

REVIEW OF INCONSISTENCIES BETWEEN SUDAS AND IOWA DOT SPECIFICATIONS

Phase III: Continued Implementation of Recommendations into SUDAS Specifications

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Background Summary

In the 1990's, city, county, and utility agencies in the Des Moines metropolitan area joined together to develop the Des Moines Metropolitan Standards and Specification Committee, with the goal of developing a unified set of design and construction standards that could be applied to work within these communities. The work of these communities resulted in the development of the Urban Standard Specifications for Public Improvements, which were ultimately adopted in 1998. Communities outside central Iowa began to realize the potential cost savings from these new specifications, and adopted them for their own use. Growing interest carried the central Iowa specifications to statewide use, and eventually they were placed under the direction of the Institute for Transportation (InTrans). The SUDAS Specifications, developed from the original Des Moines Metropolitan Standards, have become the benchmark documents used for construction of water main, sanitary sewer, storm sewer, site improvements, and other urban items of work in Iowa.

As the use and influence of the SUDAS Specifications grew, they drew the interest of the Iowa DOT. Because the SUDAS specifications were developed specifically for urban construction, and because both designers and contractors are familiar with them, the Iowa DOT desired to utilize the SUDAS Specifications on federal aid projects in urban areas. However, due to differences with definitions, general conditions, and format between the Iowa DOT and SUDAS specifications, utilizing the SUDAS Specifications on DOT projects was difficult and therefore limited.

In response to this difficulty, a research project (now referred to as Phase 1) was initiated in 2004 to find the incompatibilities between the two sets of specifications and standard drawings. The ultimate goal of this project was to update both the DOT and SUDAS specifications to develop uniformity between the two documents. The project compared the following areas:

- Definitions and abbreviations
- Bid items, measurement, and payment
- Construction methods and materials
- Standard drawings.

Both specifications were also examined to identify all references to the contractual provisions portions of the documents (Division I of SUDAS and Division 11 of the DOT). The elimination of such references would make it possible to utilize the means and methods of one set of specifications with the general conditions of another. The specifications were also examined to determine areas of overlap and items of work covered by one and not the other.

Comparisons were made in 2005 and 2006, with a final report issued in May 2006.

In 2006, a second research project (now referred to as Phase 2) commenced with the intention of incorporating many of the recommendations made in the Phase 1 report. The Phase 2 project focused on sections of the SUDAS Specifications that were particularly

Background Summary

urban in nature including Trench and Trenchless; Sewers and Drains; Water Mains; Structures for Storm and Sanitary; and Driveways, Sidewalks, and Recreational Trails.

The work completed under Phase 2 included rewriting the specification sections described above to eliminate the inconsistencies identified under the Phase 1 project and redrafting 124 of the 240 SUDAS figures to a new landscape format similar to the Iowa DOT's Standard Road Plans.

While the Phase 2 project, and other related projects, eliminated a majority of the inconsistencies identified in Phase 1, portions of Division 7, Streets and Related Work, and Division 9, Site Work and Landscaping, still needed to be updated. To finish what was started with Phase 1, a third and final phase of the inconsistencies project was proposed.

Phase 3 addresses the remaining items in Division 7 including Section 7010, (PCC Pavement – figures only), Section 7020 (HMA Pavement - figures only), and Section 7040 (Pavement Rehabilitation). In addition, a majority of the specifications and figures in Division 9 also required updates to eliminate inconsistencies. This included Section 9020 (Sodding), Section 9030 (Plant Material and Planting), Section 9050 (Gabions and Rip Rap), Section 9060 (Fencing), Section 9070 (Retaining Walls), and Section 9080 (Concrete Steps and Handrail).

Project Objectives

The objective of the Phase 3 project was to re-write the identified sections of the SUDAS specifications into the imperative mood, consistent with the format utilized during the Phase 2 project and other work completed by SUDAS staff. Figures for the identified sections were updated to match the new SUDAS format, similar to the Iowa DOT Standard Road Plans. While the Iowa DOT does not intend to incorporate all of the following sections into their specification book, consistency with the Iowa DOT specifications was strived for wherever possible. Maintaining consistency between the specifications simplifies design, bidding, and construction.

The following summarizes the major objectives of this project:

1. Division 7: Streets and Related Work

Revise the specifications for Section 7040, Pavement Repair and Rehabilitation as follows:

- Eliminate discrepancies between the SUDAS and Iowa DOT specifications regarding sawcut requirements, patching materials, pavement mixes, and measurement and payment.
- Rewrite the specifications to the imperative mood.

2. Division 9: Site Work and Landscaping

Revise the specifications for Sections 9020, Sodding; 9030, Plant Material and Planting; 9050, Gabions and Rip Rap; 9060, Fencing; 9070, Retaining Walls; and 9080, Concrete Steps and Handrails as follows:

- Clarify sod watering and warranty requirements for SUDAS.
- Coordinate planting methods between SUDAS and the Iowa DOT specifications.
- Remove proprietary references within the gabions and retaining wall sections.
- Update the concrete steps and handrail specifications to comply with current ADA requirements.
- Rewrite the specifications to the imperative mood.

3. Standard Drawings

Revise the SUDAS figures for the following sections: 7010, PCC Pavement; 7020, Hot Mix Asphalt; 7040, Pavement Repair and Rehabilitation; 9030, Plant Material and Planting; 9050, Gabions and Rip Rap; 9060, Fencing; 9070, Retaining Walls; and 9080, Concrete Steps and Handrail as follows:

- Update figures to match the new SUDAS landscape format, similar to the Iowa DOT Standard Road Plans. Revise figures as necessary based upon the revised specifications.

Review Process

The specification revision process for each section began with Snyder and Associates staff reviewing the existing specifications and the conflicts identified during the Phase I project. Snyder then developed a plan for revising the specifications to eliminate these conflicts. For some of the specification sections, this required a complete restructuring and rewrite of the section.

Each of the revised specifications sections underwent a number of drafts before being presented to the committee for review. During the revision process, questions inevitably arose which required the consideration of the review committee. These questions were noted in the revised specifications for eventual discussion with and input from the review committee.

The final draft of the revised specifications sections was then presented to the committee for review and comment. The committee and Snyder staff reviewed each of the specifications section by section. Invaluable feedback was provided by the review committee. Through their input, additional changes were recommended and incorporated into the revised specification sections.

During the review period for a particular specification section, Snyder staff would begin the revisions to the SUDAS figures related to the specifications under review. Each of the figures was updated following the Iowa DOT's drafting standards for Standard Road Plans, with the exception of utilizing a larger font size upon request of the SUDAS Districts. During each figure's update, any errors were corrected and the language within the figure was revised to comply with the new specifications.

After completion of the specification review, the committee then had the opportunity to review and comment on the figures for that section.

The committee's recommended changes to the updated specifications and figures were incorporated and presented to them for final approval before moving on to the next specification section.

After receiving final approval from the review committee, the specifications and figures were presented to the SUDAS District Committees and Board of Directors for approval.

Results

General

All specification sections were re-written into the active voice, imperative mood to match the current SUDAS standard. In addition, the measurement and payment sections were updated into the current three-part standard.

A copy of the updated specifications and a summary of the revisions for each section is included in Appendix A.

A copy of updated SUDAS figures, along with a summary of major figure revisions is included in Appendix B.

A brief overview of revisions made to each section is presented below.

Division 7 – Streets and Related Work

- *Section 7010, Portland Cement Concrete Pavement & 7020, Hot Mix Asphalt Pavement*

The figures for Section 7010 (Portland Cement Concrete Pavement) and 7020 (Hot Mix Asphalt Pavement) were completely re-drawn. A number of these figures will be shared as joint figures between the Iowa DOT and SUDAS.

- *Section 7040, Pavement Rehabilitation*

Both the specifications and the figures for Section 7040 (Pavement Repair and Rehabilitation) were updated. The pavement repair methods described in the specifications and shown on the figures were updated based upon the Concrete Pavement Preservation Workshop Reference Manual, published by USDOT / FHWA in February of 2008. This manual, developed by the National Concrete Pavement Technology Center at InTrans, represents the current state of practice for pavement repair and rehabilitation.

Division 9 – Site Work and Landscaping

- *Section 9020, Sodding*

The warranty period, requiring the contractor to replace sod for up to one year was removed as it was deemed unreasonable and beyond the contractor's control. Fertilizer requirements were removed and replaced with references to the Iowa Department of Agriculture and the Iowa DOT. One question was left for SUDAS district consideration. The current SUDAS specifications only require the contractor to maintain (water, weed, mow, etc) the sod for 14 days. The committee's opinion is that this is not long enough for the sod to become established and take root. The committee

Results

recommends that the SUDAS districts consider increasing this to 30 days, which would match the Iowa DOT specifications.

- *Section 9030, Plant Material and Planting*

The most significant change to this section was an update to the plant establishment and warranty period. The previous SUDAS specifications required the contractor to warranty plants for one-year after initial acceptance and replace any dead plants or trees at the end of the warranty period. An additional one-year warranty would be included for any plants the contractor replaced. Theoretically, this could continue in perpetuity.

The revised specifications provide for a one-year establishment period for all plants. At the end of the period, any necessary replacements are made and the contract is completed. In addition, optional bid items were developed to provide for an extended warranty which stretches the establishment period to two-years. This configuration more closely matches the Iowa DOT's specifications, which provide options for either a one-year or two-year maintenance period.

The planting figures were updated to reflect changes in the specifications. Several of the planting figures were combined for clarity. The detail for the sidewalk tree well was eliminated as it contained project specific information.

- *Section 9050, Gabions*

Rip Rap was removed from this section, as it was previously included in Section 9040 as part of TR-508.

The title of this section was revised to Gabions and Revet Mattresses. Revet mattresses were included as they are commonly used in conjunction with gabion baskets. The material specifications for gabions were completely re-written. The previous specifications simply referenced an obscure federal specification for wire and specific manufacturers as approved products. The revised specifications refer to ASTM A 975 for the material requirements for gabion and revet mattresses. An option to specify PVC coated gabions or revet mattresses was also added.

The execution section was updated to include revet mattresses and more closely follow the typical order of installation.

A new figure detailing the assembly and installation of gabions and revet mattresses was developed.

- *Section 9060, Fencing*

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Updated the materials requirements to follow both Iowa DOT and current ASTM specifications for fence, posts, and PVC coating. A separate bid item for barbed wire was added along with updated barbed wire specifications.

The SUDAS fencing details were updated to closely follow the Iowa DOT's fencing details in the Standard Road Plans. This will not be a shared detail at this time due to minor variations in gate design and fence location with respect to the right-of-way line; however, the review committee anticipates that this could become a shared figure in the future.

– *Section 9070, Landscape Retaining Walls*

This section was re-written to develop a set of retaining wall specifications for short landscape retaining walls with a height of up to 4 feet. These walls do not require a separate structural and geotechnical analysis and design by a licensed professional engineer.

The previous specifications included broken concrete, railroad tie, and combination cast-in-place concrete walls with sidewalk. The broken concrete and railroad tie walls were deleted due to their infrequent construction and un-aesthetically pleasing appearance. The combination concrete sidewalk / wall was moved to Section 9072 since the standard detail allows it to be constructed taller than 4 feet. In addition, the design engineer could provide a special design allowing the wall to be constructed even taller.

New specifications were developed for modular block, limestone, and landscape timber retaining walls.

The term “modular block” was selected to match the Iowa DOT specifications, Section 2430, for walls that typically do not require an engineered design (the DOT requires all segmental or modular block retaining walls to be engineered – even walls shorter than 4 feet). The revised specifications for the modular block walls follow the industry standard ASTM C 1372, but go on to add more stringent requirements for compressive strength, absorption, and freeze-thaw durability. The increased performance requirements, which match the Iowa DOT's specifications, are necessary because it is common for these walls to be installed adjacent to roadways or parking lots where salt spray can affect the long-term durability of the walls. Past experience has shown that standard walls subjected to salt spray can deteriorate quickly. The specifications require that the modular blocks be supplied from an approved Iowa DOT source or system.

Figures for the modular block, landscape timber, and limestone retaining walls were developed. These figures show the typical cross section and installation for each type of wall.

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- *Section 9071, Segmental Block Walls*

This is a new section, and is similar to the Iowa DOT Section 2431 for Segmental Retaining Walls. These walls typically exceed 4 feet in height. Like the Iowa DOT, the SUDAS specifications require a licensed professional engineer to design these walls. This design work is completed either by the wall manufacturer's engineer or by an engineer hired by the contractor after the bid letting. Like the modular block walls, this section follow ASTM C 1372, but imposes additional material requirements to improve long-term performance and durability.

- *Section 9072, Combined Concrete Sidewalk and Retaining Wall*

This specification was pulled out of Section 9070 and developed into a stand-alone section due to the differences in materials and construction compared to a segmental or landscape timber wall. In addition, these walls can be constructed up to 5 feet tall with the standard concrete details included and even taller with a special design provided by the design engineer.

The measurement and payment for this item was changed from a square feet of vertical face basis to a cubic yard basis. Because the sidewalk is an integral part of the structure, and is variable in width, measuring on a cubic yard basis is more appropriate.

The materials and execution section previously referenced Section 7010 (PCC Pavement). The revised specifications were updated to reference Section 6010 (Structures for Sanitary and Storm Sewer) since the work is primarily structural concrete rather than paving work.

- *Section 9080, Concrete Steps, Handrail, and Safety Rail*

This section was updated to address compliance issues with ADA regulations. The materials specifications were updated to reference Section 6010 for structural concrete and the handrail materials were expanded to allow galvanized iron or aluminum in addition to the standard painted iron pipe. A new safety rail specification was developed for use along retaining walls, sidewalks, or other locations where there is a fall risk. The safety rail was designed to meet current building codes.

Project Summary

The SUDAS-Iowa DOT Inconsistencies Review began in 2005 with the Phase 1 (TR-524) study identifying inconsistencies between the Iowa DOT and SUDAS in Divisions 1, 2, 3, 4, 5, 6, 7, and 9 of the SUDAS specifications.

Elimination of these inconsistencies began with the Phase 1 project, continued with Phase 2 (TR-565), and was completed under this third and final phase. With the completion of Phase 3, the specifications and/or figures for 27 of the 49 SUDAS sections were revised. Most of the remaining sections have been revised by SUDAS staff or as part of other projects.

This process has eliminated numerous inconsistencies between the Iowa DOT and SUDAS specifications and resulted in the development of several shared specifications that are nearly identical in content and function. In addition, a number of common SUDAS figures and Iowa DOT Standard Road Plans were developed in cooperation and are (or will be) included in both manuals. This uniformity will ease frustration for both designers and contractors and provide consistency between local and state projects.

Currently, 12 shared specification sections and 47 common figures have been published and are already being utilized by SUDAS and the Iowa DOT. Four additional shared specification sections, and their associated figures, are in the process of being approved and will be published at a future date. Two additional sections have been identified as candidates for sharing in the future. The table on the following page summarizes the status of current, proposed, and future shared SUDAS-Iowa DOT specifications.

While the three phases of the SUDAS-Iowa DOT Inconsistencies Review project resulted in the development of several shared specifications and numerous common figures, the project also established a culture of collaboration and cooperation between the two organizations that will continue into the future. SUDAS and the Iowa DOT continue to work together to ensure their manuals are as clear, concise, and consistent as possible.

Project Summary

Status of Shared SUDAS Specifications and Common Figures

SUDAS Section	Description	Iowa DOT Sections	Shared Spec?	Common Figures? (#)
1010	Definitions	1101	Similar	N/A
1020	Proposal Requirements and Conditions	1102	No	N/A
1030	Approval for Award & Award of Contract	1103	No	N/A
1040	Scope of Work	1104	No	N/A
1050	Control of Work	1105	No	N/A
1060	Control of Materials	1106	No	N/A
1070	Legal Relations & Responsibility to the Public	1107	No	N/A
1080	Prosecution and Progress	1108	No	N/A
1090	Measurement & Payment	1109	No	N/A
2010	Earthwork, Subgrade, & Subbase	2102	No	No
3010	Trench Excavation and Backfill	2552	Yes	Yes (5)
3020	Trenchless Construction	2553	Yes	N/A
4010	Sanitary Sewers	2504	Yes	Yes (3)
4020	Storm Sewers	2503	Yes	Yes (1)
4030	Pipe Culverts	2516 to 2520	No	No
4040	Subdrains and Footing Drain Collectors	2502	No	No
4050	Pipe Rehabilitation	2549	Yes	N/A
4060	Cleaning, Inspection, and Testing of Sewers	2504	Yes	N/A
5010	Water Main, Pipe and Fittings	2554	Yes	Yes (2)
5020	Water Main, Valves, Fire Hyd., & Appurtenances	2554	Yes	Yes (1)
5030	Water Main, Testing and Disinfection	2554	Yes	N/A
6010	Structures for Sanitary and Storm Sewers	2435	Yes	Yes (30)
6020	Rehabilitation of Existing Manholes	2549	Yes	N/A
6030	Cleaning, Inspection, & Testing of Structures	2435	Yes	N/A
7010	Portland Cement Concrete Pavement	2301	No	Yes (4)
7020	Hot Mix Asphalt Pavement	2303	No	Yes (1)
7030	Recreational Trails, Sidewalks, & Driveways	2511 & 2515	No	No
7040	Pavement Repair and Rehabilitation	2212, 2529, 2530, 2541, 2542	No	No
7050	Asphalt Stabilization	N/A	N/A	N/A
7060	Bituminous Seal Coat	2307	No	N/A
7070	Emulsified Asphalt Slurry Seal	2319	No	N/A
Div. 8	Traffic Signals	Not Included in Project		
9010	Seeding	2601	Future	N/A
9020	Sodding	2601	No	N/A
9030	Plant Material and Planting	2610 & 2611	Future	Future (3)
9040	Erosion and Sediment Control	2601 & 2602	No	No
9050	Gabions and Retet Mattresses	2546	Proposed	Proposed (1)
9060	Fencing	2519	No	No
9070	Landscape Retaining Walls	2430	Proposed	Proposed (3)
9071	Segmental Block Retaining Walls	2431	Proposed	N/A
9072	Combined Concrete Sidewalk & Retaining Wall	2516	Proposed	Proposed (1)
9080	Concrete Steps, Handrail, and Safety Rail	2516	No	No
10000	Utility Service Location Details	Not Included in Project		
1110	Demolition	Not Included in Project		

Note: Shaded lines indicate sections with shared specifications, common figures, or both.

Recommendations

This project completes the Inconsistencies study that began nearly five years ago. The project has resulted in significant revisions to both the SUDAS and the Iowa DOT specifications, eliminating numerous conflicts and confusion for designers and contractors. The project also established a process of collaboration between a State DOT and local communities that is unique to the State of Iowa.

It is essential that this attitude of cooperation continue as the Iowa DOT and SUDAS work together to maintain the existing shared specifications and common figures. Without continuous communication, inconsistencies could be re-introduced into the documents, creating confusion for the end-users.

Finally, it is recommended that SUDAS and the Iowa DOT continue to expand their collaborative efforts to develop additional shared specifications and common figures and look to add joint design standards for common areas of design.

APPENDIX A

Revised Specifications for TR-607:

Review of Inconsistencies Between
SUDAS and Iowa DOT Specifications

Phase III: Implementation of Recommendations
into SUDAS Specifications

Section 7040 Specifications

Pavement Repair and Rehabilitation

Summary of Changes to Section 7040 Pavement Rehabilitation

The following major updates were made to Section 7040:

General:

- Changed the title of this section to “Pavement Rehabilitation.”
- Removed surface patching, joint cross stitching, and partial depth curb replacement from section.

Measurements and Payment:

- The measurement and payment for HMA, PCC, and composite full depth patches were put together under one measurement and payment item. Although Iowa DOT pays for the HMA layer on composite patches by weight, we treated composite patches the same as full depth HMA or PCC patches. Also added provision that patches less than 2 square yards will be considered 2 square yards.
- Eliminated the “patches by count” bid item.
- Added a bid item for subbase overexcavation. This matches a bid item in the Iowa DOT specs. There was a line in Division 3 of the existing SUDAS specs that essentially created the item, but there was nothing under measurement and payment. Unlike Iowa DOT, we propose using a unit of tons rather than square yards (to avoid the overdepth conversion factor).
- Partial depth patches were previously measured in square yards. Changed to measure by square feet with a minimum of 1 square foot.
- Changed crack and joint cleaning and filling to a 2-part bid item: 1) cleaning and filling by linear foot, 2) filler material by weight. This is similar to how Iowa DOT pays for this work, except Iowa DOT length item is along the centerline of the roadway and the SUDAS item is along the individual cracks.
 - Distinguished between hot pour and emulsion.
 - Added the emulsion method of sealing cracks in HMA. Includes item for placing HMA in cracks greater than 1 inch.
- Change bid item on curb and gutter to removal rather than replacement (replacement is covered using 7010 specs).

Materials and Equipment:

- Moved equipment requirements to Part 3 (Execution) per current Iowa DOT practice.
- Iowa DOT PCC patching specs exclusively use Class M mix, with the aim of getting high early strength (and early pavement opening). Iowa DOT patching specs have completely different materials requirements from the PCC pavement specs. We gave the option in the SUDAS specs to do standard patching (C Mix) or Iowa DOT high opening strength pavement (M mix, though we disallowed the use of calcium chloride).
- Added caveat for coarse aggregate size on partial depth PCC patches.
- Removed curb and gutter replacement from 2.01, A - installation of new curb and gutter is covered in 7010.
- Added materials information for subbase material, liquid curing compound, and cement grout.

Summary of Changes to Section 7040 Pavement Rehabilitation

Execution:

- Part 3 was reorganized to create subsections for each type of work.
- Discussion item - We have figures for full depth repairs that are less than full panel width. Does this mean the patches should be full panel width (3.01, C)?
- Updated execution items to comply with FHWA's *Concrete Pavement Preservation Workshop Reference Manual* recommendations (specifically on PCC items - PCC patching, full and partial depth, and diamond grinding).
- Pavement removals for full depth patching were revised to eliminate the second sawcut per FHWA recommendations. Aggregate interlock is not important when all joints are intended to be tied or dowelled (or B joints in some instances).
- Changed to a 15 pound maximum size pneumatic hammer for removing deteriorated pavement in partial depth patch areas (was previously a 30 pound maximum).
- Removed information concerning continuously reinforced PCC patches – removals and construction. Was considered a specialty item.
- Referred to PCC paving section for opening strength on full depth patching, but added a note stating maturity testing is not required.
- Removed cross-stitching. Was considered more of a specialty repair.
- Removed items not specifically pertaining to PCC pavement repair and rehabilitation, such as utility trench excavation and backfill.
- Crack and joint cleaning and filling had previously been limited to PCC pavement; it was expanded to include HMA pavement as well. Also added equipment information. Updated and consolidated execution information to make it consistent with Iowa DOT.
- Added emulsion option for crack cleaning and filling following Iowa DOT's requirements.
- Changed execution information for curb and gutter removal and replacement to only cover removal (7010 will cover replacement).

PAVEMENT REPAIR AND REHABILITATION**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Full and Partial Depth PCC Patches
- B. Full and Partial Depth HMA Patches
- C. Full Depth Composite Patches
- D. Diamond Grinding
- E. Milling
- F. Cleaning and Filling Joints and Cracks
- G. Curb and Gutter Replacement

1.02 DESCRIPTION OF WORK

- A. Construct full depth PCC, HMA, and composite patches.
- B. Construct partial depth PCC and HMA patches.
- C. Grind existing PCC pavement surface for profile improvement using a diamond grinder.
- D. Mill the surface of HMA or PCC pavement to improve the surface profile and cross-section in preparation for resurfacing.
- E. Clean and fill longitudinal and transverse joints and random cracks in PCC and HMA pavement.
- F. Remove existing pavement and curb and gutter.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. PCC mix design.
- B. HMA mix design.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, HANDLING, AND SALVAGING

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. PCC:** See Section 7010.
- B. HMA:** See Section 7020.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Full Depth Patches**

1. **Measurement:** Measurement will be in square yards for each type of full depth patch. Patches less than 2 square yards in area will be considered 2 square yards.
2. **Payment:** Payment will be at the unit price per square yard for each type of full depth patch.
3. **Includes:** Unit price includes, but is not limited to, sawing, removing, and disposing of existing pavement and reinforcing; restoring the subgrade; furnishing and installing tie bars and dowel bars; furnishing and placing the patch material, including the asphalt binder and tack coat; forming and constructing integral curb; surface curing and pavement protection; joint sawing and filling; and placing backfill and restoring disturbed surfaces.

B. Subbase Overexcavation:

1. **Measurement:** Measurement will be in tons of subbase material placed for authorized overexcavation.
2. **Payment:** Payment will be at the unit price per ton of subbase material.
3. **Includes:** Unit price includes, but is not limited to, removal of existing subbase or subgrade, disposal of materials removed, furnishing and placing subbase material, and any additional excavation required for subbase placement.

C. Partial Depth Patches:

1. **Measurement:** Measurement will be in square feet for each type of partial depth patch. Patches less than 1 square foot in area will be considered 1 square foot.
2. **Payment:** Payment will be at the unit price per square foot for each type of partial depth patch.
3. **Includes:** Unit price includes, but is not limited to, sawing, removing, and disposing of existing pavement; furnishing tack coat or bonding agent; furnishing and placing the patch material; curing; joint filling (PCC patches only); placing backfill; and restoring disturbed surfaces.
4. **Extra Payment:** When partial depth patches are constructed to full depth at the direction of the Engineer, payment will be at 2 times the unit price per square foot for each type of partial depth patch.

1.08 MEASUREMENT AND PAYMENT (Continued)**D. Crack and Joint Cleaning and Filling, Hot Pour:****1. Crack and Joint Cleaning and Filling, Hot Pour:**

- a. **Measurement:** Measurement will be in linear feet measured along the cracks or joints.
- b. **Payment:** Payment will be at the unit price per linear foot of crack and joint cleaning and filling.
- c. **Includes:** Unit price includes, but is not limited to, routing, sawing, cleaning, and filling joints or cracks. Unit price does not include furnishing crack and joint filler material.

2. Crack and Joint Filler Material, Hot Pour:

- a. **Measurement:** Measurement will be in pounds of material used, based on product packaging, for crack and joint filling.
- b. **Payment:** Payment will be at the unit price per pound of crack and joint filler material.
- c. **Includes:** Unit price includes furnishing crack and joint filler material and delivery to the project site.

E. Crack Cleaning and Filling, Emulsion:**1. Crack Cleaning and Filling, Emulsion**

- a. **Measurement:** Measurement will be in linear feet measured along the cracks. Map cracked areas will not be measured.
- b. **Payment:** Payment will be at the unit price per linear foot of crack cleaning and filling.
- c. **Includes:** Unit price includes, but is not limited to, cleaning cracks, placing soil sterilant, and filling cracks. Unit price does not include furnishing crack filler material.

2. Crack Filler Material, Emulsion:

- a. **Measurement:** Measurement will be in pounds of material used, based on product packaging, for crack filling.
- b. **Payment:** Payment will be at the unit price per pound of crack filler material.
- c. **Includes:** Unit price includes, but is not limited to, furnishing crack filler material and any blotting sand provided.

3. Hot Mix Asphalt for Crack Filling:

- a. **Measurement:** Measurement will be in tons of HMA used for filling cracks greater than 1 inch. Quantity will be based upon scale tickets. Mixture not used in the work will be deducted based upon scaled weights.
- b. **Payment:** Payment will be at the unit price per ton for HMA used in filling cracks over 1 inch.
- c. **Includes:** Unit price includes, but is not limited to, cleaning, applying tack coat, and furnishing and placing HMA for crack filling.

F. Diamond Grinding:

- 1. **Measurement:** Measurement will be in square yards for the area of diamond grinding.
- 2. **Payment:** Payment will be at the unit price per square yard of diamond grinding.
- 3. **Includes:** Unit price includes, but is not limited to, diamond grinding pavement, testing for smoothness according to the contract documents, and removal of slurry and residue from the project site.

1.08 MEASUREMENT AND PAYMENT (Continued)**G. Milling:**

1. **Measurement:** Measurement will be in square yards for the area of milling.
2. **Payment:** Payment will be at the unit price per square yard of milling.
3. **Includes:** Unit price includes, but is not limited to, milling pavement; furnishing water; and salvaging, stockpiling, and removing cuttings and debris.

H. Pavement Removal:

1. **Measurement:** Measurement will be in square yards. No deduction in area will be made for manholes, storm sewer intakes, valve boxes, or other structures less than 2 square yards in area. Pavement removal for patching is included as part of the patching item and will not be measured separately.
2. **Payment:** Payment will be at the unit price per square yard.
3. **Includes:** Unit price includes, but is not limited to, sawing, breaking, removing, and disposing of existing pavement and reinforcing steel.

I. Curb and Gutter Removal:

1. **Measurement:** Measurement will be in linear feet measured along the back of curb.
2. **Payment:** Payment will be at the unit price per linear foot of curb and gutter removed.
3. **Includes:** Unit price includes, but is not limited to, sawing, breaking removing, and disposing of existing curb and gutter.

- J. Sampling and Testing:** Required sampling and testing for pavement repair and rehabilitation work is incidental to other project costs and will not be paid for separately.

PART 2 - PRODUCTS**2.01 MATERIALS****A. PCC:**

1. **Standard Patching:** Use Class C mix complying with Section 7010. Comply with Iowa DOT Materials I.M. 401. Construct all patches as standard patches unless otherwise specified in the contract documents.
2. **High Early Strength Patching:** Use Class M mix complying with Section 7010. Do not use calcium chloride unless otherwise specified in the contract documents.
3. **Partial Depth Patching:** Use a coarse aggregate in concrete mix complying with Iowa DOT Article 4109.02, Gradation No. 5.

- B. HMA:** Provide a minimum 300,000 ESAL mixture complying with Iowa DOT Article 2303.02, unless otherwise specified in the contract documents. Provide mixture with a PG 64-22 asphalt binder.

C. Crack and Joint Filler Material:

1. **Hot Pour Crack and Joint Filler:** Comply with Iowa DOT Section 4136.
2. **Emulsified Asphalt Crack Filler:** Provide CRS-2 or CRS-2P emulsions complying with Iowa DOT Section 4140.
3. **HMA for Filling Cracks:**
 - a. Provide a 3/4 inch, 1/2 inch, or 3/8 inch HMA mixture complying with Section 7020, or a similar mixture from a commercial source subject to approval from the Engineer.
 - b. Upon approval of the Engineer, a high performance bituminous cold premix may be used, depending on the availability of the specified hot mix asphalt.
4. **Blotting Material:** Provide sand complying with Iowa DOT Sections 4124 or 4125, or similar sand approved by the Engineer.
5. **Soil Sterilant:** Provide soil sterilant as specified in the contract documents.

- D. Primer or Tack Coat Bitumen:** Comply with Iowa DOT Article 2303.02.

- E. Epoxy for Bonding Dowel and Tie Bars:** Comply with Iowa DOT Materials I.M. 491.11.

- F. Tie Bars and Dowel Bars:** Provide epoxy coated bars complying with Iowa DOT Section 4151.

- G. Subbase Material:** Unless otherwise specified in the contract documents, use modified subbase complying with Section 2010.

- H. Liquid Curing Compound:** Comply with Iowa DOT Section 4105.

- I. Cement Grout:** Provide a water cement grout mixture with a ratio of one part water to one part cement.

PART 3 - EXECUTION**3.01 GENERAL**

- A. Conduct all operations to minimize inconvenience to traffic. Confine operations to one traffic lane, unless the road is to be closed to traffic. Minor encroachment into the adjacent lane, such as for sawing and installing forms, will be acceptable with the use of a flagger according to MUTCD.
- B. Do not remove pavement for either full depth or partial depth patching unless the patch can be completed before the end of the working day.
- C. Construct full depth and partial depth patches to the dimensions specified in the contract documents or as marked by the Engineer in the field. Construct all full depth patches to full panel width.
- D. Make saw cuts parallel or perpendicular to the centerline.
- E. Remove and dispose of materials not designated for salvage.
- F. Restore the area outside the pavement by placing and compacting backfill material, placing topsoil, and sodding or seeding as specified in the contract documents.

3.02 FULL DEPTH PATCHING**A. Pavement Removal:**

- 1. Saw pavement to full depth at the edges of the patch.
- 2. Do not damage pavement that is to remain. Do not use heavy equipment adjacent to new concrete until the opening strength is achieved.
- 3. Two saw cuts may be necessary to prevent damage to adjacent pavement.

B. Restoring Subgrade or Subbase:

- 1. Excavate 2 inches below the bottom of the existing pavement. If more than 2 inches is excavated, place and compact new subbase material as required to bring the subbase to a level 2 inches below the bottom of the existing pavement. Correct unauthorized over-excavation at no additional cost to the Contracting Authority.
- 2. Compact the exposed subgrade or subbase by a minimum of four complete passes with a plate-type vibratory compactor with a minimum force rating of 3,500 pounds.
- 3. When unstable material or excessive moisture is encountered, the Engineer may order removal and replacement of the unstable material.
 - a. Remove existing unstable subgrade or subbase, or both, to the depth directed by the Engineer.
 - b. Place and compact new subbase material as required to bring the subbase to a level 2 inches below the bottom of the existing pavement.

C. Placing PCC Patches:

- 1. **Equipment:** Comply with Iowa DOT Article 2301.03, A, specifications on equipment for standard concrete pavement.

3.02 FULL DEPTH PATCHING (Continued)

- 2. Tie Bars and Dowel Bars:** Comply with Section 7010 and the figures in Sections 7010 and 7040.
 - a. When there is a common line between two adjacent patches, a bent bar may be placed in a keyway and later straightened.
 - b. Coat dowel bars extending into the patch area with a bond breaker. Do not coat tie bars.
- 3. Forms:** Comply with Section 7010, 3.02, D, as well as the following.
 - a. Use forms on all exposed edges and along the centerline for patches that extend into an adjacent lane, unless full pavement width patches are constructed.
 - b. Rigid wood forms may be used in lieu of steel.
- 4. Placing, Consolidation, and Finishing the Concrete:**
 - a. Moisten the subbase or subgrade, or cover with a single layer of polyethylene film lapped at 12 inches for large areas.
 - b. Except for preplanned joints, place the patch continuously until the patch is completed.
 - c. When a delay of 45 minutes cannot be avoided, construct a day's work ('DW') joint.
 - d. Carefully place concrete into the patch area to avoid segregation; spread into place and consolidate with a mechanical vibrator. Place full lane width patches over 25 feet in length with a suitable finishing machine that has at least one vibrating screed. Avoid excessive vibrating.
 - e. Finish patches per Section 7010, 3.02, H.
 - f. For joints with tie bars, tool the edge. For joints with dowel bars, saw to a depth of approximately 1 1/8 inch, leaving an opening of at least 3/8 inch in width to provide a reservoir for joint filler.
 - g. Texture the patch to match the adjacent surface.
- 5. Curing:** Comply with Section 7010, 3.02, I. Cure the concrete, including exposed vertical edges, immediately after the concrete has been finished and the surface water has evaporated.
- 6. Joints:** Construct and fill joints according to Section 7010, 3.02. Place joints at locations specified in the contract documents.
- 7. Pavement Protection:** Comply with Section 7010, 3.05.
- 8. Use of Pavement:** Comply with opening strength requirements of Section 7010, 3.06. Maturity testing is not required.

D. Placing HMA Patches:

1. Use equipment complying with Iowa DOT Article 2303.03. Use of a paving machine is not required.
2. Apply tack coat to the vertical edges of the remaining pavement at a rate of 0.10 to 0.15 gallons per square yard.
3. Place HMA patch mixture in lifts that will not exceed 3 inches in thickness after compaction, with the top lift not exceeding 2 inches in thickness when compacted.
4. Compact each lift while hot by rolling or compacting with a vibratory compactor. Subsequent lifts may be placed as soon as the preceding lift has been properly compacted.

3.02 FULL DEPTH PATCHING (Continued)

5. Smooth the final lift with a steel-tired finish roller. Ensure the final compacted surface is level with, or no more than 1/8 inch above, the adjacent pavement and has a smooth riding surface. If the patch becomes distorted for any reason, smooth the surface by blading, scraping, grinding, filling, or other approved means.
6. Do not extend patch material beyond the edge of the existing pavement; remove patch material that extends outside the patch limits.
7. Do not open to traffic until the mixture has cooled sufficiently to provide stability.

3.03 PARTIAL DEPTH PATCHING**A. Pavement Removal:**

1. Ensure all patches are square or rectangular in shape.
2. Saw to a depth of 2 inches at the removal limits.
3. Using a 15 pound maximum size pneumatic hammer, remove the deteriorated pavement down to sound pavement.
4. In lieu of removal with a pneumatic hammer, the designated patch area may be milled to the prescribed depth. Saw edges of milled removal areas to create vertical face.
5. Remove pavement to the appropriate depth. If the required depth to sound pavement exceeds the maximum removal depth, construct a full depth patch.
 - a. PCC Pavement: Minimum removal depth of 2 inches or a maximum depth of 1/3 of the pavement thickness.
 - b. HMA Pavement: Minimum removal depth of 2 inches or a maximum depth of 1/2 of the pavement thickness.

B. PCC Patch Placement:

1. Clean removal area by sandblasting, followed by airblasting, until the area is clean and dry. Ensure the compressed air used for cleaning is oil and moisture free. Place concrete the same day as sandblasting.
2. Place resilient filler material complying with Iowa DOT Article 4136.03 along existing joints. Filler material is to extend 1 inch below the patch and 3 inches beyond the patch boundaries.
3. Thoroughly coat the bottom and sides of the patch area with a cement grout immediately prior to placement of concrete. Do not allow grout to set prior to placement of concrete. Remove grout set by sandblasting and reapply.
4. Deposit concrete in the patch; finish patch from the center outward. Ensure concrete does not infiltrate into existing cracks or joints.
5. Apply joint filler material to expansion joints. At the interface between the patch and the slab, apply cement grout to fill.
6. Texture the patch similar to the adjacent surface.
7. Cure patch according to Section 7040, 3.02.

3.03 PARTIAL DEPTH PATCHING (Continued)**C. HMA Patch Placement:**

1. Clean removal area by airblasting until the area is clean and dry. Ensure the compressed air used for cleaning is moisture free.
2. Cover the entire removal area with tack coat at a rate of 0.10 to 0.15 gallons per square yard.
3. Place HMA patch mixture in lifts that will not exceed 3 inches in thickness after compaction, with the top lift not exceeding 2 inches in thickness when compacted.
4. Compact each lift while hot by rolling with an adequately weighted pneumatic tire roller or by tamping with a mechanical tamper. Succeeding lifts may be placed as soon as the preceding lift has been properly compacted.
5. Smooth the final lift with a steel-tired finish roller. Ensure the final compacted surface is level with, or not more than 1/8 inch above, the adjacent pavement and has a smooth riding surface. If the patch becomes distorted for any reason, smooth the surface by blading, scraping, grinding, filling, or other approved means.
6. Do not open to traffic until the mixture has cooled sufficiently to provide stability.

3.04 DIAMOND GRINDING

- A. Use equipment complying with Iowa DOT Article 2532.03, A.
- B. Grind and texture the entire surface of the pavement parallel to the centerline until the pavement surface on both sides of transverse joints and all cracks are in the same plane and meets the required smoothness.
- C. Ensure the ground surface is of uniform texture. In each lane, ensure at least 95% of the area in each 100 foot section has a newly textured surface.
- D. Except at joints and cracks, ensure grinding depth does not exceed 1/2 inch. At joints and cracks, ensure grinding depth does not exceed 3/4 inch.
- E. For multiple passes, ensure overlaps do not exceed 1 inch. Begin at the crown of the roadway, proceeding toward the pavement edge with each subsequent pass. Ensure each subsequent pass is at least as deep as the previous pass in order to provide transverse drainage. All passes are to begin and end at the same station location.
- F. Assemble and adjust the grinding head as necessary during the project to produce the following tolerances on pavements with the indicated coarse aggregates. Both the distance between grooves and the texture depth must be within the specified range to be in compliance.

	Crushed Stone	Gravel
Blade Segment Thickness	0.130" max.	0.130" max.
Distance Between Grooves*	0.100" to 0.125"	0.080" to 0.110"
Texture Depth**	Target of 1/16" with average between 1/32" and 3/32"	

*Based on an average of a minimum of ten measurements across the ground width for one pass.

**Based on an average of a minimum of six measurements across the ground width for one pass.

3.04 DIAMOND GRINDING (Continued)

- G. Prior to enforcement of the tolerances listed above, a 1,000 square yard test area will be allowed for a new head that has been restacked, provided a surface texture in reasonable conformance with the specifications, as determined by the Engineer, is being produced.
- H. Ensure the transverse slope of the ground pavement is uniform to a degree that there are no depressions or misalignment of slope greater than 1/4 inch in 12 feet when tested by string line or straightedge placed perpendicular to the centerline.
- I. Continuously remove all slurry or residue resulting from the grinding operations, and remove from the project limits. Ensure residue from grinding operations does not flow across lanes occupied by public traffic or into gutters, storm sewers, ditches, or other drainage facilities.
- J. When pavement smoothness testing is specified in the contract documents, measure smoothness with a profilograph, which produces a profilogram (profile trace) of the surface tested, according to Iowa DOT Materials I.M. 341 and the following requirements:
 - 1. Prior to performing any grinding work, provide a control profilogram for each lane and/or segment over 50 feet in length that is to be ground. Ensure pavement is relatively clean and free of debris prior to establishing the control profilogram.
 - 2. Ensure each segment of the finished ground surface has a final profile index less than or equal to 35% of the control profilogram trace or 22 inches per mile, whichever is greater, and does not include any bumps exceeding 1/2 inch in 25 feet.
 - 3. Depressed pavement areas due to subsidence or other localized causes and areas where the maximum cut restricts further grinding will be excluded from testing with the profilograph when approved by the Engineer.

3.05 MILLING

- A. Use equipment complying with Iowa DOT Article 2531.03, A.
- B. Mill the entire pavement area designated to the depth specified in the contract documents. Mill in straight lines. Make sufficient passes, or cuts, such that all irregularities or high spots are eliminated.
- C. Control milling operations to provide a surface that is true within a nominal tolerance of 1/4 inch and 1/4 inch at longitudinal joints where adjacent passes meet. The profile may be inspected by checking with a 10 foot surface checker placed parallel to the centerline. Correct variations greater than 1/4 inch.
- D. Load cuttings directly into dump trucks and remove the remaining small cuttings and debris from the street. Sweep the scarified surface with a rotary broom before opening to traffic. Unless otherwise specified in the contract documents, all materials removed are property of the Contractor.
- E. Do not operate metal tracked equipment on streets, other than those being milled.
- F. Ensure excessive dust does not become airborne during construction. Additional water may be required at any time for dust control.
- G. Mill around manholes and utility valves. Correct any damage to manholes or valves by the milling operation at no additional cost to the Contracting Authority.
- H. Do not leave a vertical drop of more than 2 inches at the centerline or lane line overnight. Taper the ends of milled sections subject to traffic to provide a uniform and gradual transition.

3.06 CRACK AND JOINT CLEANING AND FILLING, HOT POUR**A. General:**

1. Use equipment complying with Iowa DOT Articles 2541.03 (HMA) and 2542.03 (PCC).
2. Route or saw joints and cracks with an average opening of 3/8 inch or less to provide a minimum sealant reservoir of 3/8 inch wide by a nominal 1/2 inch deep. For joints and cracks less than 3/8 inch wide, widen by routing or sawing to a minimum width of 3/8 inch and depth of 1/2 inch.

B. Crack and Joint Cleaning:

1. Clean cracks or joints of existing joint filler material, backer rod, vegetation, dirt, and other foreign material.
2. Clean joints or cracks by air blasting or by other methods as necessary to remove debris.
3. If specified in the contract documents, clean wet sawn joints with high pressure water immediately after sawing to remove residue produced by the sawing operation.
4. When cleaned joints or cracks are contaminated before being filled, clean them again before filling.

C. Crack and Joint Filling:

1. Ensure cracks and joints are dry prior to placement of filler material.
2. Heat, handle, and apply joint filler material to the proper level as specified in the contract documents and as recommended by the manufacturer.
 - a. PCC Pavement: Do not overfill joint or crack with filler material. Immediately remove filler material placed on the pavement surface.
 - b. HMA Pavement: Slightly overfill the entire crack reservoir with filler material. Smooth with a narrow V-shaped squeegee immediately after placement of the filler material to within 1/2 inch on each side of the crack edge.
4. Place joint filler material when the pavement and ambient air temperatures are 40°F or higher. When near this minimum, additional air blasting or drying time, or both, may be necessary to ensure a satisfactory bond to the joint surfaces.
5. Lanes may be opened to traffic only after the filler material has set sufficiently so it will not pick up under traffic. Blotting material may be applied to the filler material, but only after the surface has set to avoid penetration of the blotting material into the filler material.

3.07 CRACK CLEANING AND FILLING, EMULSION

Use emulsified asphalt for filling cracks in HMA surfaces only. Do not use on PCC pavements.

A. General:

1. Clean cracks with either high pressure air or water equipment. Do not use water when freezing temperatures exist or are forecasted.
2. Ensure vegetation is removed from cracks. Alternative cleaning methods may be required to remove vegetation.

3.07 CRACK CLEANING AND FILLING, EMULSION (Continued)

3. When specified in the contract documents, apply a soil sterilant in crack prior to placing the filler material.
4. For filling cracks, use a hand operated wand or pouring pot, capable of placing the filler material into the crack and filling to the adjacent surface. Use a spout or nozzle small enough to place the filler material into the crack without soiling the adjacent surface.
5. Immediately after placement of the filler material, tightly spread the emulsion using a 2 inch, or less, V-shaped rubber-edged squeegee. Take proper measures to hold the filler in place and prevent runout at edge of pavement or at low areas.

B. Cracks Wider Than 1 inch:

1. Clean the cracks of loose and spalled material, sand, and other foreign debris to a depth of 3 inches using high pressure water.
2. When specified in the contract documents, utilize additional methods to clean cracks of old crack filler.
3. Blow the cleaned cracks free of water with high pressure air.
4. Lightly apply a tack coat to the crack surfaces.
5. Fill the cracks with hot mix asphalt.
 - a. Ensure mix is warm and pliable when placed.
 - b. Rod and tamp the mix into place level with the adjacent surface.
 - c. Place mixture prior to filling cracks with emulsion.
6. Place a thin application of emulsion over the hot mix asphalt and tightly spread with a squeegee.

C. Cracks 1/4 inch to 1 inch in Width:

1. Clean the cracks of loose and spalled material, sand, and other foreign debris with high pressure air or high pressure water. Clean crack down to sound material, but a depth greater than 3 inches will not be required.
2. When specified in the contract documents, utilize additional methods to clean cracks of old crack filler.
3. Fill cracks with emulsion filler material.

D. Cracks Less Than 1/4 inch in Width:

1. Clean sufficiently to remove sand and other foreign debris.
2. Fill cracks with emulsion filler material.

E. Map-cracked (Alligator) Areas:

1. Cover area with emulsion filler material.
2. Spread emulsion over area with squeegee, working emulsion into cracks. Provide a thin, smooth application.

3. Promptly dab the filler material with a light application of blotter material.

3.08 PAVEMENT REMOVAL

- A. Saw full depth at pavement removal limits.
- B. Extend pavement removal limits to existing joint lines as directed by the Engineer.
- C. Protect existing pavement, beyond removal limits, from damage. Remove to a new saw line and replace, at no additional cost to the Contracting Authority, all concrete broken or damaged beyond the removal limits designated by the Engineer.

