESTING PROCEDURE:

Glass beads shall be tested for compliance with specification requirements. Testing shall be conducted at standard conditions of temperature (25 ± one degrees Celsius) and humidity (50 ± five percent Relative Humidity) and shall consist of the following procedure or an approved alternate:

Weigh 900.0 grams of glass beads into a clean, dry, flat-bottomed pan.

Dry beads at 150 oC for two hours.

Cool beads to room temperature (25 ± one degrees Celsius) in a desiccator.

Using the clean, pre-washed bag described under apparatus section, turn the bag inside-out so that the sewn seam and seam-allowance are on the outside.

Quantitatively transfer the beads into the inverted cotton bag.

Grasp the gathered top of the bag with one hand and lower the bag into a container of distilled water until the beads are approximately one inch below the water level. The container shall be of such dimensions that the bag does not contact the bottom or sides during immersion. Each bag shall be immersed individually. Do not allow one bag to contact another if multiple tests are run.

Remove the bag after 30 seconds of immersion time.

Cradle the bottom of the bag uniformly in the palm of one hand and twist the top neck of the bag until the twisted bag is compressed firmly against the beads. Twist until excess water no longer drips from the bag.

After the excess water has been squeezed from the bag, allow the bag to unwind.

Gather the top of the bag and clamp. Suspend the bag on a ring stand or other support such that the bottom or sides of bag do not contact the support.

After a standing time of two hours at room temperature (25 ± one degrees Celsius), remove bag from support. Mix sample thoroughly by holding the bottom seam allowance in one hand and gathered neck of the bag in the other, invert bag and shake up and down five times. Transfer the sample into a clean, dry funnel of the type described under apparatus. If consecutive tests are run, be sure the funnel is clean, dry and free of beads from prior tests.

The entire sample shall flow through the funnel without stoppage.

At the start of the test only, it is permissible to lightly tap the stem of the funnel to initiate flow.

Small quantities of beads which have adhered to the side of the funnel or stem shall not be cause for failure.

461-3 Construction Requirements:

461-3.01 Equipment:

The traffic paint and beads shall be placed on the pavement by a spray-type, self-propelled pavement marking machine except that temporary striping during construction may be placed with other equipment designed for application of paint and beads.

The application equipment to be used on roadway installation shall have, as a minimum, the following characteristic and/or apparatus:

The machine shall be capable of applying clear-cut lines of the width specified on the project plans.

The machines shall be equipped with a mechanical device capable of placing a broken reflectorized line with a 10-foot painted segment and a 30-foot gap.

The machine shall be equipped with an air-operated glass bead drop-in dispenser controlled by the spray gun mechanism.

A glass bead dispenser which is capable of placing the glass beads into the paint line as the paint is applied to the pavement shall be utilized. This dispenser shall provide satisfactory marking and delineation.

461-3.02 Application:

Pavement markings shall be applied when the pavement surface is dry and the weather is not foggy, rainy, or otherwise adverse to the application of markings. The surface shall be free from excess asphalt or other deleterious substances before traffic paint, beads or primer are applied. The contractor shall remove dirt, debris, grease, oil, rocks or chips from the pavement surface before applying markings. The method of cleaning the pavement surface and removal of detrimental material is subject to approval by the Engineer and shall include sweeping and the use of high-pressure air spray. The placing of traffic markings shall be done only by personnel who are experienced in this work.

Painting shall not be performed when the atmospheric temperature is below 50 degrees F when using water-borne paint, nor when it can be anticipated that the atmospheric temperature will drop below said 50 degrees F temperature during the drying period. Water-borne paints shall not be applied if rain is expected within one hour of its application, unless otherwise approved by the Engineer. Water-borne paint shall not be heated to a temperature greater than 150 degrees F to accelerate drying.

The volume of paint in place shall be determined by measuring the paint tank with a calibrated rod. At the option of the Engineer, if the striping machine is equipped with air-atomized spray units (not airless) and paint gauges, the volume of paint may be determined by utilizing said gauges.

The quantity of glass reflectorizing beads in place shall be determined by measuring the glass reflectorizing bead tank with a calibrated rod.

The contractor shall provide the necessary personnel and equipment to divert traffic from the installation area where the work is in progress and during drying time when, in the opinion of the Engineer, such diversion of traffic is necessary.

Tolerances for Placing Paint, Beads, and Primer:

The length of painted segment and gap shall not vary more than six inches in a 40-foot cycle.

The finished line shall be smooth, aesthetically acceptable and free from undue waviness.

Painted lines shall be four, eight, or 12 inches wide as shown on the plans with a tolerance of ± 1/8 inch and shall be placed at a minimum rate of 16 gallons per mile for a solid four-inch line and four gallons per mile for a broken four-inch line, based on a 10-foot stripe and a 30-foot gap (40-foot cycle aggregate).

Glass reflectorizing beads shall be applied on the wet paint at a minimum rate of six pounds per gallon of paint.

Wet thickness shall not be less than 15 mils.

461-4 Method of Measurement:

Pavement marking paint will be measured by the linear foot along the centerline of the pavement stripe. Skips in dashed lines will not be included in the measurement. Length of pavement markings

will be based on four-inch wide stripe. Measurement for striping with a plan width greater or less than the basic four inches as shown on the plans or directed by the Engineer will be made by the following method:

$$\frac{\text{Plan Width of Striping (inches)} \times \text{Linear Feet}}{4 \text{ (inches)}}$$

Symbols and legends will be measured by each unit applied. Each legend, regardless of the number of letters, will be considered as a single unit.

461-5 Basis of Payment:

Pavement striping of the type specified, measured as provided above, will be paid for at the contract price per linear foot for the total length of painted line applied to the nearest foot, which price shall be full compensation for the work complete, including glass beads, as described and specified herein and on the project plans.

Pavement symbols and legends measured as provided above, will be paid for at the contract price for each painted symbol or legend, which price shall be full compensation for the work complete, including glass beads, as described and specified herein and on the project plans.

Part 400 add the following new Section:

SECTION 463
RAISED PAVEMENT MARKERS

463-1 Description:

The work under this section shall consist of cleaning and preparing the pavement surface; furnishing all materials, equipment, tools and labor; and placing raised pavement markers of the type specified at the locations and in accordance with the details shown on the plans and the requirements of these specifications.