3.09 CURB AND GUTTER REMOVAL

- A. Saw longitudinally along the existing gutter joint or at a location directed by Engineer. Saw transversely at the curb and gutter removal limits.
- B. Remove existing curb and gutter without damaging the existing pavement to remain.

END OF SECTION

Section 9020 Specifications

Sodding

Summary of Changes to Section 9020 Sodding

The following major updates were made to Section 9020:

General:

- General revisions throughout to update spec language.
- 1.07 - Removed warranty requirement. Previous requirement required contractor to warrant and replace sod one year after the maintenance period. With no control over how sod was taken care of, this requirement seems unreasonable to expect of the contractor.

Measurement and Payment:

- Updated bid item to the current 3-part format.

Products:

- 2.02 – Fertilizer: Removed a majority of the fertilizer requirements and referenced Iowa Department of Agriculture and Iowa DOT requirements.
- 2.04 – Water: Required contractor supplied water unless otherwise specified in the contract documents.

Execution:

- 3.06 – Maintenance: Current maintenance period is 14 days (no change was made). Iowa DOT requires 30 days and has a specific and rigid watering schedule that the contractor must follow, which we do not propose because it would be too labor intensive to track; however, it is recommended that SUDAS consider changing to a 30 day maintenance period to ensure the sod is established.

SODDING**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Sod Installation

1.02 DESCRIPTION OF WORK

This section includes preparation of the sodbed, furnishing and installing sod, fertilizing, watering, and maintenance for completed sodded areas.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Sod grower's certification of grass species and location of sources.
- B. Certification of the fertilizer analysis.
- C. Written instructions recommending procedures for maintenance of sodded lawns, prior to final acceptance of sod.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Harvest, deliver, and transplant sod within a period of 24 hours unless a suitable preservation method is approved by the Engineer prior to delivery.
- B. Do not harvest or transport sod when moisture content may adversely affect sod survival.
- C. Protect sod that cannot be placed immediately on delivery from sun, wind, dehydration, and rain prior to installation.
- D. Sod showing visible signs of heating or dehydration will be rejected.
- E. Do not tear, stretch, or drop sod during handling and installation.
- F. Deliver fertilizer to the site in original, unopened, and non-damaged containers, each bearing the manufacturer's guaranteed analysis.
- G. Store packaged materials off the ground and protect from moisture and deterioration.

1.06 SCHEDULING AND CONFLICTS

- A. Notify the Engineer at least 3 calendar days prior to start of sodding operations.
- B. Perform sod installation after planting and other work affecting ground surface has been completed, or as approved by Engineer.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Sod:**

1. **Measurement:** Measurement will be in squares, each square containing 100 square feet of sod.
2. **Payment:** Payment will be at the unit price per square of sod.
3. **Includes:** Unit price includes, but is not limited to, preparation of sod and sodbed, stakes, fertilizing, watering, maintenance, and clean-up. Also includes any necessary sod replacements during maintenance period.

PART 2 - PRODUCTS**2.01 SOD**

- A. Provide a well-established (no less than 18 months old), well rooted, healthy, nursery-grown sod blend of improved Kentucky Bluegrass with a uniform color, leaf texture, density, and varieties consisting of a minimum of 3 cultivars selected from the following list and grown in Iowa:

Allowed Kentucky Bluegrass Cultivars:

- | | |
|-------------|---------------|
| 1. Ram I | 11. Rugby II |
| 2. Liberty | 12. NuGlade |
| 3. Midnight | 13. Quantrum |
| 4. Meret | 14. Dragon |
| 5. Nubue | 15. Dellwood |
| 6. Nustar | 16. Blue Chip |
| 7. Apex | 17. Absolute |
| 8. Eclipse | 18. Award |
| 9. Glade | 19. Blue Moon |
| 10. America | |

- B. Sod grown in peat bedded soil will not be accepted.
- C. Ensure sod is free from objectionable grasses and broadleaf weeds, roots of trees or shrubs, stones, thatch, and other objectionable materials, nematodes and soil-born insects, and free from disease. Sod will be considered free of weeds if less than two such plants are found per 100 square feet of area.
- D. Mow at a height of 2 inches prior to cutting.
- E. Cut sod with a sod machine in strips of uniform width and length, with square ends. Cut to a uniform soil thickness of approximately 1 inch; thickness measurement excludes top growth.
- F. Ensure sod is moist when placed.

2.02 FERTILIZER

Comply with Iowa DOT Article 4169.03.

2.03 STAKES

- A. Softwood Stakes:** 3/4 inch diameter and 8 inches long.
- B. Steel Pins:** Tee shaped with a 4 inch head and 8 inch leg.

2.04 WATER

Unless otherwise specified in the contract documents, provide water and watering equipment such as hoses and sprinklers. Provide water free of substances harmful to plant growth.

PART 3 - EXECUTION**3.01 PREPARATION OF SODBED**

- A. Limit preparation to areas that will be immediately sodded.
- B. Where weed growth has developed, remove all weeds and weed debris.
- C. Shape and fine grade sodbed to remove washes or gullies, water pockets, and irregularities. Provide an even surface, true to grade and cross-section.
- D. Rototill and cultivate sodbed to a fine and mellow condition to a minimum depth of 3 inches. Clear the top 3 inches of soil lumps, stones over 3/4 inch, and foreign material using hand labor as required.

3.02 FERTILIZING - FIRST APPLICATION

- A. Provide a guaranteed analysis of 20-26-6 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) by weight at the rate of 200 pounds per acre.
- B. Incorporate fertilizer into soil to a depth of 1 1/2 inches prior to placing sod.

3.03 SOD INSTALLATION

- A. Do not install sod between the dates of June 15 and August 15, unless authorized by the Engineer.
- B. Do not lay frozen sod; do not lay sod on frozen soil or when freezing conditions are forecasted within 24 hours.
- C. Dampen dry soil prior to placing sod.
- D. Firm or heal in soil along the edges of the sodded areas.
- E. Carefully place sod in rows or strips evenly, with the longest edge parallel to the finished contours, and at right angles to the centerline of ditches and channels. On slopes, begin placing sod at the bottom and progress upward.
- F. Minimize traffic on newly laid sod during installation. Provide plank or wood sheets to protect sod already laid from equipment and vehicles.
- G. Tightly fit each strip against each other without voids. Do not overlap edges. Stagger joints at the ends of sod strips with adjacent strips of sod.
- H. Finish sod edges at walks, curbs, planting, mulch edges, and other vertical surface by cutting and fitting tightly to edge.
- I. Place sod mat approximately 1 inch below finished surface of walks, pavement, curbs, or other permanent features. Remove any sod not conforming to this requirement, adjust the subgrade, and re-lay the sod.
- J. Where new sod joins existing lawns, cut straight and neatly into existing lawn and level subgrade to match height.
- K. Stake sod on grades exceeding 4:1 and in drainage channels. Stake each roll at 2 foot intervals or as required to prevent movement during rainfall and stormwater runoff events.
- L. Roll lightly-watered sod with a small mechanical or hand sod roller to sufficiently set or heal sod into soil and remove lumps. Roll as required to firm and level the sodded areas.

3.04 WATERING

- A. Water sod within 1 hour of placement. During initial watering, thoroughly wet sod and sodbed.
- B. Water all sodded areas during the maintenance period as necessary to maintain sod and soil moisture, supplement rainfall, promote growth and proper rooting, ensure sod survival, and prevent dormancy.
- C. Apply water uniformly and consistently on all sodded areas to prevent damage to sod, trees, and shrubs.

3.05 FERTILIZING - SECOND APPLICATION

Apply second application of fertilizer with a guaranteed analysis of 10-10-10 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) at the rate of 300 pounds per acre 2 weeks after laying sod and prior to final acceptance.

3.06 MAINTENANCE

- A. Begin maintenance immediately following installation of sod and continue for a period until the sod is well established with sod rooted in place. The maintenance period will be for 14 days minimum.
- B. Maintenance of sodded areas includes:
 - 1. Watering.
 - 2. Weeding.
 - 3. Mowing. Once sod has grown to a height between 3 and 4 inches, mow to a 2 to 2 1/2 inch height.
 - 4. Remove and replace sodded areas that fail to survive.

3.07 CLEAN-UP

- A. Remove all excess materials, debris, and equipment from site.
- B. Clean all paved surfaces.
- C. Repair any damage resulting from sodding operations.

3.08 ACCEPTANCE

- A. Sod acceptance will be based on the following criteria:
 - 1. All requirements for the completed installation and maintenance have been met.
 - 2. Sodded areas are healthy and even-colored, and a viable lawn is established, free from weeds, undesirable grass species, disease, and insects.
 - 3. Sod is knit down to the soil so that it cannot be pulled up.
 - 4. Sodded areas are without scattered bare spots and dead or dormant sod.
 - 5. Clean-up operations are completed.
- B. Replacement sod work will be re-inspected before acceptance.

END OF SECTION

Section 9030 Specifications

Plant Material and Planting

Summary of Changes to Section 9030

Plant Material and Planting

The following major updates were made to Section 9030:

General:

- Changed the way that the Establishment Period and Acceptance (plant warranty) were handled. The way the existing specification is worded, the warranty, with annual plant replacements, could go on in perpetuity. Changed specifications to more closely follow the DOT Specs, with a one-year establishment period, and replacements at that time (then the contractor is finished). All information regarding establishment/warranty/acceptance was moved to Part 3.
- Added an option to bid projects with an extended warranty period, which extends the establishment period to 2 years.
- Special Requirements: Moved much of this information to materials specification. Removed warranty / establishment period / replacement information and replaced as mentioned above.
- Required submittal of a schedule of unit prices when requested.

Measurement and Payment:

- Revised the Method of Measurement and Basis of Payment to provide 2 sets of bid items based the desired establishment period (1-year or 2-year).
- Renamed “Planting Wells” as “Tree Planting Wells” and added a bid item.

Products:

- Moved some information from Section 1.07 to the plant products section.
- Removed sidewalk tree wells, tree guard, and tree grates. These are specialty items.
- Added materials section for planting wells.
- Added materials information for pre-emergent herbicide.
- Allowed use of manufactured systems for staking.
- Eliminated turnbuckles for guy wires.
- 2.07 – Water: Required contractor supplied water unless otherwise specified in the contract documents.
-

Execution:

- 3.01 – Adjusted the evergreen planting dates.
- 3.04 – Planting Pit: Eliminated the perc. test requirement (retained option for tree planting wells when directed)
- 3.05 – Tree Drainage Well: Changed tree “planting well” to tree “drainage well” to eliminate confusion with Iowa DOT, who uses “planting well” to describe the planting pit. Allowed a range in diameters for the tree drainage wells and set a maximum 10 ft. depth for the well.
- 3.07 – Mulching: added requirement to “dig in” edges of mulching on planting bed.
- 3.08 – Wrapping: changed to only when required or directed by Engineer.

Summary of Changes to Section 9030

Plant Material and Planting

- 3.09 – Staking and Guying: added requirement to flag all wires. Changed to using 2 or 3 stakes depending on size of tree. Eliminated requirement that staking wires and guy wires be pulled tight. Provided for slight slack in wire or guy.
- Rewrote acceptance and review section – now Establishment Period and Acceptance.
- 3.12 – Described the 1-year establishment and 2-year warranty periods and the maintenance requirements during those times.
- 3.12 – Eliminated generic reference to “Acts of God” and listed out specific occurrences that the contractor is not responsible for.

PLANT MATERIAL AND PLANTING**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Plant Material and Planting
- B. Tree Drainage Wells
- C. Warranty for Plant Material

1.02 DESCRIPTION OF WORK

- A. Furnishing and installing plant material.
- B. Constructing tree drainage wells.
- C. Maintaining and replacing plants for completed planting work.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Submit copy of current certification that the Supplier is an Iowa Department of Agriculture and Land Stewardship Certified Nursery Dealer or Grower prior to starting work.
- B. Prior to final acceptance, submit written maintenance instructions recommending procedures for maintenance of all plant material types, including watering, insect and disease control, fertilizing, pruning, tree wrapping, and staking.
- C. When requested, provide certification stating container-grown material has been grown in the container for no less than 1 year.
- D. Provide a sample of the proposed mulch for approval by the Engineer.
- E. When requested, submit a schedule of unit prices for each size and variety of tree, shrub, and ground cover plant specified in the contract documents.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

Where evidence is submitted that a specified plant cannot be obtained, substitution may be made upon approval of the Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Protect plant root systems during transportation and storage, as necessary, with wet straw, moss, or other suitable material that will ensure root systems are maintained in a moist, healthy condition.
- B. Protect all plants with a tarpaulin when being transported in an open vehicle.
- C. When approved by the Engineer, temporary storage of plants on the project site may be allowed. When temporary on-site storage is not approved, provide such facilities and location at no additional cost to the Contracting Authority.

1.05 DELIVERY, STORAGE, AND HANDLING

- D. During temporary storage, heel-in plants and maintain them by providing moist straw, moss, or other suitable material to protect root systems; watering; and protecting from excessive sun, wind, and inclement weather conditions. This will provide a healthy, vigorous plant when planted.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

Comply with the optimum planting dates specified in Section 9030, 3.01.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Plants, By Count:**

1. **Measurement:** Each tree, shrub, or ground cover plant accepted in place will be counted.
2. **Payment:** Payment will be at the unit price for each tree, shrub, or ground cover plant. Payment will be made in increments according to the following schedule:
 - a. 70% of unit price at acceptance.
 - b. 30% of unit price at end of establishment period, upon installation of replacements.
3. **Includes:** Unit price includes, but is not limited to, delivery, excavation, installation, watering, placing backfill material, mulching, wrapping, staking or guying, herbicide, maintenance during the establishment period, and replacements.

B. Plants, By Count, With Warranty:

1. **Measurement:** Each tree, shrub, or ground cover plant accepted in place will be counted.
2. **Payment:** Payment will be at the unit price for each tree, shrub, or ground cover plant. Payment will be made in increments according to the following schedule:
 - a. 70% of unit price at acceptance.
 - b. 15% of unit price at end of 1 year establishment period, upon installation of replacements.
 - c. 15% of unit price at end of 2 year warranty period, upon installation of replacements.
3. **Includes:** Unit price includes, but is not limited to, delivery, excavation, installation, watering, placing backfill material, mulching, wrapping, staking or guying, herbicide, maintenance during the establishment and warranty periods, and replacements.

C. Plants, Lump Sum:

1. **Measurement:** Lump sum item; no measurement will be made.
2. **Payment:** Payment will be at the lump sum price for plants. Payment will be made in increments according to the following schedule:
 - a. 70% of lump sum price at acceptance.
 - b. 30% of lump sum price at end of establishment period, upon installation of replacements.

1.08 MEASUREMENT AND PAYMENT (Continued)

- 3. Includes:** Unit price includes, but is not limited to, delivery, excavation, installation, watering, placing backfill material, mulching, wrapping, staking or guying, herbicide, maintenance during the establishment period, and replacements.

D. Plants, Lump Sum, With Warranty:

- 1. Measurement:** Lump sum item; no measurement will be made.
- 2. Payment:** Payment will be at the lump sum price for plants. Payment will be made in increments according to the following schedule:
 - a. 70% of lump sum price at acceptance.
 - b. 15% of lump sum price at end of 1 year establishment period, upon installation of replacements.
 - c. 15% of lump sum price at end of 2 year warranty period, upon installation of replacements.
- 3. Includes:** Unit price includes, but is not limited to, delivery, excavation, installation, watering, placing backfill material, mulching, wrapping, staking or guying, herbicide, maintenance during the establishment and warranty period, and replacements.

E. Tree Drainage Wells:

- 1. Measurement:** Each tree drainage well will be counted.
- 2. Payment:** Payment will be at the unit price for each tree drainage well.
- 3. Includes:** Unit price includes, but is not limited to, excavation, furnishing and placing rock, engineering fabric, and placing backfill material.

PART 2 - PRODUCTS**2.01 PLANT MATERIALS****A. General:**

1. Ensure plant material meets the minimum requirements of size and grade as stated in the latest edition of American Standard for Nursery Stock, ANSI Z60.1.
2. Provide all plants true to name and tagged legibly as to name according to nursery standards of practice as recommended by the American Nursery and Landscape Association. Plant names indicated comply with the latest edition of "Standardized Plant Names" as adopted by the American Joint Committee of Horticultural Nomenclature.
3. Plants larger than those specified in the plant list with corresponding root system may be used upon approval of the Engineer.
4. Match plants planted in rows in form and size, unless otherwise specified in the contract documents.

B. Plant Material Quality:

1. Provide nursery grown plants grown in the same climatic zone as the project.
2. One-sided branching plants from tightly planted nursery rows will be rejected.
3. Provide healthy specimens without objectionable deformities, voids, and open spaces, with well-developed branch and root systems. Ensure specimens are true to height, shape, and character of growth of the species or varieties. Provide plants showing appearance of good health and vigor.
4. Provide plants free of the following:
 - a. Harmful insects, insect eggs, borers, and all forms of infestation
 - b. Plant diseases and moldy or dried roots
 - c. Damage to trunk, bark, branches, leaders, root systems, or cut-leaders
 - d. Defects, disfiguring knots, sunscald injuries, and frost cracks
 - e. Rodent damage to bark and buds
5. Plants with broken or cut back terminal leaders may be rejected.

C. Balled and Burlapped Plants:

1. Provide firm, moist, unbroken root balls of the specified size.
2. Broken or loose root balls will be rejected.
3. No manufactured or artificially produced or mudded-in root balls will be accepted.
4. A container grown plant, in lieu of a balled and burlapped root ball, will be accepted provided it meets the specified size, complies with American Standard for Nursery Stock (ANSI Z60.1), and meets criteria for container grown plants.

D. Container Grown Plants:

1. Grow plants in sufficiently sized container for a minimum of 1 year, with a root system developed to hold its soil together, firm, whole, and moist when taken from the container.

2.01 PLANT MATERIALS (Continued)

2. No loose root systems in the container, root-bound, or circling of the root system will be accepted.

E. Bare Root Plants (BR):

1. Only use where specified in the contract documents or as approved by Engineer.
2. Ensure plants have substantially all of the root system intact, with clean cuts on roots. Root system is to be packed in moisture-retaining material and bagged to protect the root system from drying out.
3. Prior to planting, properly prune and sweat according to the nursery source instructions.
4. Ensure plants are dormant or breaking bud if sweated at the time of planting.
5. Do not plant later than May 15.

2.02 MULCH

Provide hardwood or softwood mulch complying with the following:

- A. Shredded bark and shredded wood mixture containing no more than 50% wood chips.
- B. Produced by a mechanical debarker and chipping machine.
- C. Reasonably free from leaves, twigs, dust, toxic substances, and any other foreign material.
- D. Not in an excessively wet or decomposed condition.

2.03 BACKFILL MATERIAL

- A. Acquire backfill material for plantings from soil excavated from the planting pit.
- B. Ensure backfill material is loose, friable, and free of clods and rocks 2 inches in diameter or larger. Do not use frozen or muddy soil as backfill material.

2.04 STAKING MATERIAL

A. Stakes: Comply with Iowa DOT Article 4154.09. Minimum length of 6 feet.

B. Hose:

1. Reinforced garden hose no less than 1/2 inch inside diameter or fabric straps or other material approved by the Engineer.
2. Provide hose of adequate length to prevent contact of staking or guying wire with tree trunk.

C. Wire: Provide wire of sufficient gauge to resist breaking during high winds.

D. Manufactured Staking System: Upon approval of the Engineer, manufactured staking systems may be used in lieu of stakes, wire, and hose.

2.05 GUYING MATERIAL**A. Earth Anchors:**

1. Steel auger type with looped end; minimum 3/4 inch diameter, 36 inch long anchor shank, with 5 inch minimum diameter anchor disk.
2. Driven style earth anchors with a minimum 1,000 pound capacity in normal soils.

B. Hose: Comply with Section 9030, 2.04, B.

C. Cable: 1/8 inch galvanized wire rope or equivalent cable with a minimum 1,500 pound capacity. Provide cable with ends clean and unfrayed.

D. Cable Clamps: Match size and strength of cable. Provide two for each end of cable.

E. Flagging Material: Brightly colored, minimum 12 square inches.

2.06 TREE WRAPPING MATERIAL FOR WINTER PROTECTION

4 inch wide bituminous impregnated tape, corrugated or crepe paper, specifically manufactured for tree trunk wrapping, having qualities to resist insect infestation, or similar material approved by the Engineer.

2.07 WATER

Provide water and watering equipment such as hoses and sprinklers. Provide water free of substances harmful to plant growth.

2.08 TREE DRAINAGE WELLS

A. Porous Backfill Material: Comply with Iowa DOT Section 4131.

B. Engineering Fabric: Comply with Iowa DOT Article 4196.01.

2.09 HERBICIDE

Provide a granular pre-emergent herbicide as approved by the Engineer.

PART 3 - EXECUTION**3.01 ALLOWABLE PLANTING DATES**

Install plant material during the following times:

- A. Evergreen Plants:** September 1 to October 15 and prior to June 1, but not after candles exceed 1 inch.
- B. Deciduous Plants (Balled and Burlapped and Container):** August 15 to November 15 and in the spring prior to June 1.
- C. Deciduous Plants (Bare Root):** In the spring prior to May 15.
- D. Weather Restrictions:** Planting may be conducted under unseasonable conditions, except in weather below 32°F or above 90°F. No variance from plant warranty or other requirements will be given for plants installed outside the specified periods.

3.02 PREPARATION

- A. Provide notice to the Engineer 3 days prior to planting.
- B. All plants will be inspected by the Engineer prior to planting. Plants may be inspected and approved at the place of growth by the Engineer for compliance with the specifications for quality, size, and variety. Such approval does not waive the right to reject any plant material after it has been delivered to the site and/or installed.
- C. Provide barriers or fencing as approved by Engineer to protect the public from injury when planting installation is within the right-of-way.

3.03 LOCATION OF PLANTS

- A. Mark the location of all plants with flags or lathe according to the contract documents. Mark trees individually. Stake the outline of bedded plants or shrub groups for the quantity on the plans without marking individual plants. The Engineer will approve the locations marked prior to excavation of planting pits and tree drainage wells.
- B. Make field adjustments in plant locations where underground or overhead obstruction is encountered, or where changes have been made as approved by the Engineer.

3.04 EXCAVATION OF PLANTING PIT

- A. Excavate the plant pit, centered at the location marks, cylindrical in shape with a diameter 1 1/2 to 2 times larger than ball or root condition, with vertical sides and flat or saucer-shaped bottom. Excavate plant pit to a depth to match the nursery grade of the root crown for all balled and container root systems. Excavate plant pit to a depth 6 inches deeper for bare-rooted systems.
- B. Scarify sides of excavated pit.

3.05 TREE DRAINAGE WELLS

Install drainage wells when specified in the contract documents or when directed by the Engineer due to the presence of impervious soils.

- A. Locate the drainage well at the edge of the excavated planting pit.
- B. Auger an 8 inch to 12 inch diameter hole to existing pervious soil or to a maximum depth of 10 feet.
- C. Fill the excavated hole with porous backfill material and cover the aggregate with engineering fabric.

3.06 PLANTING**A. Bare Root Plants:**

- 1. Remove all ties, ribbons, wrap, and other items except plant identification from the branch system.
- 2. Remove all root packing and prune broken roots to sound wood with clean cuts.
- 3. Place a minimum of 6 inches of backfill material in the bottom of the planting pit.
- 4. Place the plant centered, upright, plumb, and with desired orientation in the planting pit, with the root crown matching existing grade.
- 5. Spread and arrange roots in their natural position. Do not mat roots together.
- 6. Carefully place and compact backfill material in layers, filling all voids and avoiding injury to the root system until two thirds of the planting pit is complete; fill the pit with water and allow the soil to settle.
- 7. Continue placing backfill material and form a 3 inch deep saucer around the plant.
- 8. Water the plant and surrounding area until thoroughly moist.

B. Balled and Burlapped and Container Plants:

- 1. Ensure root systems are moist at the time of planting.
- 2. Remove all ties and wrap from branch system, except plant identification.
- 3. Container Plants:
 - a. Remove plant root system carefully from container prior to planting without disturbance to root systems.
 - b. Inspect root system and cut any circled (girdled) roots.
 - c. Place plants centered, upright, plumb, and with desired orientation in planting pit with the root crown matching existing grade.
- 4. Balled and Burlapped Plants:
 - a. Place plants centered, upright, plumb, and with desired orientation in planting pit with the root crown matching existing grade.
 - b. After plant placement, cut and remove burlap from root ball.
- 5. Carefully place and compact backfill material in layers, filling all voids until two thirds of plant pit is complete; fill pit with water and allow soil to settle.

3.06 PLANTING (Continued)

6. Lightly compact the settled topsoil.
7. Continue placing backfill material and form a 3 inch deep saucer around plant.
8. Water plant and surrounding area until thoroughly moist.

C. Planting on Slopes:

1. Place the top of the root crown at or slightly above the finished grade at the center of the planting pit.
2. For all plants planted on significant slope, form a saucer as a dam or shoulder on the downhill side to catch and hold water and to discourage erosion.

3.07 MULCHING

- A. Dig edges of mulched areas to ensure the top of the mulch at the edge of the planting area matches the existing ground surface.
- B. Place mulch 3 inches deep in the planting saucer within 2 calendar days of planting.
- C. Mulch an 18 inch radius area around tree trunks and shrub branch lines.
- D. Provide a continuous mulch area around plant groupings.
- E. Following mulch placement, pull mulch back 1 to 2 inches from the base of all trees and shrubs to allow air circulation.
- F. Thoroughly water mulched areas. Rake to a smooth finished surface.

3.08 WRAPPING

- A. When specified in the contract documents, or when directed by the Engineer, wrap the trunk of deciduous trees in the fall of the year in which the tree is planted.
- B. Inspect the trunk for injuries and evidence of insect infestation prior to wrapping.
- C. Wrap trunks spirally from ground line by overlapping one-half of the tree wrapping material and completely cover trunk to the height of the first branch.
- D. If necessary, secure wrapping material with twine or paper tape wound spirally downward in opposite direction, with ties around tree in at least three places in addition to top and bottom.
- E. Remove wrapping material by April 1 of the next spring.

3.09 STAKING AND GUYING**A. General:**

1. Maintain all plants in an upright and plumb condition.
2. Complete staking or guying by the end of the day in which they were installed for all single stem plants over 1 inch diameter.
3. Do not stake clump form plants and plants in paved pedestrian areas unless approved by the Engineer.

3.09 STAKING AND GUYING (Continued)**B. Staking:**

1. Provide two stakes for each tree for trees 2 1/2 inches in diameter and smaller. Place one of the stakes on the southwest side of the tree, or as directed by the Engineer, and place the second stake directly opposite the first.
2. Provide three stakes for each tree for trees 2 1/2 to 4 inches in diameter. Locate one stake on the southwest side of the tree with remaining stakes equally spaced around the tree.
3. Locate stakes uniformly from the trunk of the tree at a distance equal to 1/4 to 1/3 of the height of the tree, or 2 feet minimum.
4. Set posts vertically into unexcavated soil at a minimum 2 foot depth or until firm, providing a required post height above grade.
5. Attach wire to with hose protector to trunk at a minimum of 4 feet above grade or between one half and two thirds distance from finished grade to the top of the tree with slight slack in wire to allow for tree movement.
6. Secure wire to stakes at 6 inches from the top of the stake; mark all wire with flagging material.
7. Install manufactured staking system according to manufacturer's published recommendations.

C. Guying:

1. Provide three earth anchors and cables for evergreen trees 10 feet and taller and deciduous trees over 4 inches in diameter. Locate one anchor on the southwest side of the tree with remaining anchors equally spaced.
2. Locate the anchor a distance from the trunk equal to 1/3 of the tree height.
3. Attach the cable with a hose protector to the trunk between 1/3 and 1/2 of the tree height, or near the lowest main branches for deciduous trees.
4. Screw an auger style anchor into unexcavated soil until only the looped top is exposed. Install driven style anchors a minimum of 2 1/2 feet into the soil.
5. Secure cable to anchor with slight slack in cable; mark all anchor cables with flagging material.
6. Install manufactured staking system according to the manufacturer's published recommendations.

- D. Removal:** Remove all staking and anchoring materials from all plants at the end of the establishment period and remove from site.

3.10 PRUNING**A. General:**

1. Provide proper and sharp pruning tools to provide a clean cut without injuring the branch collar.
2. Prune in such a manner as to retain the natural shape of the plant. Do not prune the terminal leader of a plant. Leave no protruding stubs, and prune to the closest outward growing bud.
3. Plant materials incorrectly pruned will be rejected.

B. Deciduous Trees:

1. Prune broken, damaged, or otherwise defective branches. Remove all branches that may not develop properly. Also, eliminate narrow crotches or competing leaders.
2. Prune to develop an upright leader that will promote the symmetry of the tree. Prune flowering or specimen trees to develop their natural form.
3. Prune all trees in Class A sidewalks or other paved pedestrian areas to provide a 7 foot height clearance, unless otherwise directed by the Engineer.

C. Evergreen Trees and Shrubs: Remove dead and broken branches.

D. Deciduous Shrubs: Remove dead or irregular branches.

3.11 CLEANUP

- A. Perform cleaning during installation and upon completion of work.
- B. Remove all excess materials, trimmings, branches, soils, debris, and equipment from the site.
- C. Repair any damage resulting from planting operations.
- D. Clean all paved areas with a broom.
- E. Remove all tags and labels from plants following acceptance by the Engineer.

3.12 ESTABLISHMENT AND WARRANTY PERIODS AND ACCEPTANCE

A. Establishment Period: The plant establishment period is 1 year after the installation is accepted by the Engineer. A plant inspection will be made by the Engineer prior to the expiration of the establishment period.

B. Warranty Period: If a plant warranty is specified in the contract documents, the 1 year warranty period begins immediately after the expiration of the 1 year establishment period. Inspection of plants will be made by Engineer at the end of the 1 year establishment period and again prior to the expiration of the warranty period.

C. Maintenance: Care for all plants during the establishment or warranty period as required to keep plants in a live, healthy growing condition.

1. Prune plants to maintain a desirable shape.
2. Remove weeds and grasses from planting beds and mulch areas. Apply herbicide to control weed growth when directed by the Engineer.

3.12 ESTABLISHMENT AND WARRANTY PERIODS AND ACCEPTANCE (Continued)

3. Water as required to enhance early root growth and maintain a moist soil.
 4. Adjust stakes and ties to maintain plant in an upright and plumb condition.
 5. Re-set settled plants to proper grades and position. Restore planting saucer and mulch; add backfill material and mulch as may be required.
 6. Apply appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
- D. Plant Condition:** Ensure all plants are in a live, healthy, and growing condition both at the date of acceptance of the installation by the Engineer, at the end of the plant establishment period, and at the end of the warranty period.
- E. Replacement:** Replace all plants not found to be in a live, healthy, and growing condition during inspection at the 1 year establishment period and again at the warranty period (if specified) at no additional cost to the Contracting Authority.
1. Upon notice from Engineer, remove rejected plants from the site and replace with plant material of the same species and size as originally specified. Install replacement plants complying with the contract documents.
 2. Plants damaged due to fire or flooding beyond the contractors control or hail, tornados, or acts of vandalism do not require replacement.

END OF SECTION

Section 9050 Specifications

Gabions and Revet Mattresses

Summary of Changes to Section 9050 Gabions and Revet Mattresses

The following major updates were made to Section 9050:

General:

- Removed rip rap from this section. Rip rap was previously added to Section 9040 (Erosion and Sediment Control). When rip rap was added to Section 9040 it was called “revetment and erosion stone.” Another agenda item will handle changing the terminology back to rip rap.
- Added revet mattresses in addition to gabion baskets. These are frequently used for outlet protection and channel lining to prevent bank erosion.
- Added a statement to 1.03 (submittals) requiring submittal of certification that products comply with the identified specifications.

Measurements and Payment:

- Added measurement item for anchor stakes to maintain consistency with the Iowa DOT.
- Added a reference to Section 2010 for measurement and payment of excavation associated with installation of gabions or revet mattresses.

Products:

- Added option for PVC coated gabions/mattresses. This is commonly used for stream/channel projects where the basket is in constant contact with water.
- Removed current language and referenced ASTM A 975 (Double Twisted Hexagonal Mesh Gabions and Revet Mattresses). This ASTM is referenced by the major gabion manufacturers and contains information for all gabion materials (mesh, lacing wire, fasteners, etc.) except the stone.
- Gabion products specified are nearly identical to Iowa DOT’s specs; however, the Iowa DOT does not reference ASTM A 975.
- Referencing ASTM A 975 provides for additional testing requirements that the Iowa DOT’s specs do not currently require, including: tensile strength of the twisted mesh, pull apart strength of a jointed panel, metallic coating weight, salt spray resistance, and PVC coating thickness.
- Updated Iowa DOT reference for gabion stone.
- Updated Iowa DOT reference for engineering fabric.
- Added anchor stakes for use with revet mattresses.
- Added granular subbase for use under gabion basket walls.

Execution:

- Updated language for bedding and backfill. Split items apart to follow typical sequence of installation more closely (prepare subgrade/bedding, place and fill baskets, then place backfill).
- Expanded the section for gabion basket assembly and installation. Developed a more detailed description of installation requirements.
- Added item for revet mattress installation.

GABIONS AND REVET MATTRESSES**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Gabions
- B. Revet Mattresses

1.02 DESCRIPTION OF WORK

- A. Assembly and installation of gabions.
- B. Assembly and installation of revet mattresses.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

Upon request, submit certification that products supplied comply with identified specifications.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Gabions:**

1. **Measurement:** Measurement will be the plan quantity in cubic yards for the total volume of each type of gabion installed.
2. **Payment:** Payment will be at the unit price per cubic yard for each type of gabion installed.
3. **Includes:** Unit price includes, but is not limited to, furnishing and assembling wire mesh baskets, PVC coating (if specified in the contract documents), fasteners, furnishing and placing gabion stone, and engineering fabric.

1.08 MEASUREMENT AND PAYMENT (Continued)**B. Revet Mattresses:**

1. **Measurement:** Measurement will be the plan quantity in cubic yards for the total volume of each type of revet mattress installed.
2. **Payment:** Payment will be at the unit price per cubic yard for each type of revet mattress installed.
3. **Includes:** Unit price includes, but is not limited to, furnishing and assembling wire mesh baskets, PVC coating (if specified in the contract documents), fasteners, furnishing and placing mattress stone, and engineering fabric.

C. Anchor Stakes:

1. **Measurement:** Each anchor stake will be counted.
2. **Payment:** Payment will be at the unit price for each anchor stake.

- D. Excavation:** Refer to Section 2010 for measurement and payment information for Class 10, Class 12, or Class 13 Excavation.

PART 2 - PRODUCTS**2.01 BASKETS**

A. General: Fabricate baskets according to ASTM A 975.

B. Wire

- 1. Galvanized:** Comply with ASTM A 975, Style 1 for mesh, selvedge, and lacing wire.
- 2. PVC Coated:** Comply with ASTM A 975, Style 3 for mesh, selvedge, and lacing wire.
- 3. Tensile Strength:** Minimum tensile strength of 60,000 psi. Maximum tensile strength as specified in ASTM A 975.

C. Fasteners: Provide galvanized or stainless steel fasteners complying with ASTM A 975. Provide only stainless steel fasteners when PVC coated wire is specified in the contract documents.

2.02. GABION AND MATTRESS STONE

Comply with Iowa DOT Article 4130.06.

2.03. ENGINEERING FABRIC

Comply with Iowa DOT Article 4196.01, B for embankment erosion control.

2.04 ANCHOR STAKES

When anchor stakes are specified in the contract documents provide 2 inch galvanized standard weight pipe complying with ASTM A 53. Provide stakes with length as specified in the contract documents.

2.05 GRANULAR SUBBASE

Comply with Iowa DOT Section 4123 for modified subbase.

PART 3 - EXECUTION**3.01 SUBGRADE PREPARATION AND BEDDING**

- A. When applicable, cut and reshape the area behind a proposed gabion wall as specified in the contract documents to allow for placement of the wall.
- B. Excavate the subgrade area to the required elevation and smooth as necessary for proper placement of the gabions or mattresses.
- C. Prepare a firm unyielding subgrade foundation. In fill areas, construct and compact subgrade to no less than 95% of maximum Standard Proctor Density according to ASTM D 698.
- D. If unsuitable foundation materials exist, remove and replace with suitable materials and compact to no less than 95% of maximum Standard Proctor Density according to ASTM D 698.
- E. If specified in the contract documents, place and compact granular subbase materials to the dimensions specified in the contract documents.

3.02 ENGINEERING FABRIC

- A. Install engineering fabric under the proposed gabion or mattress installation.
- B. Extend fabric behind gabion walls to the top of the wall.
- C. Overlap adjacent sections of engineering fabric a minimum of 3 inches, with the upstream strip on top.

3.03 CONNECTIONS

Make all connections with lacing wire or approved fasteners.

A. Lacing Wire:

- 1. Loop or twist lacing wire to secure it to the wire mesh.
- 2. Proceed to lace with alternating double and single loops through every mesh opening, approximately every 4 inches, pulling each loop tight.
- 3. Secure end of lacing wire to the wire mesh by twisting or looping.

B. Fasteners: Install fasteners according to manufacturer's specified spacing.

3.04 GABION ASSEMBLY AND INSTALLATION

- A. Refer to the contract documents for special details of gabion wall installation including height, slope of wall, gabion setback, special backfill materials, and tieback requirements. Construct these features as specified in the contract documents.
- B. Unfold baskets and flatten all kinks and bends. Erect the sides, ends, and diaphragms, ensuring all panels are in the correct position and the tops of all sides are aligned.
- C. Connect the four corners of the gabion first followed by connecting the diaphragms to the outside walls.

3.04 GABION ASSEMBLY AND INSTALLATION (Continued)

- D. Install and secure gabion baskets together.
 - 1. After initial assembly, move baskets into their final position.
 - 2. Join empty baskets together along the vertical and top edges.
- E. Fill gabion baskets with gabion stone.
 - 1. When PVC coated baskets are specified, take care not to damage PVC coating during stone placement.
 - 2. Fill baskets in lifts not exceeding 1 foot each.
 - 3. Manually orient stones after placement of each lift.
 - 4. Machine placement of stone will be allowed. However, considerable handwork is required to provide maximum density without bulges, a compact and dense exposed face, and maximum aggregate contact with the lid and other baskets to be placed in the structure.
 - 5. For gabions 3 feet high, install internal connecting wires after placement of each lift. Internal connecting wires are not required on gabions with a height of 18 inches or less.
 - a. Connect each exposed cell face to the opposite face or diaphragm with internal connecting wires.
 - b. Install two connecting wires on each exposed face, in each cell, in between each lift.
 - c. Locate wires with equal horizontal spacing approximately 1 foot apart.
 - d. Install wires by looping each end around two mesh openings, then wrapping wire tightly around itself for at least four full turns, locking the end of the wire in place by lacing it under the previous lap.
 - e. A 3 foot high cell with one exposed face requires four connecting wires. A 3 foot high end cell with two exposed faces requires eight connecting wires.
 - 6. Fill adjacent cells consecutively. Do not allow stone fill in one cell to be more than 1 foot higher than an adjacent cell.
 - 7. Overfill gabions 1 to 2 inches to allow for settlement.
- F. Attach gabion lids.
 - 1. Pull edges of lids tight until lid meets the perimeter edge of the gabion.
 - 2. Install lacing wire or fasteners at edges and diaphragms to connect lid.
- G. Place and compact backfill behind gabion walls to the same level as the filled gabions as gabions are installed.
- H. If structure requires more than one layer, connect the upper empty baskets to the top of the completed lower gabions along the front and back edges of the baskets.

3.05 REVET MATTRESS ASSEMBLY AND INSTALLATION

- A. Assemble revet mattresses in their final location. Unroll baskets and flatten all kinks and bends.
- B. Erect the sides, ends, and diaphragms, ensuring that all panels are in the correct position and the tops of all sides are aligned.
- C. Connect the four corners of the mattress first followed by connecting the diaphragms to the outside walls.
- D. Join adjacent empty mattresses together along the vertical and top edges.
- E. If anchor stakes are specified in the contract documents, install stakes at required spacing. Drive stakes into ground so the top of the stake is flush with the top of the mattress. Tie anchor stakes to baskets at the top and base of the mattress.
- F. Fill revet mattresses with mattress stone.
 - 1. When PVC coated baskets are specified, take care not to damage PVC coating during stone placement.
 - 2. Machine placement of stone will be allowed. However, handwork is required to provide maximum density without bulges or voids.
 - 3. Fill mattresses in stages as required to prevent bulges between adjacent cells.
 - 4. Overfill mattresses 1 to 2 inches to allow for natural settlement of stone.
- G. Attach mattress lids.
 - 1. Pull edges of lids tight until lid meets the perimeter edge of the mattress.
 - 2. Install lacing wire or fasteners at edges and diaphragms to connect lid.

END OF SECTION

Section 9060 Specifications

Fencing

Summary of Changes to Section 9060 Fencing

The following major updates were made to Section 9060:

General:

- Removed item for replacement (reinstallation?) of existing fence.
- Added materials and color submittals for PVC fence. Added materials certification submittal for all fence types.

Measurements and Payment:

- Added measurement and payment item for temporary fence.
- Added measurement and payment item for barbed wire.

Materials and Equipment:

- Reviewed current ASTM's related to chain link fence and updated materials accordingly. Generally reference ASTM and use terminology from ASTM.
- Increased terminal post frequency from 300 feet to 500 feet.
- Reduced distance between connections for fabric to post from 15" to 12"
- Changed the removal of existing fence to salvage it to the contractor, rather than the property owner.
- Removed information regarding tennis court fencing.
- Removed type I and type II pipe designation for posts, rails, and braces. ASTM does not make these designations. Simply referenced applicable ASTM standards.
- Changed post sizes to "nominal" instead of outside diameter.
- Updated fence height / post diameter table to match DOT. Although previous table gave outside diameters for pipe, these didn't match weight per foot of pipe - the diameter was most likely a nominal diameter. Once table was updated accordingly, it generally matched the DOT.
- Updated ASTM references for PVC coating. ASTM standard previously referenced is now void.
- Barbed wire previously described fit a particular ASTM designation; updated to refer to ASTM designation.
- Previous barbed wire supporting arms text was covered by ASTM. Removed redundant text and updated to include arm types.
- Combined all wire under a single item. Removed coating weights as those are covered in the ASTM standard.
- Added information for ground rods on fences (was previously in execution section).

Execution:

- Clarified locations where ground rod is required. More closely matches DOT now.
- Removed clean-up section.

FENCING**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Chain Link Fence
- B. Removal of Existing Fence
- C. Temporary Fence

1.02 DESCRIPTION OF WORK

- A. Installation of chain link fence.
- B. Removal of existing fences.
- C. Installation and removal of temporary fence.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Materials and color samples for vinyl-coated fence fabric.
- B. Upon request, submit certification that products supplied comply with identified specifications.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

Provide chain link fencing and gates as completed units constructed by a single source including necessary erection accessories, fittings, and fastenings.

1.08 MEASUREMENT AND PAYMENT**A. Chain Link Fence**

1. **Measurement:** Measurement will be in linear feet along the bottom of the fence fabric, excluding the length of gates, for each type and height of fence installed.
2. **Payment:** Payment will be at the unit price per linear foot of fence installed.
3. **Includes:** Unit price includes, but is not limited to, posts, fabric, rails, braces, truss rods, ties, tension wire, tension bands, tension bars, grounds, fittings, PVC coating (if specified in the contract documents), excavation of post holes, and concrete encasement of posts.

1.08 MEASUREMENT AND PAYMENT (Continued)**B. Gates**

1. **Measurement:** Measurement will be by count for each type, height, and span of gate installed.
2. **Payment:** Payment will be at the unit price for each gate.
3. **Includes:** Unit price includes, but is not limited to, gate rails, fabric, stretcher bars, braces, vertical stay, hinges, latches, keepers, drop bar lock, center gate stop, and barbed wire (if specified).

C. Barbed Wire

1. **Measurement:** Measurement will be in linear feet along the top of fence for the length of fence to which barbed wire is applied.
2. **Payment:** Payment will be at the unit price per linear foot.
3. **Includes:** Unit price includes, but is not limited to, furnishing and installing all necessary strands of barbed wire, anchors, and barbed wire supporting arms.

D. Removal of Fence

1. **Measurement:** Measurement will be in linear feet along the bottom of fence fabric, including length of gates.
2. **Payment:** Payment will be at the unit price per linear foot of fence removed.
3. **Includes:** Unit price includes, but is not limited to, removing and disposal of fence including posts, concrete encasement of posts, gates, grounds, and barbed wire, and placing and compacting backfill material in post holes.

E. Temporary Fence

1. **Measurement:** Measurement will be in linear feet along the bottom of the fence fabric, excluding the length of gates, for each type and height of fence installed.
2. **Payment:** Payment will be at the unit price per linear foot of temporary fence installed.
3. **Includes:** Unit price includes, but is not limited to, furnishing, installing, and removing posts, fabric, ties, and fittings.

PART 2 - PRODUCTS**2.01 FABRIC**

- A. General:** Provide fence fabric manufactured from wire meeting the requirements of ASTM A 817. Use No. 9 gauge wire woven in a 2 inch mesh. Construct knuckled selvedge at the top and bottom of the fabric.
- B. Zinc-coated fabric:** meet the requirements of ASTM A 392.
1. Wire coated prior to weaving: Use Type II, Class 5 zinc coating per ASTM A 817.
 2. Fabric coated after weaving: Use Class 2 coating per ASTM A 392.
- C. Aluminum-coated fabric:** meet the requirements of ASTM A 491. Coat wire prior to weaving fabric per ASTM A 817, Type I coating.
- D. PVC-coated fabric:** meet the requirements of ASTM F 668, Class 2b.
1. Apply PVC coating to zinc or aluminum-coated wire prior to weaving fabric.
 2. PVC coating color as specified in the contract documents, meeting the requirements of ASTM F 934.

2.02 POSTS, RAILS, AND BRACES

- A.** Standard weight (Schedule 40) pipe meeting the requirements of ASTM F 1083.
1. Galvanize pipe inside and out.
 2. Unless otherwise specified, provide the following nominal sizes for the respective uses:

	FENCE HEIGHT		
	48" and under	48" to 96"	Greater than 96"
	Nominal Diameter	Nominal Diameter	Nominal Diameter
Line Post	2"	2 1/2"	3"
Terminal Post*	2 1/2"	3"	4"
Top/intermediate Rail Braces	1 1/4"	1 1/4"	1 1/4"
Gate Post	Refer to contract documents and ASTM F 900		
*Includes corner, angle, end, and pull posts.			

- B.** Pipe meeting the requirements of ASTM F 1043, Group 1A (Type A coating) or Group 1C (Type B coating). Use nominal sizes shown in ASTM F 1043.
- C.** When PVC-coated fence is specified in the contract documents, coat all posts, rails, and braces, with a PVC-coated finish in accordance with ASTM F 1043.
1. Zinc-coated post per ASTM F 1083 prior to application of PVC coating.
 2. Color as specified in the contract documents, meeting the requirements of ASTM F 934.
- D.** Ensure all posts, rails, and braces provided for a given section of fence have similar coatings and shapes.
- E.** Provide caps for all posts. Comply with ASTM F 626

2.03 FITTINGS

- A. Comply with ASTM F 626.
- B. Attach braces to posts by fittings that will hold both post and brace rigidly.
- C. Provide 3/8 inch diameter round steel diagonal tension rods with an appropriate commercial means for tightening. Provide a locknut or other device to hold the tightening device in place.
- D. Provide a suitable sleeve or coupling device, recommended by the manufacturer, to connect sections of top rail and provide for expansion and contraction.
- E. Use stretcher (tension) bars of the size indicated in ASTM F 626 with suitable bands for attaching fabric to corner, end, or gate posts.