463-2 Materials:

463-2.01 General:

Certificates of Compliance, for raised pavement markers and adhesive, conforming to the requirements of Subsection 106.05 shall be submitted to the Engineer at least 10 days prior to use. A minimum of one sample per lot per type of marker shall be taken by the Engineer.

The pavement marker samples shall be tested to determine conformance to the applicable standard drawings and these specifications.

The base of the pavement markers shall be free from glass glaze or from substances which may reduce its bond to the adhesive. The base shall be flat and its deviation from a flat surface shall not exceed 0.05 inches.

463-2.02 Reflective Pavement Markers:

Reflective pavement markers shall be of the following type:

Type C Clear, red

Type D Yellow, two-way

Type E Clear, yellow Type G Clear, one-way

Type H Yellow, one-way

Reflective pavement markers shall be of the prismatic reflector type consisting of a molded methyl methacrylate or suitably compounded acrylonitrile butadiene styrene (ABS) shell filled with a mixture of an inert thermosetting compound and filler material. The exterior surface of the shell shall be smooth and shall contain one or two prismatic reflector faces of the color specified.

When illuminated by an automobile headlight, the color of the reflectors shall be an approved clear, yellow, or red as designated. Reflectors not meeting the required color may be rejected.

Permanent reflective pavement markers will be tested for compressive strength, abrasion resistance and specific intensity. Permanent reflective pavement markers shall have thin untempered glass or other abrasion resistant material bonded to the prismatic reflector face to provide an extremely hard and durable, abrasive resistant reflector surface.

The glass, or other abrasion resistant surface, is not required on the red faces of two-way (Clear/Red) permanent reflective markers. The area covered by the glass, or other abrasion resistant surface, shall not be less than three square inches.

Temporary reflective pavement markers will be tested for compressive strength and specific intensity. Temporary reflective pavement markers, or permanent reflective pavement markers used as temporary, will not be tested for abrasion resistance.

The strength by compressive loading shall be at least 2,000 pounds for both permanent and temporary reflective pavement markers.

The original specific intensity of each reflecting surface for both temporary and permanent reflective markers shall not be less than the following:

Reflectance:	**Specific Intensity: candelas/foot-candle**		
degrees incidence	**Clear**	**Yellow**	**Red**
0	3.0	1.8	0.75
20	1.2	0.72	0.30

Permanent reflective pavement markers shall be subject to an abrasion resistance test as follows:

Steel Wool Abrasion Procedure: Form a one-inch diameter flat pad using No. 3 coarse steel wool per Federal Specification FF-W1825. Place the steel wool pad on the reflector lens face. Apply a force of 50 pounds and rub the entire lens surface 100 times. After the lens surface has been abraded, the specific intensity of each clear and yellow reflective surface shall be not less than that required above for the original specific intensity.

463-2.03 Non-Reflective Pavement Markers and Reflectorized Dagmars:

Non-reflective pavement markers shall be of the following types:

Type	**Color**
A	white
AY	yellow

Reflectorized Dagmars shall be of the following types:

Type J white
Type JY yellow

Non-reflective pavement markers and reflectorized dagmars shall consist of a heat-fired, vitreous ceramic base and a heat-fired, opaque glazed surface which will produce the required properties. Markers shall be produced from any suitable combination of intimately mixed clays, shales, flints, feldspars, or other inorganic material which will meet the properties herein required. Markers shall be thoroughly and evenly matured and free from defects which will affect appearance or serviceability.

The top surface of the marker shall be in reasonably close conformity with the configuration shown on the plans. Markers shall be convex and the radius of curvature shall be between 3-1/2 and six inches, except that the radius of the 1/2 inch nearest the edge may be less. All edges shall be rounded and any change in curvature shall be gradual. The top and sides shall be smooth and free of mold marks, pits, indentations, air bubbles, or other objectionable marks or discolorations.

Non-reflective pavement markers and dagmars shall meet the following requirements:

Glaze Thickness: Inches	0.005 Minimum
Moh Hardness:	6 Minimum
Directional Reflectance: (White Only) Glazed Surface Body of Marker	 75 Minimum 70 Minimum
Yellowness Index: (White Only) Glazed Surface Body of Marker	 0.07 Maximum 0.12 Maximum
Color (Yellow Only): Purity: percent, range Dominant Wave Length: mu, range Total Luminous Reflectance (Y valve)	 75 - 96 579 - 585 0.41 Minimum
Compressive Strength: pounds	1,500 Minimum
Water Absorption: percent	2.0 Maximum
Autoclave	Glaze shall not spall, craze or peel

Reflectorized dagmars shall have encapsulated lens reflectors conforming to standard manufacturing practices.

463-2.04 Jiggle Bars:

(A) General:

Types K and KY jiggle bars shall be concrete or ceramic, at the option of the contractor, and shall be shaped to conform to the details shown on the plans. The same type of jiggle bar shall be used throughout any one project.

Jiggle bars shall be painted either white or yellow and shall be reflectorized, as shown on the plans. The color shall be uniform.

The bottom surface of the jiggle bars shall be of a roughness comparable to at least that of fine grade sandpaper. The bottom surface shall not be grooved such that air will be trapped in the grooves when it is pressed into the adhesive.

(B) Concrete:

Concrete jiggle bars shall be made of Class B concrete conforming to the requirements of Section 1006.

(C) Ceramic:

Ceramic jiggle bars shall be made of a heat-fired vitreous base. The glazed surface shall not craze, spall or peel when tested in accordance with the requirements of ASTM C 424 for one cycle at 250 pounds per square inch.

The jiggle bar tiles shall have a compressive strength as follows when tested in accordance with the requirements of ASTM C 773:

Minimum average of five units	6,000 psi
Individual minimum, one unit	5,000 psi

463-2.05 Bituminous Adhesive:

The bituminous adhesive for pavement markers shall be a hot-melt adhesive manufactured by an approved manufacturer. A list of approved manufacturers of bituminous adhesive is shown on the Department's Approved Products List (APL). Copies of the most current version of the APL are available on the internet from the Arizona Transportation Research Center (ATRC), through its PRIDE program.