2.04 TIE WIRE AND TENSION WIRE

- A. **Tie Wire:** Provide tie wires for chain link fence that are the size and type the manufacturer recommends, but no smaller than No. 9 diameter for post ties or No. 12 diameter for rail and brace ties. Comply with ASTM A 626.
- B. **Tension Wire:** Comply with ASTM A 824, with Type I or Type II (Class 3) coating per ASTM A 817.

2.05 BARBED WIRE SUPPORTING ARMS

- A. Comply with ASTM F 626, for type of arm configuration specified in the contract documents, as listed below:
 - 1. Type I: Single slanted arm for three barbed wire strands.
 - 2. Type II: Single vertical arm for three barbed wire strands.
 - 3. Type III: V-shaped arm for six barbed wire strands.
 - 4. Type IV: A-shaped arm for five barbed wire strands.
- B. Anchor arms to line, end, corner, and pull posts

2.06 BARBED WIRE

Comply with ASTM A 121, design number 12-4-5-14R, Type A or Type Z (Class 3) coating.

2.07 GATES

- A. Provide the type, height, and width of gates as specified in the contract documents.
- B. Comply with ASTM F 900.
- C. Provide coating on gate, gate posts, and fabric as required for adjacent fence.

2.08 CONCRETE

Provide concrete materials meeting the requirements of Section 6010.

2.09 ELECTRICAL GROUND

- A. **Ground Rod:** 5/8 inch diameter, 8 foot long copper-clad rod.
- B. **Ground Wire:** No. 6 AWG bare copper wire.

PART 3 - EXECUTION**3.01 CHAIN LINK FENCE INSTALLATION****A. General:**

1. Construct fence at the location and height shown in the contract documents.
2. Comply with ASTM F 567 for fence installation.

B. Posts:**1. Post Location:**

- a. Place posts in the line of the fence with equal spacing not to exceed 10 feet on center.
- b. Set terminal (end, corner, and gate) posts at the beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignments. Place pull posts so that no more than 500 linear feet of fence is constructed with only line posts.

2. Post Setting:

- a. Dig or drill post holes to the dimensions shown in the contract documents.
- b. Set posts in concrete. Ensure all posts are set plumb in a vertical position.
- c. Form top of concrete footing so it extends 1 inch above grade and is sloped to direct water away from the post. Ensure footing is a uniform size to full depth without flare at top of grade, to prevent frost heave.
- d. Install posts no less than 24 hours prior to installation of fabric.
- e. Set terminal, corner, angle, pull, and gate posts with the required brace-post assembly as shown in the contract documents.

C. Rails:

1. **Top Rail:** Pass the top rail through the base of the line post caps to form a continuous brace from end to end of each stretch of fence. Join rail sections with sleeve or coupling device to allow for expansion and contraction. Securely fasten the top rail to the terminal posts with pressed steel connectors.
2. **Intermediate Rail:** Securely fasten the intermediate rail between all line posts and terminal posts with pressed steel fasteners. Intermediate rail is required only on fences 8 feet tall and taller.

D. Braces:

1. Securely fasten braces to the post by means of malleable iron or pressed steel connections, then truss from the line post back to the end, gate, or corner post.
2. Tighten the diagonal tension rod (truss rod) to produce proper tension.

E. Fabric:

1. Install fabric on the outside of the posts from the area being fenced or on the roadway side of the posts.
2. Secure one end of the fabric by a stretcher bar inserted in the final link of the fabric. Pull fabric taut with bottom selvedge 2 inches above grade before making attachment elsewhere.

3.01 CHAIN LINK FENCE INSTALLATION (Continued)

3. Tighten and secure each end of each run of chain link fabric by a stretcher bar inserted in the final link of the fabric. Secure stretcher bar to the end post by tension bands equally spaced not more than 15 inches apart.
4. Attach fence fabric securely to the braces, top rail, tension wire, and all intermediate posts with wire ties or bands at intervals of not more than 12 inches .

F. Bottom Tension Wire:

1. Install bottom tension wire on fence 5 feet high and taller.
2. Stretch bottom tension wire taut from terminal post to terminal post and securely fasten to each intermediate post within the bottom 6 inches of fabric.

G. Barbed Wire (When Specified):

1. Install 3 parallel wires on each barbed wire supporting arm on the outside of the area being secured, unless otherwise shown.
2. Pull wires taut, without kinks or twists for tension.

H. Gates:

1. Install gates according to ASTM F900.
2. Ensure outer member of the gate does not sag from level more than 1% of the gate leaf width or 2 inches, whichever is less.

I. Electrical Grounds:

1. Install electrical grounds per contract documents at the following locations:
 - a) Where a primary electrical transmission line (not a secondary feeder line for individual service) passes over the fence. Also ground the fence at a distance of 25 to 50 feet in each direction from the crossing.
 - b) Where the fence is adjacent to and within 50 feet of a primary electrical transmission line, ground at 500 foot maximum intervals
 - c) In at least one location on each applicable straight section of fence.
2. Drive ground rod vertically until the top is 6 inches below the ground surface.
3. Clamp ground wire to the rod and to the fence in such a manner that each element of the fence is grounded.

3.02 REMOVAL OF EXISTING FENCE

Remove all fences, including posts and footings, within work areas unless otherwise shown in the contract documents or designated by the Engineer. Remove fence to first line post beyond construction limits.

3.03 TEMPORARY FENCE

- A. Furnish and install chain link fence fabric, posts, ties, and other materials for the height specified in the plans.
- B. Install in accordance with permanent fence with the following exceptions:
 - 1. Drive posts into the ground. Do not set posts in concrete except at corner or temporary gate posts.
 - 2. Top rail, tension wire, and bracing will not be required.
- C. Remove temporary fence and materials when no longer necessary. Place suitable backfill material in post holes. Fence materials will remain the property of the Contractor and removed from the site.

END OF SECTION

Section 9070 Specifications

Landscape Retaining Walls

Summary of Changes to Section 9070 Landscape Retaining Walls

The following major updates were made to Section 9070:

General:

- Separated section into three separate sections:
 - 9070: Landscape Retaining Walls. These are un-engineered walls limited in height to 4 feet. Includes modular block walls, landscape timber walls, and limestone walls.
 - 9071: Segmental Block Retaining Walls: Engineered retaining walls which require design after letting. No height limit.
 - 9072: Combination Concrete Retaining Wall and Sidewalk: Walls under this section are built per details.
- Removed broken concrete and railroad tie retaining walls. Updated description on work to match format from other sections.

Measurements and Payment:

- Landscape timbers, limestone, and modular block walls: The area measured for payment is the actual face of wall; the height of the wall was previously measured based on a line 6 inches below the finished grade at the bottom on the wall. New area measurement matches DOT. Excavation and wall backfill material is incidental to wall unit cost.

Materials and Equipment:

- Landscape timbers: updated to use pressure-treated timbers, rated for ground contact. Updated materials section to include spikes for landscape timber walls.
- Limestone Walls: as requested by districts, required the limestone blocks to be a minimum of 8 inches deep.
- The listing of proprietary modular block wall systems was removed. Referenced updated ASTM information and required that the block be from an Iowa DOT approved supplier / system.
- In recent years, studies have been done on block units manufactured per the standard ASTM specifications, and have shown that road salt and, to a lesser extent, fertilizer, tend to rapidly degrade the wall units. The additional Iowa DOT specifications require modular blocks with 6000 psi compressive strength (rather than ASTMs 3000 psi), reduce the allowable water absorption (increases salt resistivity), and increases the freeze-thaw durability requirements.
- Added information for granular backfill and suitable backfill material.

Execution:

- Require all walls to be constructed on a 12-inch thick compacted foundation.
- Required all walls to be placed on a 6 inch compacted leveling pad. Specified method of compaction for the leveling pad.
- Required the installation of a subdrain, porous backfill, and engineering fabric for all walls types.
- Revised excavation and embankment requirements to simply minimize excavation to that necessary to install the wall.

Summary of Changes to Section 9070 Landscape Retaining Walls

- Described the length/spacing requirements for installation of tiebacks on landscape timber walls.
- Modular block walls: referenced manufacturer's requirements for installation of tieback reinforcement.

LANDSCAPE RETAINING WALLS**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Modular Block Retaining Walls
- B. Limestone Retaining Walls
- C. Landscape Timbers

1.02 DESCRIPTION OF WORK

- A. Constructing modular block retaining walls.
- B. Constructing retaining walls from limestone.
- C. Constructing retaining walls from landscaping timbers.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Upon request, submit certification that products supplied comply with identified specifications.
- B. Test results on modular blocks, if required.
- C. Catalog cuts for modular retaining wall blocks and cap stones indicating the size, type, and color proposed for installation.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None

1.08 MEASUREMENT AND PAYMENT**A. Modular Block Retaining Wall:**

1. **Measurement:** Measurement will be in square feet for the area of the face of retaining wall, from the top of the leveling pad to the top of the wall, including coping or cap stones.
2. **Payment:** Payment will be at the unit price per square foot of retaining wall.
3. **Includes:** Unit price includes, but is not limited to, excavation, foundation preparation, furnishing and placing wall units, geogrid (if necessary), leveling pad, subdrain, porous backfill material for subdrain, granular backfill material, suitable backfill material, and shoring as necessary.

B. Limestone Retaining Wall:

1. **Measurement:** Measurement will be in square feet for the area of the face of retaining wall.
2. **Payment:** Payment will be at the unit price per square foot.
3. **Includes:** Unit price includes, but is not limited to, excavation, foundation preparation, furnishing and placing leveling pad, limestone, subdrain, porous backfill material, suitable backfill material, and shoring as necessary.

C. Landscape Timbers:

1. **Measurement:** Measurement will be in square feet for the area of the face of retaining wall, from the top of the leveling pad to the top of the wall.
2. **Payment:** Payment will be at the unit price per square foot.
3. **Includes:** Unit price includes, but is not limited to, excavation, foundation preparation, furnishing and placing leveling pad, landscape timbers, spikes, reinforcing bar, subdrain, porous backfill material, suitable backfill material, and shoring as necessary.

PART 2 - PRODUCTS**2.01 MATERIALS****A. Modular Block Walls:****1. Dry-cast Concrete Wall Units:**

- a. Comply with ASTM C 1372. Sample and test units according to ASTM C 140.
- b. Provide certification that the blocks comply with the freeze-thaw durability requirements of ASTM C 1262 and the additional requirements for concrete units of Iowa DOT Materials I.M. 445.04.
- c. Furnish from an approved supplier.
 - 1) Iowa DOT Materials I.M. 445.04, Appendix A lists approved suppliers.
 - 2) Provide written certification that blocks comply with ASTM C 1372 and the additional materials requirements of Iowa DOT Materials I.M. 445.04, Appendix A.
- d. In lieu of furnishing blocks from an approved supplier, provide blocks from an approved system.
 - 1) Iowa DOT Materials I.M. 445.04, Appendix B lists approved systems.
 - 2) Test the required number of blocks from the lot to be installed in accordance with Materials I.M. 445.04.
 - 3) Submit results of test data to the Engineer.

2. Wet-cast Concrete Wall Units: Comply with the materials and compressive strength requirements of Iowa DOT Materials I.M. 445.05.

- a. Furnish from an approved supplier.
 - 1) Iowa DOT Materials I.M. 445.05, Appendix A lists approved suppliers.
 - 2) Provide written certification that blocks comply with Iowa DOT Materials I.M. 445.05.
- b. In lieu of furnishing blocks from an approved supplier, provide blocks from an approved system.
 - 1) Iowa DOT Materials I.M. 445.05, Appendix B lists approved systems.
 - 2) Test the required number of blocks from the lot to be installed in accordance with Materials I.M. 445.05.
 - 3) Submit results of test data to the Engineer.

B. Limestone: Limestone slabs with a flat bottom and top and a clean face. Provide slabs with a minimum depth of 8 inches, or as required to ensure stability of the wall.**C. Landscape Timbers:**

1. Minimum 6 inch by 6 inch (nominal) pressure-treated landscape timbers rated for ground contact. Ensure timbers are straight, solid, have at least three good sides, and are free of visible dry rot, with only a minor amount of splitting or cracking. Ensure all timbers used in a wall have the same cross sectional area.
2. Provide 3/8 inch diameter galvanized spikes, 10 to 12 inches long.

D. Leveling Pad: Provide material recommended by the wall manufacturer or supplier.

1. **Granular Material:** Comply with the requirements of Iowa DOT Section 4132.
2. **Concrete:** Comply with Section 6010. Provide Class C Concrete.

F. Subdrain: Comply with Section 4040, 2.02. Minimum 4 inch diameter pipe.**G. Porous Backfill Material (for Subdrain):** Comply with Section 4040, 2.04.

2.01 MATERIALS (Continued)

H. Engineering Fabric: Provide fabric complying with Iowa DOT Article 4196.01 for subsurface drainage.

I. Unit Fill Material: Comply with Iowa DOT Section 4131.

J. Backfill Material:

- 1. Granular Backfill Material:** Provide granular backfill material complying with the requirements of Iowa DOT Section 4133 within the reinforced zone of landscape and segmental block retaining walls.
- 2. Suitable Backfill Material:** Comply with Section 2010.

PART 3 - EXECUTION**3.01 EXCAVATION AND EMBANKMENT**

- A. Prior to beginning wall construction, compact proposed embankment behind the wall to a minimum of 90% of maximum Standard Proctor Density.
- B. Excavate to the line and grade shown in the contract documents. Minimize over-excavation. Install sheeting, shoring, or other retention systems to as required to ensure the stability of the excavation.

3.02 INSTALLATION

- A. **Modular Block Retaining Wall:** Overall wall height is limited to 4 feet.

- 1. **Foundation Soil Preparation:** Excavate and compact 12 inches of native soil beneath the leveling pad to 95% of maximum Standard Proctor Density.
- 2. **Leveling Pad:** Construct a minimum 6 inch thick leveling pad of material as specified by the manufacturer.
- 3. **Unit Installation:**
 - a. Place units side by side for the full length of wall alignment. Establish alignment by means of a string line or offset from the base line.
 - b. Ensure units are in full contact with the leveling pad.
 - c. Place subdrain behind the first course of modular block retaining wall units. Surround with porous backfill, ensuring a trench width of at least 8 inches. Wrap porous backfill with engineering fabric. Ensure positive drainage on subdrain and provide adequate outlet for water.
 - c. Install connecting pins. Fill units with unit fill material; tamp the fill.
 - d. Sweep all excess material from top of units and install the next course. Ensure each course is completely filled prior to proceeding to the successive course.
 - e. Place each course so that pins protrude into adjoining courses a minimum of 1 inch or to tolerances recommended by the supplier/manufacturer. Two pins are required per unit. Repeat the above procedure for each course to the top of wall height.
 - f. At the end of each course, where the wall changes elevation, turn the units into the backfill material. Place units to create the minimum radius possible. Install a minimum of 3 units into the grade. Ensure only the front face of the units is visible from the side of the wall.
- 4. **Backfill Material Placement:**
 - a. Place each lift of granular backfill material following the erection of each lift of wall. Where reinforcement material is present, roughly level the backfill material before placing and connecting the reinforcement. If necessary, decrease the lift thickness to obtain the specified density.
 - b. At the end of each day's operations, shape the last level of backfill material to permit runoff of rainwater away from the wall face.
 - c. Compact granular backfill material according to the Field Quality Control requirements of Section 2010 with the following exception: ensure the moisture content falls within a range from 3% under optimum moisture to no more than the optimum moisture content.
 - d. Place and compact backfill material without disturbing or distorting the tieback reinforcement (if present) or the wall. Do not use tamping type rollers or other rollers that may damage the reinforcing. Use light mechanical tampers to achieve the required compaction in a strip 3 feet wide adjacent to the backside of the wall; compaction density testing will not be required within 3 feet of the back of the wall.
- 5. **Tieback Reinforcement Installation:** Install tieback reinforcement in accordance with the manufacturer's requirements.

3.02 INSTALLATION (Continued)**B. Limestone Retaining Wall:** Overall wall height is limited to 4 feet.

1. Excavate and compact 12 inches of native soil beneath the leveling pad to 95% of maximum Standard Proctor Density.
2. Construct a leveling pad of minimum 6 inches of granular material. Compact granular material with three passes of a vibratory plate compactor.
3. Place limestone slabs. Ensure adjacent slabs are in full contact without gaps.
4. Place subdrain behind the first course of limestone. Surround with porous backfill, ensuring a trench width of at least 8 inches. Wrap porous backfill with engineering fabric. Ensure positive drainage on subdrain and provide adequate outlet for water.
5. After each course is laid, place backfill material behind the wall and compact with hand tools to a density equal to or greater than the existing soil behind the wall.

C. Landscape Timbers: Overall wall height is limited to 4 feet.

1. Construct a leveling pad of minimum 6 inches of granular material, at a depth such that the entire first course of timbers will be completely below the finished grade at the base of the wall. Compact granular material with three passes of a vibratory plate compactor.
2. Lay first course of timbers horizontally, ensuring timbers are level. Set back each succeeding course 1/2 inch.
3. Secure each course to the course below it using spikes placed 2 feet from each joint, and spaced at no more than 4 feet. Drill pilot holes in timbers to facilitate installation of spikes.
4. Stagger vertical joints so no joint is located closer than 2 feet to a joint in the course below it.
5. Install tiebacks with length equal to the wall height, perpendicular to the wall face, spaced at 8 feet. Stagger location of tieback on each course. Do not install tiebacks in bottom three courses or upper two courses of timbers. Ensure the end of the tieback is flush with the front of the retaining wall. Attach tieback to course below it using a spike.
6. Place a subdrain behind the first course of timbers. Surround with porous backfill, ensuring a trench width of at least 8 inches. Wrap porous backfill with engineering fabric. Ensure positive drainage on subdrain and provide adequate outlet for water.
7. After each course is laid, place backfill material behind the wall and compact with hand tools to a density equal to or greater than the existing soil behind the wall.

END OF SECTION

Section 9071 Specifications

Segmental Block Retaining Walls

Summary of Changes to Section 9071 Segmental Block Retaining Walls

Section 9071 is new. This section was developed to add Segmental Block Retaining Walls to the SUDAS Specifications.

The following summarizes the details of the new specification:

General

- Added Segmental Block Retaining Walls as a new product. These walls exceed a height of 4 feet and must be designed by a licensed engineer. The engineer is either retained by the contractor, or the design is completed by the wall manufacturer's engineer.
- The signed & sealed wall design must be submitted for review.

Measurements and Payment:

- The wall is bid in square feet of wall face from the top of the wall to the top of the leveling pad.
- Granular backfill material, required behind the wall, is paid for separately by the ton.
- At the request of the SUDAS districts, the bid item for excavation and suitable backfill material was removed and this work is now incidental to the square foot price for the wall. It should be noted that this differs from the DOT specifications, which pay for required excavation/backfill separately.

Materials and Equipment:

- In general, the wall materials and manufacturing requirements are similar to those for modular block walls and include the Iowa DOT's additional requirements for compressive strength, absorption, and freeze-thaw durability.

Execution:

- General installation requirements follow that for a modular block wall.
- Specific installation requirements are as specified by the wall manufacturer.
- Changed from 95 to 90% proctor compaction for embankment fill behind wall.

SEGMENTAL BLOCK RETAINING WALLS**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Segmental Block Retaining Walls

1.02 DESCRIPTION OF WORK

Constructing segmental block retaining walls.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Upon request, submit certification that products supplied comply with identified specifications.
- B. Detailed design calculations (including soil bearing pressure), construction drawings, and shop drawings for all segmental block retaining walls, prepared by licensed Professional Engineer in the State of Iowa.
- C. A detailed explanation of the design properties of geogrid reinforcement and quality control tests limits.
- D. Test results on segmental blocks, if required.
- E. Catalog cuts of segmental retaining wall blocks and cap stones indicating the size, type, and color specified for installation.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

- A. A licensed Professional Engineer in the State of Iowa must prepare, sign, and seal detailed design calculations, construction drawings, and shop drawings for all segmental block retaining walls.
- B. Ensure design complies with the National Concrete Masonry Association (NCMA) "Design Manual for Segmental Retaining Walls."

1.08 MEASUREMENT AND PAYMENT**A. Segmental Block Retaining Wall:**

1. **Measurement:** Measurement will be in square feet for the area of the face of retaining wall, from the top of the leveling pad to the top of the wall, including coping or cap stones.
2. **Payment:** Payment will be at the unit price per square foot of retaining wall.
3. **Includes:** Unit price includes, but is not limited to, design by a Licensed Professional Engineer in the State of Iowa, excavation, foundation preparation, furnishing and placing wall units, geogrid, leveling pad, subdrain, porous backfill material for subdrain, suitable backfill material, and shoring as necessary.

B. Granular Backfill Material:

1. **Measurement:** Measurement will be in tons, based on load tickets, for material used in connection with segmental block retaining walls.
2. **Payment:** Payment will be at the unit price per ton.
3. **Includes:** Unit price includes, but is not limited to, furnishing, transporting, placing, and compacting material.

PART 2 - PRODUCTS**2.01 MATERIALS****A. Segmental Block Walls:****1. Dry-Cast Concrete Wall Units:**

- a. Comply with ASTM C 1372. Sample and test units per ASTM C 140.
- b. Provide certification that the blocks comply with the freeze-thaw durability requirements of ASTM C 1262 and the additional requirements for concrete units of Iowa DOT Materials I.M. 445.04.
- c. Furnish from an approved supplier.
 - 1) Iowa DOT Materials I.M. 445.04, Appendix A lists approved suppliers.
 - 2) Provide written certification that blocks comply with ASTM C 1372 and the additional materials requirements of Iowa DOT Materials I.M. 445.04, Appendix A.
- d. In lieu of furnishing blocks from an approved supplier, provide blocks from an approved system.
 - 1) Iowa DOT Materials I.M. 445.04, Appendix B lists approved systems.
 - 2) Test the required number of blocks from the lot to be installed in accordance with Materials I.M. 445.04.
 - 3) Submit results of test data to the Engineer.

2. Wet-cast Concrete Wall Units: Comply with the materials and compressive strength requirements of Iowa DOT Materials I.M. 445.05.

- a. Furnish from an approved supplier.
 - 1) Iowa DOT Materials I.M. 445.05, Appendix A lists approved suppliers.
 - 2) Provide written certification that blocks comply with Iowa DOT Materials I.M. 445.05.
- b. In lieu of furnishing blocks from an approved supplier, provide blocks from an approved system.
 - 1) Iowa DOT Materials I.M. 445.05, Appendix B lists approved systems.
 - 2) Test the required number of blocks from the lot to be installed in accordance with Materials I.M. 445.05.
 - 3) Submit results of test data to the Engineer.

3. Geogrid: Provide geogrid as specified in the retaining wall design.**B. Leveling Pad:** Provide material recommended by the wall manufacturer or supplier.**1. Granular Material:** Comply with the requirements of Iowa DOT Section 4132.**2. Concrete:** Comply with Section 6010. Use Class C Concrete.**C. Subdrain:** Comply with Section 4040, 2.02. Minimum 4 inch diameter pipe.**D. Porous Backfill Material (for Subdrain):** Comply with Section 4040, 2.04.**E. Engineering Fabric:** Provide fabric complying with Iowa DOT Article 4196.01 for subsurface drainage.**F. Unit Fill Material:** Comply with Iowa DOT Section 4131.**G. Backfill Material:****1. Granular Backfill Material:** Provide granular backfill material complying with the requirements of Iowa DOT Section 4133 within the reinforced zone of segmental block retaining walls.**2. Suitable Backfill Material:** Comply with Section 2010.

PART 3 - EXECUTION**3.01 EXCAVATION AND EMBANKMENT**

- A. Prior to beginning wall construction, compact proposed embankment behind the wall to a minimum of 90% of maximum Standard Proctor Density.
- B. Excavate to the line and grade shown in the contract documents. Minimize over-excavation. Install sheeting, shoring, or other retention systems as required to ensure stability of the excavation.

3.02 INSTALLATION

- A. **Foundation Soil Preparation:** Excavate and compact 12 inches of native soil beneath the leveling pad to 95% of maximum Standard Proctor Density.
- B. **Leveling Pad:** Construct a minimum 6 inch thick leveling pad of material as specified by the manufacturer.
- C. **Unit Installation:** Install materials at the proper elevation and orientation shown in the contract documents. Install the concrete segmental units and geogrid reinforcement according to the approved submittals.

D. Subdrains:

- 1. Install subdrains as shown in the contract documents to maintain gravity flow of water to outside of the reinforced earth zone. Outlet subdrains into a storm sewer or along a slope at an elevation lower than the lowest point of the pipe within the reinforced earth zone.
- 2. Place porous backfill material around the subdrain to a minimum cover of 3 inches.
- 3. Wrap porous backfill material with engineering fabric.

E. Backfill Material Placement:

- 1. Place the backfill material in maximum 8 inch lifts, spread, and compact in such a manner that eliminates the development of wrinkles and/or movement of the geogrid reinforcement.
- 2. Compact granular backfill material according to the Field Quality Control requirements of Section 2010 with the following exception: ensure the moisture content falls within a range from 3% under optimum moisture to no more than the optimum moisture content.
- 3. Use only hand-operated compaction equipment within 3 feet of the front of the wall face.
- 4. Do not operate tracked construction equipment directly on the geogrid reinforcement. A minimum thickness of 6 inches of backfill material is required over the geogrid reinforcement prior to operation of tracked vehicles. Minimize turning of tracked vehicles to prevent tracks from displacing the fill and damaging the geogrid reinforcement.
- 5. Rubber-tired equipment may pass over the geogrid reinforcement, if done according to the manufacturer's recommendations. Avoid sudden braking and sharp turning.

3.02 INSTALLATION (Continued)**F. Geogrid Installation:**

1. Do not overlap the geogrid in the design strength direction; use one continuous piece of material. The design strength direction is perpendicular to the wall face. Butt adjacent sections of geogrid in a manner to ensure 100% coverage after placement.
2. Install the geogrid reinforcement under tension. Apply a nominal tension to the reinforcement and maintain it by staples, stakes, or hand tensioning. The tension applied may be released after the geogrid reinforcement has been covered and held in place with soil fill.

END OF SECTION

Section 9072 Specifications

Combined Concrete Sidewalk and Retaining Wall

Summary of Changes to Section 9072 Combination Concrete Retaining Wall and Sidewalk

Section 9072 is new. This section was developed to separate concrete retaining walls from landscape retaining walls.

The following summarizes the details of the new specification:

General

- This section was previously included in 9070. It was developed as a standalone section due to the differences in construction methods and materials between a concrete wall and a landscape timber or modular block wall. Also, concrete walls are not limited to the 4 foot height restriction imposed on landscape retaining walls.

Measurements and Payment:

- 1.08 – changed from a square foot measurement to a cubic yard measurement. The previous method of measurement was based upon the square feet of the face of the wall, and included the sidewalk as an incidental. Because the combined sidewalk portion is a structural element of the wall system, it makes more sense to measure and pay for the combined wall and sidewalk together, by the cubic yard. This method also matches the Iowa DOT.

Materials and Equipment:

- 2.01 – The previous section referenced Section 7010 for concrete and reinforcing requirements. Because this is structural concrete, the reference was changed to Section 6010.
- 2.01 – Added a reference to Section 2010 for suitable backfill material.
- 2.01 – Added specifications for subdrain, rodent-proof hardware cloth, and porous backfill material.

Execution:

- 3.01 – Made weep holes a requirement for all wall heights. Previously only required if the wall was taller than 3 feet.
- 3.02 – Required the installation of subdrain and porous backfill behind the wall.
- 3.02 – Added rustication and jointing info to the specifications.

COMBINED CONCRETE SIDEWALK AND RETAINING WALL**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Combined Concrete Sidewalk and Retaining Wall

1.02 DESCRIPTION OF WORK

Constructing combined concrete sidewalk and retaining wall.

1.03 SUBMITTALS

A. Follow the General Provisions (Requirements) and Covenants.

B. Upon request, submit certification that products supplied comply with identified specifications.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None

1.08 MEASUREMENT AND PAYMENT**A. Combined Concrete Sidewalk and Retaining Wall:**

1. **Measurement:** Measurement will be in cubic yards for the volume of combined sidewalk and retaining wall, as shown in the contract documents.
2. **Payment:** Payment will be at the unit price per cubic yard of combined sidewalk and retaining wall.
3. **Includes:** Unit price includes, but is not limited to, excavation, foundation preparation, furnishing and placing all concrete, reinforcing steel, joint material, subdrain, porous backfill material, suitable backfill material, and shoring as necessary.

PART 2 - PRODUCTS**2.01 MATERIALS****A. Combined Concrete Sidewalk and Retaining Wall:**

1. **Portland Cement Concrete:** Comply with Section 6010, part 2.02.
2. **Reinforcing Steel:** Comply with Iowa DOT Section 4151.
3. **Expansion Joint:** Comply with Iowa DOT Section 4136.02. Use resilient filler when the type is not specified.

B. Subdrain: Comply with Section 4040, Part 2.02. Minimum 4 inch diameter.**C. Porous Backfill Material (for Subdrain):** Comply with Section 4040, part 2.04.**D. Suitable Backfill Material:** Comply with Section 2010.**E. Rodent-Proof Hardware Cloth:** Copper screening or galvanized hardware cloth with a minimum grate spacing of 0.15 inches and maximum spacing of 0.25 inches.

PART 3 - EXECUTION**3.01 EXCAVATION AND EMBANKMENT**

- A. At locations where the wall is to be constructed against embankment, compact to a minimum of 90% of maximum Standard Proctor Density prior to beginning wall construction.
- B. Excavate to the line and grade shown in the contract documents. Minimize over-excavation. Install sheeting, shoring, or other retention systems as required to ensure the stability of the excavation.

3.02 INSTALLATION

- A. Comply with Section 6010.
- B. Forming the back of the wall is not required unless specified in the contract documents. Where the back of the walls is not formed and sloughing occurs, remove the loose material and replace with concrete at no additional compensation.
- C. Install 3 inch diameter weep holes at 8 foot intervals. Form weep holes with an approved rustproof device backed with rodent-proof hardware cloth.
- D. Install 8 inch wide trench of porous backfill behind the wall. Install subdrain within porous backfill trench when specified in the contract documents. Ensure positive drainage on subdrain. Outlet subdrain to weep holes.

3.03 JOINTS

Form joints in the wall and sidewalk.

- A. Form ED joints in the wall at no more than 60 foot spacing. Affix expansion material to retaining wall.
- B. Place C joints in the wall at no more than 20 foot spacing.
- C. Form E joints in the sidewalk to coincide with ED joints in the wall. Place C joints in the sidewalk at spacing equal to the sidewalk width.
- D. Place a longitudinal joint in the sidewalk when sidewalk width is greater than 8 feet.

3.04 RUSTICATION

Decorative form liners or inserts may be used when forming the face of the wall with the approval of the Engineer. Form rustications as indicated in the contract documents.

END OF SECTION

Section 9080 Specifications

Concrete Steps, Handrail, and Safety Rail

Summary of Changes to Section 9080 Concrete Steps, Handrail, and Safety Rail

The following major updates were made to Section 9080:

General:

- Removed ornamental handrail from specifications. This is considered a specialty item.
- Now requires contractor to furnish shop drawings and color samples for handrail.
- Added a statement to 1.03 (submittals) requiring submittal of certification that products comply with the identified specification.
- Added a new item for Safety Rail.
- Updated measurement and payment sections to new format. Added information stating what is included with each bid item.

Materials:

- Referred to Section 6010 for concrete materials.
- Updated handrail specifications to meet ADA requirements.
- Bolted handrail attachments now have four bolts at each location for better stability (previously two bolts).
- Updated specifications for primer and paint on handrail.
- Added information on bolt and anchor plate material requirements for handrail.
- Removed statement about using a bolted attachment when securing handrail by bolts. Also removed statement about using four bolts. This is execution information and is already stated in the execution section.

Execution:

- Generally referenced other sections for forming (Iowa DOT Section 2403), concrete placement (Section 6010), and reinforcing steel (Iowa DOT Section 2404).
- Added statement that painting is required for steel handrail and that galvanized and aluminum rail should not be painted.

CONCRETE STEPS AND HANDRAIL**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Concrete Steps
- B. Handrail

1.02 DESCRIPTION OF WORK

- A. Furnish and install concrete steps.
- B. Furnish and install handrail.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants, as well as the following:

- A. Submit color samples and product literature for primer and paint to be used on handrail.
- B. Submit shop drawings for handrail.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Concrete Steps:**

1. **Measurement:** Measurement will be the area in square feet. The length will be the horizontal length between expansion joints, and the width will include curbs.
2. **Payment:** Payment will be at the unit price per square foot of concrete steps.
3. **Includes:** Unit price includes, but is not limited to, reinforcement, expansion joint material, and preparation of subgrade.

1.08 MEASUREMENT AND PAYMENT (Continued)**B. Handrail:**

1. **Measurement:** Measurement will be the linear feet of handrail installed, measured along the top of the handrail from end of rail to end of rail.
2. **Payment:** Payment will be at the contract unit price per linear foot.
3. **Includes:** Unit price includes, but is not limited to, posts, mounting hardware or concrete grout, and painting or galvanizing rail.

PART 2 - PRODUCTS**2.01 MATERIALS****A. Steps**

1. **Concrete:** Use Class C concrete. Comply with Section 6010, 2.02.
2. **Reinforcing Steel:** Comply with Iowa DOT Section 2404.
3. **Non-shrink Grout:** Comply with Iowa DOT Materials I.M. 491.13.
4. **Expansion Joint:** Meet the requirements of Iowa DOT Article 4136.03, A.
5. **Forms:** Comply with Iowa DOT Section 2403.

B. Handrail:

1. Construct handrail and posts of welded or seamless black steel pipe complying with ASTM A 53, Grade A or B.
2. Ensure outside diameter of handrail pipe is between 1 1/4 inches and 2 inches. Post diameter to match handrail diameter.
3. Ensure bends in pipe are manufactured, not field bent.
4. Use welded connections between handrail components. Grind connections and remove other irregularities in handrail to ensure no sharp or abrasive edges.
5. Shop coat handrail and posts with primer prior to fabrication. Apply two field coats of paint upon completion of fabrication.
6. Use a bolted handrail attachment when handrails are to be secured to the steps by bolts. Use four bolts at each connection.
 - a. Weld handrail post to a 1/4 inch thick, 5 inch by 8 inch, 36,000 psi steel anchor plate. Paint anchor plate to match handrail.
 - b. Zinc coated or stainless steel concrete anchor bolts of type and length providing a minimum 3,000 pound pull-out rating in 4,000 psi concrete. Anchor bolts are to be minimum 3/8 inch diameter.
7. Use single component, water-based rust and corrosion resistant primer specifically designed for use on steel surfaces.
8. Use water-based, abrasion-resistant paint specifically designed for use on steel surfaces.

PART 3 - EXECUTION**3.01 INSTALLATION OF STEPS**

- A. Prepare Subgrade:** In fill areas, construct and compact to 95% of maximum Standard Proctor Density.
- B. Forming:** Comply with the forms specifications in Iowa DOT Article 2403.03, B.
- C. Concrete:** Comply with Section 6010, 3.02. In addition, deposit concrete for the full depth of the steps in one operation.
- D. Reinforcing Steel:**
 - 1. Comply with Iowa DOT Section 2404.
 - 2. Provide a minimum 2 inches of cover on all reinforcing steel.
- E. Handrail:**
 - 1. Install handrail on both sides of the stairs. Handrail is to be continuous.
 - 2. Install the top of railing to between 34 inches and 38 inches above the nose of the step tread. The top of rail is to be a consistent height above the step treads. Install the bottom rail halfway between the top of the steps and the top of the top handrail.
 - 3. Attach handrail to the concrete curb in one of two ways:
 - a. Bolt handrail to concrete steps. Use four bolts at each attachment point. Bolts are to be drilled into cured concrete rather than set into wet concrete.
 - b. Embed posts in concrete. Form a hole in the concrete curb 1 inch diameter larger than the post, to a depth of 6 inches. After concrete has been cured, install handrail. Fill the void around the post with non-shrink grout.
- F. Paint:** Unless otherwise specified in the contract documents, provide factory-mixed paint/primer. Mix paint to correct consistency according to manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to paint unless such a procedure is specifically described in manufacturer's product instructions.

END OF SECTION

APPENDIX B

Revised Figures for TR-607:

Review of Inconsistencies Between
SUDAS and Iowa DOT Specifications

Phase III: Implementation of Recommendations
into SUDAS Specifications

Section 7010 Figures

Portland Cement Concrete Pavement

Summary of Revisions to 7010 Figures Portland Cement Concrete Pavement

Revised Figures:

New #	Proposed Name	Current #	Summary of Changes
7010.101 (PV-101)	Joints	7010.4A	Combined current figures with Iowa DOT SRP.
		7010.4B	Included two options for sealing longitudinal joint
		7010.4C	(based upon contracting authority).
7010.102 (PV-102)	PCC Curb Details	7010.7A	Combined current figure with Iowa DOT SRP. Added integral 4" sloped curb. Added HMA detail against standard curb and gutter. Deleted removable curb info.
7010.103 (PV-103)	Manhole Boxouts in PCC Pavement	7010.2B	Revised boxout dimensions to match Iowa DOT. Added roundout option. Removed intake information to make figure manhole specific. Added cross-sections for two-piece and three-piece castings.
7010.104 (PV-104)	Ramped Median Nose	7010.9A	Combined current figure with Iowa DOT SRP.
7010.901	PCC Pavement Jointing	7010.1A	Removed offset table. Added a table for transverse
		7010.1B	joint requirements.
7010.902	PCC Pavement Widening	7010.8A	Added detail for curb on widening when an overlay will be placed. Updated so widening is not only depicted with an overlay.
7010.903	PCC Railroad Crossing Approach	7010.10	For skewed crossing, changed entire skewed section to HMA and squared up the PCC approach. Added sidewalk, detectable warning panel, and reference to 7030.
7010.904	Typical Jointing Layout	7010.2A	Updated format
7010.905	PCC Cul-de-sac Joint Locations	7010.3A	Updated format
		7010.3B	
		7010.3C	
7010.906	Medians	7010.9B	Updated format. Deleted Type B and D options.
		7010.9C	

Note: highlighting is only for ease of reading

Figures Moving to Design:

Current #	Current Name	Comments
7010.1C	49' B/B & 53' B/B PCC Pavement Jointing and Crown	These figures are actually direction to the Engineer, not the Contractor, or are elements that would have specific information in the contract documents.
7010.1D	24' Rural PCC Pavement Jointing and Crown	
7010.1E	48' Rural PCC Pavement Jointing and Crown	
7010.1F	Reinforced Pavement Detail, 26' B/B Street	
7010.1G	Reinforced Pavement Detail, 31' B/B Street	
7010.5	PCC Pavement Section Between Existing Curb & Gutter	

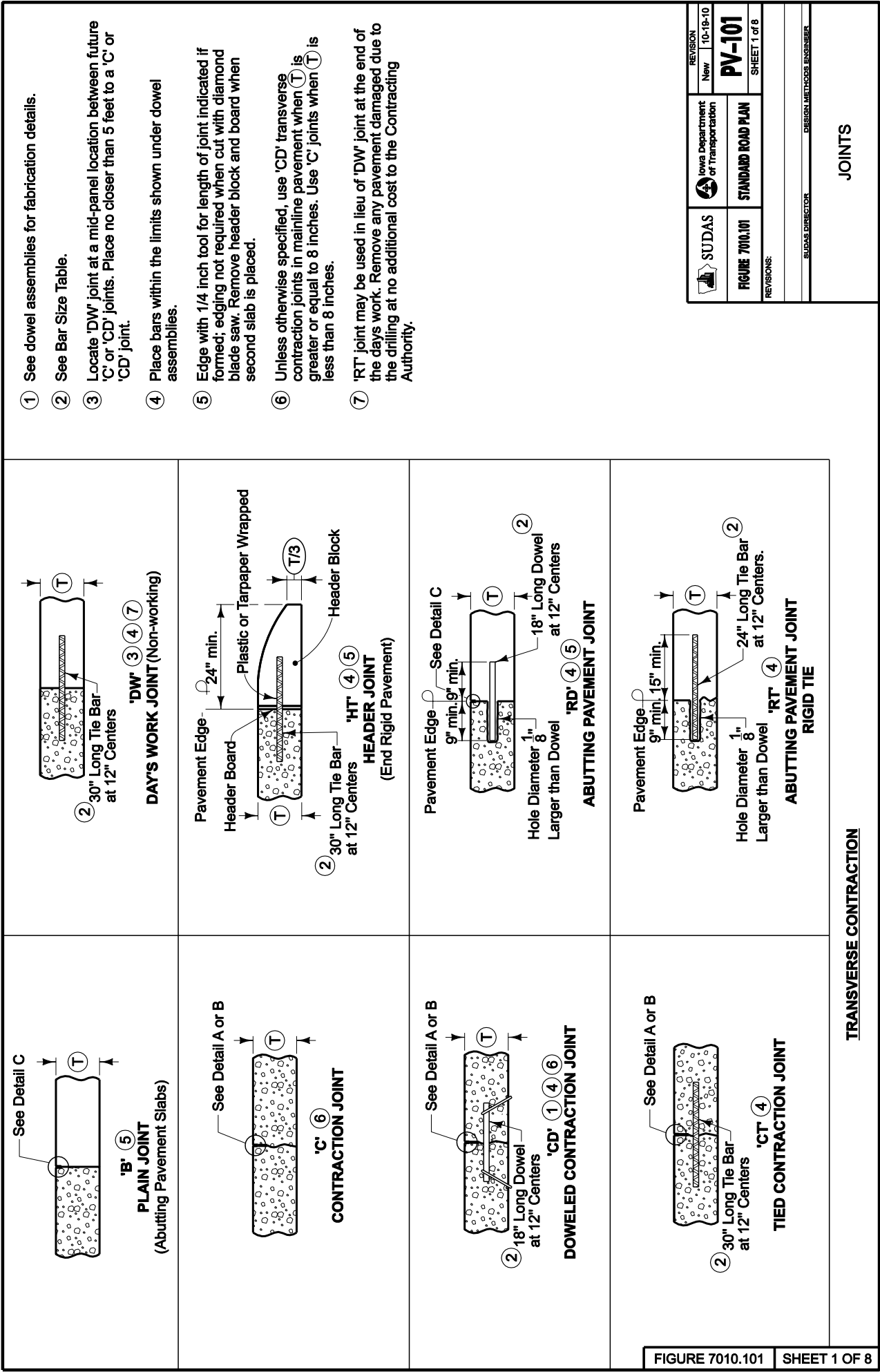
Figures to Archive:

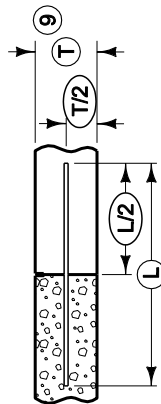
Current #	Current Name	Comments
7010.6	PCC Paved Shoulder with Sloped Curb	Derived from Iowa DOT RH-41E. A paved shoulder with a curb is not typically used.
7010.7B	Precast PCC Curb	These are specific to private projects and not applicable on public improvements.

Summary of Revisions to 7010 Figures Portland Cement Concrete Pavement

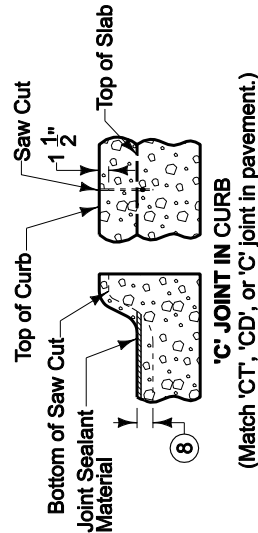
Figures to Delete:

Current #	Current Name	Comments
7010.8B	PCC Base Pavement Widening - Rural	Base widening of a rural section is not typical for SUDAS. Reference Iowa DOT RG-1 when needed.
7010.9B	Traffic Islands – Type A and B	Type A is included on 7010.906
7010.9C	Traffic Islands – Type C and D	Type C is included on 7010.906

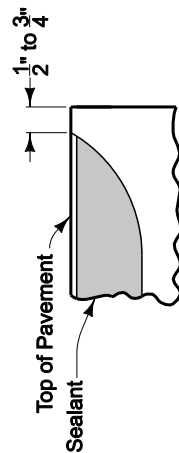




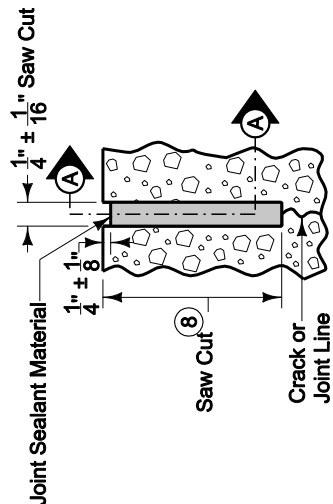
BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



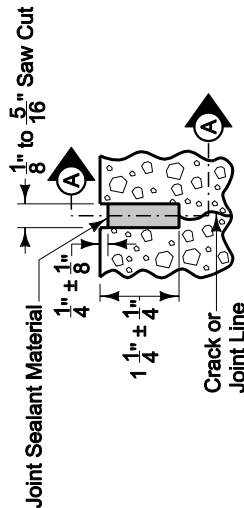
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' joint in pavement.)



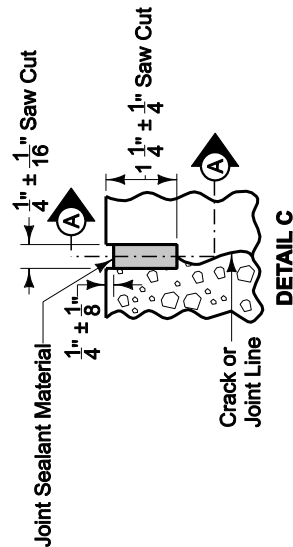
SECTION A-A
(Detail at Edge of Pavement)



DETAIL A
(Saw cut formed by conventional concrete sawing equipment.)





DETAIL B
(Saw cut formed by approved early concrete sawing equipment.)

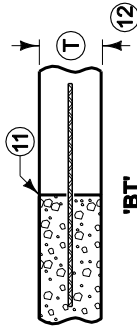
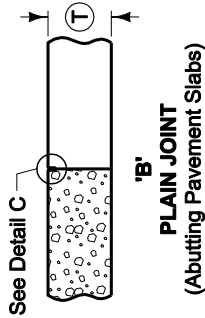


DETAIL C

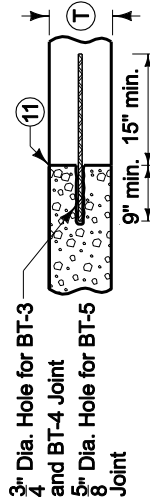
- ⑧ Saw 'CD' joint to a depth of $T/3 \pm 1/4"$; saw 'C' joint to a depth of $T/4 \pm 1/4"$.
- ⑨ When tying into old pavement, ⑧ represents the depth of sound PCC.