463-3 Construction Requirements:

The portion of the highway to which the markers are to be attached shall be free of dirt, existing painted lines, curing compound, grease, oil, moisture, loose or unsound layers and any other material which could adversely affect the bond of the adhesive. The method of cleaning the pavement surface and removal of detrimental material is subject to approval by the Engineer and shall include sweeping and the use of high-pressure air spray. On Portland cement concrete pavement and old asphaltic concrete pavements, cleaning shall be accomplished by sandblasting, followed by sweeping and/or air blowing. Newly placed asphaltic concrete pavement need not be sandblasted unless, in the opinion of the Engineer, the surface is contaminated with materials that would adversely affect the bond of the adhesive.

The adhesive shall be placed uniformly on the cleaned pavement surface in an amount sufficient to result in complete coverage of the area of contact of the markers, with no voids present and with a slight excess after the markers have been placed. The markers shall be placed in position and pressure applied until firm contact is made with the pavement. The markers shall be protected against impact until the adhesive has set to the degree acceptable to the Engineer.

Excess adhesive on the pavement and on the exposed surfaces of the markers shall be immediately removed. Thinners or solvents which may be detrimental to either the markers or the bond provided by the adhesive shall not be used in removing excess adhesive.

Markers shall not be installed when the temperature of the pavement surface or the atmosphere is less than 40 degrees F, when the relative humidity is 80 percent or higher or when the pavement surface is not dry.

All markers shall be installed to the line approved by the Engineer and in such manner that the reflective face of the markers is perpendicular to a line parallel to the roadway centerline. No pavement markers shall be installed over longitudinal or transverse joints of the pavement surface.

463-4 Method of Measurement:

Pavement markers will be measured as a unit for each marker furnished and placed.

463-5 Basis of Payment:

The accepted quantities of pavement markers, measured as provided above, will be paid for at the contract unit price for the type designated in the bidding schedule, complete in place, including adhesive and surface preparation.

Part 400 add the following new Section:

SECTION 464
ROADSIDE SIGN SUPPORTS

464.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing roadside sign supports in accordance with the details shown on the plans and the requirements of these specifications.

Sign supports shall consist of breakaway, square perforated tube, and U-channel sign posts, and foundations. The type, size, and installation location of the sign posts will be shown on the project plans.

Sign post and foundations shall conform to the requirements of Cochise County Standard Details.

464.2 MATERIALS

464.2.1 General: Certificates of Analysis shall be submitted for all square perforated tube sign posts and U-channel sign posts.

Excessive damage to the finish of the posts during shipping, handling, or installation will result in rejection of the damaged posts.

464.2.2 Breakaway Sign Post Shapes: Posts shall be fabricated from structural steel conforming to the requirements of ASTM A 572, Grade 50 or ASTM A 588 at the option of the contractor. Base plates for the breakaway connections and friction fuse plates and back plates for the post hinge assembly shall be fabricated from the same type structural steel selected for the sign posts.

Posts shall be fabricated from structural steel conforming to the requirements of ASTM A 572, Grade 50 or ASTM A 588 at the option of the contractor. Base plates for the breakaway connections and friction fuse plates and back plates for the post hinge assembly shall be fabricated from the same type structural steel selected for the sign posts.

All plate holes shall be drilled and all plate notches shall be saw cut, except that flame cutting will be permitted provided all edges are ground. Flange holes shall be drilled or sub-punched and reamed. The posts shall be saw cut for the hinge and bolted as detailed on the plans.

Bolts, nuts and washers shall conform to the requirements of ASTM A 325. Posts and plates shall be galvanized after fabrication in accordance with the requirements of ASTM A 123. Bolts, nuts and washers shall be cadmium plated in accordance with the requirements of ASTM B 766, or zinc plated in accordance with the requirements of ASTM B 633.

464.2.3 Perforated Sign Posts: Single and telescoping perforated posts shall be square tube fabricated from galvanized sheet steel 0.105 inches (12 gauge) or 0.135 inches (10 gauge) as required by the project specifications. Sheet steel shall conform to the requirements of ASTM A 653 for either SQ Grade 40 or SQ Grade 50 Class 1, and be galvanized in accordance with the requirements of Coating Designation G-90. The posts shall have a wall thickness, including coating, of 0.097 to 0.116 inches for 12 gauge and 0.127 to 0.146 inches for 10 gauge.

Posts shall be welded directly in the corner by high frequency resistance welding or equal. The outside edges of the posts shall be scarfed as necessary to produce a standard corner radii of 5/32 ± 1/32 inch.

External welded surfaces and scarfed areas shall be re-galvanized after fabrication.

Holes 7/16 ± 1/64 inch in diameter shall be provided on one-inch centers along all four sides over the entire length of the post. The holes shall be laterally centered on the longitudinal centerline of each face. Hole positioning and spacing shall be the same on all four faces, such that the hole centerlines for each group of four holes shall pass through a common point on the longitudinal centerline of the tube. For telescoping posts, holes shall be in proper alignment to allow 3/8-inch diameter bolts to pass through the entire post.
The finished posts shall be straight and have a smooth, uniform finish. All consecutive sizes of posts shall be freely telescoping for not less than 10 feet of their length without the necessity of matching any particular face to any other face.

Perforated sign posts shall be manufactured by an approved manufacturer. A list of approved manufacturers of perforated sign posts is shown on the Department's Approved Products List (APL). Copies of the most current version of the APL are available on the
internet from the Arizona Transportation Research Center (ATRC), through its PRIDE program.

Bolts shall conform to the requirements of SAE Specification J 429, Grade 5, or ASTM A 449, Type 1. Nuts shall conform to the requirements of ASTM A 563, Grade A. Washers shall conform to the requirements of ASTM F 844.

Bolts, nuts and washers shall be zinc coated in accordance with the requirements of ASTM B 633 or cadmium plated in accordance with the requirements of ASTM B 766.

464.2.4 U-Channel Sign Posts: *U-channel sign post shall be used for temporary signing only.*

U-channel posts shall be fabricated from rerolled rail steel conforming to the requirements of ASTM A499 or hot-rolled carbon steel bars.

Prior to rerolling the rail steel, the rail nominal weight shall be 91 pounds per yard and shall meet the requirements of ASTM A1 pertaining to quality assurance.

Yield Point of the steel shall be 80,000 pounds per square inch (psi) minimum.

The cast heat analysis of the steel shall conform to the following requirements:

Element	**Composition (Percent)**
Carbon	0.67 - 0.82
Manganese	0.70 - 1.10
Phosphorus, max.	0.04

Sulphur, max.	0.05
Silicon	0.10 - 0.25

Posts shall be a uniform, modified, flanged channel-section as shown in Cochise County Standard Detail CC133. Weight of the posts shall be 2.00 lbs. per lineal foot, plus or minus five percent. The post shall be punched with continuous 3/8-inch diameter holes on 1.0-inch centers. The first hole shall be 1.0 inches from top and bottom of post.