BAR SIZE TABLE		
⑧	Dowel Diameter	Tie Bar Size
< 8"	$\frac{3}{4}$ "	#6
$\geq 8"$ but < 10"	$1 \frac{1}{4}$ "	#10
$\geq 10"$	$1 \frac{1}{2}$ "	#11

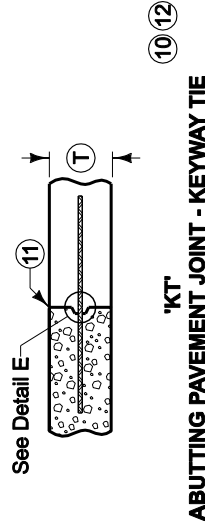
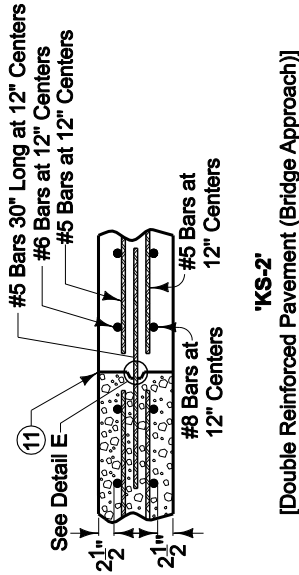
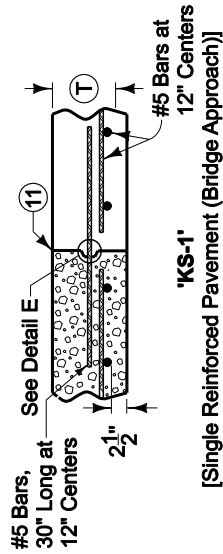
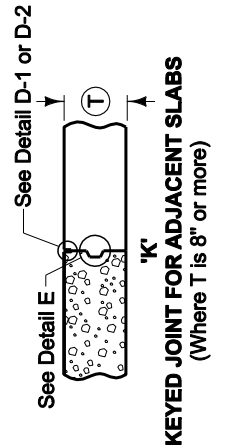
	SUDAS		Iowa Department of Transportation	REVISION	
				New	10-19-10
FIGURE 7010.101		STANDARD ROAD PLAN		PV-101	
				SHEET 2 of 8	
REVISIONS:					
				DESIGN METHODS ENGINEER	
				SUDAS DIRECTOR	
JOINTS					



(T)	Joint	Bars	Bar Length and Spacing
< 8"	'BT-1'	#4	36" Long at 30" Centers
≥ 8"	'BT-2'	#5	36" Long at 30" Centers

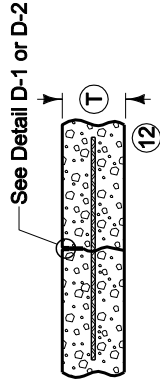


(T)	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers

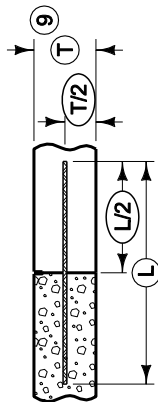


(T)	Joint	Bars	Bar Length and Spacing
< 8"	'KT-1'	#4	30" Long at 30" Centers
≥ 8"	'KT-2'	#5	30" Long at 30" Centers
	'KT-3'		30" Long at 15" Centers

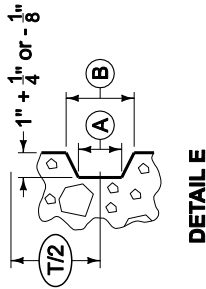
- (10) Bar supports may be necessary for fixed form paving to ensure the bar remains in a horizontal position in the plastic concrete.
- (11) Sawing or sealing of joint not required.
- (12) The following joints are interchangeable, subject to the pouring sequence:
'BT-1', 'L-1', and 'KT-1'
'BT-2' and 'L-2'
'KT-3' and 'L-3'



(T)	Joint	Bars	Bar Length and Spacing
< 8"	'L-1'	#4	36" Long at 30" Centers
≥ 8"	'L-2'	#5	36" Long at 30" Centers
	'L-3'		36" Long at 15" Centers

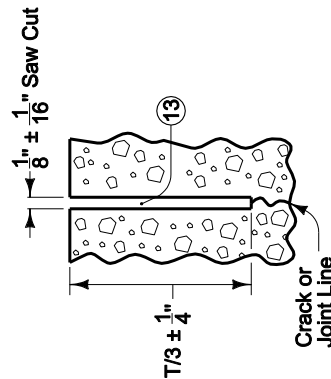


TIE BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)

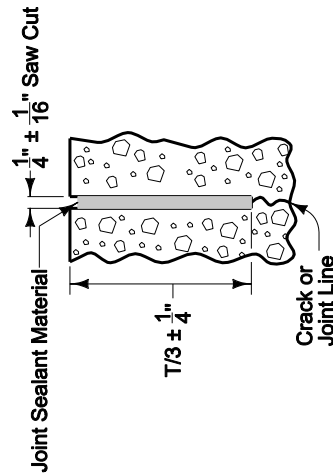


DETAIL E

KEYWAY DIMENSIONS				
Keyway Type	Pavement Thickness	T	A	B
Standard	8" or greater	13/4	13/4	2 3/4
Narrow	Less than 8"		1"	2"



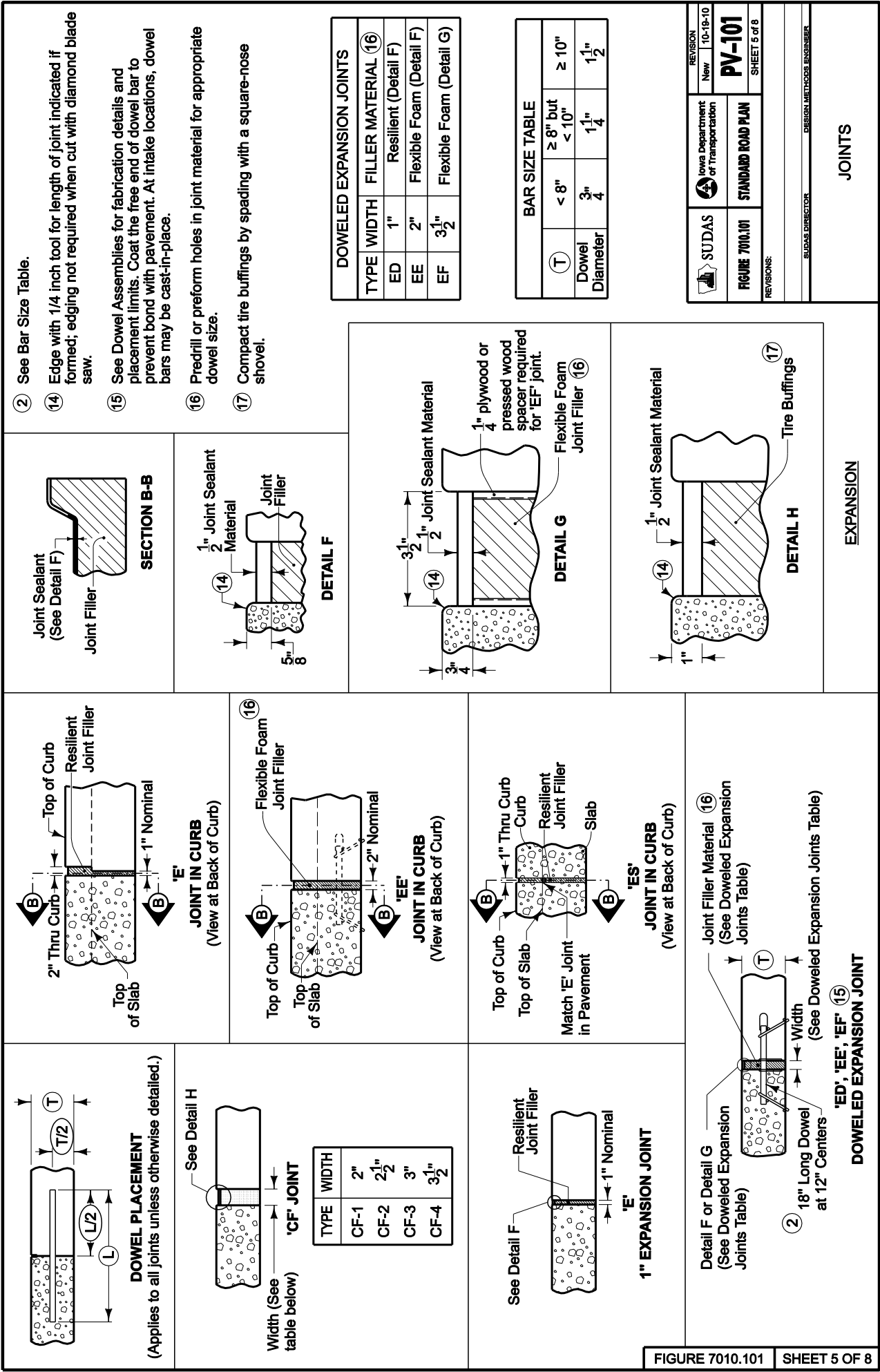
DETAIL D-1
(Required when the Department of Transportation is the Contracting Authority, or when specified in the contract documents.)



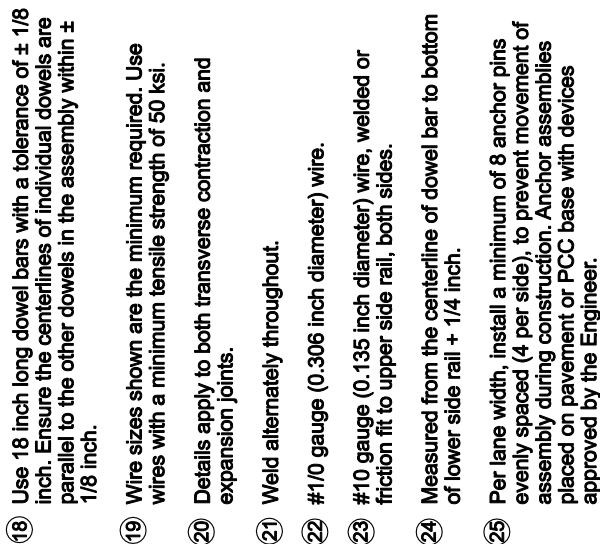
DETAIL D-2
(Required when the Department of Transportation is not the Contracting Authority, or when specified in the contract documents)

- ⑨ When tying into old pavement, ⑨ represents the depth of sound PCC.
- ⑬ Sealant or cleaning not required.

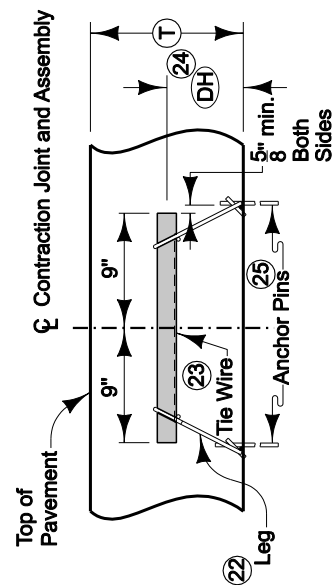
SUDAS	Iowa Department of Transportation	REVISION
		New 10-19-10
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101
REVISIONS:		SHEET 4 of 8
SUDAS DIRECTOR		
DESIGN METHOD ENGINEER		
JOINTS		






⑮ Use 18 inch long dowel bars with a tolerance of $\pm 1/8$ inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within $\pm 1/8$ inch.



DOWEL HEIGHT AND DIAMETER		
(T)	(DH) (24)	Diameter
7" to 7 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "
8" to 9 $\frac{1}{2}$ "	4 $\frac{1}{4}$ "	1 $\frac{1}{4}$ "
10" to 11 $\frac{1}{2}$ "	5 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "
12" to 13"	6 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "

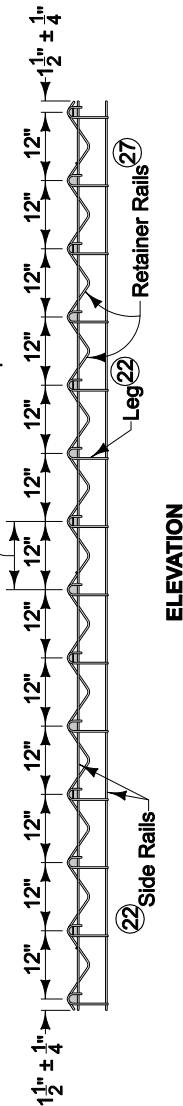


DOWEL ASSEMBLIES

	SUDAS		Iowa Department of Transportation	REVISION
				New 10-18-10
 STANDARD ROAD PLAN				PV-101
				SHEET 6 of 8
REVISIONS:				
SUDAS DIRECTOR				DESIGN METHODS ENGINEER
JOINTS				

[illegible]

Spaces between dowel bars are nominal dimensions with a $\frac{1}{4}$ " allowable tolerance.



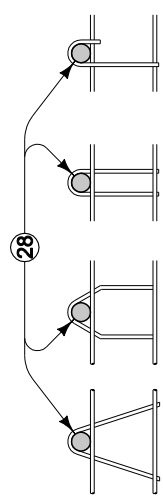
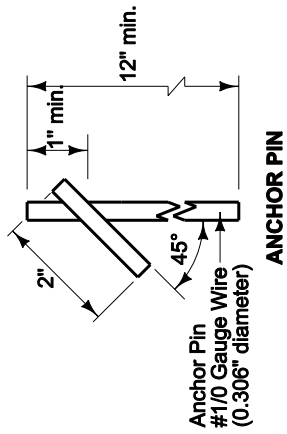
SECTION THRU EXPANSION JOINT^c

JOINT OPENING AND EXPANSION TUBE EXTENSION		
Joint Type	(X)	Minimum Tube Length
"ED"	1"	6"
"EE"	2"	7"
"EF"	4"	9"

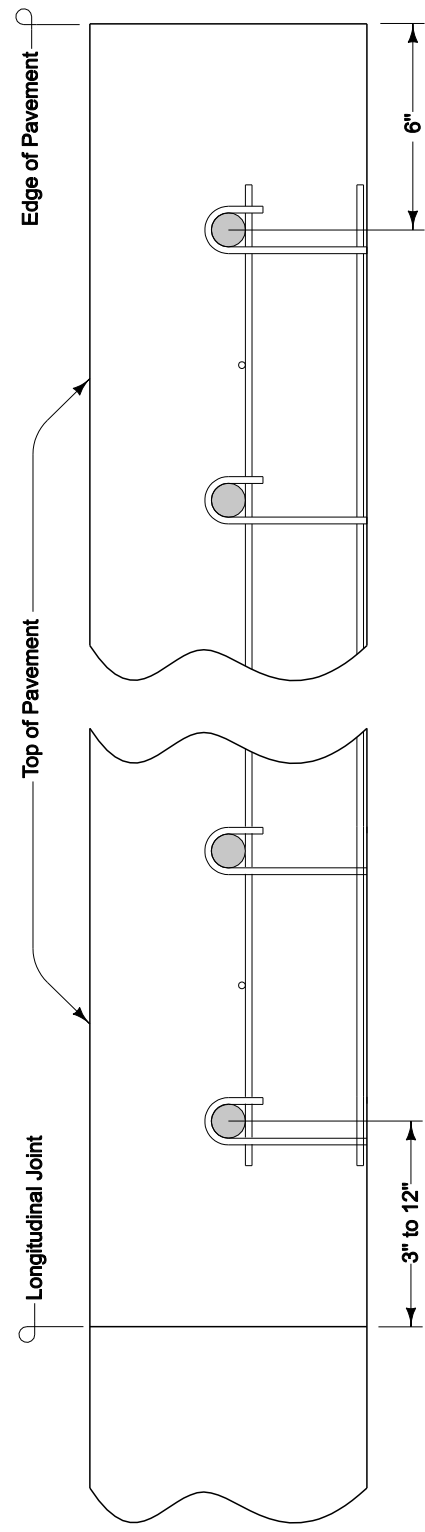
DOWEL HEIGHT AND DIAMETER		
(T)	(DH) (24)	Diameter
7" to 7 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "
8" to 9 $\frac{1}{2}$ "	4 $\frac{1}{4}$ "	1 $\frac{1}{4}$ "
10" to 11 $\frac{1}{2}$ "	5 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "
12" to 13"	6 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "

- (18) Use 18 inch long dowel bars with a tolerance of $\pm 1/8$ inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within $\pm 1/8$ inch.
- (19) Wire sizes shown are the minimum required. Use wires with a minimum tensile strength of 50 ksi.
- (20) Details apply to both transverse contraction and expansion joints.
- (21) Weld alternately throughout.
- (22) #1/0 gauge (0.306 inch diameter) wire.
- (23) #10 gauge (0.135 inch diameter) wire, welded or friction fit to upper side rail, both sides.
- (24) Measured from the centerline of dowel bar to bottom of lower side rail + $1/4$ inch.
- (25) Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.
- (26) Clip and remove center portion of tie during field assembly.
- (27) $1/4$ inch diameter wire.



- ⑱ Use 18 inch long dowel bars with a tolerance of $\pm 1/8$ inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within $\pm 1/8$ inch.
- ⑲ Wire sizes shown are the minimum required. Use wires with a minimum tensile strength of 50 ksi.
- ⑳ Details apply to both transverse contraction and expansion joints.
- ㉔ Diameter of bend around dowel is dowel diameter + $1/8$ to $3/16$ inches.



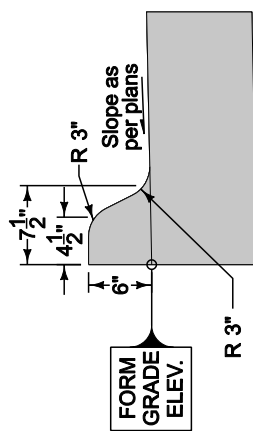
OPTIONAL LEG SHAPES



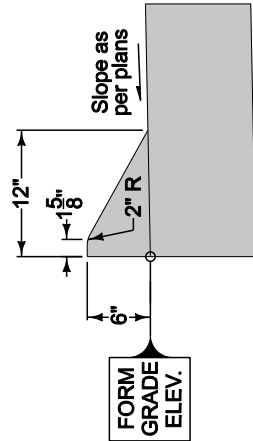
PLACEMENT LIMITS

	SUDAS		Iowa Department of Transportation	REVISION	
				New	10-19-10
FIGURE 7010.101		PV-101		SHEET 8 of 8	
STANDARD ROAD PLAN					
REVISIONS:					
SUDAS DIRECTOR				DESIGN METHODS ENGINEER	
JOINTS					

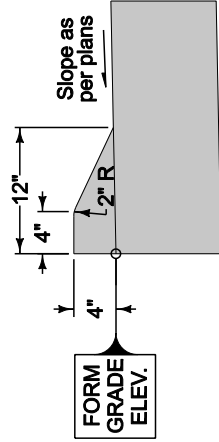
DOWEL ASSEMBLIES ⑱ ⑲ ㉔



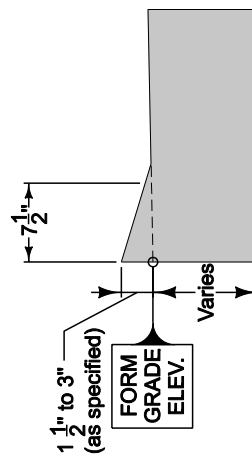
6" STANDARD CURB



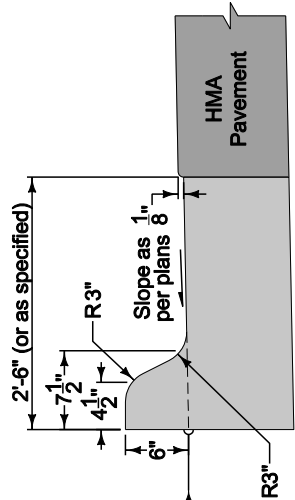
6" SLOPED CURB



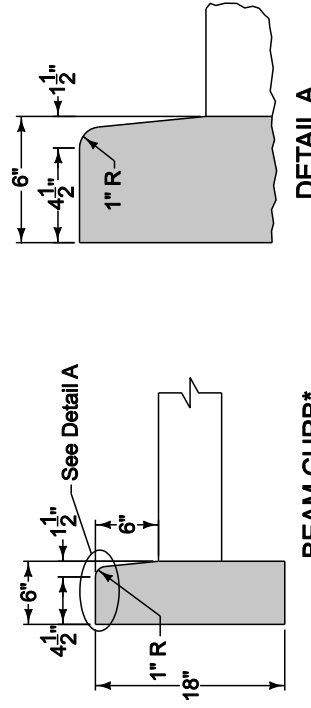
4" SLOPED CURB



DRIVEWAY DROP CURB

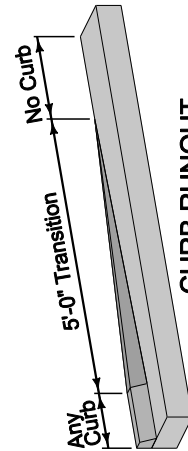


6" STANDARD CURB AND GUTTER

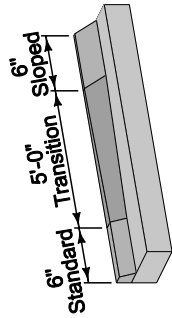


BEAM CURB*
*For short replacement sections,
match existing curb profile

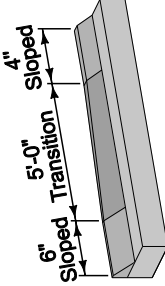
DETAIL A



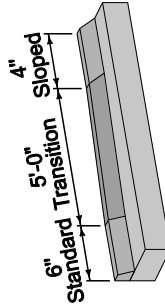
CURB RUNOUT
FOR ALL CURBS





CURB TRANSITION
FROM 6" STANDARD TO 6" SLOPED



CURB TRANSITION
FROM 6" SLOPED TO 4" SLOPED

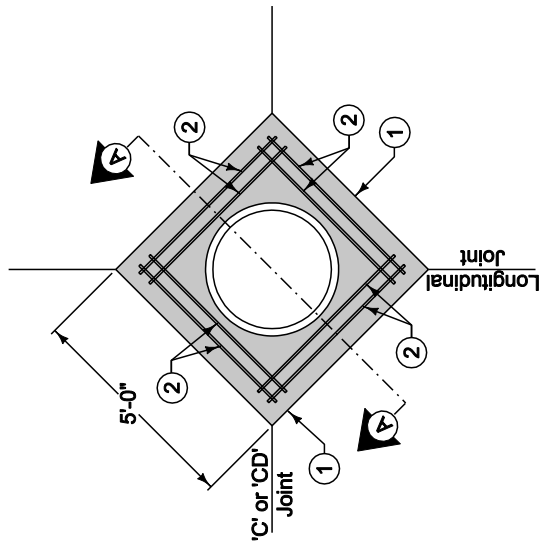


CURB TRANSITION
FROM 6" STANDARD TO 4" SLOPED

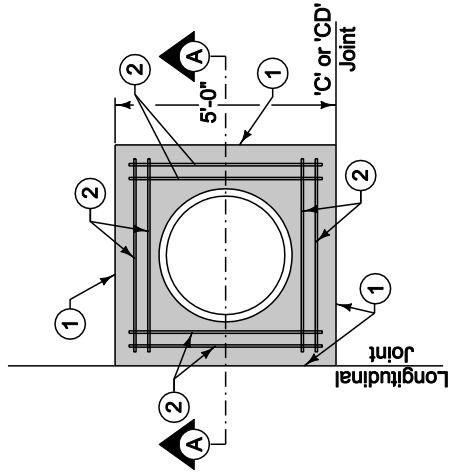
	SUDAS		Iowa Department of Transportation	REVISION	10-18-10
				New	
FIGURE 7010.102				PV-102	
STANDARD ROAD PLAN				SHEET 1 of 1	
REVISIONS:					
SUDAS DIRECTOR				DESIGN METHOD ENGINEER	
PCC CURB DETAILS					

Construct boxout with Class C concrete or match pavement class. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

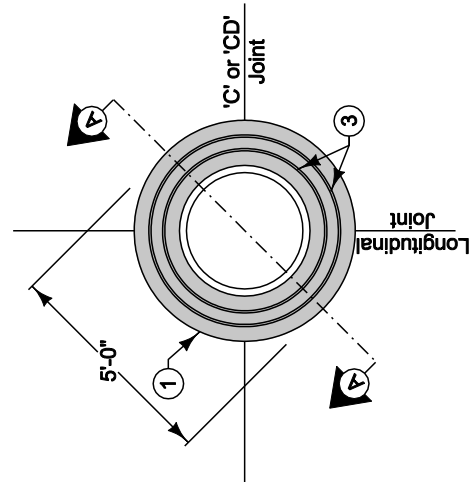
- ① 'KT-1', 'KT-2', 'BT-1', or 'BT-2' joint if three-piece floating casting (SW 601 Type B and D or SW-602 Type F) is used. 'E' joint if two-piece fixed casting (SW 601 Type A and C or SW-602 Type E) is used.
- ② 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.
- ③ #4 hoops (variable length). Place at mid-slab.
- ④ No boxout is required for three-piece floating castings (SW 601 Type B and D or SW-602 Type F). If a boxout is provided for a three-piece casting, construct as detailed in Section A-A for three-piece floating casting.



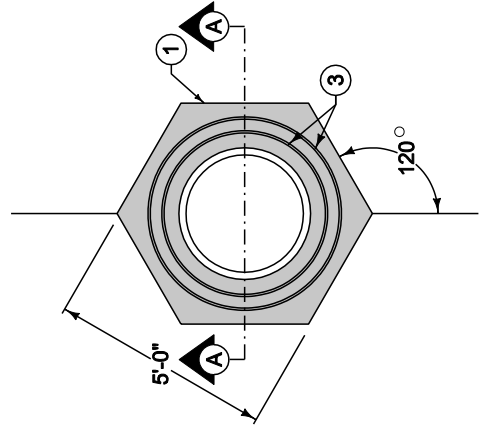
AT JOINT INTERSECTION



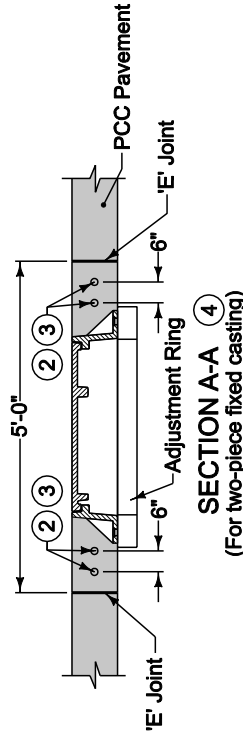
OFFSET AT JOINT INTERSECTION



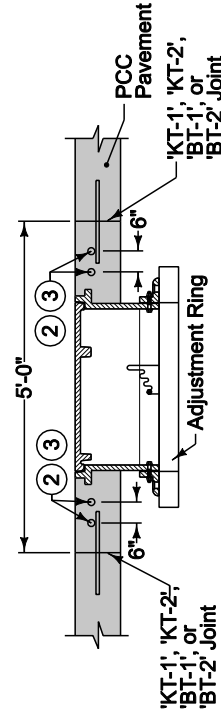
CIRCULAR





AT A SINGLE JOINT



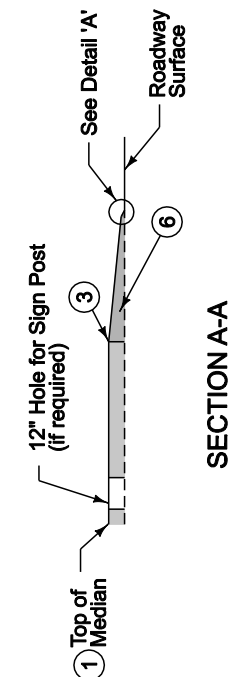
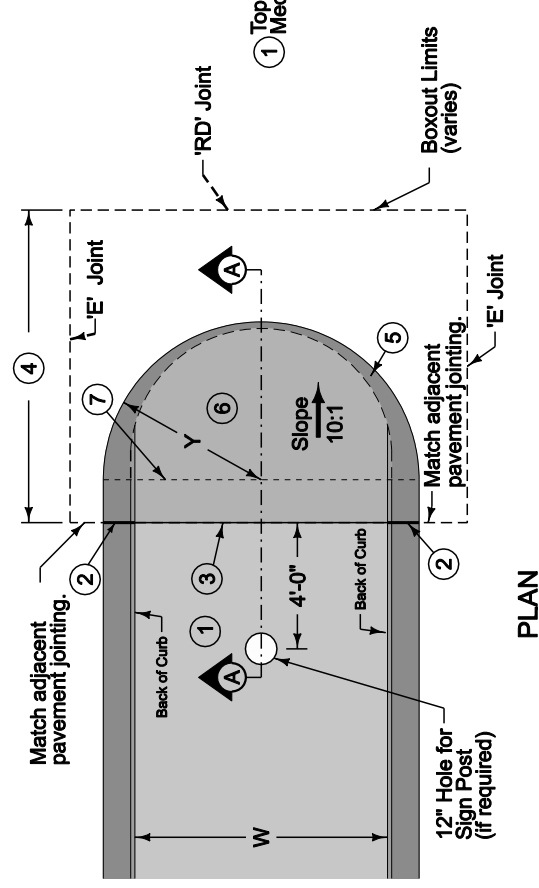
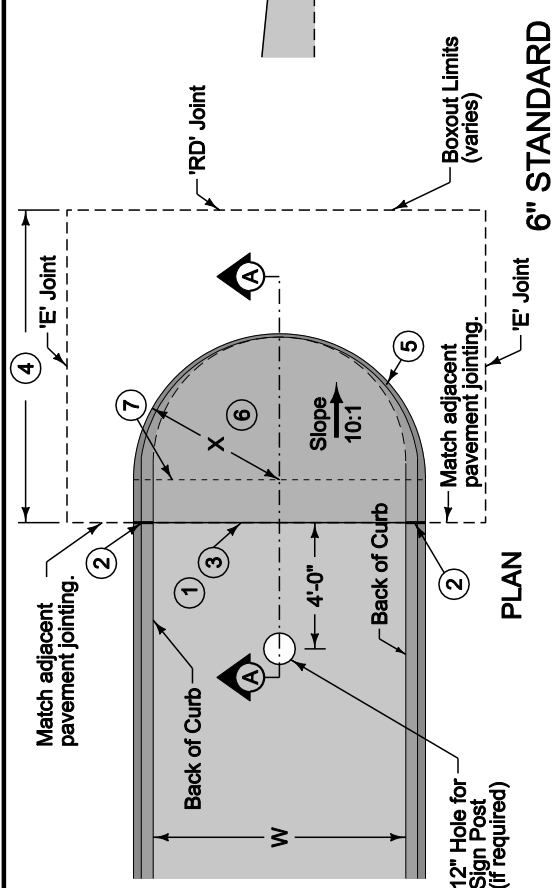
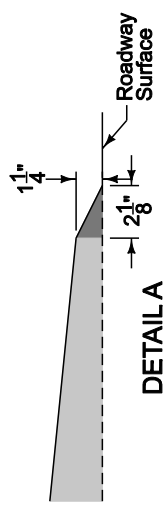
SECTION A-A ④
(For two-piece fixed casting)



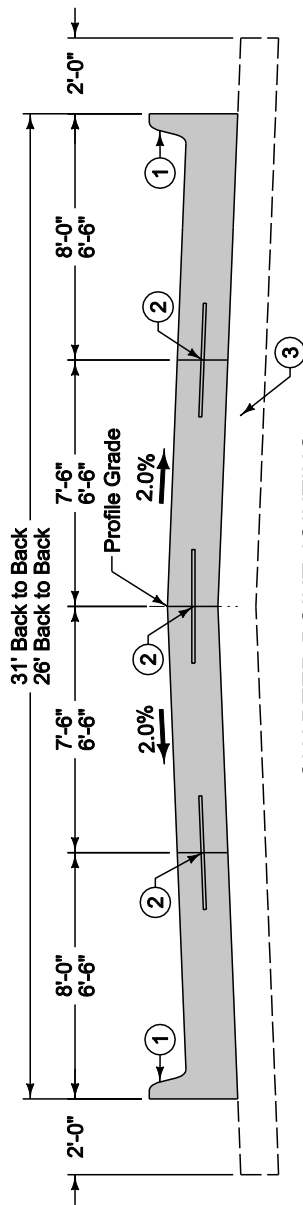
SECTION A-A ④
(For three-piece floating casting)

	SUDAS		Iowa Department of Transportation	REVISION	10-19-10
				New	
FIGURE 7010.103		STANDARD ROAD PLAN		PV-103	
				SHEET 1 of 1	
REVISIONS:					
		SUDAS DIRECTOR			
		DESIGN METHODS ENGINEER			
MANHOLE BOXOUTS IN PCC PAVEMENT					

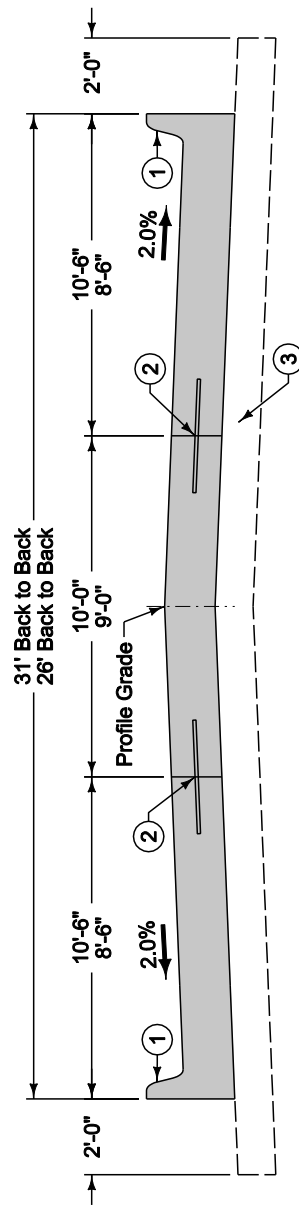
- ① For details of paved median, see contract documents.
- ② 'EE' Joint. Expansion joints located at the end of normal curb.
- ③ 'E' Joint. If median is paved, place expansion joints at the end of normal curb.
- ④ If boxout length is less than or equal to 12 feet, provide 'C' Joint. If boxout length is greater than 12 feet, provide 'RD' joint.
- ⑤ Special shaping of curb.
- ⑥ Quantities for ramped median nose area is included in roadway pavement quantities.
- ⑦ When X or Y is 4 feet or greater the expansion joints will be at the beginning of the rounded median.
 W = Width from back of curb to back of curb
 $X = W/2 + 7.5"$
 $Y = W/2 + 12"$



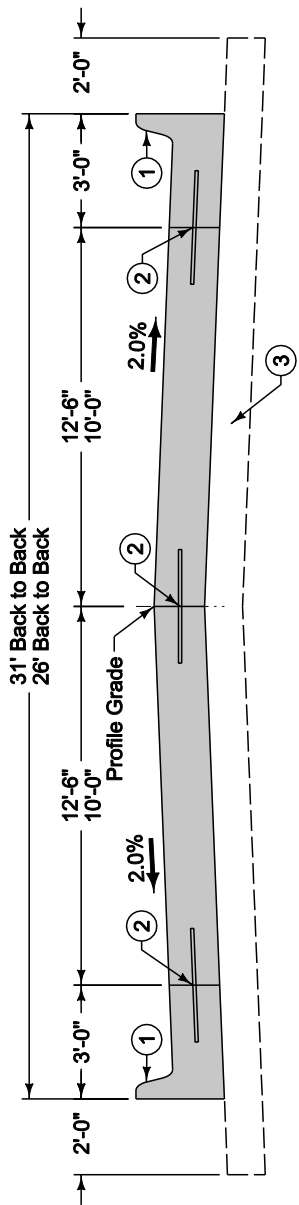
SUDAS	Iowa Department of Transportation	REVISION New 10-19-10
FIGURE 7010.104	STANDARD ROAD PLAN	PV-104
REVISIONS:		SHEET 1 of 1
SUDAS DIRECTOR		DESIGN METHOD ENGINEER
RAMPED MEDIAN NOSE		



QUARTER POINT JOINTING



THIRD POINT JOINTING



GUTTERLINE JOINTING

- ① 6 inch standard curb.
- ② BT, KT, or L joint depending on pavement thickness and construction staging.
- ③ Subbase or subgrade as specified.
- ④ Unless otherwise specified in the contract documents.
- ⑤ No dowels within 24" of the back of curb.

TRANSVERSE JOINT REQUIREMENTS ④			
Pavement Thickness	Transverse Joint Type	Transverse Joint Spacing	
6"	C		12'
7"	C		15'
8"	CD ⑤		15'
9"	CD ⑤		15'
≥10"	CD ⑤		20'

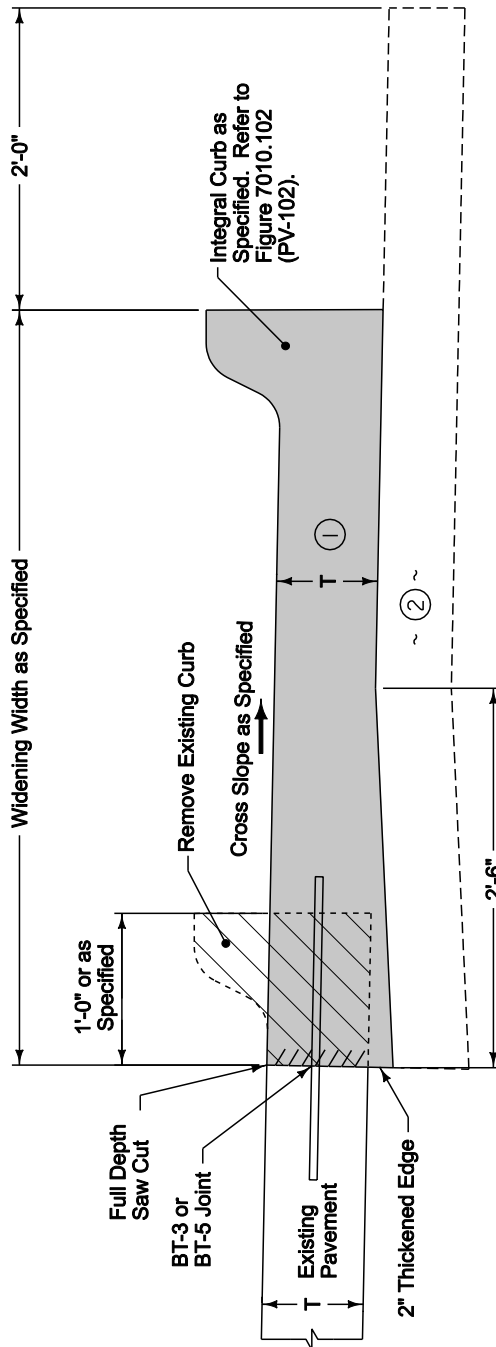
REVISION
New 10-19-10

7010.901

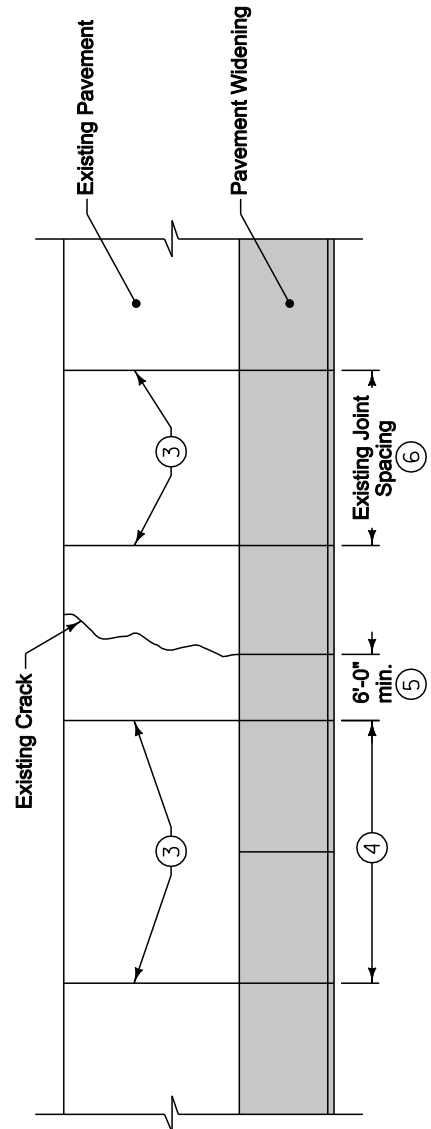
SHEET 1 of 1

SUDAS Standard Specifications

PCC PAVEMENT JOINTING

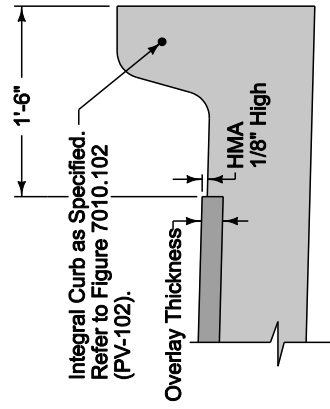


TYPICAL SECTION



TYPICAL JOINT LAYOUT

- ① Match existing pavement thickness or as specified in the contract documents.
- ② Subgrade or subbase material as specified.
- ③ Existing C or CD joint.
- ④ Where existing joint spacing exceeds 20 feet, place joint at half way point.
- ⑤ If placing a joint at an existing crack results in a panel less than 6 feet long, do not place joint.
- ⑥ Match all existing expansion joints. Match existing C or CD joints where possible.



DETAILA
(Curb for Widening with HMA Overlay)

	REVISION	3	10-18-10
	7010.902		
	SHEET 1 of 1		

SUDAS Standard Specifications

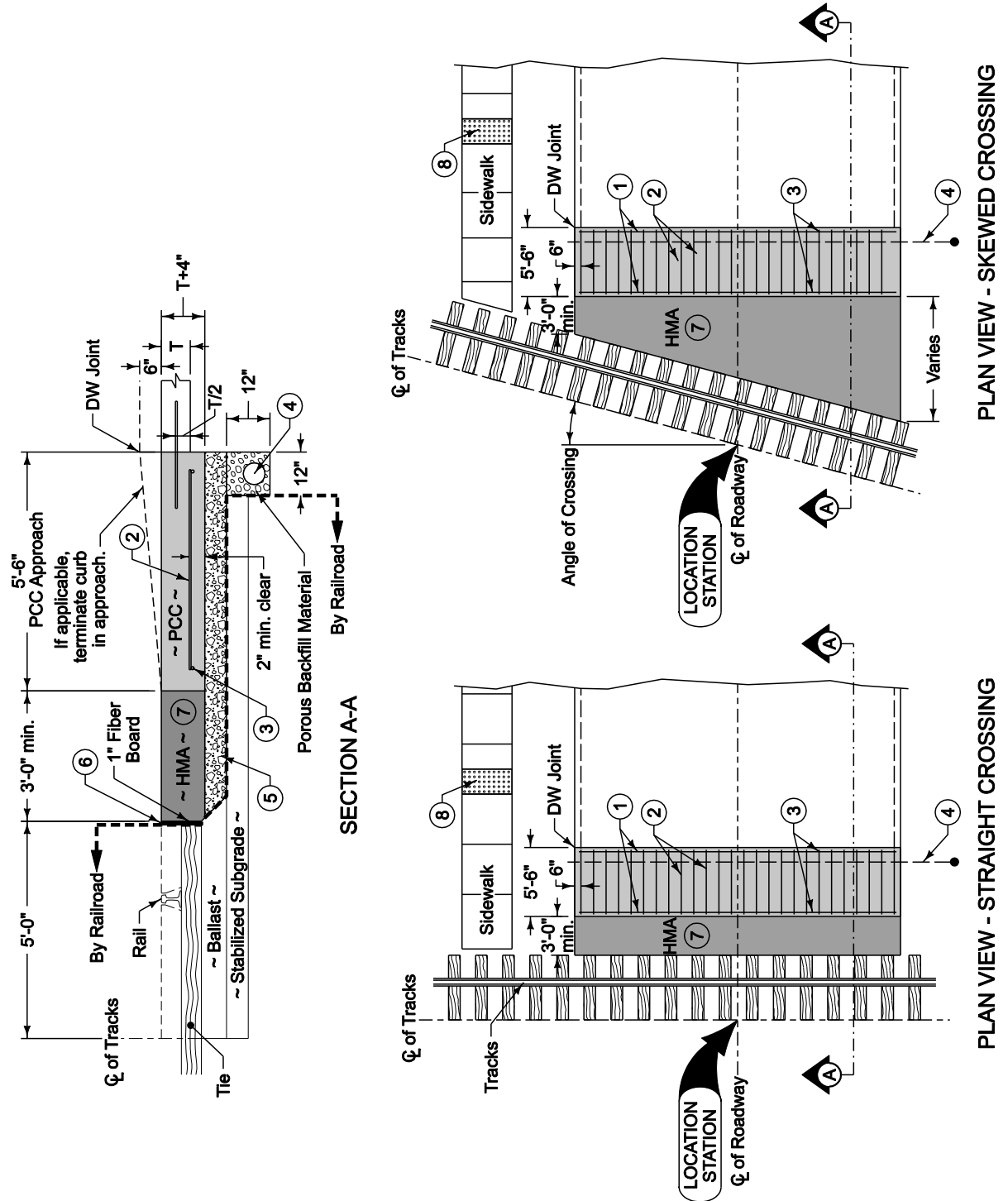
PCC PAVEMENT WIDENING

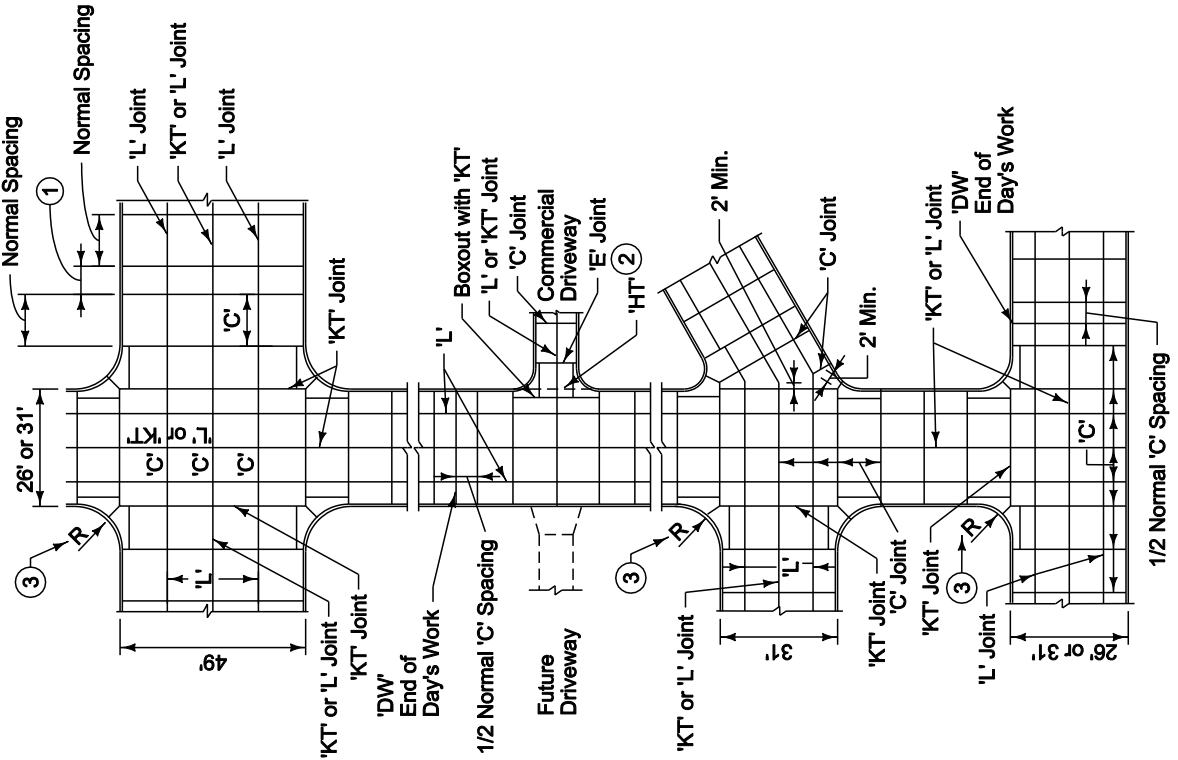
- ① Tie reinforcing bars with wire at all intersections with other bars. Lap reinforcing bars a minimum of 12 inches when necessary and tie securely.
- ② 5 foot 2 inch (typ.) #5 bar or pavement length minus 4 inches, at 12 inches on center.
- ③ #5 bars X (approach width minus 4 inches).
- ④ Install 6 inch perforated CMP subdrain, if specified. Include rodent guard per Iowa DOT Materials I.M. 443.01.
- ⑤ Granular subbase, modified subbase, or ballast meeting railroad specifications.
- ⑥ For new crossings, construct pavement 1/2 inch to 1 inch below top of rail. For existing crossings, construct pavement level to 1/2 inch below top of rail.
- ⑦ HMA full depth patch per Section 7040.
- ⑧ Refer to Figure 7030.204 for detectable warning location.