The post shall consist of two parts, a sign post and a base post. The sign post lengths shall be supplied in 6-inch increments up to 12.0 feet as required for the installation location. The base posts shall be 3.5 feet in length, pointed at one end, and have at least eighteen holes in the base post, starting 1.0 inch from the top and continuing at 1.0-inch increments.

Posts shall be machine straightened to have a smooth uniform finish, free from defects affecting their strength, durability, or appearance. All holes and edges shall be free from burrs. Permissible tolerance for straightness shall be within 1/16 inch in 3 feet.

Posts shall be galvanized after fabrication in accordance with the requirements of ASTM A123. Bolts, nuts, washers and spacers shall be cadmium plated in accordance with the requirements of ASTM B 766 or zinc plated in accordance with the requirements of ASTM B633.

U-channel base posts shall be driven into the ground to a minimum depth of 36 inches. Where rock is encountered, the rock shall be cored, drilled or removed to a minimum diameter of eight inches and to a depth sufficient to place Portland cement concrete two inches below the bottom of the base post and fill the hole to within one inch of the top. Solid rock coring or drilling is not required to continue beyond 2 inches in depth regardless of the depth at which the rock is encountered, the base post may be cut at the bottom prior to being set in Portland cement concrete where rock does not permit use of full length base post.

464.2.5 Concrete: Concrete for perforated sign post foundations shall be Class B in accordance with Section 725.

Concrete for breakaway sign post foundations shall be Class B, except that utility concrete may be used for foundations using stub post sizes S 3 x 5.7 and S 4 x 7.7. Class B concrete shall conform to the requirements of Section 725. Concrete for perforated sign posts foundations and U-channel sign post foundations, when required, shall conform to the requirements of Subsections 922-2 and 922-3.

Foundation stub posts shall be fabricated from the same type of steel selected for the appropriate sign posts. Breakaway stub posts shall be galvanized a minimum of 12 inches down from the top of the stub. Galvanizing shall be in accordance with the requirements of ASTM A 123.

Reinforcing steel bars for breakaway sign post foundations shall conform to the requirements of ASTM A 615, Grade 40. Reinforcing steel wire shall conform to the requirements of ASTM A 82.

464.3 CONSTRUCTION:

Foundations for perforated sign posts and U-channel posts shall be constructed to the details and dimensions shown on the plans.

Perforated and U-channel sign post lengths shall be determined by the contractor at the time of construction staking. Posts shall be cut to the proper lengths in the field. Splicing will be permitted for single perforated posts; however, splices will be limited to one per each post installation and the

splicing shall be accomplished in accordance with the details shown on the plans. The minimum length of any spliced piece of post shall be two feet.

Sign posts shall be erected plumb.

464.4 MEASUREMENT:

Breakaway sign posts will be measured by the linear foot for each size of post furnished and erected. The length of each size of post will be measured from the bottom of the upper base plate to the top of the post, measure dot the nearest 0.1 feet. The total length of all posts of the same size will be rounded to the nearest foot.

Perforated sign posts and U-channel sign posts shall be measured by the foot, to the nearest 0.1 feet for each post furnished and installed. The total length of all posts of the same type will be rounded to the nearest foot. Telescoping post members will be considered as one post after installation and will not be measured separately. The length of perforated sign post shall be measured from the top of the post to the bottom of the eighteen inches (18") located in the post foundation. The length of U-channel sign posts shall not include the U-channel base post.

Foundations for sign posts will be measured by the unit each for each type of foundation constructed, except that concrete and excavation, when required for setting U-channel base posts, will be considered as part of the post.

464.5 PAYMENT:

The accepted quantities of breakaway posts, perforated sign posts, U-channel sign posts, and foundations for the sign posts, measured as provided above, will be paid for at the contract unit prices complete in place.

The contract unit prices paid shall include full compensation for furnishing all labor, excavation, materials, tools, equipment and incidentals, and for doing all the work involved in constructing foundations, furnishing and erecting the sign posts including galvanizing and furnishing all metal plates and hardware, as shown on the plans and as specified herein, complete in place.

SECTION 465 SIGN PANELS:

465-1 Description:

The work under this section shall consist of furnishing and installing sign panels in accordance with the details shown on the plans and the requirements set forth herein.

The sign panels shall be of the following types:

- Extruded Aluminum Sign Panels with Demountable Characters
- Flat Sheet Aluminum Sign Panels with Direct-Applied or Silk-Screened Characters
- Warning, Marker, and Regulatory Sign Panels
- Route Shields for Installation on Sign Panels
- EXIT ONLY for Installation on Sign Panels

465-2 Materials:
465-2.01 General:

Certificates of Compliance, conforming to the requirements of Subsection 106.05, shall be submitted for all materials required for fabricating sign panels, including retro reflective sheeting.

Shipment, storage, and handling of sign panels shall conform to the recommendations of the manufacturers of the sign panel components. Fabricated signs and overlay sheets shall be shipped on edge. Damage to the sign panel or legend resulting from banding, crating or stacking may be cause for rejection of the signs.

465-2.02 Extruded Aluminum Sign Panels with Demountable Characters:

Panels shall be fabricated from 12-inch wide aluminum extrusions formed from Aluminum Alloy 6063-T6 conforming to the requirements of ASTM B 221 and fastened together by bolt connections as shown on the plans.

Panel facing shall be covered with retroreflective sheeting of the color specified on the plans. The retroreflective sheeting shall conform to the requirements of Section 1007.
The letters, numerals, symbols, borders and other features of the sign message shall conform to the requirements of Subsection 465-2.14, Demountable Characters.

Panel surfaces to be covered with retroreflective sheeting shall be prepared in accordance with the recommendations of the sheeting manufacturer. Panel surfaces not covered with sheeting shall be etched in accordance with the recommendations of the extrusion manufacturer to reduce glare from reflected sunlight.

After all fabrication has been completed, including the cutting and punching of holes, except holes for demountable letters, numerals, symbols and borders, the aluminum extrusions shall be degreased and the retroreflective sheeting shall be applied.

Aluminum extrusions shall be flat with 1/4 inch of tolerance allowed in an eight-foot length, with proportionally greater tolerances permitted on lengths greater than eight feet. Flatness tolerance across the face of each extrusion shall be 0.5 percent of the width.

Aluminum extrusions shall be bolted together on 12-inch centers with a maximum allowable gap of 1/32 inch between extrusions.

Shop fabricated sub-assemblies shall be rigidly braced for transportation and erection. Hardware utilized to fasten panels to supports shall conform to the panel manufacturer's recommendations.

Each completed sign panel shall be provided with a side trim molding fabricated from extruded Aluminum Alloy 6063-T6 conforming to the requirements of ASTM B 221. The trim molding shall be fastened to each individual 12-inch aluminum extrusion with two 5/32-inch diameter self-plugging aluminum blind rivets, 2-1/2 inches from either edge. The exposed surface of the side trim molding shall be treated by etching as recommended by the manufacturer to reduce glare from reflected sunlight.

Each completed sign panel shall be shipped with sufficient bolt clamps placed to install the panel on the sign posts as shown in the plans. Bent bolt channels will be cause for rejection of the sign panel.

465-2.03 Blank
465-2.04 Blank
465-2.05 Blank
465-2.06 Blank

465-2.07 Flat Sheet Aluminum Sign Panels with Direct-Applied or Silk-Screened Characters:

Panels shall be fabricated from 0.125-inch thick, 5052-H38 Aluminum Alloy conforming to the requirements of ASTM B 209.

Panel facing shall be prepared and covered with retroreflective sheeting in accordance with the recommendations of the sheeting manufacturer. The color of the sheeting shall be as specified on the plans or as shown in the Manual of Approved Signs.

All surfaces not covered shall be etched to reduce glare from reflected sunlight.

The retroreflective sheeting shall conform to the requirements of Section 1007. Splicing of retroreflective sheeting shall not be allowed on sign panels having a minimum dimension up to and including four feet.

Messages shall be reflectorized white or, if called for on the plans, opaque black and shall be produced by either silk screening or direct-applying lettering as specified under Subsection 465-2.15.

465-2.08 Blank

465-2.09 Warning, Marker, and Regulatory Sign Panels:

Panels shall be fabricated from flat sheet aluminum and shall be reflectorized as specified herein.

Panels shall be fabricated in one piece from 0.125-inch thick, 5052-H38 or 6061-T6 Aluminum Alloy conforming to the requirements of ASTM B 209.

All surfaces of panels to be covered with retroreflective sheeting shall be prepared in accordance with the recommendations of the sheeting manufacturer. Surfaces not covered shall be etched to reduce glare from reflected sunlight. Retroreflective sheeting shall conform to the requirements of Section 1007.

Warning signs shall be reflectorized with yellow retroreflective sheeting.

Regulatory signs shall be reflectorized with silver-white retroreflective sheeting.

Reflectorized red signs shall be reflectorized with silver-white retroreflective sheeting. The red color shall be produced by silk screening.

Regulatory signs with reflectorized red circles and slashes shall be reflectorized with silver-white retroreflective sheeting. The red color shall be produced by silk screening.

Interstate route markers shall be cut to shape. The colors and legend shall be as shown on the plans and shall be reflectorized with silver-white retroreflective sheeting. The Interstate route colors shall be silk screened. The numerals may be silk-screened or direct-applied characters.

United States, State Route, and Cardinal Direction markers shall be reflectorized with silver-white retroreflective sheeting unless otherwise shown on the plans.

Splicing of retroreflective sheeting shall not be allowed on sign panels having the minimum dimension up to and including four feet.

Sign panels shall be attached to the posts with bolts as shown in the plans. A nylon washer,

conforming to ANSI Standard and having a diameter two times the bolt head diameter, shall be placed between the bolt head and panel face. Fastening nuts shall be heavy hex; however, standard nuts may be used if a flat wash is placed between the nut and sign posts.

465-2.10 Blank

465-2.11 Route Shields (For Installation on Sign Panels):

Route shields shall be cut to shape and shall consist of 0.063-inch thick, 5052-H38 Aluminum Alloy conforming to the requirements of ASTM B 209. The aluminum shall be degreased and etched in accordance with the recommendations of the sheeting manufacturer. Retroreflective sheeting shall be silver-white and shall conform to the requirements of Section 1007. The size of the numerals shall be half the height of the shield.

Route shields shall be attached to the sign panel with self-plugging aluminum blind rivets with a 1/4-inch thick nylon spacer on each rivet between the route shield and the sign panel.

465-2.12 EXIT ONLY (For Installation on Sign Panels):

EXIT ONLY panels shall be fabricated from 0.063-inch thick, 5052-H38 Aluminum Alloy conforming to the requirements of ASTM B 209 with yellow retroreflective sheeting adhered to the face side. The aluminum shall be degreased and etched in accordance with the recommendations of the sheeting manufacturer. Retroreflective sheeting shall conform to the requirements of Section 1007.

EXIT ONLY panels shall be attached to the sign panel with self-plugging aluminum blind rivets with a 1/4-inch thick nylon spacer on each rivet between the EXIT ONLY panel and the sign panel.

The letters, arrows, and borders shall consist of black embossed aluminum frames or flat sheet aluminum frames with no reflectors. The height of the letters shall be 12 inches unless otherwise specified in the plans. The panel shall be 36 inches in height unless otherwise specified in the plans.

465-2.13 Retroreflective Sheeting, Inks and Opaque Film:

Retroreflective sheeting, sign-making inks, and opaque films shall conform to the requirements of Section 1007.

Signs shall be fabricated in accordance with the recommendations established by the manufacturer of the sign sheeting. All processes and materials used to make a sign shall in no way impact the performance, uniform appearance (day and night), or durability of the sheeting, or invalidate the sign sheeting manufacturers' warranty.

All sheeting used for letter and number text shall be of the same type and brand, and shall be installed at a zero-degree orientation.

465-2.14 Demountable Characters:

(A) General:

Letters, numerals, symbols, route shields, borders, and other features of the sign message shall consist of cut-out, flat sheet aluminum legends, with direct-applied sign sheeting or other finishes, that are mounted to the sign panel with rivets as described herein. All characters shall be placed on the signs in a straight and true fashion.