	REVISION	4
	10-19-10	
	7010.903	
	SHEET 1 of 1	

SUDAS Standard Specifications

PCC RAILROAD
CROSSING APPROACH





PLAN VIEW

Refer to Figure 7010.901 for maximum transverse joint spacing.

Where new and existing pavements meet, and no existing dowels, tie bars, or keyed joints are present, provide a 'BT', 'RT', or 'RD' joint.

- ① Shorten jointing pattern on either side of openings to allow joints to intersect round castings and fall at the edges of intake boxouts.
- ② Where pavement abuts an unimproved street, terminate with a type 'HT' joint.
- ③ When radius exceed 20 feet, add one additional 'C' joint at radius intersections.

REVISION

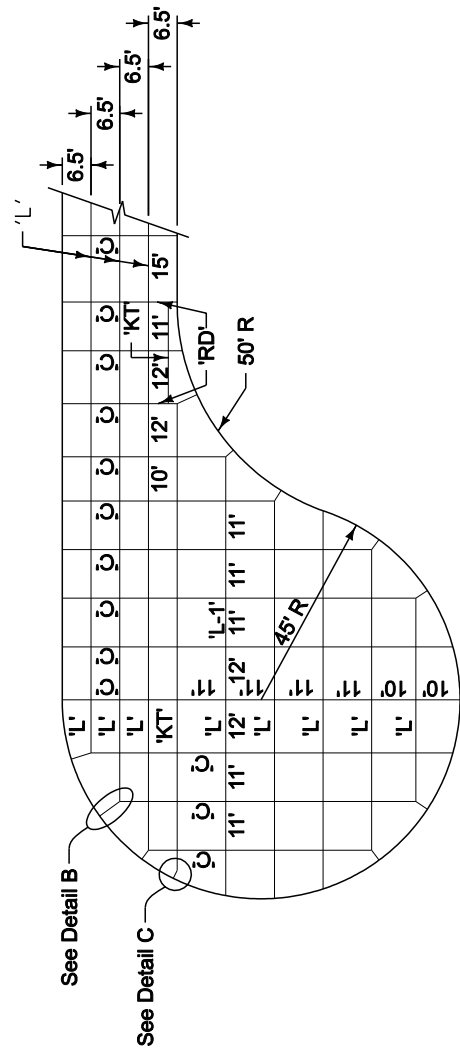
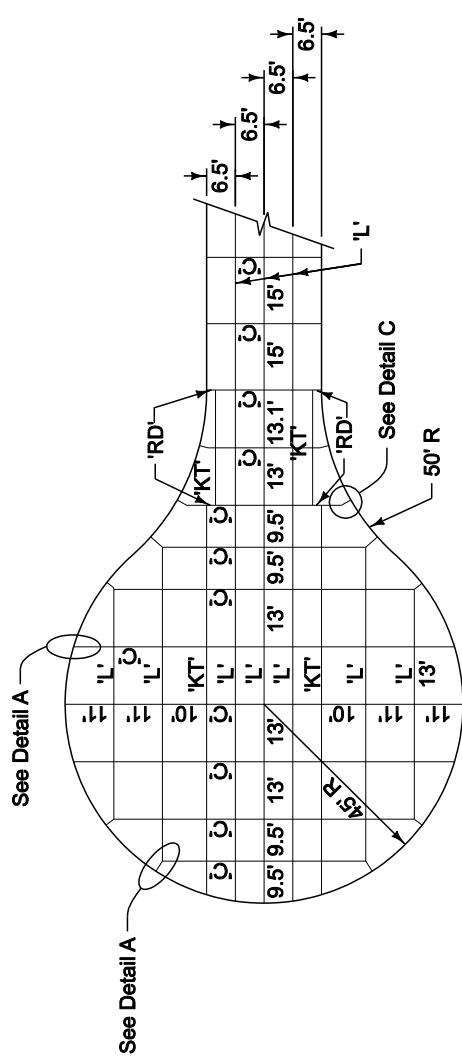
New 10-19-10

7010.904

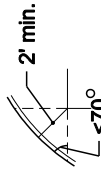
SHEET 1 of 1

SUDAS Standard Specifications

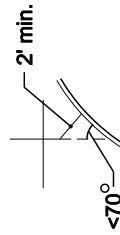
TYPICAL JOINTING LAYOUT



DETAIL A



DETAIL B



DETAIL C



REVISION	-
1W	

New

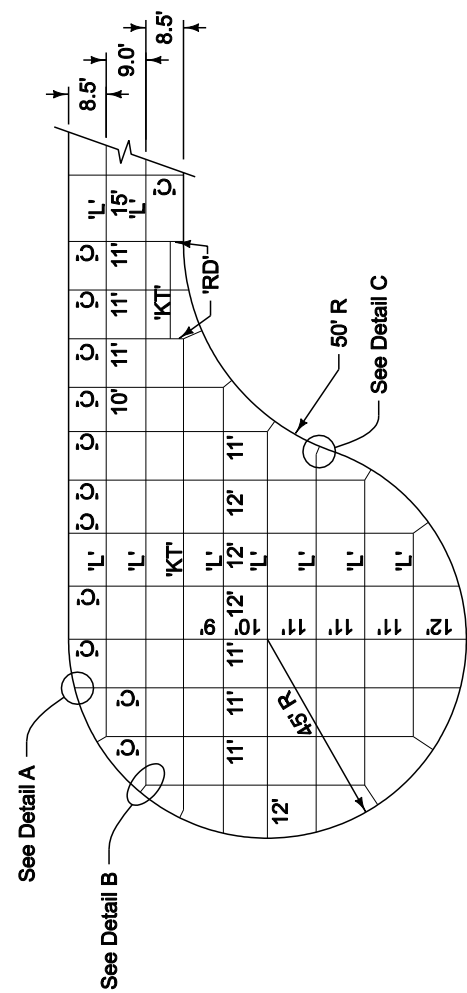
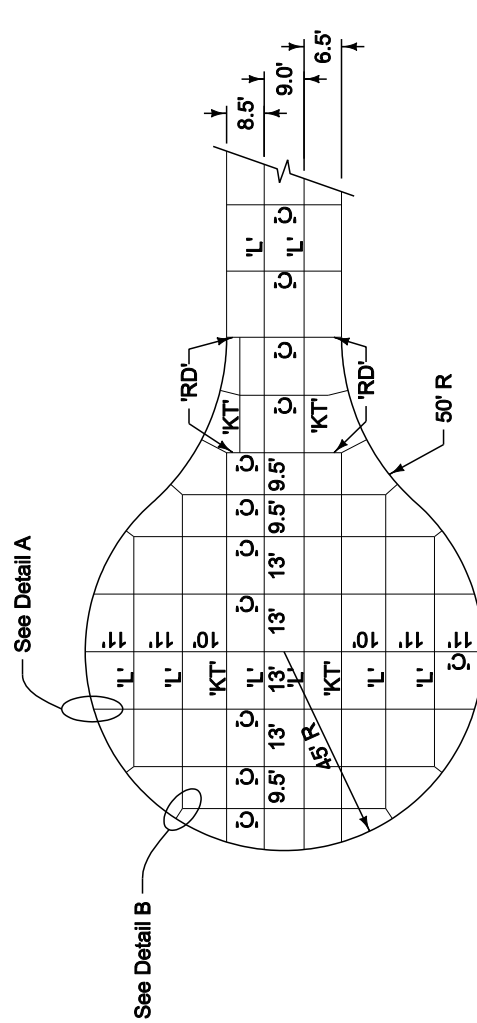
7010.905

SHEET 1 of 3

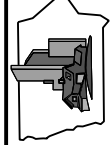
SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS

QUARTER POINT JOINTING



THIRD POINT JOINTING



REVISION

New

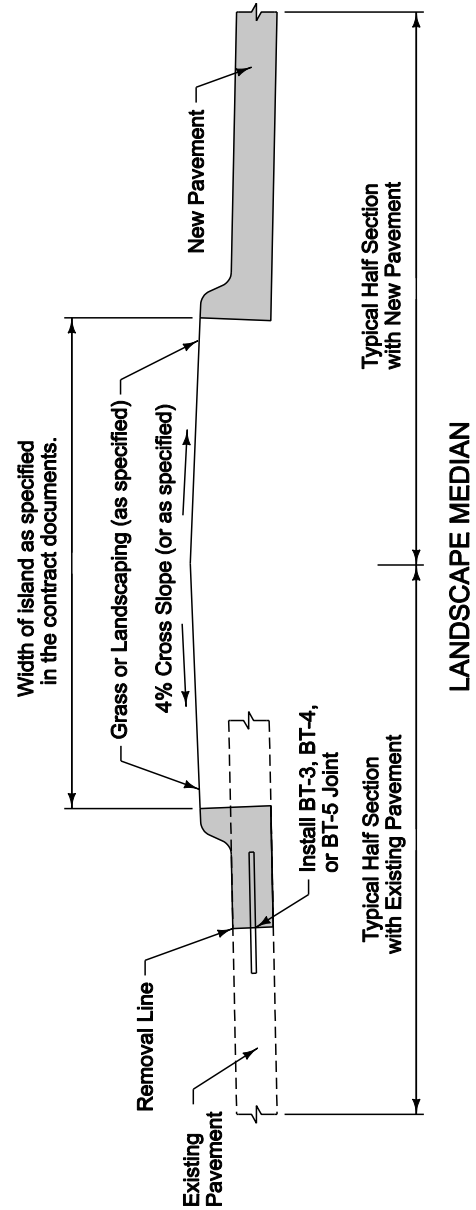
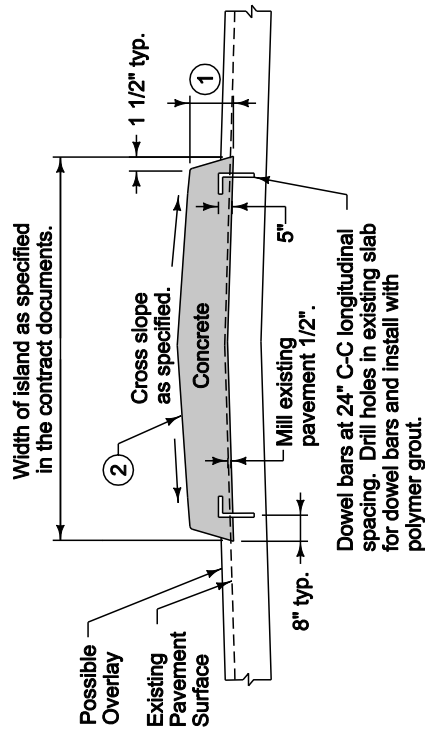
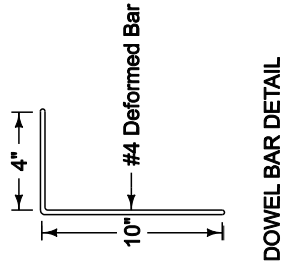
7010.905

SHEET 2 of 3

SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS

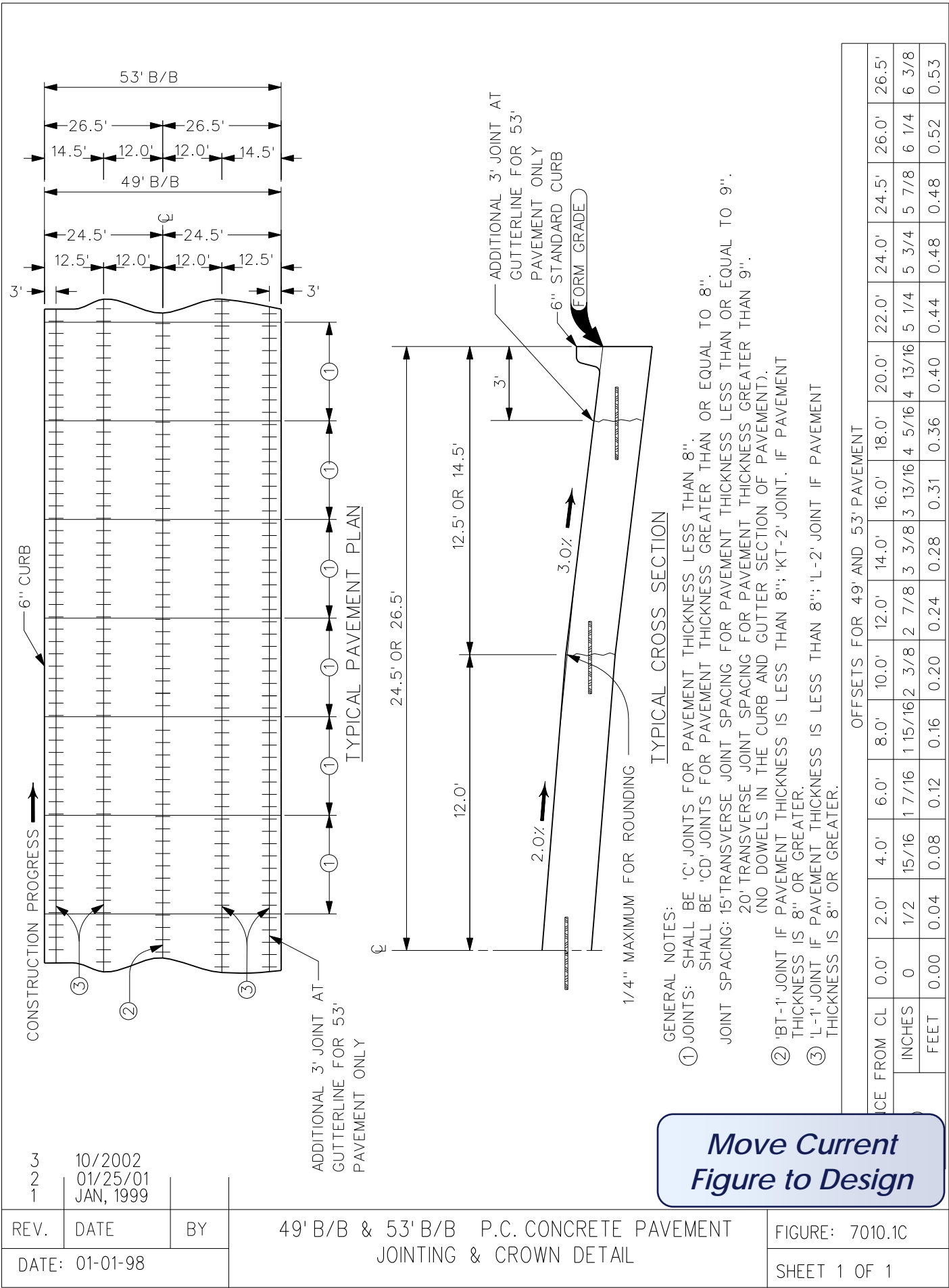
- ① Median height as specified in the contract documents.
- ② Construct 'C' joints at a maximum spacing of 15'. Match the joint pattern of the existing pavement. Install expansion joints as directed by the Engineer. Construct expansion joints with 1 inch expansion material. Seal all joints.



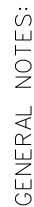
	REVISION	NEW	10-19-10
	7010.906		
	SHEET 1 of 1		

SUDAS Standard Specifications

MEDIANS



SHEET 1 OF 1

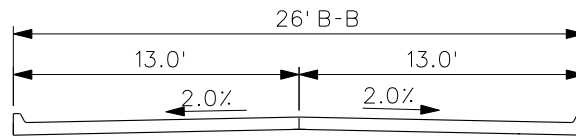


- GENERAL NOTES:
- ① JOINTS: SHALL BE 'C' JOINTS FOR PAVEMENT THICKNESS LESS THAN 8".
SHALL BE 'CD' JOINTS FOR PAVEMENT THICKNESS GREATER THAN OR EQUAL TO 8".
JOINT SPACING: 15' TRANSVERSE JOINT SPACING FOR PAVEMENT THICKNESS LESS THAN OR EQUAL TO 9".
20' TRANSVERSE JOINT SPACING FOR PAVEMENT THICKNESS GREATER THAN 9".
(NO DOWELS IN THE CURB AND GUTTER SECTION OF PAVEMENT).
 - ② 'BT'-1' JOINT IF PAVEMENT THICKNESS IS LESS THAN 8"; 'KT'-2' JOINT, IF PAVEMENT THICKNESS IS 8" OR GREATER.
 - ③ 'L'-1' JOINT IF PAVEMENT THICKNESS IS LESS THAN 8"; 'L'-2' JOINT IF PAVEMENT THICKNESS IS 8" OR GREATER.

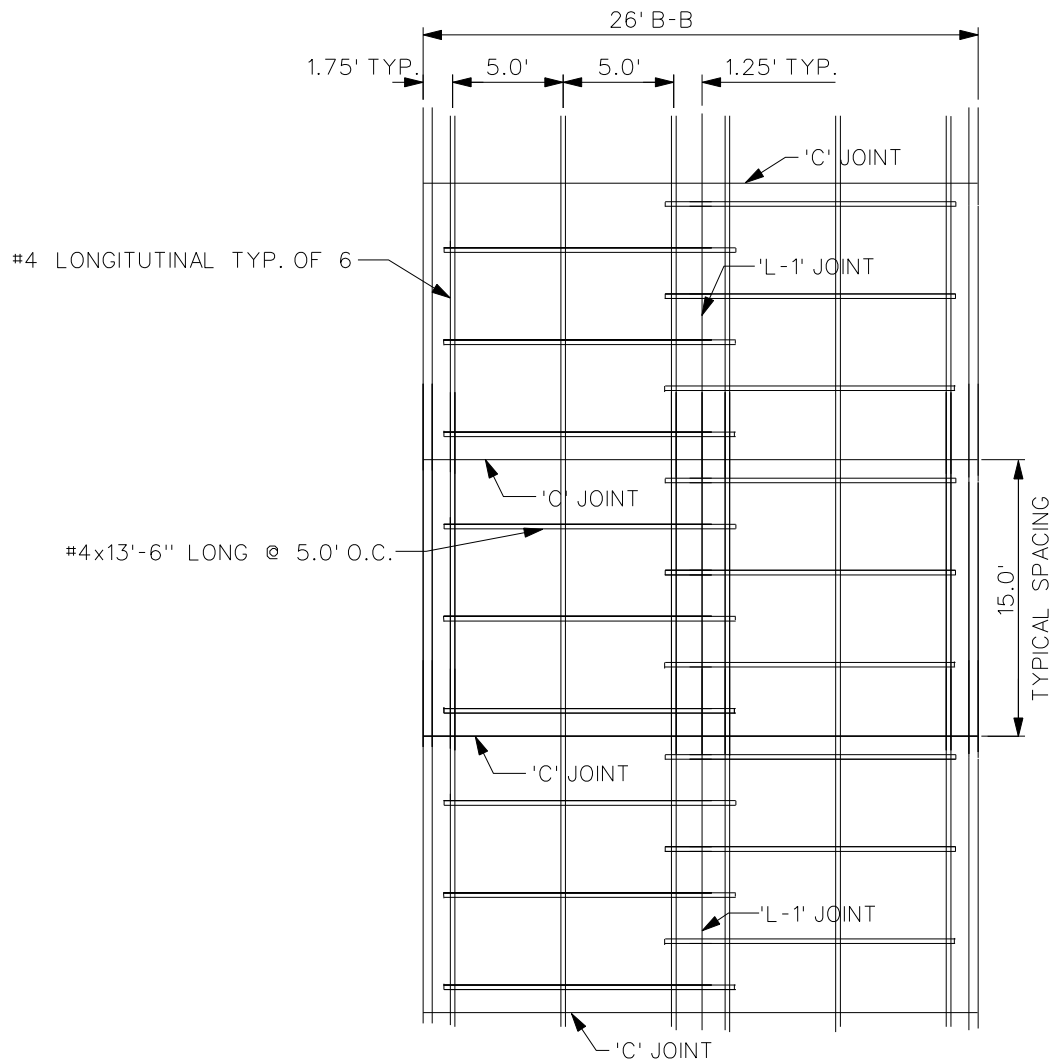
OFFSETS FOR 48" RURAL													
DISTANCE FROM CL	0.0'	2.0'	4.0'	6.0'	8.0'	10.0'	12.0'	14.0'	16.0'	18.0'	20.0'	22.0'	24.0'
	INCHES	0	15'16	17'16	1 15/16	2 3/8	2 7/8	3 3/8	3 13/16	4 5/16	4 13/16	5 1/4	5 3/4
Ⓐ	FEET	0.00	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.31	0.36	0.40	0.48

Move Current Figure to Design

SUDAS STANDARD SPECIFICATIONS



SECTION

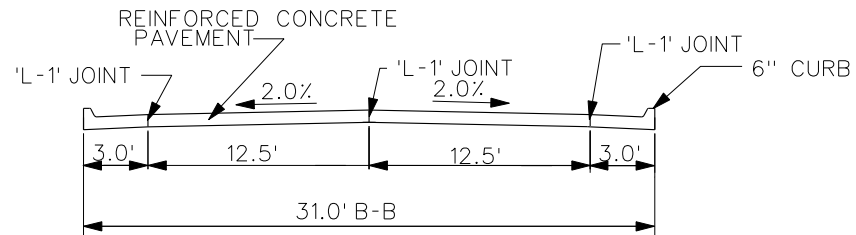


PLAN

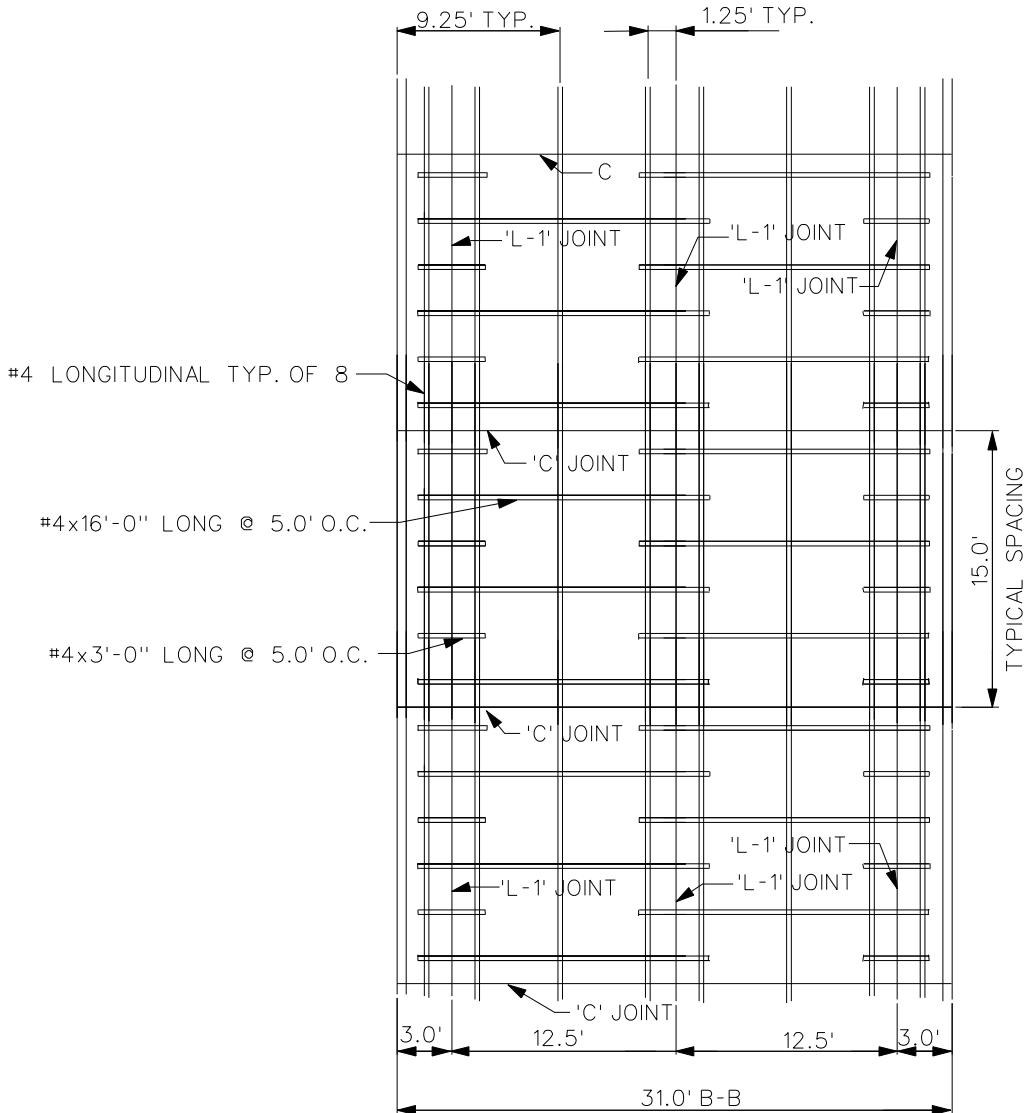
**Move Current
Figure to Design**

			<div>Figure to Design</div>	
REV.	DATE	BY	REINFORCED PAVEMENT DETAIL 26' B/B STREET	FIGURE: 7010.1F
DATE: 01/25/01				SHEET 1 OF 1

SUDAS STANDARD SPECIFICATIONS



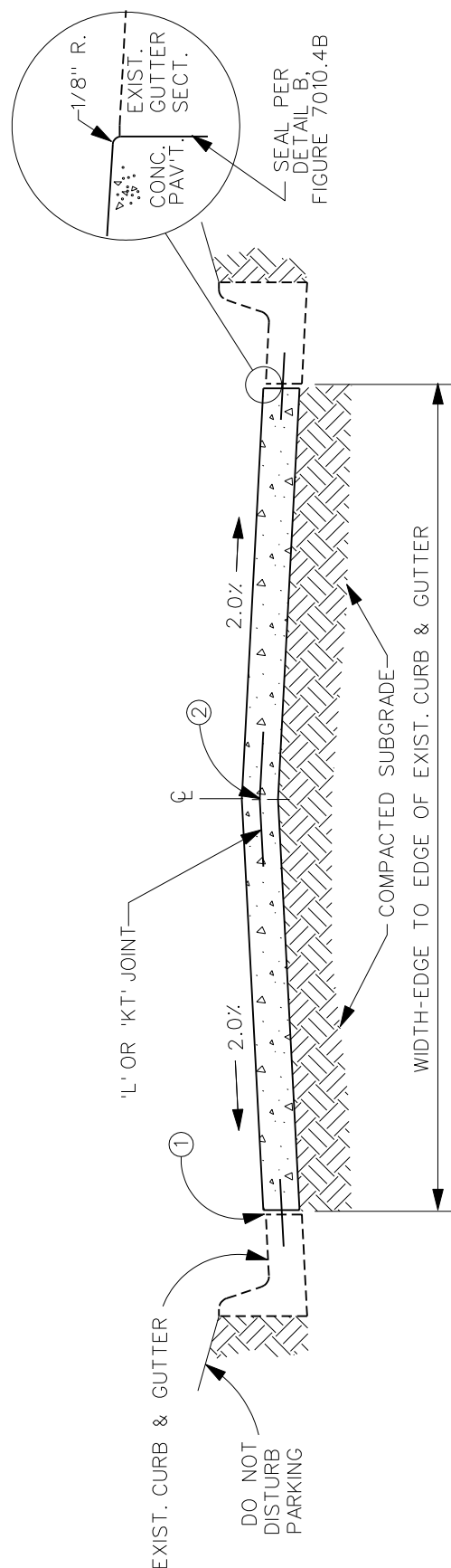
SECTION



PLAN

*Move Current
Figure to Design*

1	01/25/01		<div>Figure to Design</div> <div>REINFORCED PAVEMENT DETAIL 31' B/B STREET</div>		FIGURE: 7010.1G
REV.	DATE	BY			SHEET 1 OF 1
DATE: 01-25-99					

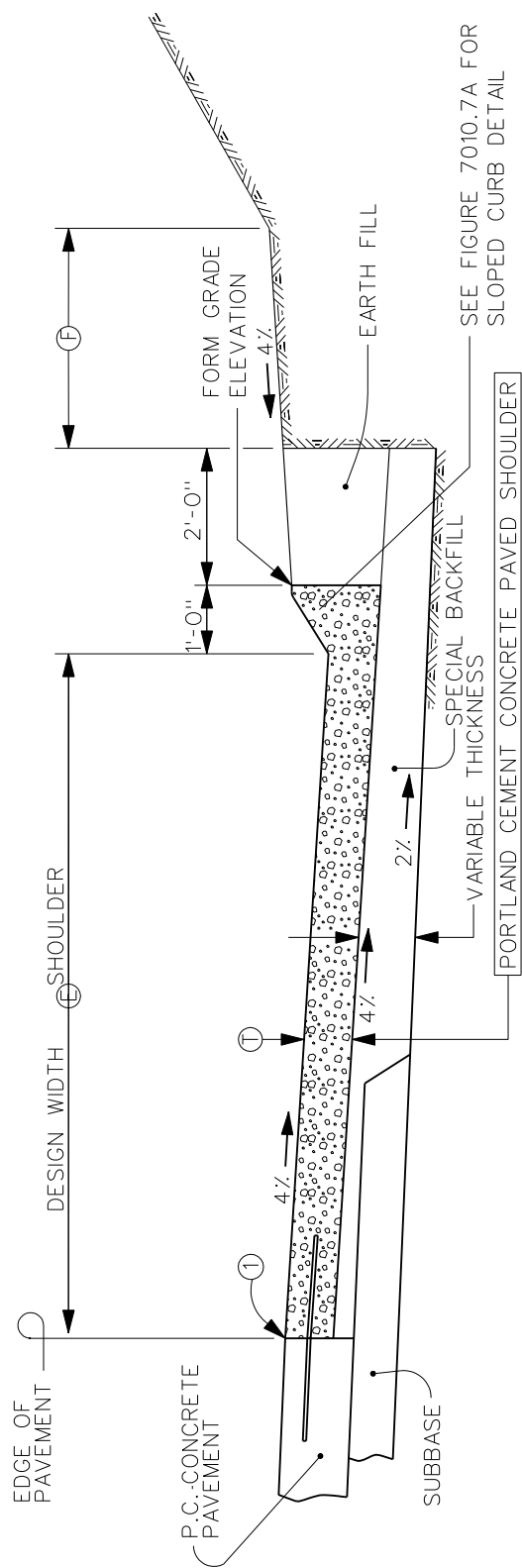


FOR CROWN SEE FIGURES 7010.1A (SHEET 1 OR 2) OR 7010.1B

- ① 'BT-1' JOINT IF PAVEMENT THICKNESS IS LESS THAN 8"; 'BT-2' JOINT IF PAVEMENT THICKNESS IS 8" OR GREATER.
- ② 'L-1' OR 'BT-1' JOINT IF PAVEMENT THICKNESS IS LESS THAN 8"; 'L-2' OR 'KT-2' JOINT IF PAVEMENT THICKNESS IS 8" OR GREATER.

Move Current Figure to Design

2	10/18/05		PCC CONCRETE PAVEMENT SECTION BETWEEN EXISTING CURB & GUTTER	FIGURE: 7010.5
REV.	DATE	BY		SHEET 1 OF 1
DATE: 01-01-98				



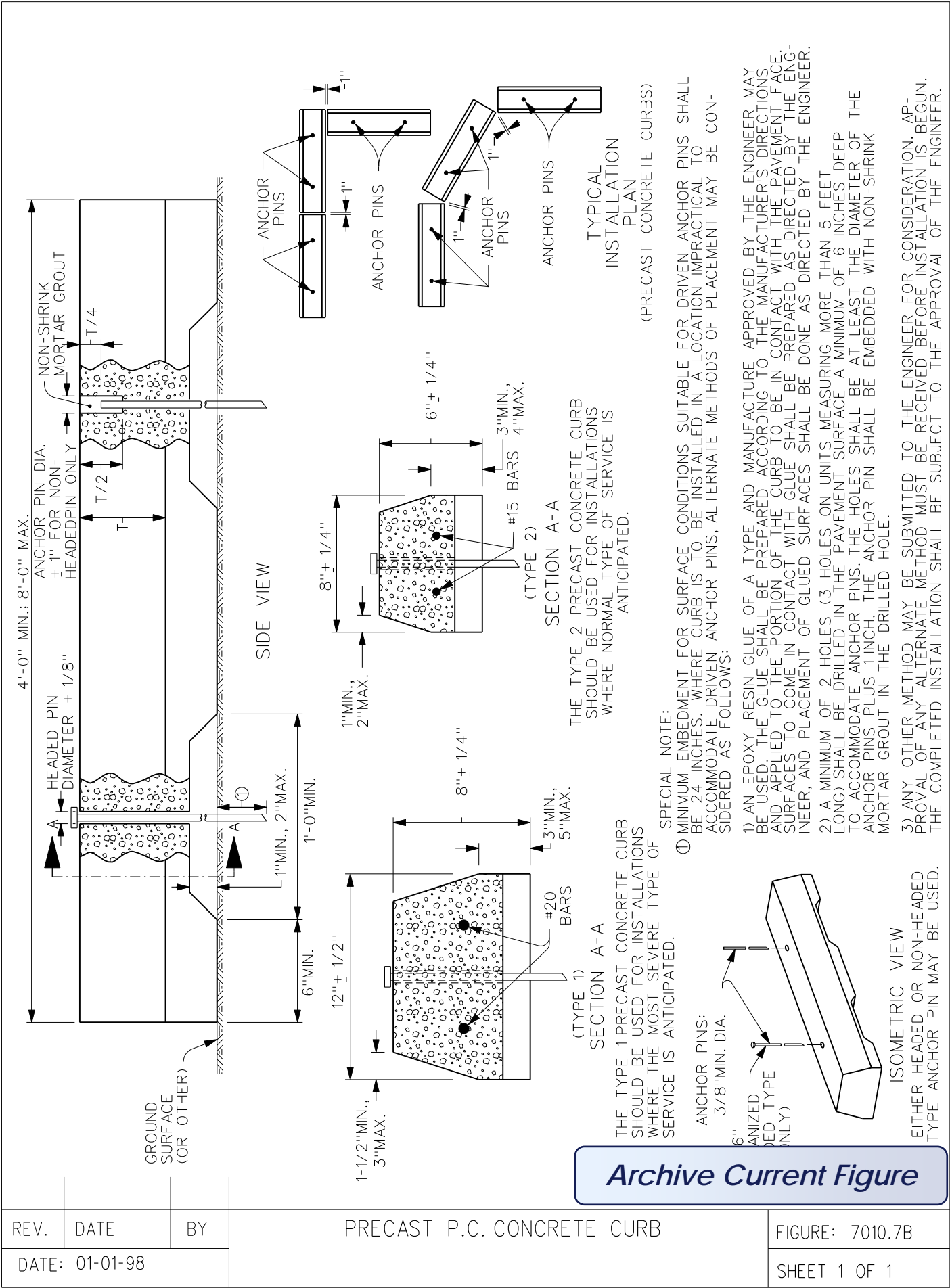
TYPICAL SECTION
P.C. CONCRETE PAVED SHOULDER

① 'L-2', KT-2' OR MODIFIED 'BT-3' JOINT. MODIFIED 'BT-3' REQUIRES A KEYWAY. CONTRACTOR OPTION TO POUR EITHER THE TONGUE OR GROOVE OF THE KEYWAY WITH THE MAINLINE PAVEMENT. REFER TO FIGURE 7010.4B.

NOTE: WHEN SPECIFIED, PROVIDE RUMBLE STRIPS IN PAVED SHOULDER AS SHOWN ON THE PLANS. (RUMBLE STRIPS SHOULD ONLY BE UTILIZED WHEN APPROPRIATE ACCOMMODATIONS FOR BICYCLISTS ARE PROVIDED)

Archive Current Figure

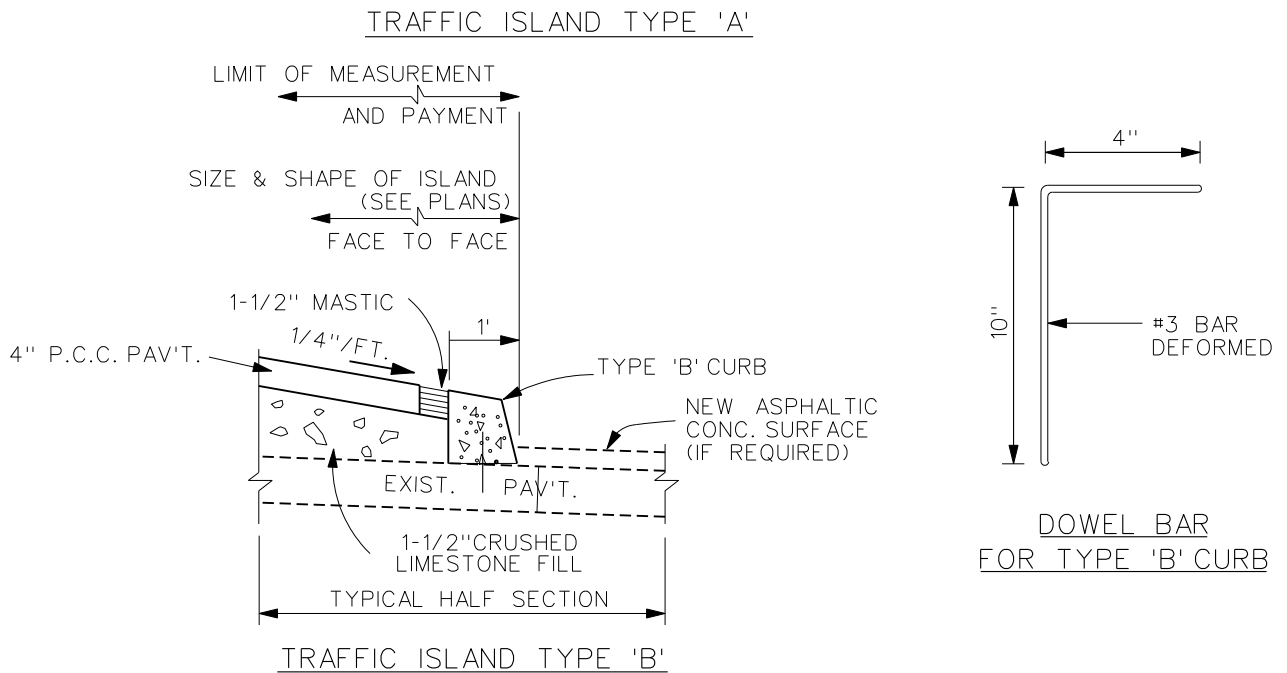
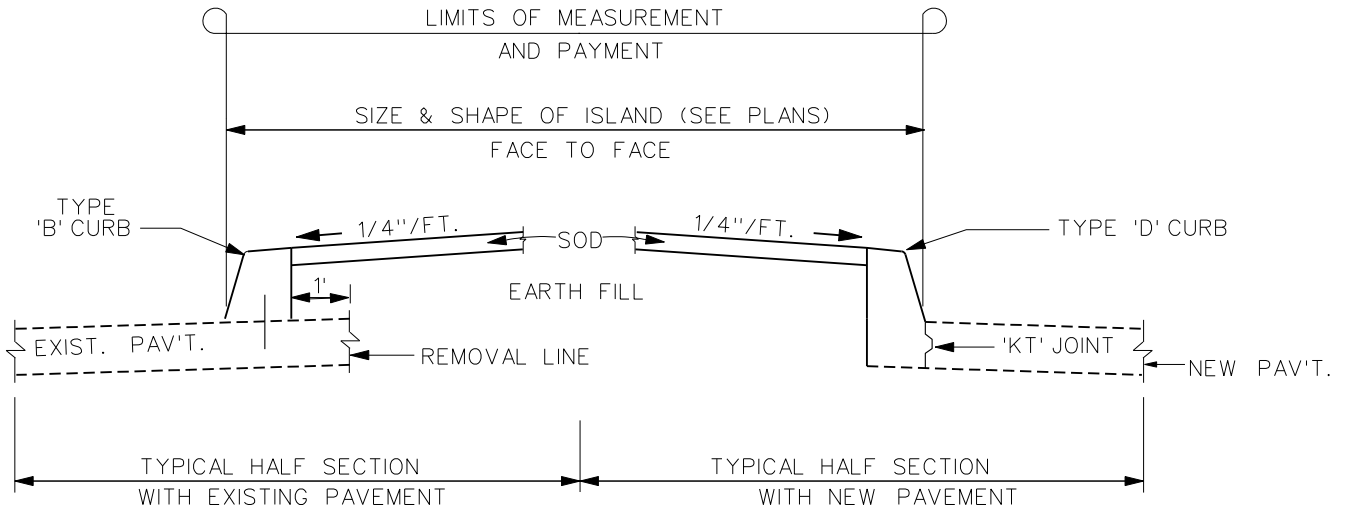
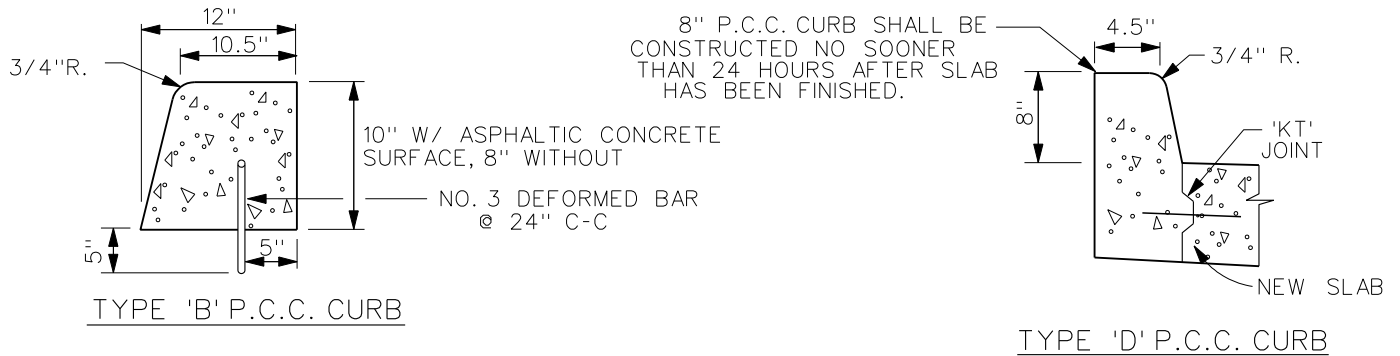
2	10/19/04		P.C. CONCRETE PAVED SHOULDER WITH SLOPED CURB		FIGURE: 7010.6	
REV.	DATE	BY			SHEET 1 OF 1	
DATE: 01-01-98						



SHEET 1 OF 1



SUDAS STANDARD SPECIFICATIONS



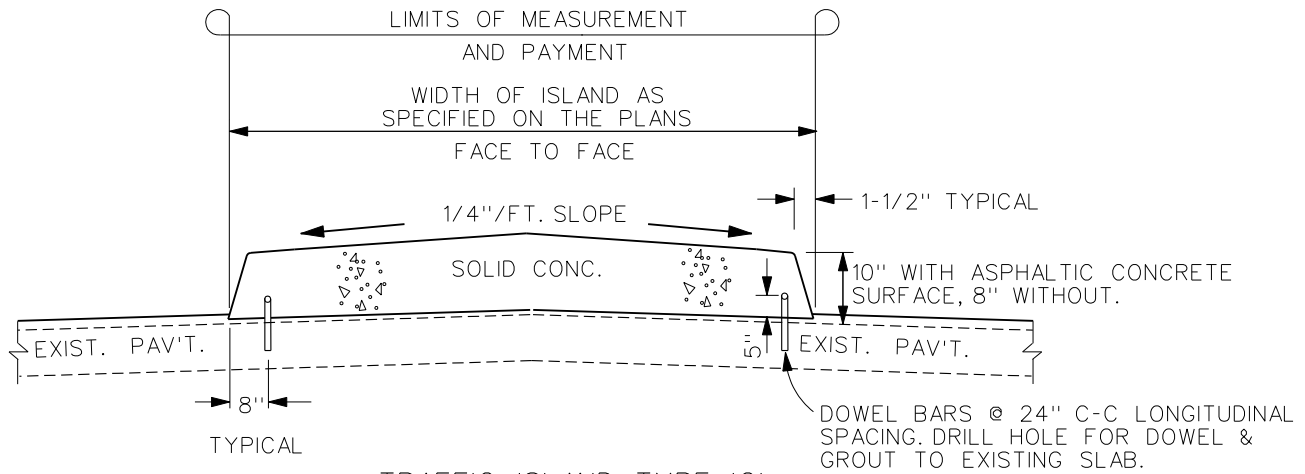
NOTES:

'C' TRANSVERSE JOINTS IN TYPE "A" & "B" ISLANDS AND CURBS SHALL MATCH THE JOINT SPACING OF THE EXISTING AND/OR NEW PAVEMENT WITH A MAXIMUM SPACING OF 15 FT. 'C' LONGITUDINAL JOINTS SHALL BE SEaled. WIDTH EXCEEDS 12 FT. ALL JOINTS SHALL BE SEALED.