Flat sheet aluminum substrates used for characters and borders shall be either aluminum alloy 3105-

H14, 3003-H14, or 5052 as specified in ASTM B 209. Characters produced from the flat sheet aluminum alloy shall sit flat on the face of the sign panel without visible gap or deformation.

The thickness for letters and numbers shall be 0.032 inches. The thickness for symbols, route shields, and borders shall be 0.063 inches.

All aluminum shall be chemically treated with a chromate acid conversion type coating, or equivalent, to form an oxidation resistant barrier film that is suitable for long term outdoor application. The coating shall prevent the occurrence of oxidation that may cause streaking or discoloration on the sign. The coating shall be applied in accordance with the manufacturer's specifications, and shall have a minimum thickness of 0.002 inches.

All corners and edges of the characters shall be clean and well-defined with no apparent waviness, tears, delamination, deformation or flaws. Burrs and waste material generated from the cutting process shall be removed so characters have a clean, flat, and correct appearance.

Design of letters and numbers shall be in accordance with the project plans.
Splicing of aluminum panels will be acceptable for diagrammatic arrows or other large symbols and shields exceeding 48 inches in more than one direction. Splices, when required, shall include a continuous four- to six-inch wide aluminum back plate that overlaps the joint. The back plate shall ensure no gap at the splice joint when the symbol is assembled and attached to the sign.

Borders on signs with demountable characters shall also be made of aluminum substrate panels, unless otherwise specified. However, in all cases borders on signs with demountable characters shall be made of the same material as the legend.

(B) Sheeting and Colors:

Sheeting or film applied to demountable characters shall be a continuous monolithic piece, without splice or patch, that covers the entire front face of the character. Splicing of the sheeting for demountable borders or characters which have a dimension larger than 48 inches in more than one direction will be allowed. Only one splice shall be allowed every four feet. When a splice is necessary, the adjoining edges shall be placed so there is no visible gap between the two pieces.

The adhesive system for sheeting and opaque films shall form a durable bond which tightly adheres to the aluminum or sign background. After attachment, the sheeting and opaque films shall not discolor, crack, craze, blister, bubble or delaminate. Sheeting and film adhesives must be warranted by the manufacturer against such defects as specified in Section 1007. Only those sheeting and film products which provide the specified warranty will be acceptable.

The color for demountable letters, numbers, symbols, and route shields on green, blue, and brown background signs shall be white, and shall conform to the requirements of Section 1007. Demountable legends on white and yellow background signs shall be black, and shall be opaque and non-reflective. Acceptable finishes for black characters shall be porcelain-enameled black, powder-coated black, or laminated black opaque acrylic film.

When borders are used with demountable characters, white legend and border shall be used on green, blue, or brown sign backgrounds, and black legend and border shall be used on white or yellow sign backgrounds. Sign sheeting conforming to Section 1007 shall be used for white borders. Black borders shall be porcelain-enameled black, powder-coated black, or laminated black opaque acrylic film.

Black porcelain enameling, black powder-coatings, or laminated black opaque acrylic film to be used for characters or borders, as specified above, shall be applied in accordance with the coating

manufacturer's recommendations. The contractor shall provide copies of any warranties provided by the manufacturer for such coatings to the Engineer.

On combination signs, such as a green background sign with white characters that also includes a smaller panel with yellow background and black characters, the color scheme used for the characters and border for each portion of the sign shall be as specified above, i.e. white legend and border shall be used on the green background portion of the sign and black legend and border shall be used on the yellow background portion.

(C) Attachment of Characters and Borders:

Self plugging aluminum, protruding, regular head blind rivets shall be used to secure all demountable characters. The rivets shall conform to the applicable requirements of International Fasteners Institute (IFI) 114 standard for break mandrel blind rivets. All rivets shall be 5/32 inch in diameter with the appropriate grip range.

Rivets shall be either IFI 114 Grade 10 or 11 aluminum alloy rivets. The rivets shall have an ultimate shear and tensile strength that has been determined by IFI 135 Specification 2.1 and 2.2. The ultimate shear and tensile strength shall meet or exceed those values specified for a 5/32 inch (0.1562) nominal rivet diameter per IFI 114 Table 6 for Grades 10 or 11. A higher strength and grade aluminum rivet can be used at the option of the sign fabricator.

Rivets securing the characters to the back panel shall be of sufficient length to ensure a secure attachment and conform to the grip length specifications of the rivet manufacturer. The determination of rivet grip length shall include the total thickness of the joint. This thickness shall include the character (sheeting and aluminum sheet), spacer (if applicable) and the sign back panel (sheeting and aluminum extrusion).

The hole size used to install the rivets shall conform to the recommendation of the rivet manufacturer and Table 2 of IFI 114. Rivets shall be placed a minimum of four times the diameter of the rivet from the edge of the character being attached, e.g., 5/8-inch clearance for a 5/32-inch diameter rivet. Clearance shall be measured to the outside of the rivet head.
Minimum requirements for attaching demountable characters shall be as follows:

Straight numerals and letters such as "1" shall have three rivets, one at the top, middle and bottom. The more complex numerals and letters shall have from four to seven rivets. Letters such as "W" and "M" typically require seven rivets. Letters and numerals such as "P", "H" and "9" typically require six rivets. Letters and numerals such as "G", "S", "2", "3" and "7" typically require five rivets. A rivet shall secure each corner of the letter or numeral. For shields and symbols, rivets shall be spaced evenly around the entire perimeter. Additional rivets shall be added in the middle of the shield or symbol as necessary to eliminate bowing. Rivets for borders shall be spaced evenly around the border.

The actual number of rivets used will depend on the thickness, configuration, weight, position (with or without spacers), size of the character being attached, and the recommendations of the rivet manufacturer. The number and location of rivets shall be sufficient to secure the character to the panel so it shall not miss-align, bend or move when subjected to wind loading. Additionally, the number of rivets used shall ensure that the character does not bow or pull away from the back panel for the life of the sign. Rivets shall be placed in a defined, evenly spaced pattern which is consistent from character to character. The placement and pattern of rivets shall not interfere with the appearance of the sign from normal drive-by viewing distances. The contractor shall supply standard punch details prior to fabrication.

The protruding head and shaft of the rivets shall closely match the color of the character on which they are being applied, e.g., black characters shall be applied with black rivets. Aluminum colored

rivets are acceptable for mounting white characters.