Delete Current Figure

1	01/25/01			
REV.	DATE	BY	TRAFFIC ISLANDS - TYPE 'A' & 'B'	FIGURE: 7010.9B
	DATE: 01-01-98			SHEET 1 OF 1

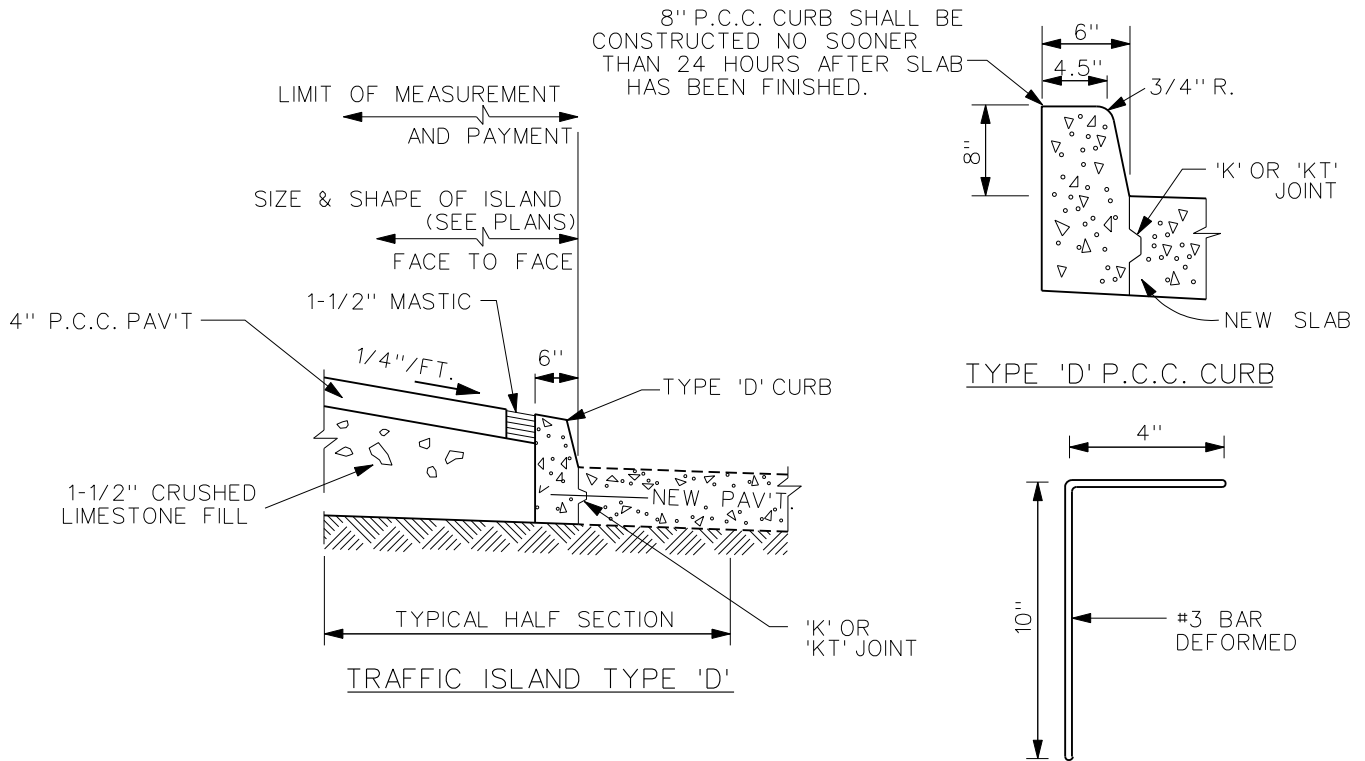
SUDAS STANDARD SPECIFICATIONS



TRAFFIC ISLAND TYPE 'C'

NOTES:

'C' TRANSVERSE JOINTS SHALL MATCH THE JOINT PATTERN OF THE EXISTING PAVEMENT WITH A MAXIMUM SPACING OF 15 FT. ALL EXPANSION JOINTS SHALL BE PLACED AS DIRECTED BY THE ENGINEER. EXPANSION JOINTS SHALL BE MADE WITH 1" EXPANSION MATERIAL. ALL JOINTS SHALL BE SEALED.



TRAFFIC ISLAND TYPE 'D'

NOTES:

TRANSVERSE JOINTS IN THE ISLAND & CURB SHALL BE TYPE 'C' TO MATCH JOINT PATTERN OF THE NEW PAV'T. A 'C' LONGITUDINAL JOINT SHALL BE USED WHEN THE ISLAND WIDTH EXCEEDS 12 FT. EXPANSION JOINTS SHALL BE USED IN THE CURB AND THE 4 INCH P.C.C. CAP TO MATCH THE 'ED' JOINTS IN THE PAVEMENT. ALL JOINTS SHALL BE SEALED, WITHOUT BACKER ROD.

Delete Current Figure

1	01/25/01			
REV.	DATE	BY	TRAFFIC ISLANDS - TYPE 'C' & 'D'	FIGURE: 7010.9C
DATE: 01-01-98				SHEET 1 OF 1

Section 7020 Figures

Hot Mix Asphalt Pavement

Summary of Revisions to 7020 Figures Hot Mix Asphalt Pavement

Revised Figures:

New #	Proposed Name	Current #	Summary of Changes
7020.201 (PV-201)	Manhole Boxouts in HMA Pavement and HMA Overlays	7020.3	Removed intake boxouts - these are shown in Division 6 figures. Updated to reflect full depth HMA as well as composite pavements, new construction, and rehabilitation. Added roundout option.
7020.901	HMA Pavement	7020.1 7020.2A	Updated format.
7020.902	HMA Railroad Crossing Approach	7020.7	Updated the format and modified the skewed portion to square up the mainline paving. Added sidewalk, detectable warning panel, and reference to 7030.
7020.903	HMA Resurfacing	7020.5	This figure was revised to make it similar to Iowa DOT SRPs RG-2 and RG-6, but with more accommodation for urban work. It is intended that this figure could eventually become a shared figure.

Note: highlighting is only for ease of reading

Figures Moving to Design:

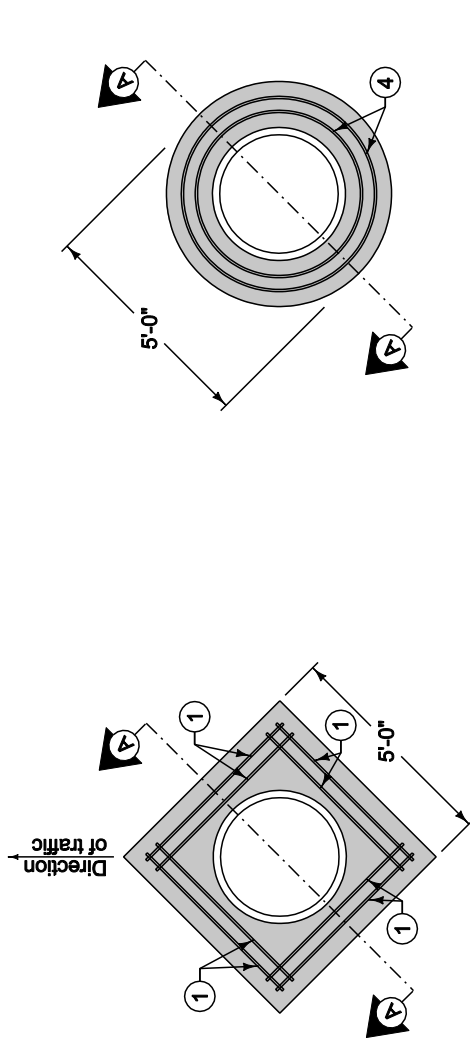
Current #	Current Name	Comments
7020.2B	49' B/B & 53' B/B HMA Pavement	This figure consists of elements that would have specific information in the contract documents.

Figures to Archive:

Current #	Current Name	Comments
7020.4	End Returns – HMA Pavement	Should be designed with individual projects

Figures to Delete:

Current #	Current Name	Comments
7020.6	HMA Base Widening	HMA Widening of a rural section is not typical for SUDAS. Reference Iowa DOT RG-8 when needed

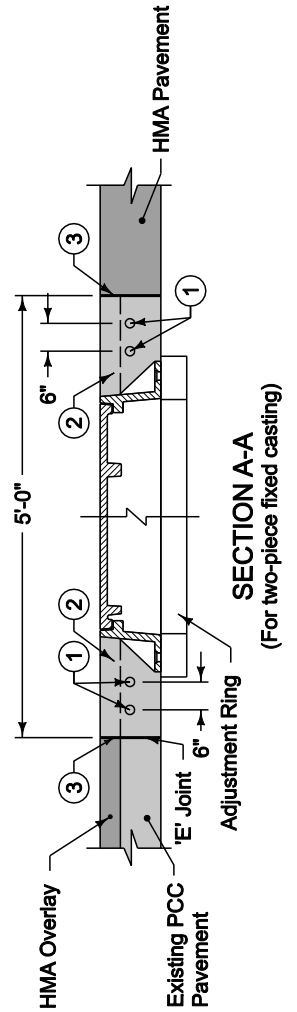
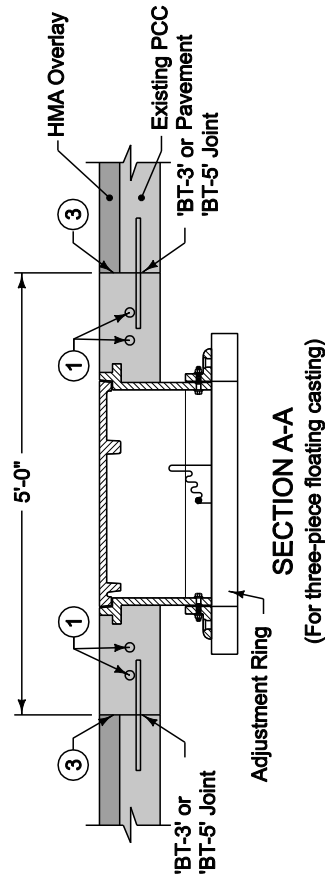


Construct boxout with Class C concrete. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

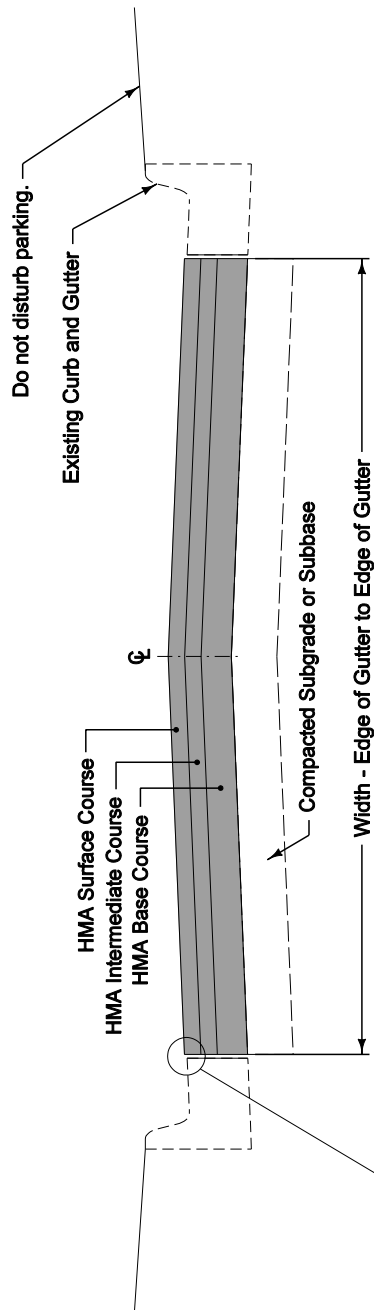
- ① 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.
- ② If boxout is constructed prior to placement of HMA overlay or final lift of HMA pavement, boxout may be constructed low and then final lift or overlay placed.
- ③ Apply tack coat.
- ④ #4 hoops (variable length). Place at mid-slab.

RECTANGULAR

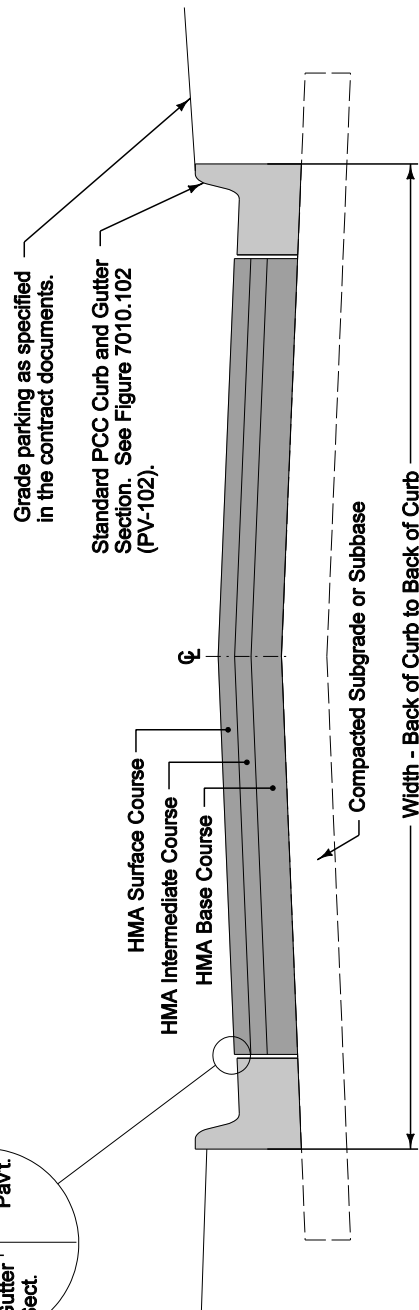
CIRCULAR



SUDAS	Iowa Department of Transportation	REVISION New 10-19-10
FIGURE 7020.201	STANDARD ROAD PLAN	PV-201
REVISIONS:		SHEET 1 of 1
SUDAS DIRECTOR DESIGN METHOD ENGINEER		
MANHOLE BOXOUTS IN HMA PAVEMENT AND HMA OVERLAYS		



HMA PAVEMENT SECTION
WITH EXISTING CURB AND GUTTER

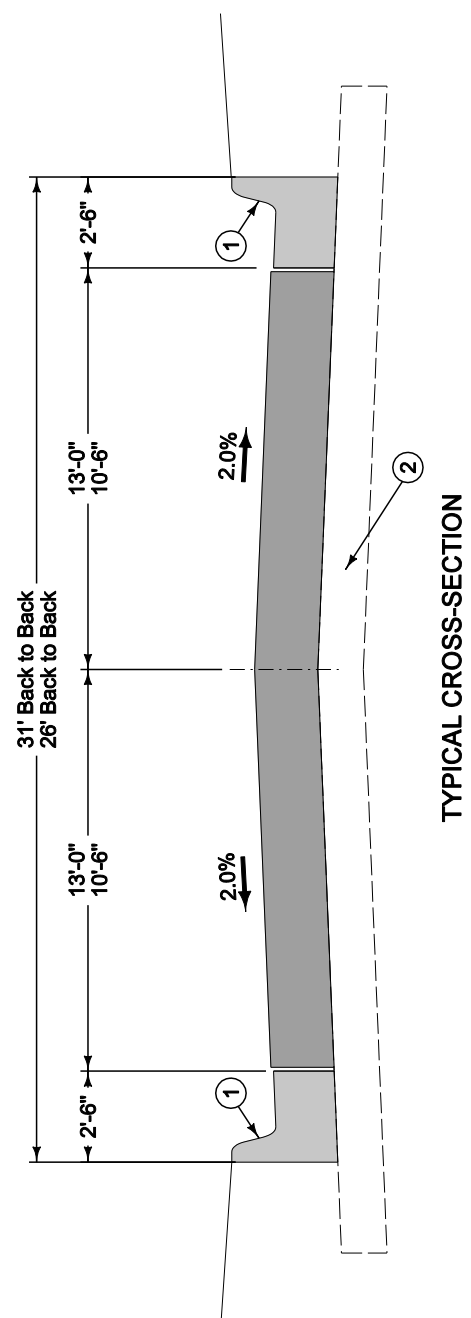
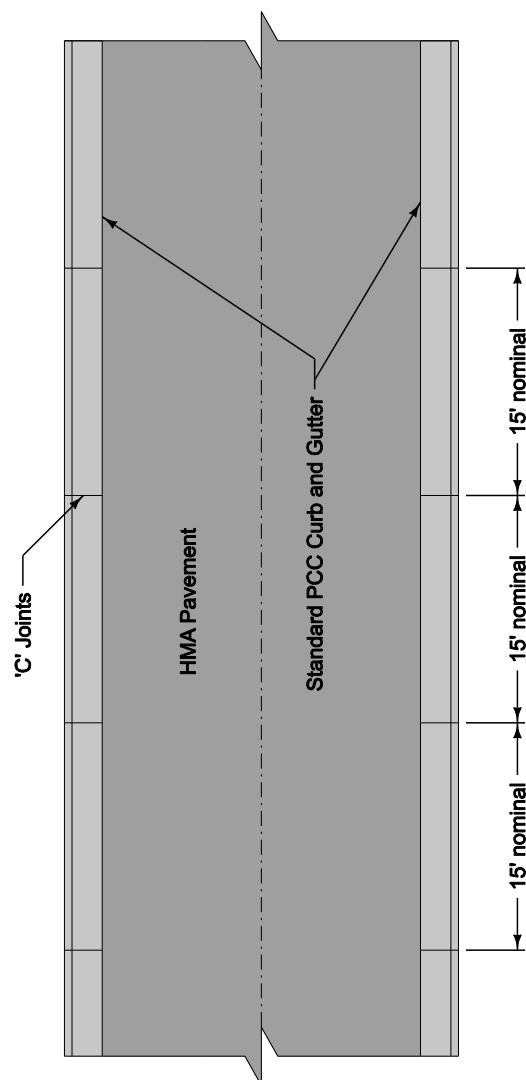


HMA PAVEMENT SECTION
WITH NEW CURB AND GUTTER


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	7020.901		
	SHEET 1 of 2		

SUDAS Standard Specifications

HMA PAVEMENT



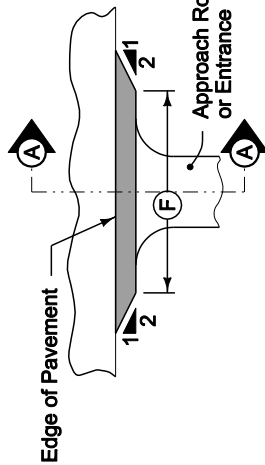
- ① 6 inch standard curb and gutter.
- ② Subbase or subgrade as specified.

	SUDAS		REVISION New
	7020.901		- -
	SHEET 2 of 2		

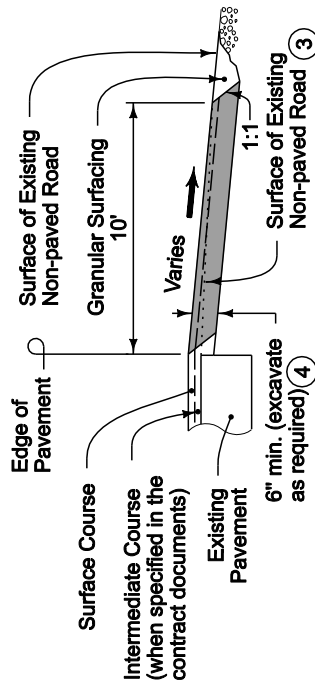
SUDAS Standard Specifications

HMA PAVEMENT

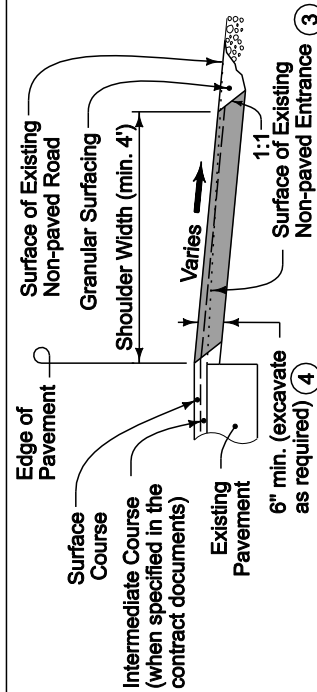
-
- The image contains two plan view diagrams of a railroad crossing, labeled 'PLAN VIEW - STRAIGHT CROSSING' and 'PLAN VIEW - SKEWED CROSSING'.
- PLAN VIEW - STRAIGHT CROSSING:** This diagram shows a set of tracks intersecting a roadway at a 90-degree angle. The tracks are labeled 'Tracks' and 'Q of Tracks'. The roadway is labeled 'Mainline Paving'. A rectangular area of Hot Mix Asphalt (HMA) is labeled 'HMA (5)'. A sidewalk is labeled 'Sidewalk' and '6'. The 'LOCATION STATION' is indicated by a curved arrow pointing to the intersection. The 'Q of Roadway' is indicated by a dashed line. The 'Q of Tracks' is indicated by a dashed line. The width of the HMA area is labeled '5'-6"'. The 'Varies' dimension is indicated by a dashed line.
- PLAN VIEW - SKEWED CROSSING:** This diagram shows a set of tracks intersecting a roadway at an angle. The tracks are labeled 'Tracks' and 'Q of Tracks'. The roadway is labeled 'Mainline Paving'. A trapezoidal area of Hot Mix Asphalt (HMA) is labeled 'HMA (5)'. A sidewalk is labeled 'Sidewalk' and '6'. The 'LOCATION STATION' is indicated by a curved arrow pointing to the intersection. The 'Q of Roadway' is indicated by a dashed line. The 'Q of Tracks' is indicated by a dashed line. The width of the HMA area is labeled '5'-6"'. The 'Varies' dimension is indicated by a dashed line.



TYPICAL PLAN FOR FILLET AT ENTRANCE OR INTERSECTING ROAD



SECTION A-A
(Full Thickness Fillet - Non-paved Road)



SECTION A-A
(Wedge Shaped Fillet - Paved Entrance or Road)

TYPE OF ACCESS	MINIMUM FILLET WIDTH	
	PRIMARY ROADS (F) ft.	SECONDARY AND LOCAL ROADS (F) ft.
Residential Entrance	40	12
Farm Entrance	60	18
Commercial Entrance	80	24
Non-paved Road	100	30
Paved Road	Variable (5)	Variable (5)

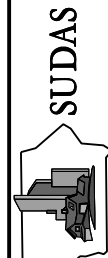
GENERAL DETAILS

For temporary runouts and wedges, place subgrade paper, burlap, or similar material over adjacent surfaces to facilitate removal. Construct temporary runout at a length of 10 feet for each 1 inch of resurfacing thickness.

Construct wedge shaped asphalt fillets at all paved entrances and paved roads. Construct full thickness fillets at all non-paved entrances and non-paved roads.

- Width of fillet is 4 feet for each inch of overlay thickness.
- The runout length of the intermediate course is equal to the total runout length, multiplied by the intermediate course thickness, divided by the total resurfacing thickness.
- Excavate and shape road or entrance as required to accommodate proposed fillet.
- For existing fillets at non-paved roads and entrances, construct a wedge shaped fillet matching the thickness of the resurfacing.
- Match width and shape of existing pavement.

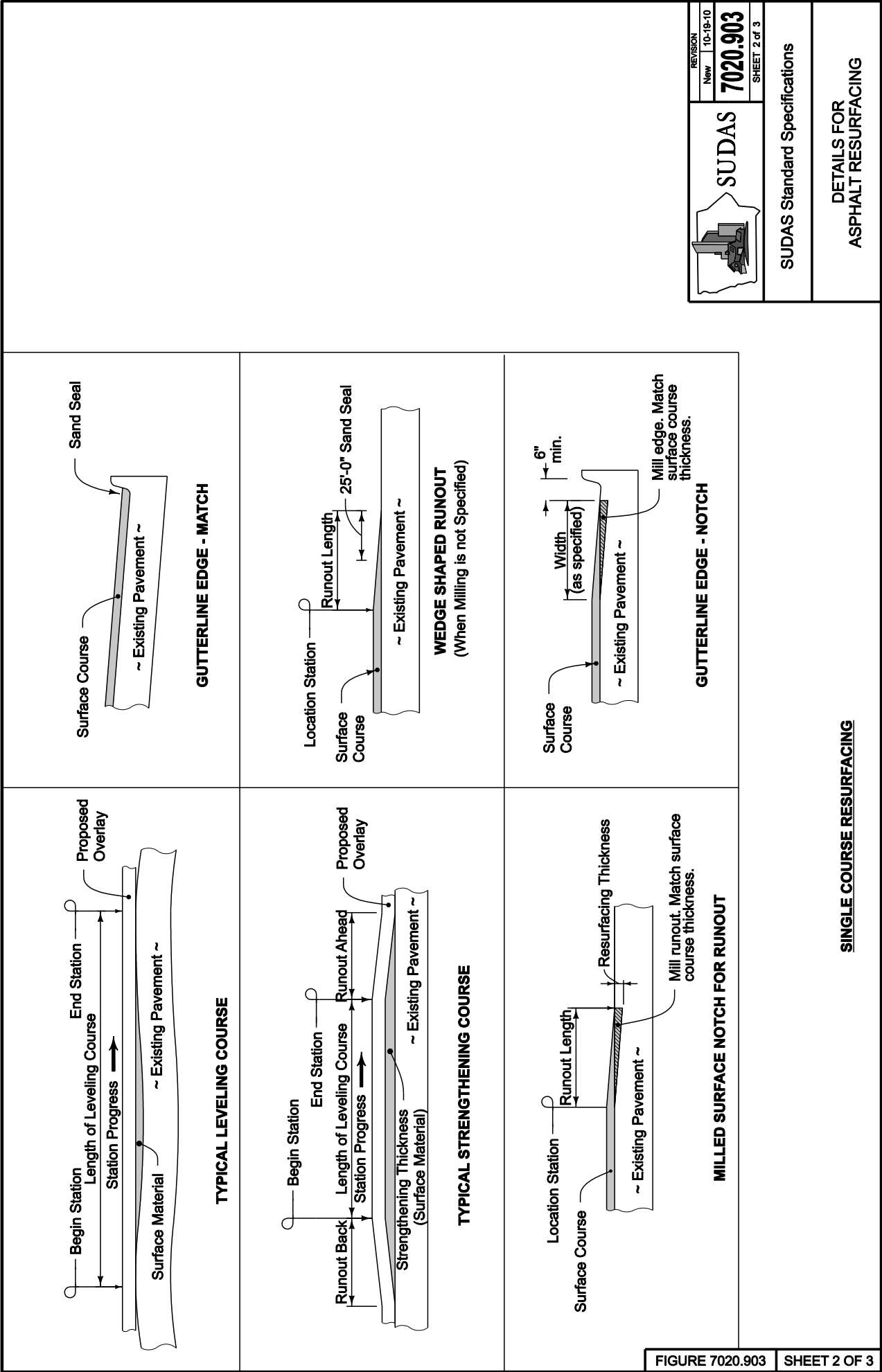
RUNOUT LENGTH	
POSTED SPEED LIMIT (mph)	RUNOUT RATIO (ft. per inch)
45 or More	50
20 to 45	25



REVISION
New 10-19-10
7020.903
SHEET 1 of 3

SUDAS Standard Specifications

DETAILS FOR
ASPHALT RESURFACING



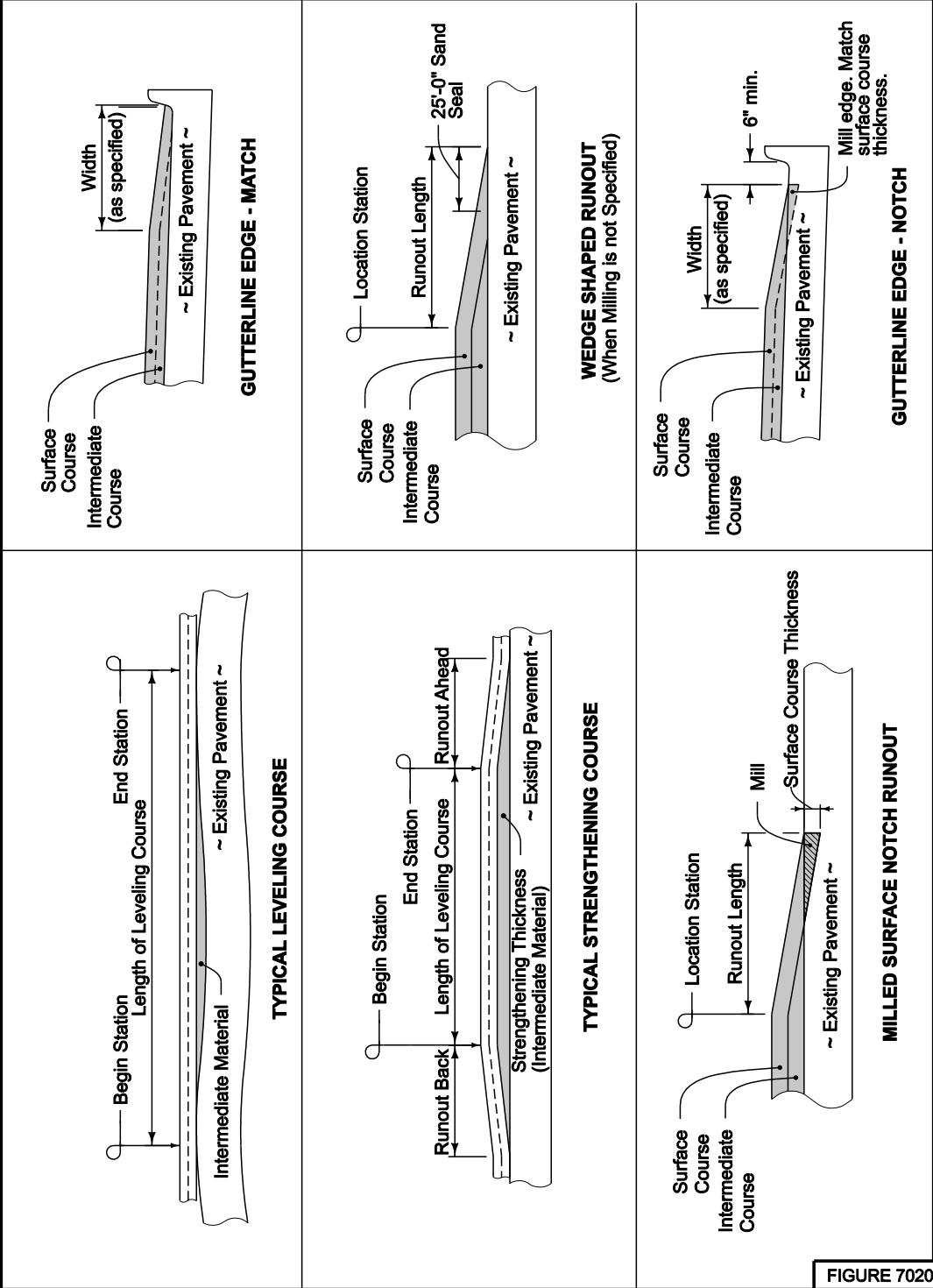


FIGURE 7020.903 SHEET 3 OF 3

REVISION

New 10-19-10

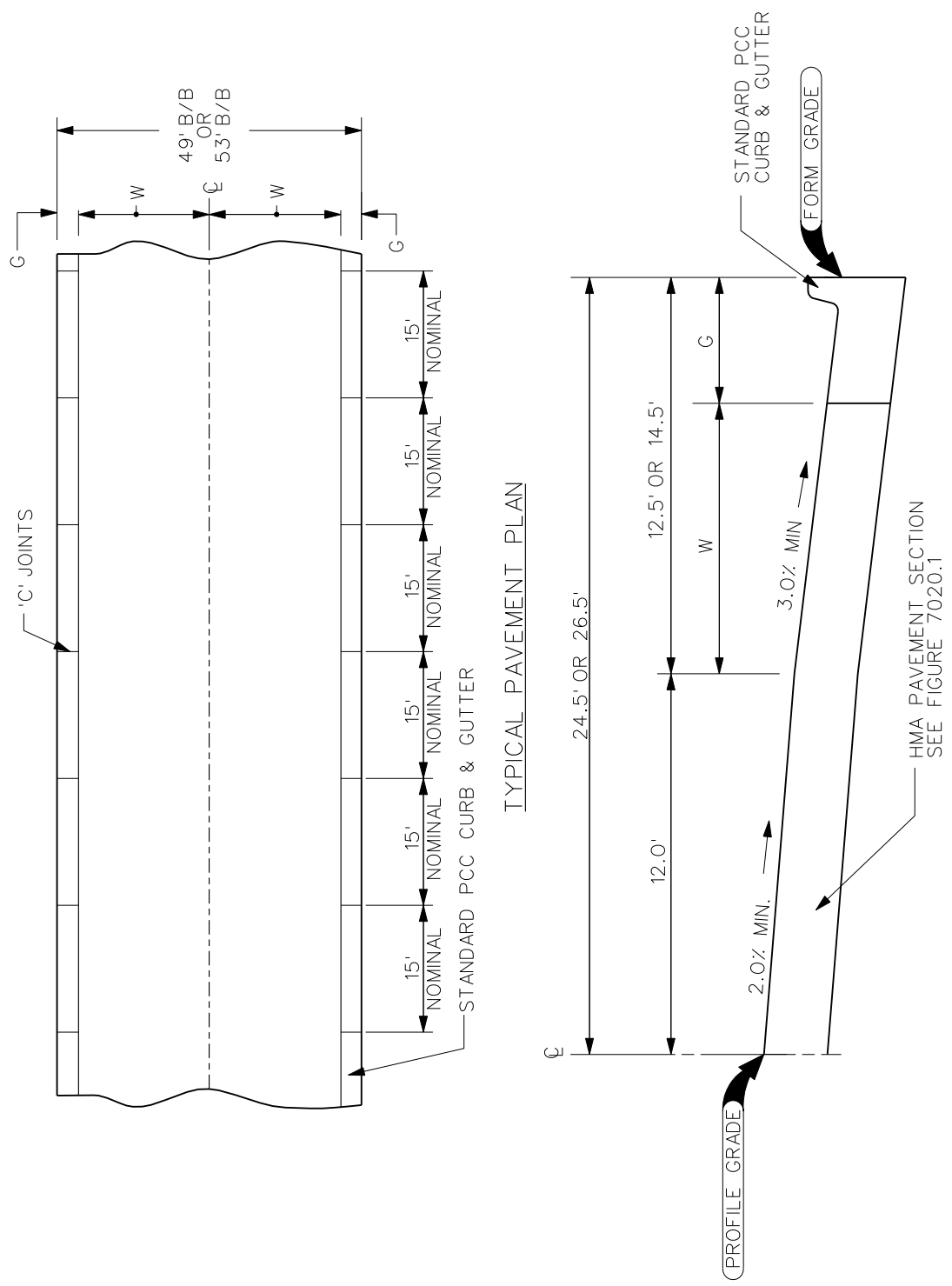
7020.903

SHEET 3 of 3

SUDAS Standard Specifications

DETAILS FOR
ASPHALT RESURFACING

DOUBLE COURSE RESURFACING

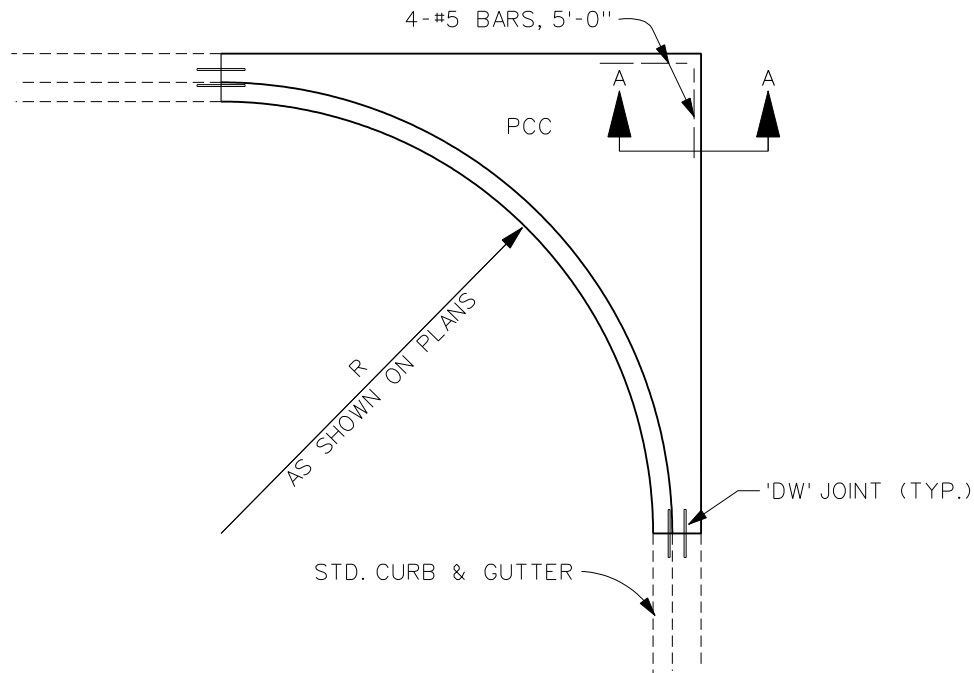


TYPICAL CROSS SECTION

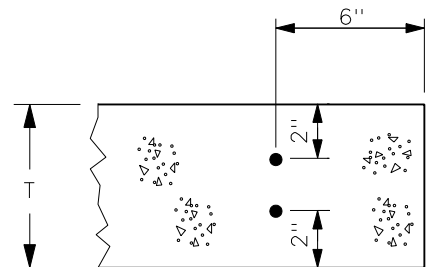
	W	G
49' B-B STANDARD CROSS SECTION	10.0'	2.5'
53' B-B STANDARD CROSS SECTION	12.0'	2.5'

Move Current
Figure to Design

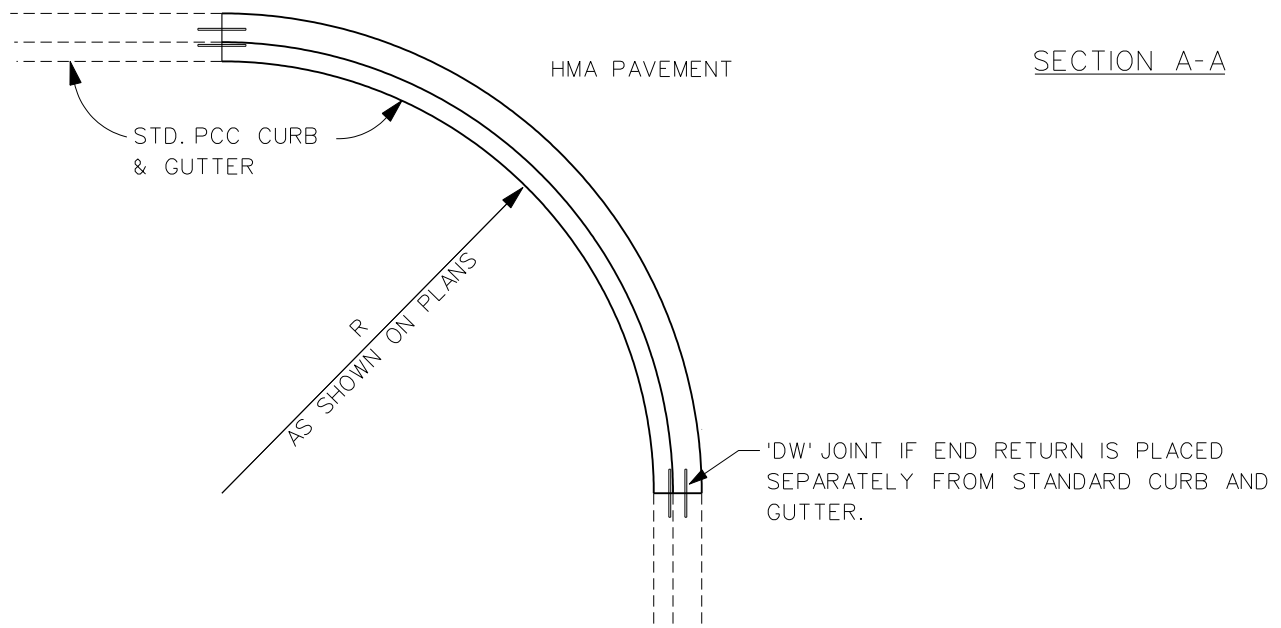
SUDAS STANDARD SPECIFICATIONS



PCC PAVEMENT END RETURN



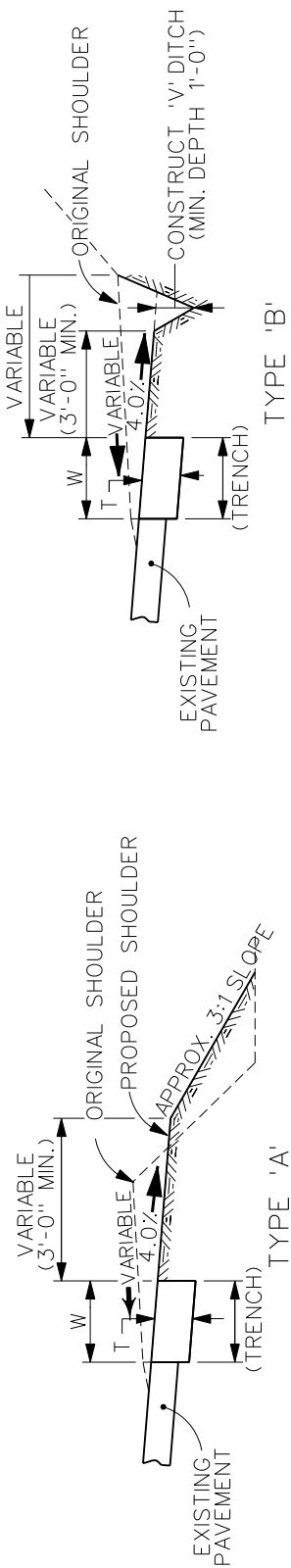
SECTION A-A



CURB AND GUTTER END RETURN

Archive Current Figure

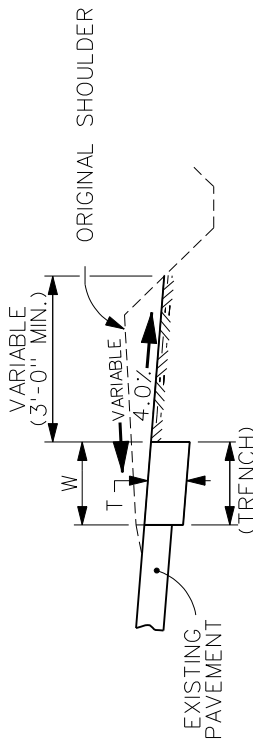
2	10/18/05		<div>Archive Current Figure</div>	
REV.	DATE	BY	END RETURNS - HMA PAVEMENT	FIGURE: 7020.4
DATE: 01-01-98				SHEET 1 OF 1



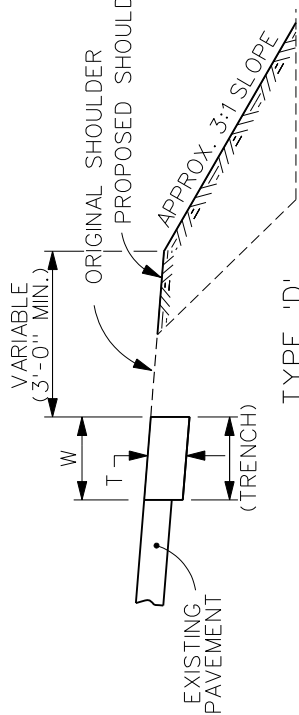
TYPE 'A'



TYPE 'B'

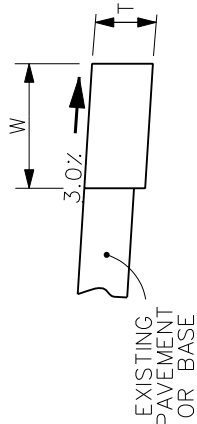


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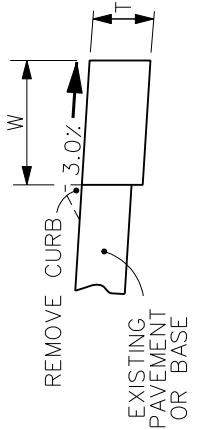


TYPE 'D'

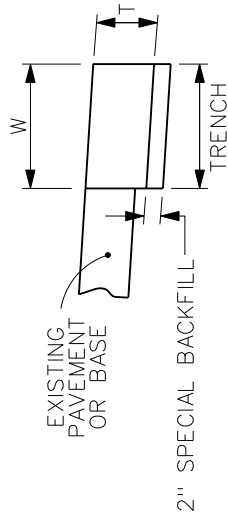
TYPICAL DETAILS OF SHOULDERS FOR PAVEMENT WIDENING



HMA WIDENING ON EXISTING PAVEMENT WITHOUT CURB



HMA WIDENING ON EXISTING PAVEMENT WITH CURB



DETAILS OF OPTIONAL PLACEMENT OF SPECIAL BACKFILL

Delete Current Figure

3

10/18/05

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DATE

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DATE: 01-01-98

HMA BASE WIDENING

FIGURE: 7020.6

SHEET 1 OF 1

Section 7040 Figures

Pavement Repair and Rehabilitation

Summary of Revisions to 7040 Figures Pavement Rehabilitation

Revised Figures:

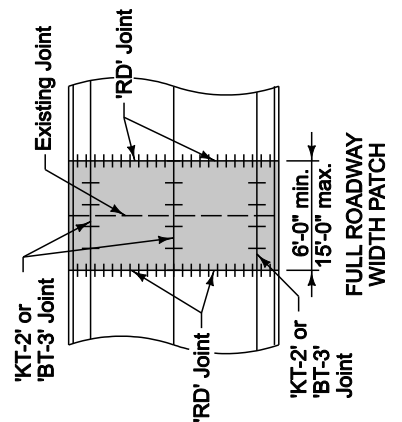
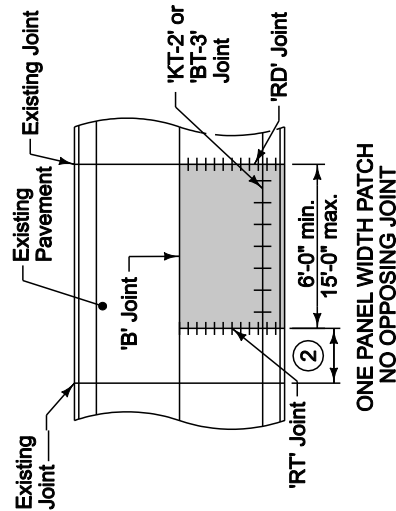
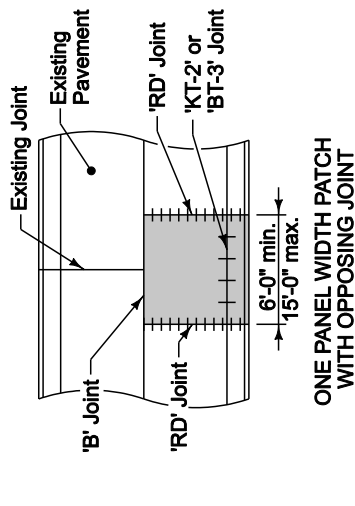
New #	Proposed Name	Current #	Summary of Changes
7040.101	Full Depth PCC Patches \leq 15' Long	7040.1 & 7040.2	Revised boxout dimensions to match Iowa DOT. Added roundout option. Removed intake information to make figure manhole specific. Added cross-sections for two-piece and three-piece castings.
7040.102	Full Depth PCC Patches > 15' Long		
7040.103	Full Depth HMA Patches	7040.3	Editing and formatting revisions
7040.104	Partial Depth Patches	7040.5	Figure was updated based upon recommendations from the Concrete Pavement Preservation Workshop Reference Manual. Added plan views of PCC patches. At request of districts and ICPA, a milled, rounded bottom partial depth patch option was added.
7040.105	Flowable Mortar Cutoffwall	7040.7	Updated format.

Note: highlighting is only for ease of reading

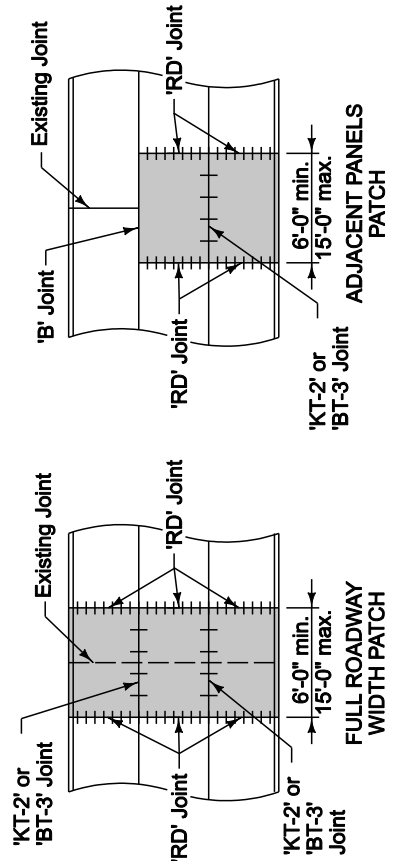
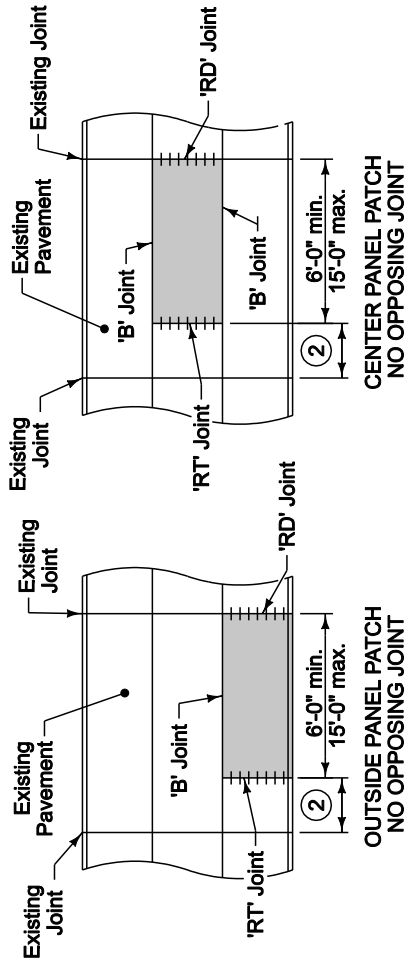
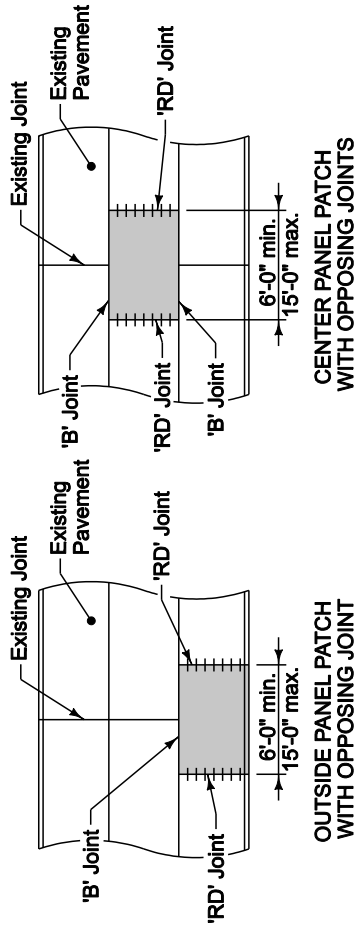
Figures to Archive:

Current #	Current Name	Comments
7040.4	Street Excavation and Other Pavement Restoration	Street excavation and backfill should be completed according to Section 3010.
7040.6	P.C. Concrete Joint Stitching	
7040.8	Partial Depth Curb Replacement Partial Depth Patch	Partial depth replacement of curb is uncommon. Common method would be to remove part of the gutter section and replace the entire curb full depth. Five out of six districts were in favor of archiving.

GUTTERLINE JOINTING

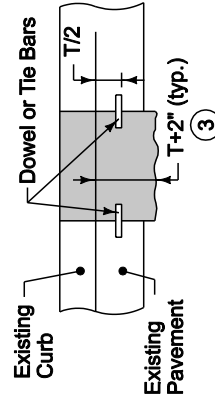


THIRD POINT JOINTING ①



- ① Patches on roadways with quarter point jointing will be similar to third point jointing details.
- ② Minimum distance between existing joint and patch is 6 feet. If distance is less than 6 feet, extend patch to existing joint.
- ③ When subgrade or subbase material is required below patch, bring material to bottom of pavement and match existing patch thickness.

LONGITUDINAL SECTION THRU PCC PATCH

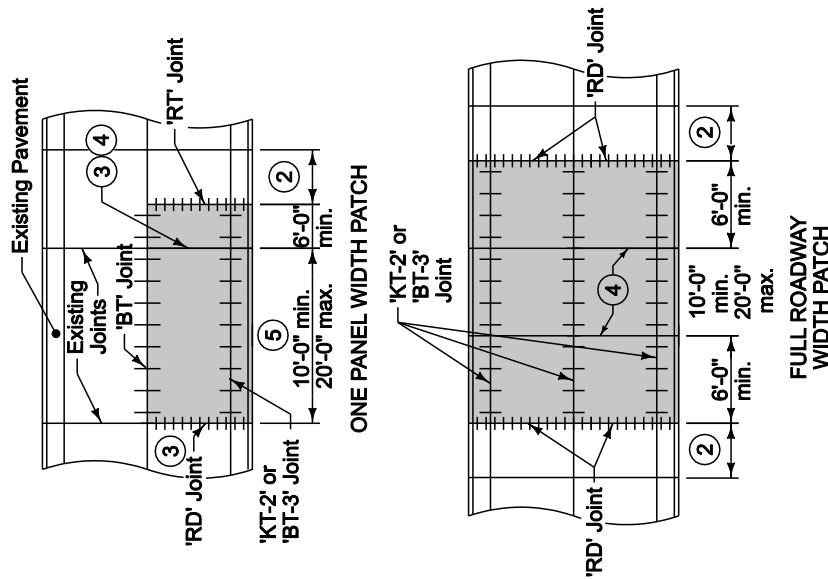


	REVISION
	New 10-19-10
7040.101	
SHEET 1 of 1	

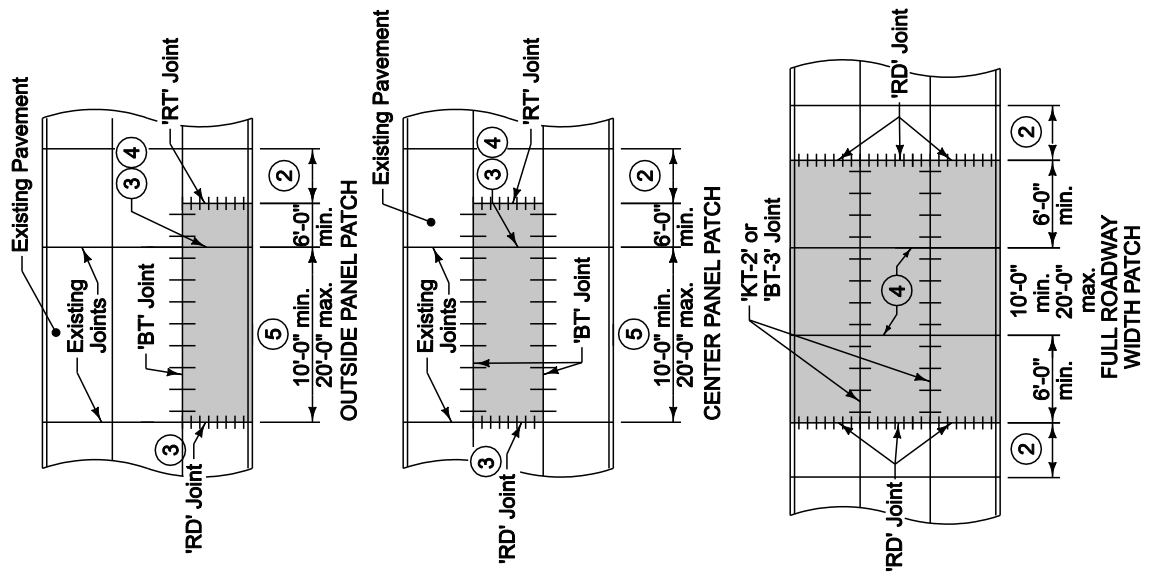
SUDAS Standard Specifications

FULL DEPTH PCC PATCHES
LESS THAN OR EQUAL TO 15' LONG

GUTTERLINE JOINTING

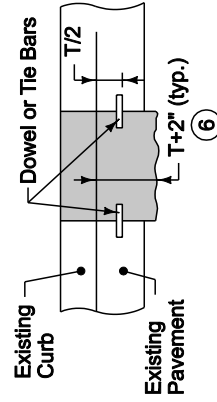


THIRD POINT JOINTING ①



- ① Patches on roadways with quarter point jointing will be similar to third point jointing details.
- ② Minimum distance between existing joint and patch is 6 feet. If distance is less than 6 feet, extend patch to existing joint.
- ③ Match existing joint type and locations.
- ④ 'C' joint unless 'CD' joint is specified.
- ⑤ If existing joint spacing is greater than 20 feet, add a 'CT' joint at mid-panel.
- ⑥ When subgrade or subbase material is required below patch, bring material to bottom of pavement and match existing patch thickness.

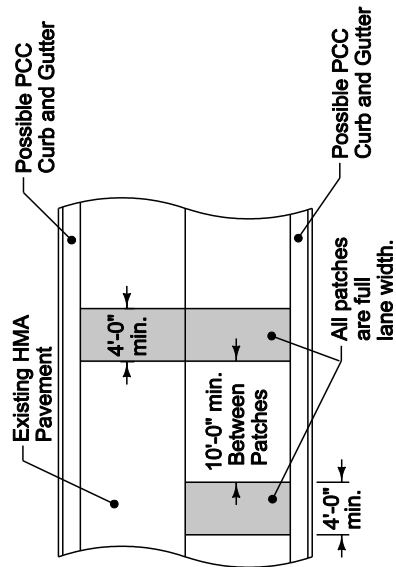
LONGITUDINAL SECTION THRU PCC PATCH



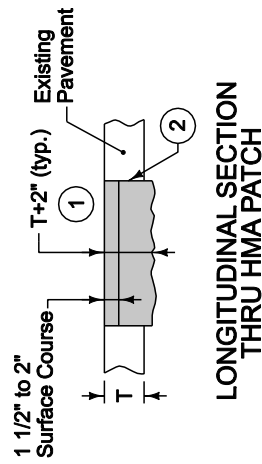
	REVISION	10-19-10
	New	7040.102
SHEET 1 of 1		

SUDAS Standard Specifications

FULL DEPTH PCC PATCHES
GREATER THAN 15' LONG

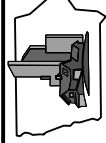


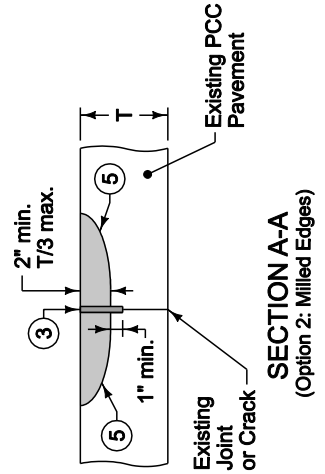
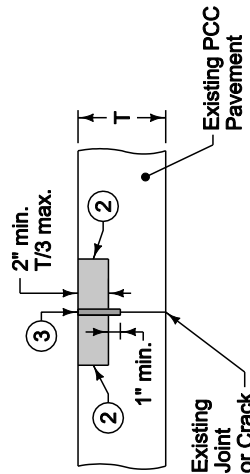
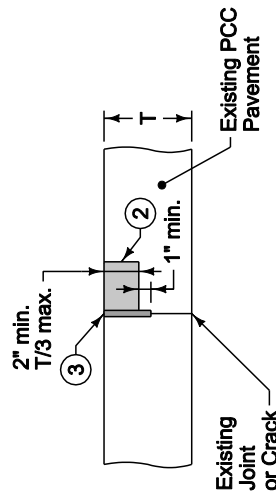
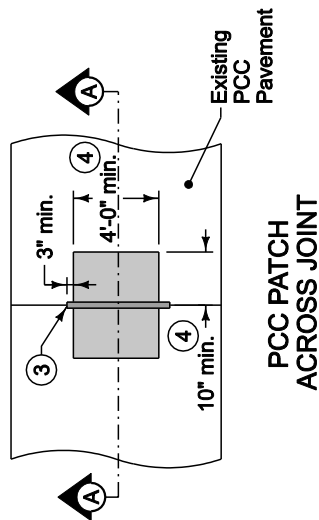
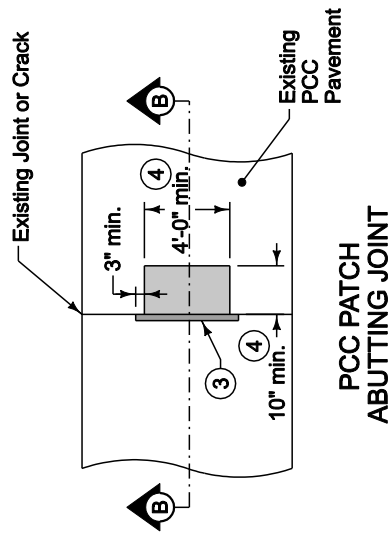
HMA PATCHES



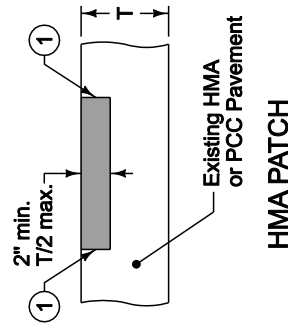
LONGITUDINAL SECTION
THRU HMA PATCH

- ① When subgrade or subbase material is required below patch, bring material to bottom of pavement and match existing patch thickness.
- ② When removing pavement, saw to full depth or 10 inches, whichever is less.

	REVISION	New	10-19-10
	7040.103		
	SHEET 1 of 1		
SUDAS Standard Specifications			
FULL DEPTH HMA PATCHES			



- ① Vertical saw cut (typical). Apply tack coat to sides and bottom.
- ② Vertical saw cut (typical). Apply cement grout to sides and bottom.
- ③ Saw and seal existing joint.
- ④ Extend patch limits at least 3 inches beyond distressed area.
- ⑤ When milled removal is allowed, sawed vertical edges are not required. Apply cement grout to milled area.

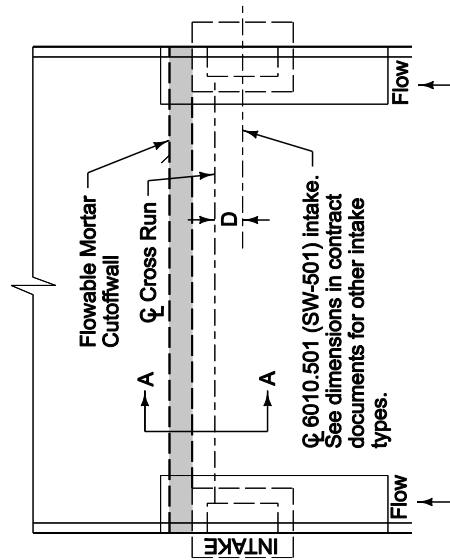


	REVISION	New	10-19-10
	7040.104	SHEET 1 of 1	

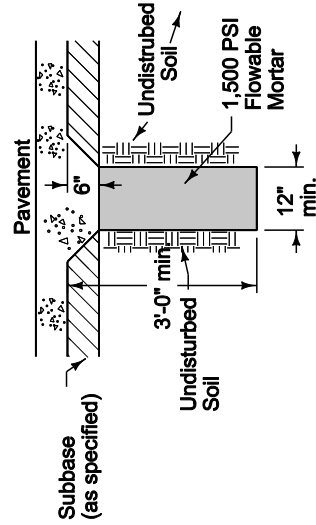
SUDAS Standard Specifications

PARTIAL DEPTH PATCHES

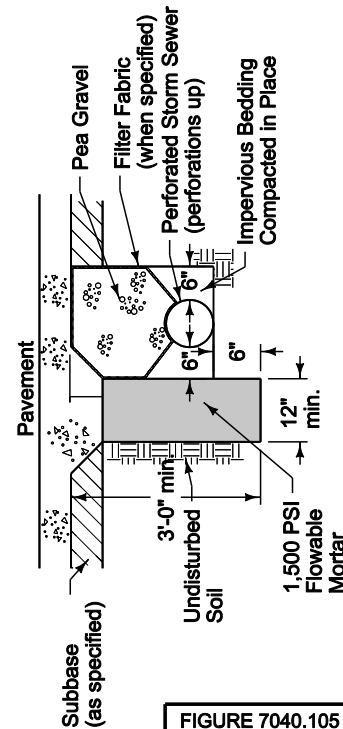
Length of cutoffwall to be back of curb to back of curb.



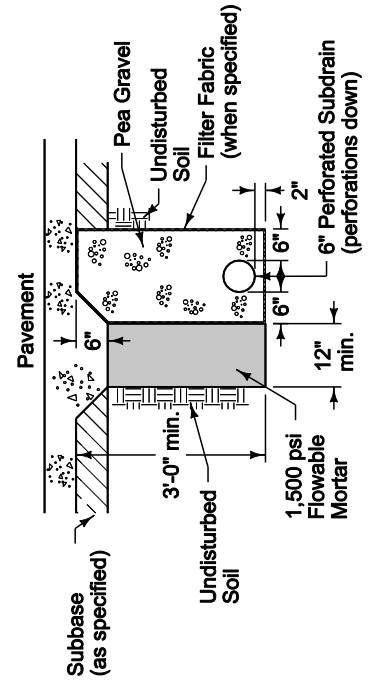
PLAN VIEW
(Flowable mortar cutoffwall and cross run location.)



FLOWABLE MORTAR CUTOFFWALL
(Without Sewer)

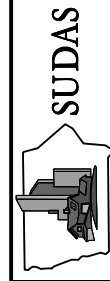


SECTION A-A
(Flowable mortar cutoffwall and storm sewer.)



FLOWABLE MORTAR CUTOFFWALL
(With Subdrain)

DISTANCE FROM ϕ INTAKE TO ϕ CROSSRUN	
Size	D
15" RCP	0.7'
15" CMP	0.8'
18" RCP	0.5'
18" CMP	0.7'

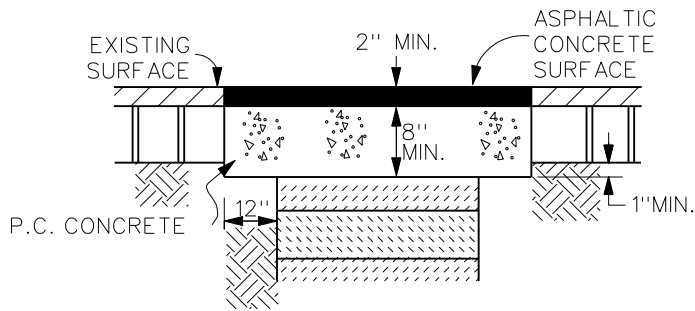


REVISION
New 10-19-10
7040.105
SHEET 1 of 1

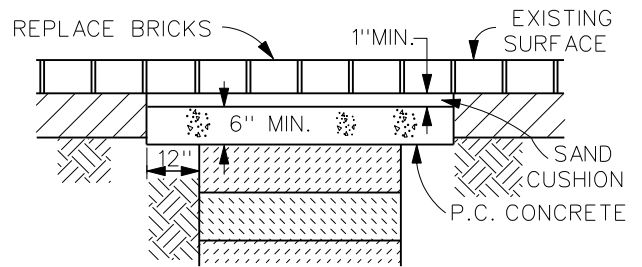
SUDAS Standard Specifications

FLOWABLE MORTAR CUTOFFWALL

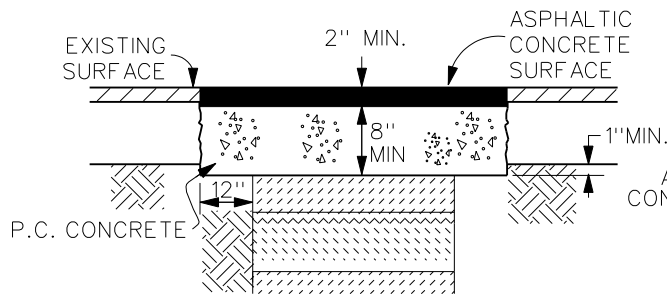
SUDAS STANDARD SPECIFICATIONS



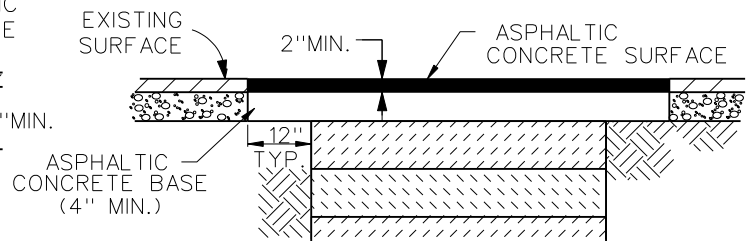
ASPHALT RESURFACED
BRICK PAVEMENT



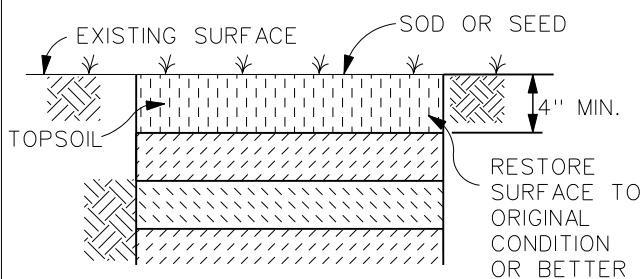
BRICK PAVEMENT



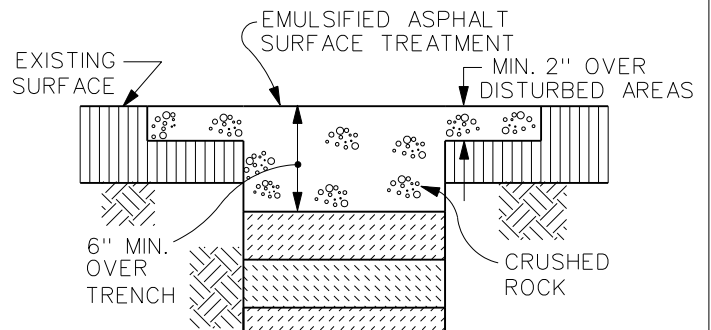
ASPHALT RESURFACED
BITULITHIC PAVEMENT



ASPHALT SURFACED
AGGREGATE BASE



PARKINGS AND OTHER
GRASSED OR SOIL AREAS



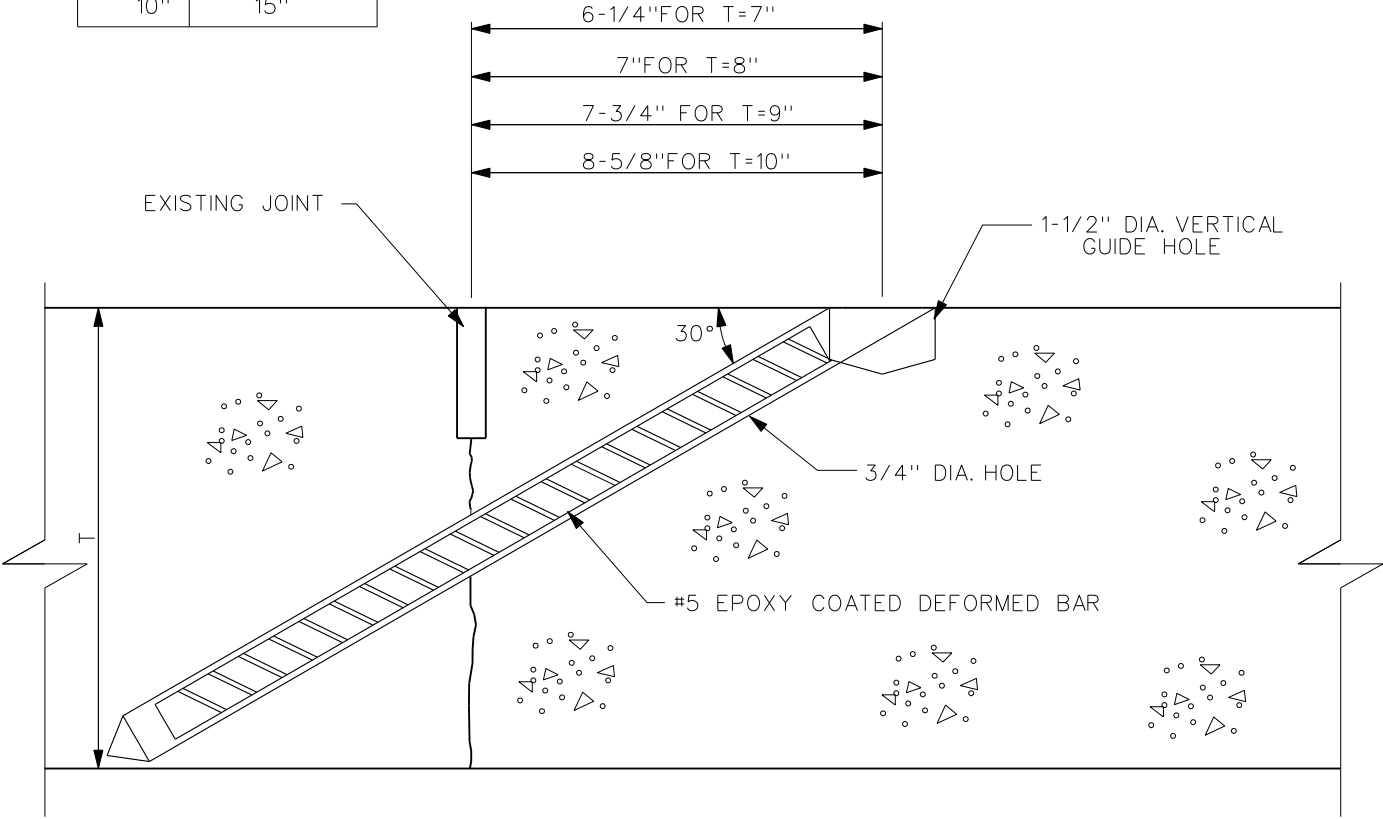
ROCK, DIRT, OIL, OR
ASPHALT STABILIZED STREETS

Archive Current Figure

1	01/25/01		STREET EXCAVATION AND OTHER PAVEMENT RESTORATION		FIGURE: 7040.4	
REV.	DATE	BY			SHEET 1 OF 1	
DATE: 01-01-98						

SUDAS STANDARD SPECIFICATIONS

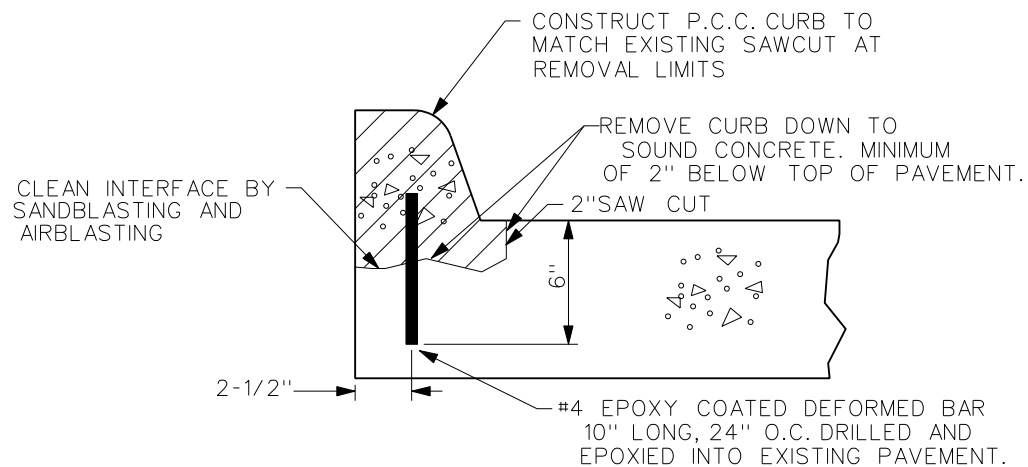
BAR LENGTH	
T	LENGTH
7"	12"
8"	13"
9"	14"
10"	15"



Archive Current Figure

			Archive Current Figure	
REV.	DATE	BY	P.C. CONCRETE JOINT STITCHING	FIGURE: 7040.6
DATE: 01-01-98				SHEET 1 OF 1

SUDAS STANDARD SPECIFICATIONS



CURB REPLACEMENT - PARTIAL DEPTH

Archive Current Figure

REV.	DATE	BY	PARTIAL DEPTH CURB REPLACEMENT	FIGURE: 7040.8
	DATE: 01/25/01		PARTIAL DEPTH PATCH	SHEET 1 OF 1

Section 9030 Figures
Plant Material and Planting

Summary of Revisions to 9030 Figures Plant Material and Planting

Revised Figures:

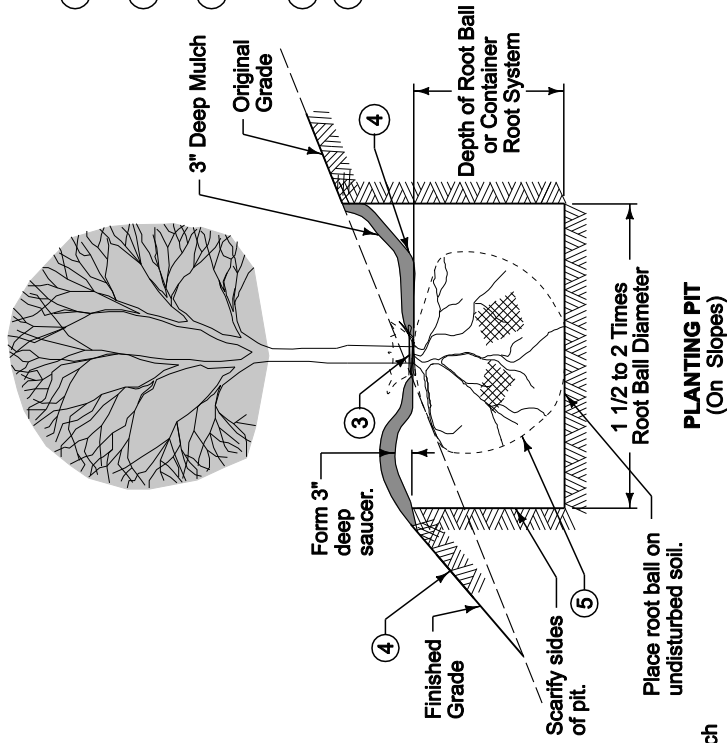
New #	Proposed Name	Current #	Summary of Changes
9030.101	Planting Pit	9030.1	Combined the planting pit and planting on slopes details.
		9030.2	
9030.102	Tree Staking, Guying, and Wrapping	9030.3	Added plan view to show orientation of stakes and guys. Eliminated turnbuckle from guys. Added manufactured system as option for guying.
		9030.4	
9030.103	Tree Planting Well	9030.6	Added a range to the diameter of the augered hole. Changed from septic rock to porous backfill material for backfill. Changed name from planting well to tree planting well to avoid conflict with Iowa DOT terminology.

Note: highlighting is only for ease of reading

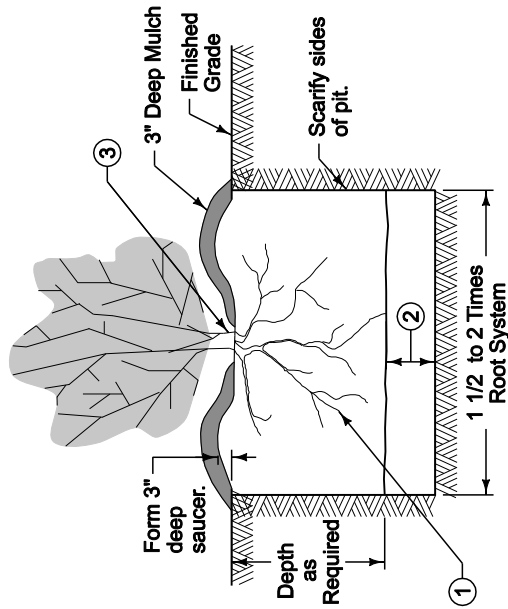
Figures to Delete:

Current #	Current Name	Comments
9030.5	Sidewalk Tree Well	This is a fairly specialized application. When used, it is likely that the specific tree grate, tree guard, distance from the back of curb, etc. will be tailored to the project and the details will be shown on the plans.

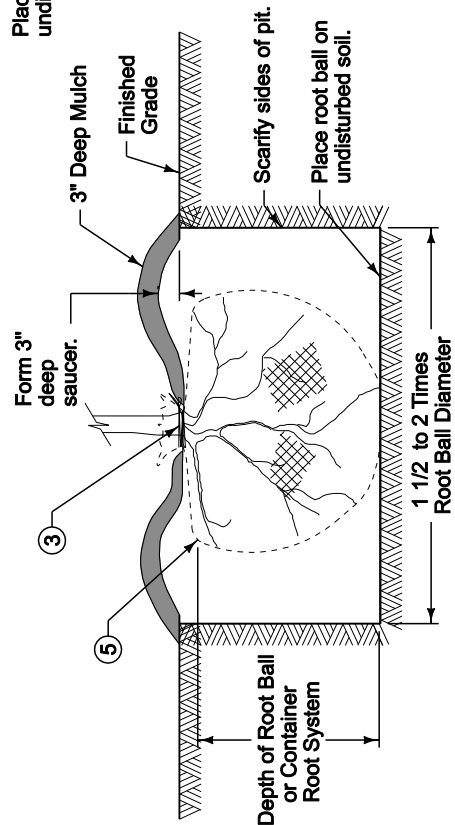
- ① Spread root system in natural position with soil excavated from pit.
- ② Over-excavate 6 inches. Place 6 inches of loose soil in pit prior to planting.
- ③ Install with root collar at or slightly above grade. Do not place mulch within 2 inches of trunk.
- ④ Begin transition at edge of root ball.
- ⑤ Cut and completely remove all twine, burlap, and wire baskets from root ball prior to placing backfill material.



PLANTING PIT
(On Slopes)

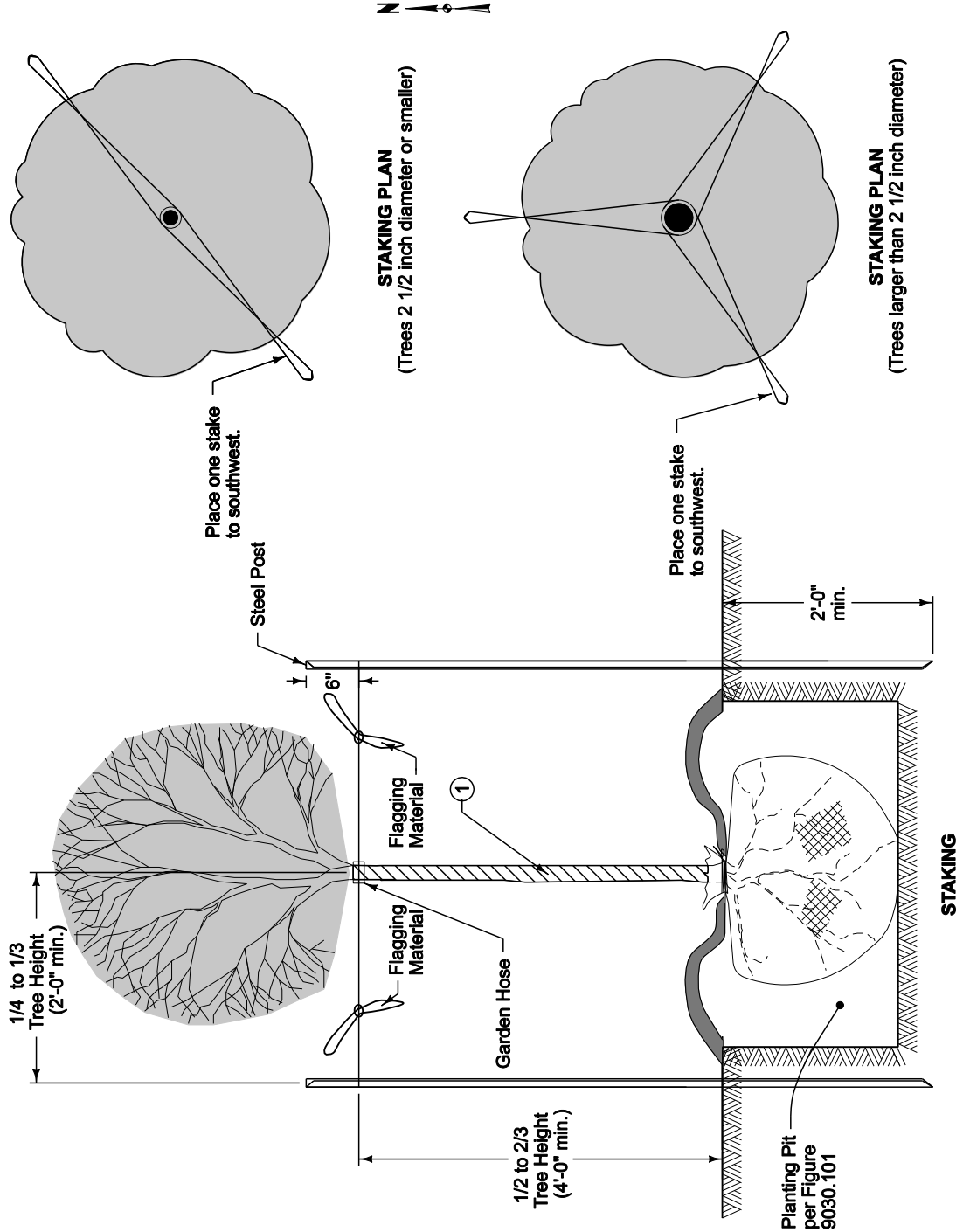


PLANTING PIT
(Bare Root Plants)



PLANTING PIT
(Balled and Burlapped Plants)

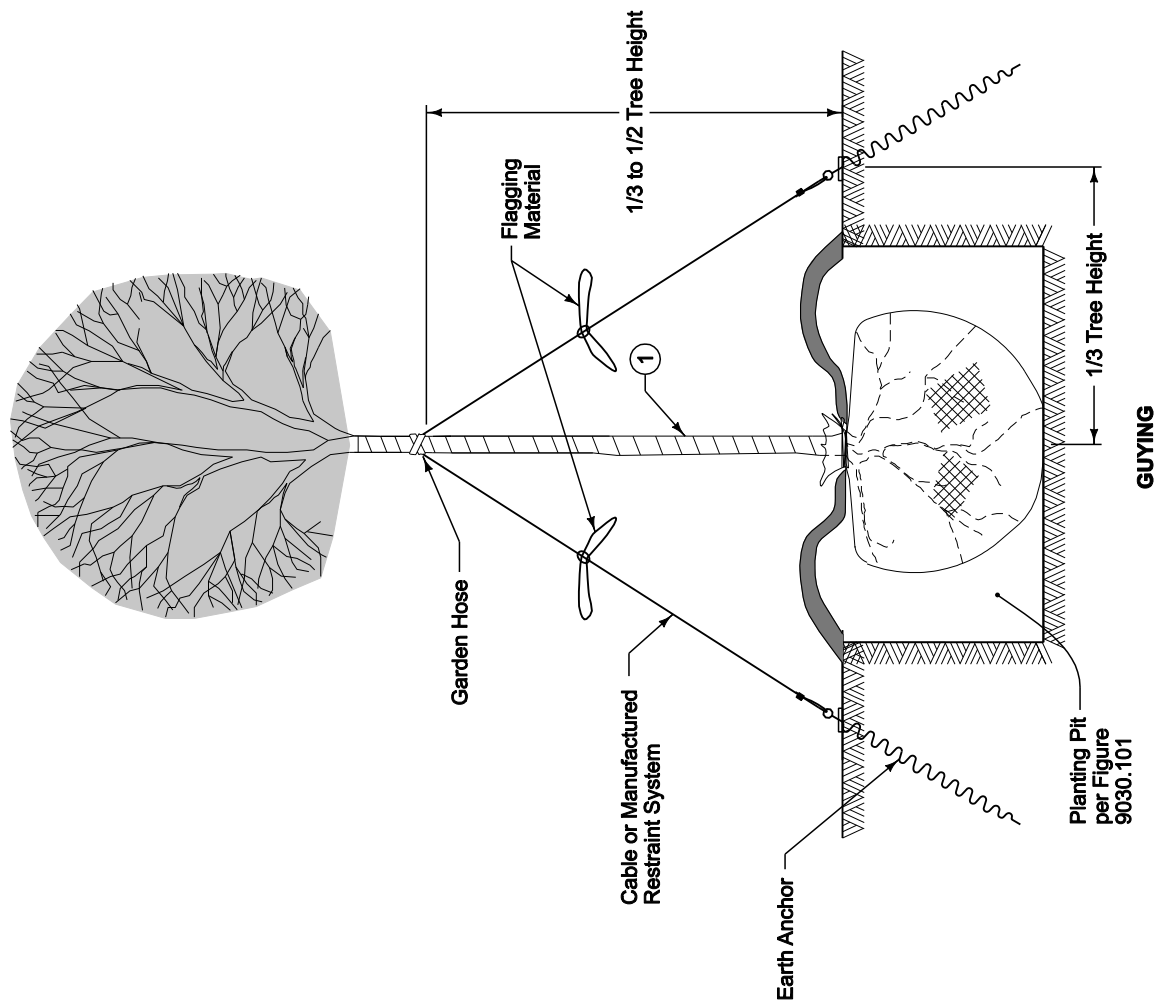
- ① Wrap trunk from ground line to first branch when specified in the contract documents.



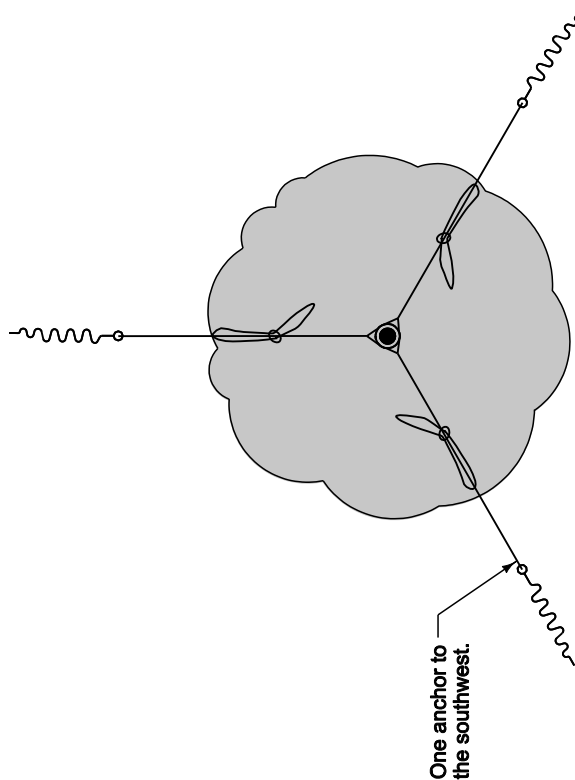
	REVISION	10-17-11
	New	10-17-11
9030.102		SHEET 1 of 2

SUDAS Standard Specifications

TREE STAKING, GUYING,
AND WRAPPING

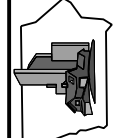


① Wrap trunk from ground line to first branch when specified in the contract documents.