The coating used to color the rivets shall be a factory-applied anodized type finish, or equivalent, that is suitable for long term outdoor application. The coating shall have durable colorfastness and shall be capable of preventing the occurrence of oxidation that may cause streaking or discoloration on the sign. Non-factory painting of the protruding heads of the rivets is not acceptable.

465-2.15 Silk-Screened or Direct-Applied Characters:

Silk-screened letters, numerals, arrows, symbols, and borders, shall be applied on the retroreflective sheeting background of the sign by direct or reverse screen process. Messages and borders of a color darker than the background shall be applied to the retroreflective sheeting by direct process. Messages and borders of a color lighter than the sign background shall be produced by the reverse screen process.
Opaque or transparent colors, inks, and paints used in the screen process shall be of the type and quality recommended by the manufacturer of the retroreflective sheeting.
The screening shall be performed in a manner that results in a uniform color and tone, with sharply defined edges of legends and borders and without blemishes on the sign background that will affect intended use.

Signs, after screening, shall be air dried or baked in accordance with the manufacturer's recommendations to provide a smooth hard finish. Any signs on which blisters appear during the drying process will be rejected.

Direct-applied letters, numerals, symbols, borders, and other features of the sign message shall be cut from black opaque or retroreflective sheeting of the color specified and applied to the retroreflective sheeting of the sign background in accordance with the instructions of the manufacturer of the retroreflective sheeting and shall be applied by heat activation of the adhesive.

The retroreflective sheeting used for characters shall meet or exceed the minimum Specific Intensity Per Unit Area (SIA) of the background sheeting.

465-3 Construction Requirements:

465-3.01 Fabrication:

Fabrication of the sign panels shall be in accordance with the details shown on the plans and the requirements of these specifications. If additional details for sign panel fabrication are required, the contractor shall submit shop drawings in accordance with the requirements of Subsection 105.03.

Panels shall be cut to size and shape and shall be free of buckles, warps, dents, cockles, burrs and defects resulting from fabrication.

Fabricated signs shall be stored indoors and kept dry during storage. If packaged signs become wet, all packaging material shall be removed immediately and the signs allowed to dry. The signs may be repackaged using new dry materials. If outdoor storage is necessary, all packaging materials shall be removed. Signs shall be stored on edge, above ground, in an area where dirt and water will not contact the sign face. Materials used to support stored signs shall not contact sign faces.

465-3.02 Installation of Sign Panels:

The sign panels shall be installed on overhead sign structures and roadside sign supports in accordance with the details shown on the plans and in accordance with the recommendations of the manufacturers of the sign panel components.

Minor scratches and abrasions resulting from fabrication, shipping and installation of panels may be patched; however, patching shall be limited to one patch per 50 square feet of sign area with the total patched area being less than five percent of the sign area. Panels requiring more patching than the specified limit will be rejected. Patches shall be edge sealed by a method approved by the retroreflective sheeting manufacturer.

The heads of bolts on the panel face shall be anodized or painted to match the background or legend color in which they are placed. The nylon washers on the panel face shall be the color of, or shall be painted to match, the background or legend color in which they are placed. The sign manufacturer's name and date of installation shall be placed on the back of each sign in black, one-inch block letters. Use of felt markers for this purpose will not be permitted. Bolts shall be tightened from the back by holding the bolt head stationary on the face of the panel. Twisting of the bolt head on the panel face will not be allowed.

The contractor shall provide two copies of a detailed list of all new signs installed on the project to the Engineer. The list shall include the sign identification code, the date each sign was installed (month and year), the fabricator of the sign, and the materials used to make the sign (manufacturer, type of sheeting, ink and film). The list shall be provided in a commonly used electronic spreadsheet format, such as EXCEL, and the two copies shall be submitted on either CD-ROM disks or IBM-formatted 3.5-inch floppy diskettes. Signs shall be listed in numerical order by route, direction, and milepost and, where more than one sign is installed at the same general location, a letter subscript.
Signs shall be placed at the same orientation along the roadway so that the entire legend of the signs appear uniform under normal viewing conditions, both day and night.

Upon the installation of each finished sign, the contractor shall place information on the back of the sign showing the sign identification code, the sign fabricator, the manufacturer of the sheeting used, and the month and year of the installation. The formatting of the required information shall be as shown on the plans. The information shall be positioned to be readily visible from a vantage point outside the flow of traffic and not obstructed by sign posts, extrusions, stringers or brackets. All letters shall be made of a long life material such as a black opaque acrylic film. Signs not marked as required will not be eligible for payment.
Construction signs are exempt from the installation information requirement unless noted otherwise on the project plans.

Bolts shall be tightened from the back of the sign by holding the bolt head stationary on the face of the panel to prevent damage to the sheeting surface.

465-3.03 Miscellaneous Work (Sign Panels):

The work under this section shall also include furnishing all miscellaneous materials, tools, equipment and labor necessary to relocate exit panels to the right side of the parent sign panel; removing, cutting, and installing side trims and new or salvaged aluminum extrusions on existing sign panels; relocating large guide and exit gore signs; and cutting post tops on existing installations, as required on the plans.

465-3.04 Inspection:

An inspection of the completely installed sign panels will be made by the Engineer during the daytime and at night for proper appearance, visibility, color, specular gloss and proper installation. Each sign panel face shall be cleaned thoroughly just prior to the inspection by a method recommended by the manufacturer. The cleaning solvent and cleaning material shall in no way scratch, deface or have any adverse effect on the sign panel components.

All apparent defects disclosed by the inspection shall be corrected by the contractor at no additional cost to the Department. If color variations or blemishes between sign panel increments are visible from a distance of 50 feet either during the day or at night, the panels shall be removed and replaced at no additional cost to the Department.

465-4 Method of Measurement:

Sign panels will be measured by the square foot for each type or types of sign panels furnished and installed. The area of each sign panel, except for warning, regulatory and marker sign panels, will be measured per plans dimensions.
For warning, regulatory and marker sign panels, the area of each sign panel will be measured to the nearest square foot and the areas will be determined as follows:

> The areas of each rectangular, square or triangular sign panel will be determined from the dimensions shown on the plans. The area of irregular shaped signs, such as stop signs and route markers, will be determined by multiplying the maximum height in feet by the maximum width in feet, using the dimensions shown on the plans.

Miscellaneous Work (Sign Panels) will be measured on a lump sum basis.

465-5 Basis of Payment:

The accepted quantities of each type of sign panel designated in the bidding schedule, measured as provided above, will be paid for at the contract unit price per square foot, complete in place.

Payment shall be made on the total area of each type of sign panel to the nearest square foot, except Route Shields and EXIT ONLY (For Installation On Sign Panels) which shall be paid for as part of the overall panel.

The contract unit price shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for performing all the work involved in furnishing and installing the sign panels, complete in place, including furnishing and applying all retroreflective sheeting, all fastening hardware, all necessary sign supports, stringers and post ties, all as shown on the plans and as specified herein.

The accepted quantities of Miscellaneous Work (Sign Panels), measured as provided above will be paid for at the contract lump sum price, which price shall be full compensation for the work complete in place as shown on the plans and as described and specified herein.

Part 500 add the following new Section:

SECTION 508
CATTLE GUARD

508.1 DESCRIPTION:

This work shall consist of furnishing all materials and labor to construct new cattle guards at the locations shown on the plans.

508.2 MATERIALS & CONSTRUCTION: Materials and construction requirements shall be in accordance with Section 906 Cattle Guards of the current Arizona Department of Transportation (ADOT) Standard Specifications for Road and Bridge Construction and the referenced ADOT Standard Drawing.

508.2.1 Beam Design: Cattle guards shall be constructed using beams designed for HS-20 or heavier loading.

508.2.2 Precast Units: Precast units may be used when fabricated in accordance with shop drawings approved by Cochise County. The precast option shall incorporate a proactive design acceptable to the County to ensure the gap space between adjacent grill units will be limited to 1/4 - inch plus or minus 1/16 - inch.

508.3 MEASUREMENT:

Cattle guards shall be measured as complete units in place for each size structure constructed. The size of cattle guards shall be noted by the number of grill units used in the installation.

508.4 PAYMENT:

Payment for cattle guards constructed and accepted will be made at the contract unit price for each structure, complete in place.

SECTION 601
TRENCH EXCAVATION, BACKFILLING AND COMPACTION

601.1 DESCRIPTION, add the following:

Backfill around manholes and junction structures shall comply with requirements of Section 206.4 Structural Backfill.

The work covered by this specification includes the backfilling of utility potholes.

601.4.5 Final Backfill, add the following:

Trenches within existing paved areas, roadway shoulders, and the travelled way of unpaved roadways shall use ½-sack CLSM or 1-sack CLSM for backfill unless use of an alternative material has received prior approval. Utility potholes in existing paved areas or within two feet of pavement shall use ½-sack CLSM or 1-sack CLSM for backfill unless use of an alternative material has received prior approval.

Requests for the use of alternative materials shall include project information such as trench width, trench depth, backfill material source, properties of the proposed backfill material,

proposed backfill procedures, and proposed testing.

For trenches and utility potholes within paved areas the CLSM backfill shall extend from twelve inches (12") above the top most conduit to the bottom of the aggregate base as defined for Trench Repair of MAG Detail 200. For trenches and utility potholes within unpaved areas the CLSM backfill shall extend from twelve inches (12") above the top most conduit to six (6) inches below the finished grade, material for the top six (6) inches shall match the existing surfacing.

Add the following new section:
601.4.12 Embedment Zone Material Requirements for HDPE Pipe: Controlled low strength material (CLSM) shall be used within the pipe embedment zone for HDPE pipe. The CLSM shall be ½-sack or 1-sack per Section 728. Placement of the CLSM shall be per Section 604 and extend from the trench foundation to 12 inches above the pipe crown.

Add the following new section:

601.4.13 Allowable Resistivity and pH Values for Material Placed within the Pipe Embedment Zone and Backfill: Material placed within the pipe embedment zone and final backfill area for pipes, pipe-arches, or arches made of metal shall have a value of resistivity not less than 2000 ohm-cm or of the value shown on the project Plans. When resistivity is not shown on the Plans, the material shall have a value of resistivity not less than that of the existing in-place material or 2000 ohm-cm, whichever is greater. Material for all metal pipe installations shall have a pH value between 6.0 and 9.0 inclusive. Material for all concrete or plastic pipe installations shall have a pH value between 6.0 and 12.0. Tests for pH and resistivity shall be in accordance with the requirements of Arizona Test Method 236.

SECTION 710
ASPHALT CONCRETE

710.2 MATERIAL:

710.2.3 Reclaimed Asphalt Pavement (RAP), Replace the third paragraph with the following**:**

RAP shall not exceed 20% contribution of the aggregate or binder in the base or intermediate courses of arterial streets. RAP shall not exceed 30% contribution of the aggregate or binder in the base or intermediate courses of collector streets. RAP shall not be used in the surface course for all roadway classifications.

710.3 MIX DESIGN REQUIREMENTS:

710.3.1 General, add the following:

710.3.1.1 Verification Testing: The Engineer may conduct tests to verify the laboratory air voids using the submitted target binder content and design gradation. If the resulting air voids is outside the required range, the Contractor shall make adjustments on the binder content to gain compliance with the air voids requirement. The Contractor shall make available samples of the proposed aggregate and binder to conduct verification testing by the Engineer.

SECTION 728
CONTROLLED LOW STRENGTH MATERIAL

728.4 MIXING, add the following:

The project identification used to obtain the Engineer's pre-approval for dry batched unmixed CLSM shall be on the batch weight records.

SECTION 738
HIGH DENSITY POLYETHYLENE PIPE & FITTINGS FOR STORM DRAIN & SANITARY SEWER

Section 738.1 is modified as follows:

HDPE pipe size shall be limited to sizes 8-inch through 60-inch diameter. Sizes greater than 60-inch diameter shall not be used within Cochise County rights-of-way without specific written approval from Cochise County.

SECTION 740
POLYPROPYLENE PIPE & FITTINGS FOR STORM DRAIN, IRRIGATION & SANITARY SEWER

Polypropylene pipe (PP) shall not be used within Cochise County rights-of-way without specific written approval from Cochise County.

SECTION 771
GALVANIZING

771.4 REPAIR OF GALVANIZED SURFACES, replace with the following:

Unless otherwise specified, where galvanized surfaces are field or shop cut, broken, burned, or abraded, thus breaking the galvanizing, the locations thus damaged shall be repaired to the satisfaction of the Engineer with zinc dust-zinc oxide coating conforming to the Repair of Damaged Coatings section of AASHTO M-36.