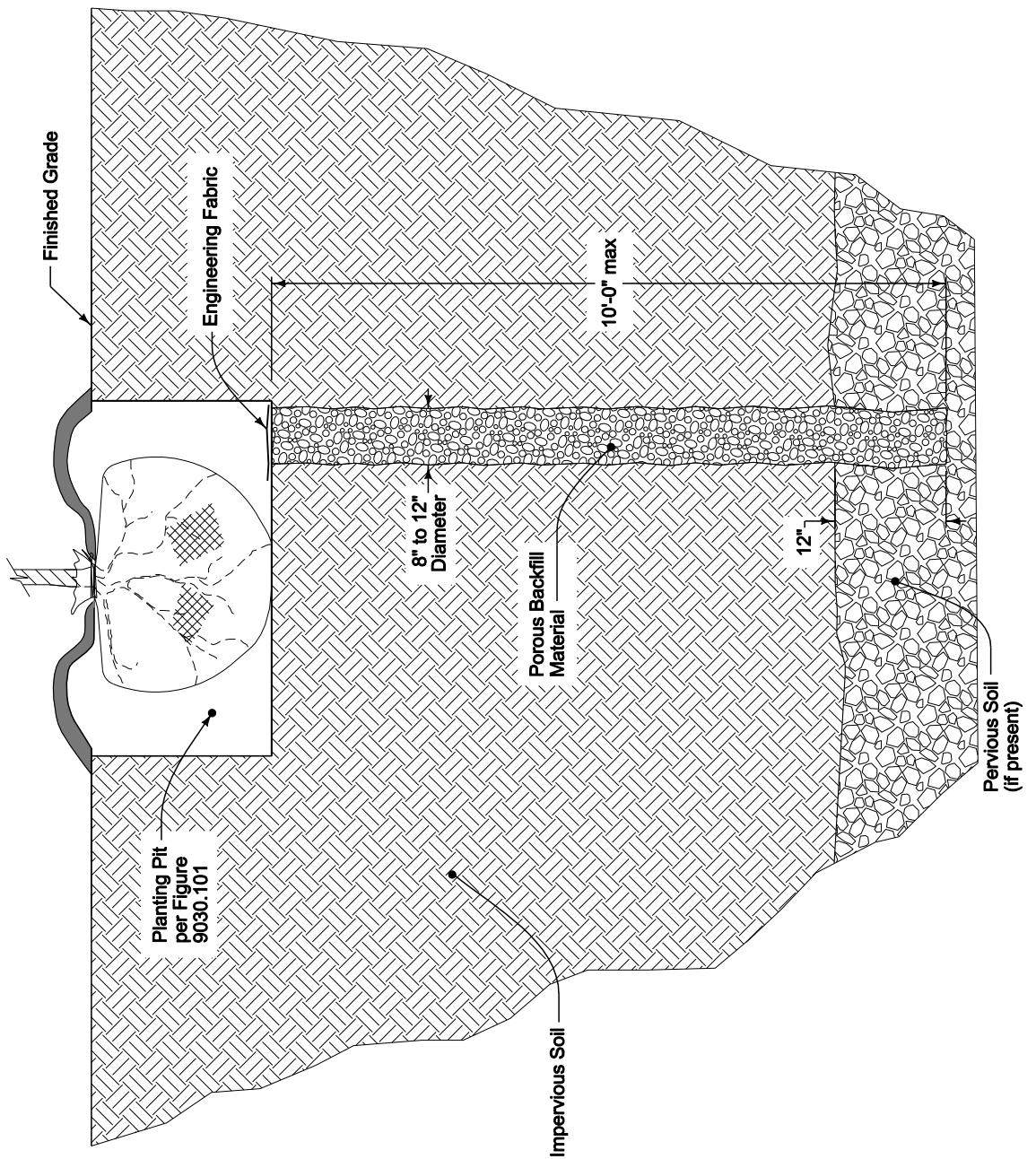
GUYING PLAN

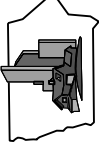
	REVISION		
	New	10-17-11	
	9030.102		
SHEET 2 of 2			



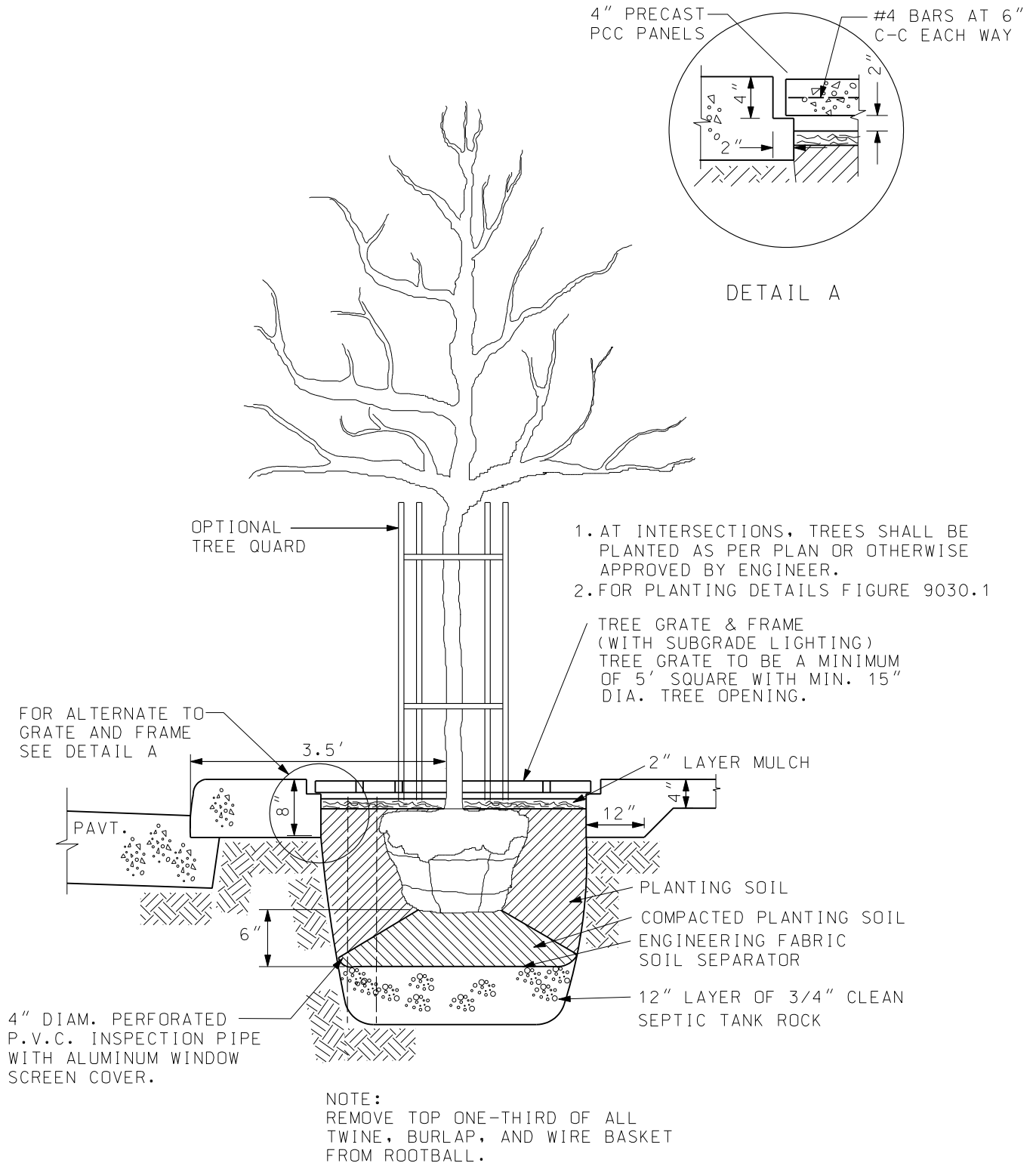
SUDAS Standard Specifications

TREE STAKING, GUYING,
AND WRAPPING



	REVISION		
	New	10-17-11	
	9030.103		
SHEET 1 of 1			
SUDAS Standard Specifications			
TREE DRAINAGE WELL			

SUDAS STANDARD SPECIFICATIONS



Delete Current Figure

1	10/2002		<div>Delete Current Figure</div>			
REV.	DATE	BY			SIDEWALK TREE WELL	FIGURE: 9030.5
DATE: 04-04-97						SHEET 1 OF 1

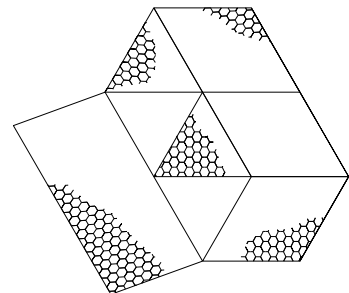
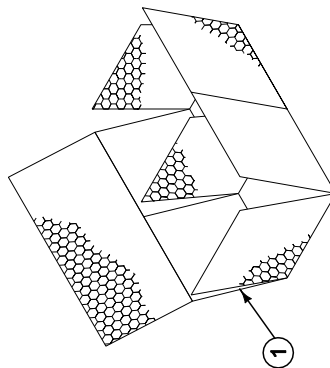
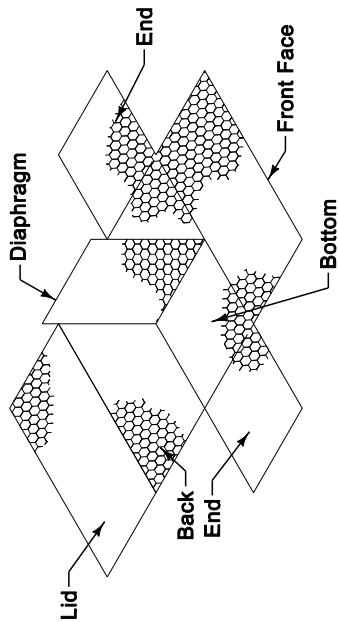
Section 9050 Figures

Gabions and Revet Mattresses

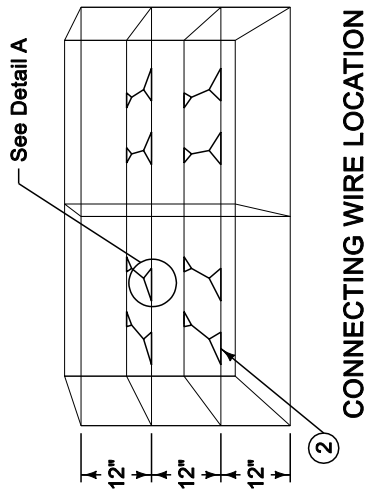
Summary of Revisions to 9050 Figures Gabions and Revet Mattresses

Revised Figures:

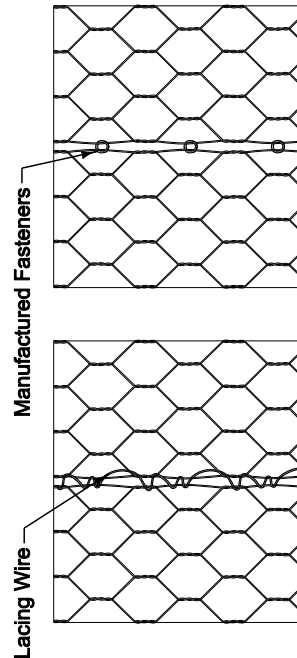
New #	Proposed Name	Current #	Summary of Changes
9050.101	Gabion Assembly	9050.1	Project specific details showing basket sizes and placement were removed. General details showing basket assembly requirements were retained and updated.



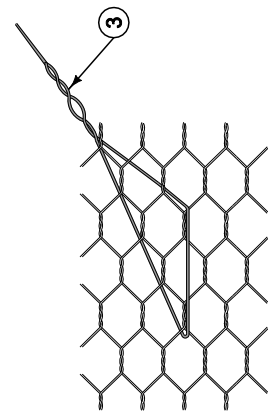
GABION ASSEMBLY



CONNECTING WIRE LOCATION

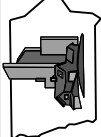


EDGE CONNECTIONS



DETAIL A

- ① Connect edges of basket with lacing wire or fasteners.
- ② Install connecting wires on exposed gabion faces.
- ③ Twist wire a minimum of four turns.

	REVISION	
	New	--
	9050.101	
	SHEET 1 of 1	
SUDAS Standard Specifications		
GABION ASSEMBLY		

Section 9060 Figures

Fencing

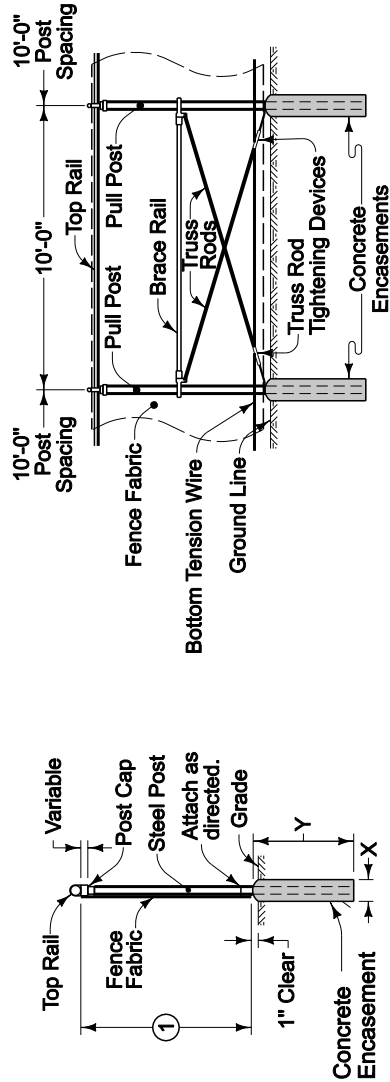
Summary of Revisions to 9060 Figures Fencing

Revised Figures:

New #	Proposed Name	Current #	Summary of Changes
9060.101	Chain Link Fence	9060.1 & 9060.2	<p>Existing figures are very similar to (and appear to be based upon) the Iowa DOT's Standard Road Plan for chain link fence; therefore a future joint figure is recommended.</p> <p>Figure is based upon Iowa DOT SRP MI-102. removed language making the default fence 6 feet tall. Removed bid item and material specifications language. Did not include barbed wire details (as shown on previous SUDAS figures) as this is adequately covered by the specifications.</p> <p>The table for fence post footing depth and diameter were revised to follow published standards.</p>
9060.102	Chain Link Gate	9060.1 & 9060.3	<p>Gate details are based upon Iowa DOT SRP MI-101, but were expand to shown additional gate configurations depending on the width of the gate. A table for gate post footing depth and diameter (based upon gate height) was added.</p>
9060.103	Post Installation Adjacent to Retaining Walls	None	<p>A new figure was developed to detail post installation of a fence or railing behind a retaining wall.</p>

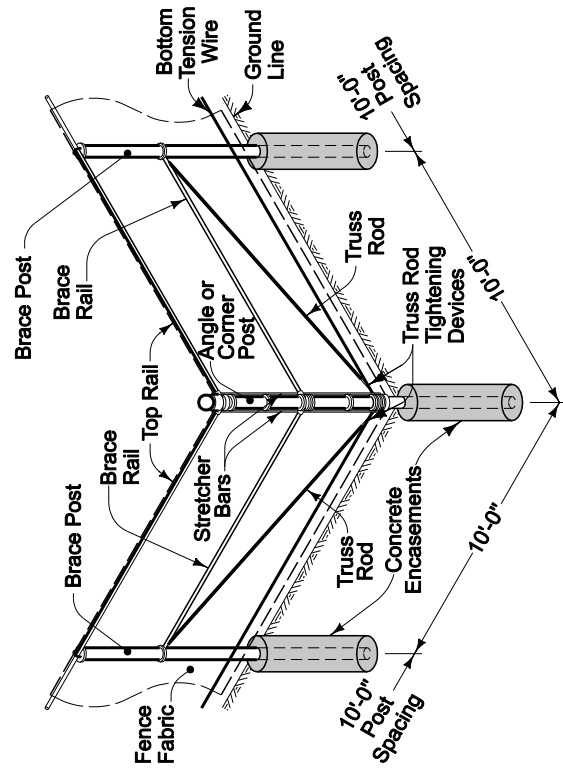
Note: highlighting is only for ease of reading

- Place fence fabric on roadway side of post. For certain curves, stream crossings, or other locations, the Contractor has the option to place fabric on the side of the post away from the roadway.
- ① Fabric width as specified in the contract documents.
 - ② For fence heights greater than 8 feet, the depth of the fence post footing is 3 feet plus 3 inches for each 1 foot in height over 8 feet.
 - ③ For rural installations, install the fence on the roadway side of the right-of-way when specified in the contract documents.



POST INSTALLATION

PULL POST INSTALLATION

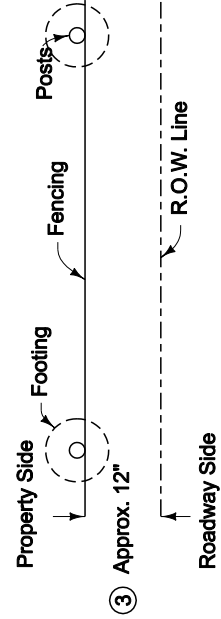


ANGLE OR CORNER POST INSTALLATION

FENCE POST FOOTING DEPTH AND DIAMETER

USE IN FENCE	FENCE HEIGHT					
	4'-0" and less	Y	X	Y	Over 8'-0"	Over 8'-0"
Line and Brace Posts	0'-8"	3'-0"	0'-10"	3'-0"	1'-0"	②
Terminal Post*	0'-10"	3'-0"	1'-0"	3'-0"	1'-4"	②

*Includes corner, angle, end, and pull posts.

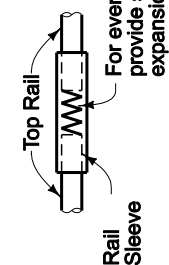
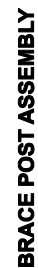


PLAN OF FENCE

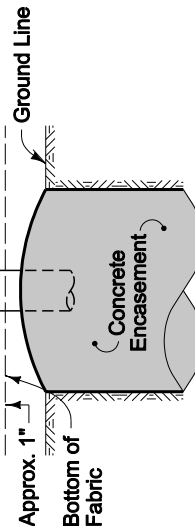


SUDAS Standard Specifications

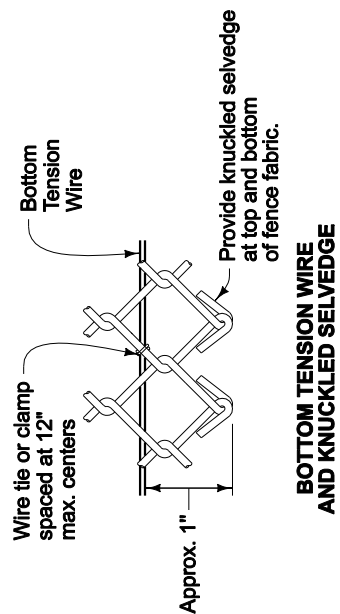
CHAIN LINK FENCE



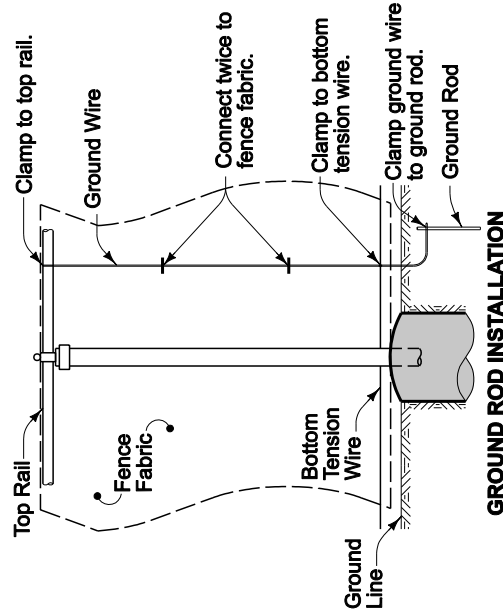
RAIL SLEEVE



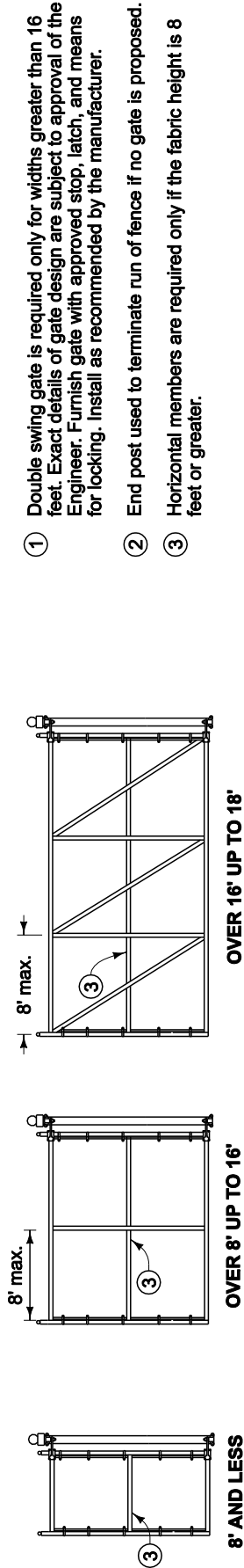
**ANGLE, CORNER, OR
END POST ASSEMBLY**



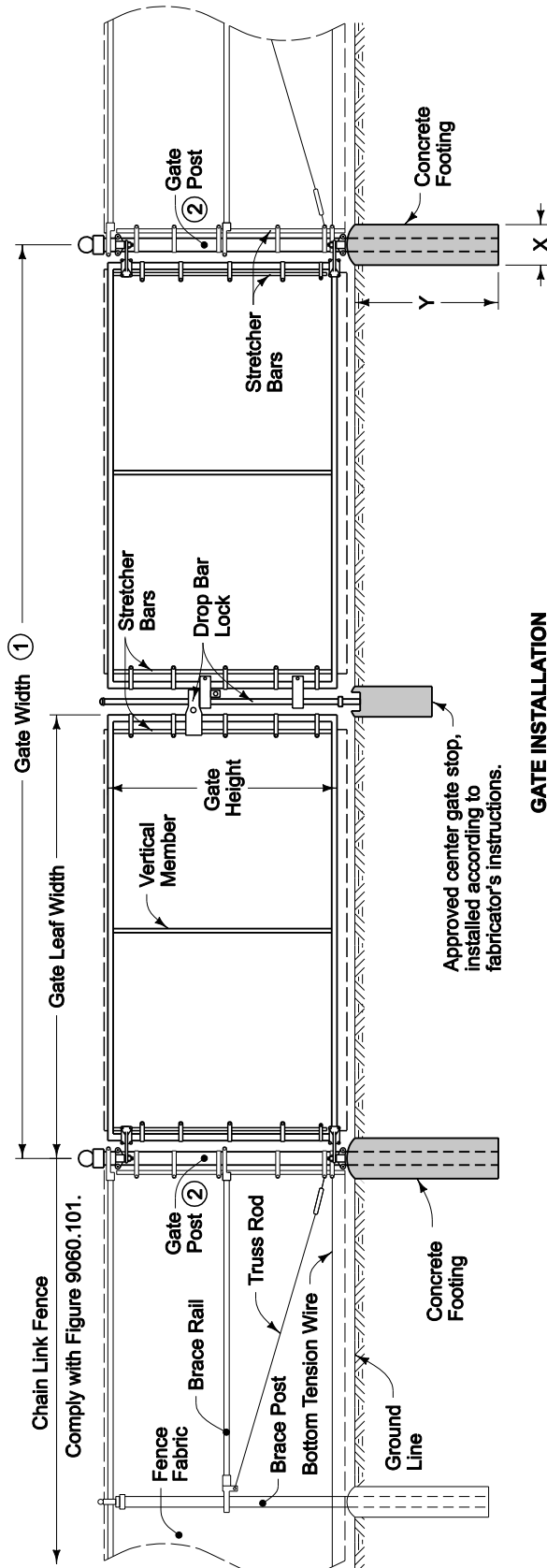
BOTTOM TENSION WIRE AND KNUCKLED SELVEDGE



GROUND ROD INSTALLATION



FRAME PATTERNS FOR VARIOUS GATE OPENINGS



GATE INSTALLATION

GATE POST FOOTING DEPTH AND DIAMETER

GATE HEIGHT	GATE LEAF WIDTH	X	Y
6'-0" or less	4'-0" or less	0'-10"	3'-0"
6'-0" or less	over 4'-0" to 10'-0"	0'-12"	3'-0"
6'-0" or less	over 10'-0" to 18'-0"	1'-2"	3'-0"
over 6'-0"	6'-0" or less	0'-10"	3'-0"
over 6'-0"	over 6'-0" to 12'-0"	1'-0"	3'-0"
over 6'-0"	over 12'-0" to 18'-0"	1'-4"	3'-6"
over 6'-0"	over 18'-0" to 24'-0"	1'-6"	4'-0"

REVISION

New

10-18-11

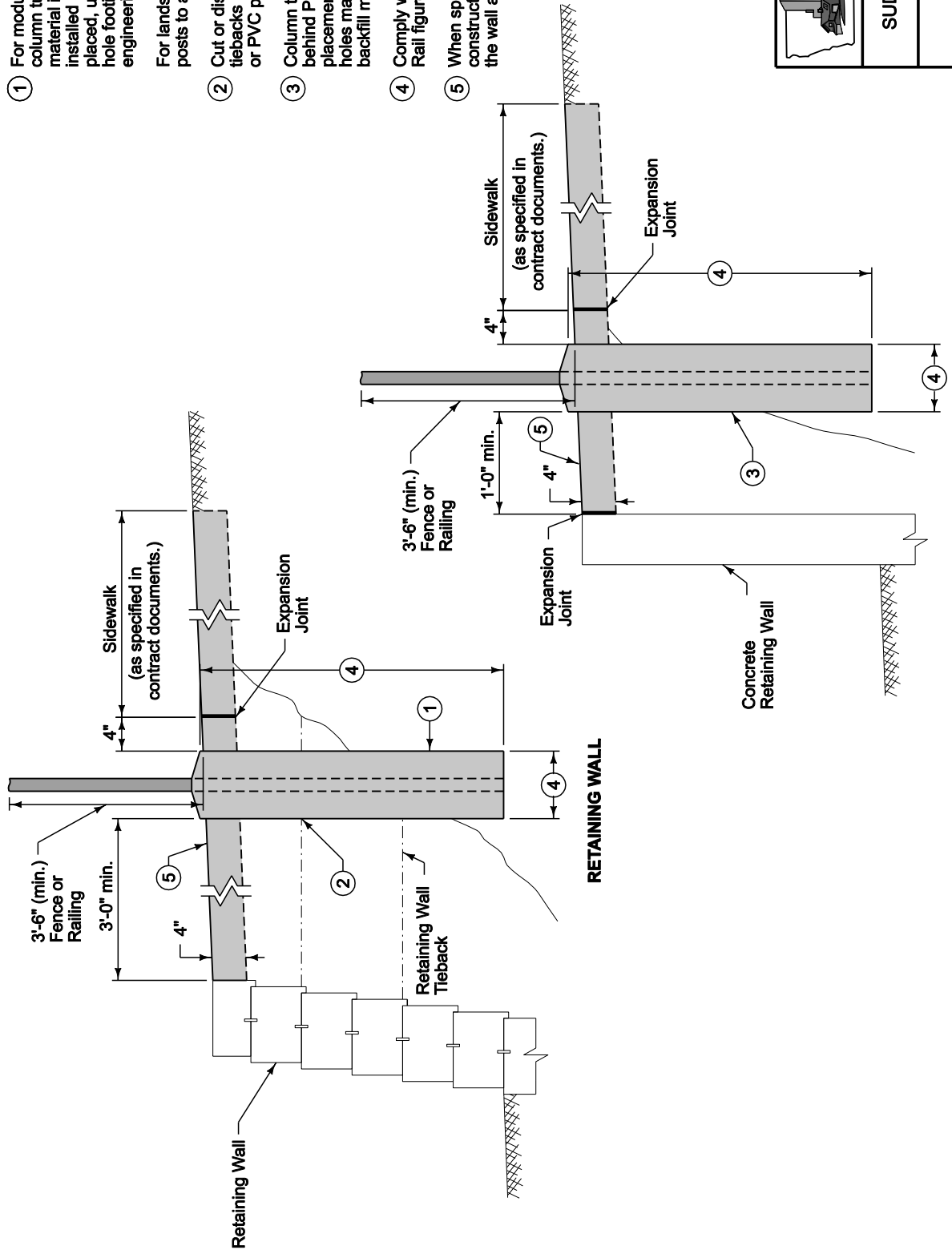
9060.102

SHEET 1 of 1

SUDAS Standard Specifications

CHAIN LINK GATE

- ① For modular block retaining walls, install column tube or PVC pipe as backfill material is placed. When fence is installed after backfill material is placed, utilize hand excavation of post hole footings to avoid damaging engineering fabric tiebacks.
- For landscape timber walls, locate fence posts to avoid timber tiebacks.
- ② Cut or displace engineering fabric tiebacks (if present) around column tube or PVC pipe.
- ③ Column tubes or PVC pipes may be installed behind PCC retaining walls during placement of backfill material or post holes may be excavated upon completion of backfill material placement.
- ④ Comply with Chain Link Fence or Safety Rail figures for post footing dimensions.
- ⑤ When specified in the contract documents, construct a PCC cap between the back of the wall and the fence or rail.



	REVISION	
	New	10-18-11
	9060.103	
SHEET 1 of 1		

SUDAS Standard Specifications
POST INSTALLATION ADJACENT TO RETAINING WALLS

Section 9070 Figures

Landscape Retaining Walls

Summary of Revisions to 9070 Figures Landscape Retaining Walls

Revised Figures:

New #	Proposed Name	Current #	Summary of Changes
9070.101	Landscape Timber Retaining Wall	9070.4	The use of RR ties for retaining walls was eliminated from the specifications. Height of wall was restricted to 4 feet. Figure was updated to match the specifications. Added filter fabric around the porous backfill. Added a general note referencing the fence or stair/handrail section. Extended the leveling pad back under the porous backfill area. Added note to use suitable soil for backfill in the excavated area.
9070.102	Modular Block Retaining Wall	9070.5	Figure was renamed to match the specifications. A note was added indicating that for walls greater than 4' in height, use segmental block retaining walls. Added filter fabric around the porous backfill. Added a general note referencing the fence or stair/handrail section.
9070.103	Limestone Retaining Wall	9070.1	At the request of the SUDAS Districts, a limestone retaining wall detail was added back into the specifications. The new detail is based upon the revised specifications.

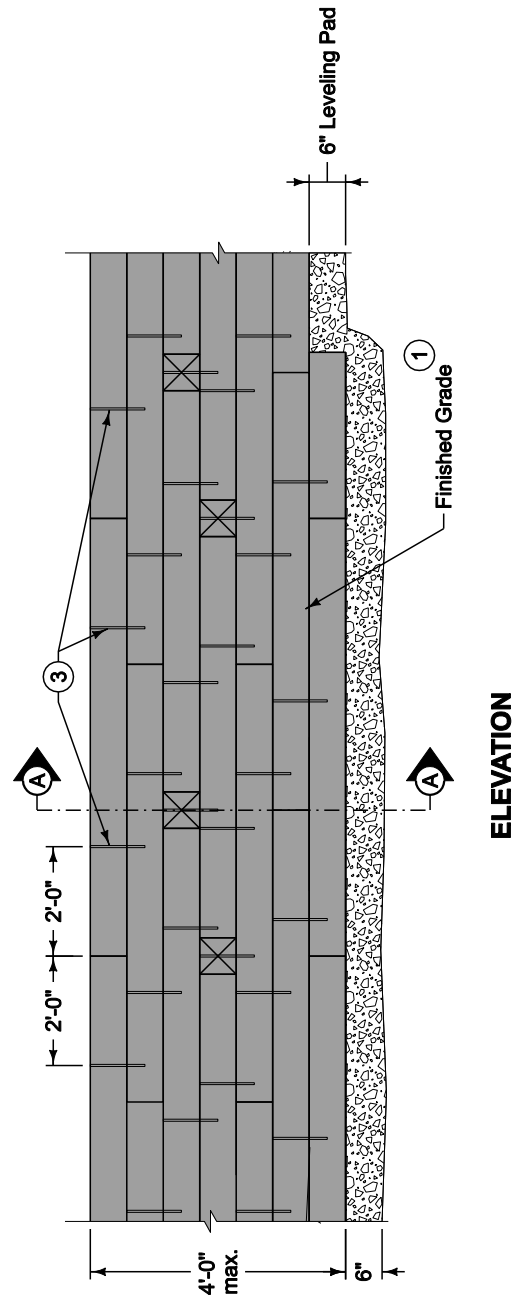
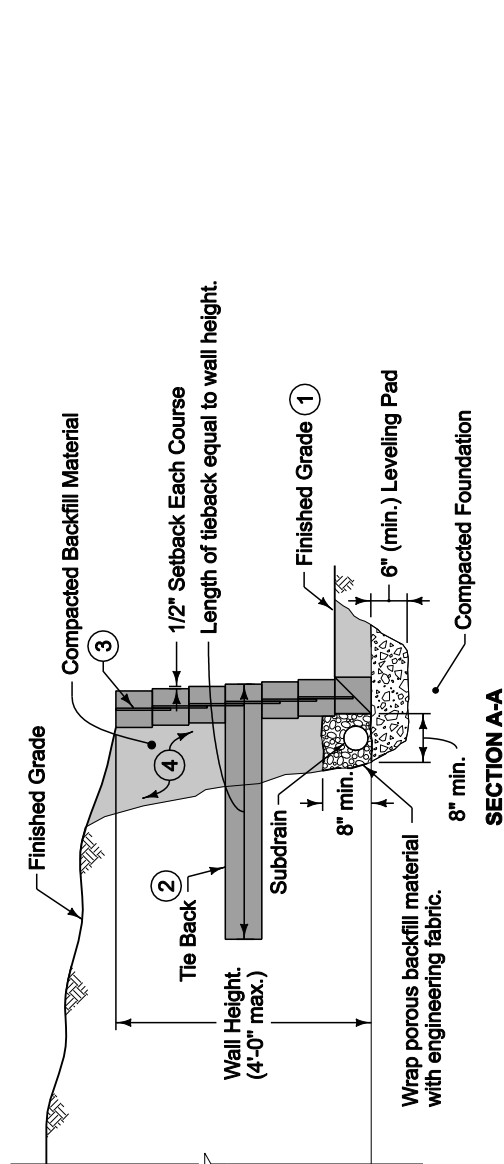
Note: highlighting is only for ease of reading

Figures to Archive:

Current #	Current Name	Comments
9070.1	Dry Walls	Broken concrete was eliminated as a retaining wall material. New figures were developed for modular block and limestone retaining walls.
9070.2	Tree Dry Wells	Specific retaining wall dimensions and grading for tree dry wells need to be detailed in the project plans. The existing figure does not appear to add any information that would not be shown in the plans.
9070.3	Retaining Walls Adjacent to Driveways	Retaining walls should be laid out on a case by case basis. The only information shown is that the radius of the wall is 5 feet and the driveway pavement extends to the wall. The radius used can vary and should be shown on the plans.

If the contract documents require fence or safety rail along the top of the retaining wall, comply with Section 9060 or Section 9080.

- ① Construct entire first course of timbers beneath finished grade.
- ② No tie backs in upper two courses or lower three courses of timbers. Stagger tie back location.
- ③ Secure each course with spikes.
- ④ Excavate and place backfill material. Use suitable soil or granular material.



REVISION
New 10-17-11

9070.101

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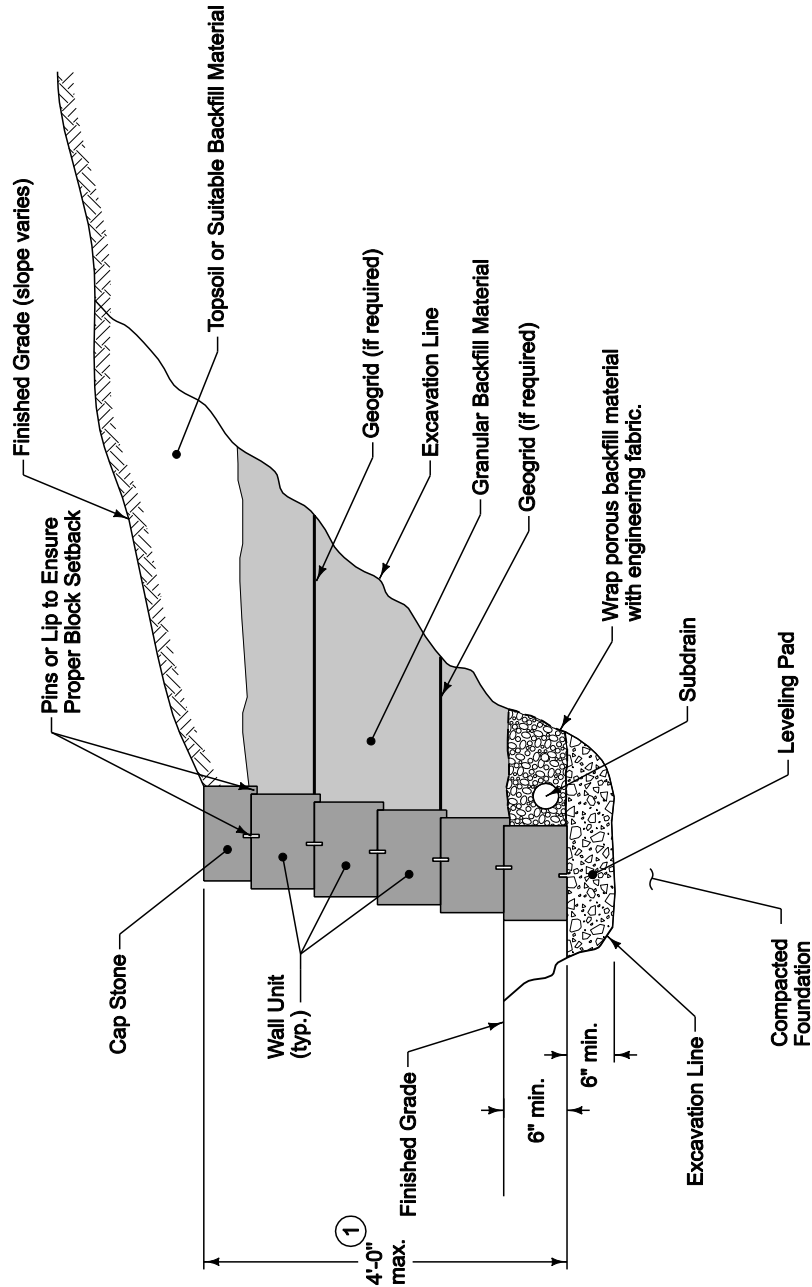
SUDAS Standard Specifications

LANDSCAPE TIMBER RETAINING WALL

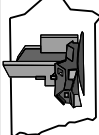
Exact dimensions, wall batter, backfill limits, reinforcement, and leveling pad materials and dimensions will be specified by the wall manufacturer.

If the contract documents require fence or safety rail along the top of the retaining wall, comply with Section 9060 or Section 9080.

- ① For walls higher than 4 feet, use segmental block retaining wall.

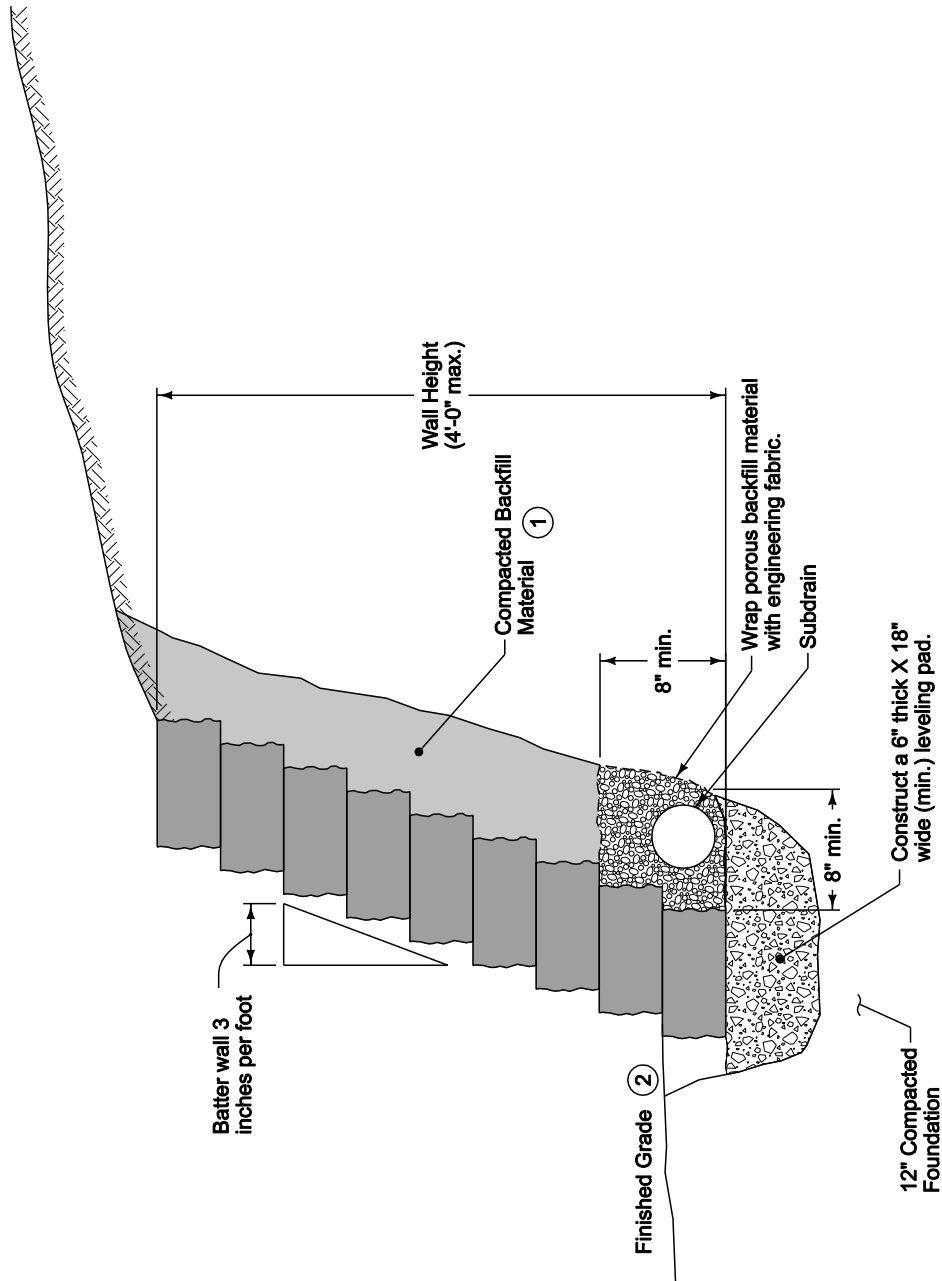


TYPICAL SECTION

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	New	
	9070.102	
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SUDAS Standard Specifications		
MODULAR BLOCK RETAINING WALL		

If the contract documents require fence or safety rail along the top of the retaining wall, comply with Section 9060 or Section 9080.

- ① Compact backfill material as wall construction progresses.
- ② Construct entire first course of limestone below finished grade.



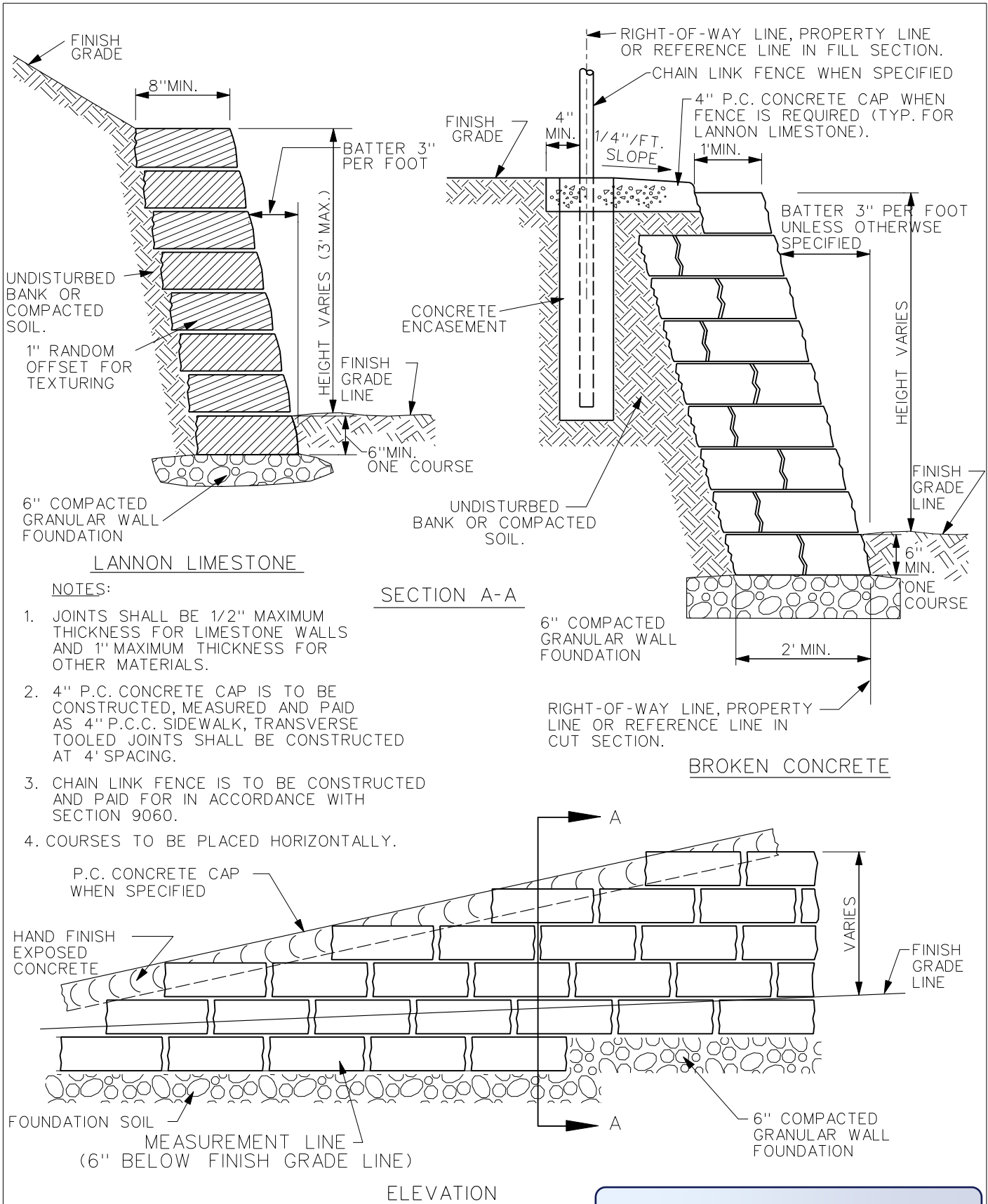
TYPICAL SECTION

	REVISION	10-17-11
	New	
	9070.103	
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LIMESTONE RETAINING WALL

SUDAS STANDARD SPECIFICATIONS



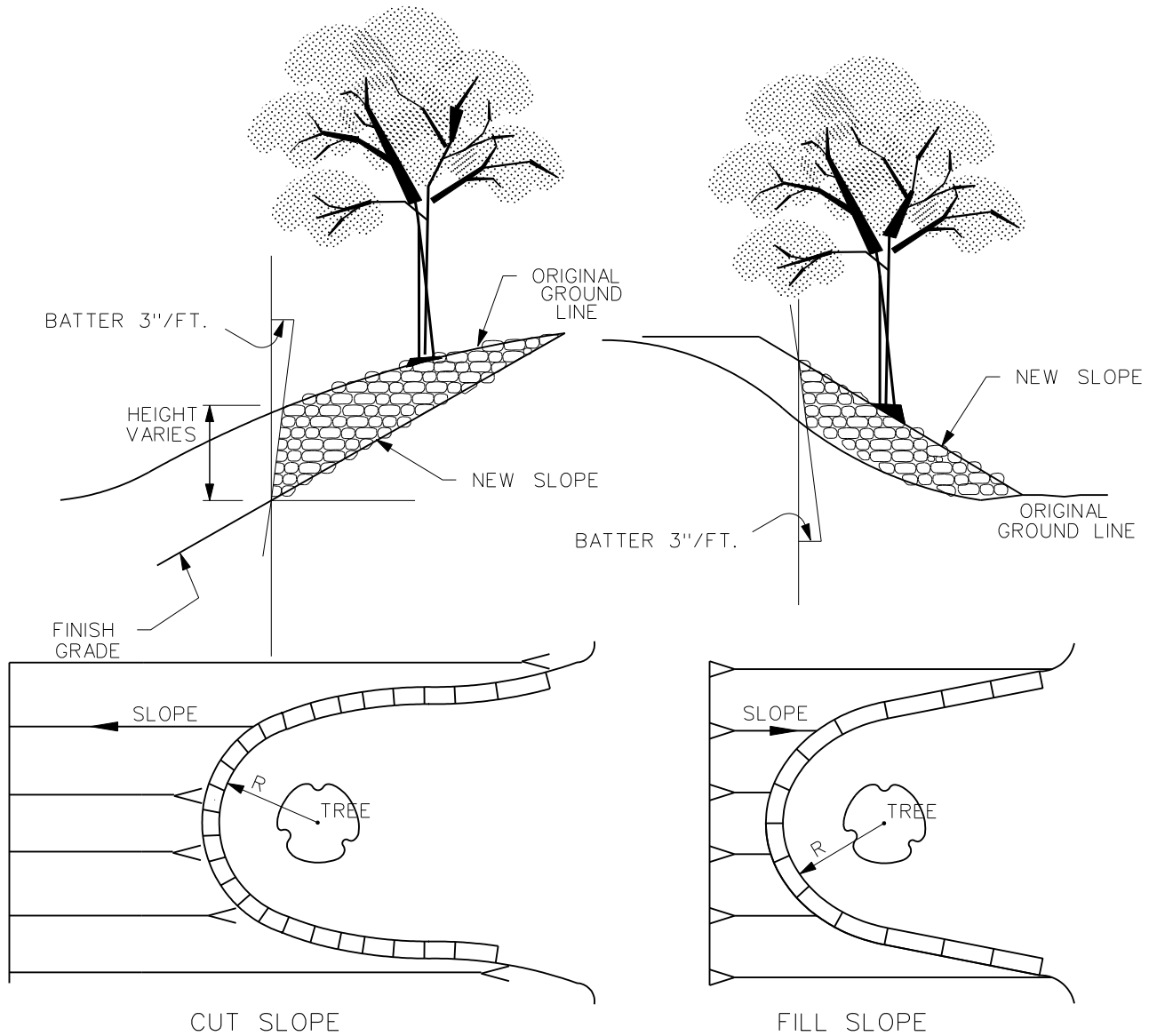
NOTES:

- JOINTS SHALL BE 1/2" MAXIMUM THICKNESS FOR LIMESTONE WALLS AND 1" MAXIMUM THICKNESS FOR OTHER MATERIALS.
- 4" P.C. CONCRETE CAP IS TO BE CONSTRUCTED, MEASURED AND PAID AS 4" P.C.C. SIDEWALK, TRANSVERSE TOOLED JOINTS SHALL BE CONSTRUCTED AT 4' SPACING.
- CHAIN LINK FENCE IS TO BE CONSTRUCTED AND PAID FOR IN ACCORDANCE WITH SECTION 9060.
- COURSES TO BE PLACED HORIZONTALLY.

Archive Current Figure

REV.	DATE	BY	DRY WALLS	FIGURE: 9070.1
	DATE: 03-03-98			SHEET 1 OF 1

SUDAS STANDARD SPECIFICATIONS



TREE DIA.	MIN. R (FT)
LESS THAN 6"	3'
6" - 12"	4'
12" - 18"	6'
GREATER THAN 18"	8'
OR AS APPROVED BY JURISDICTIONAL ENGINEER	

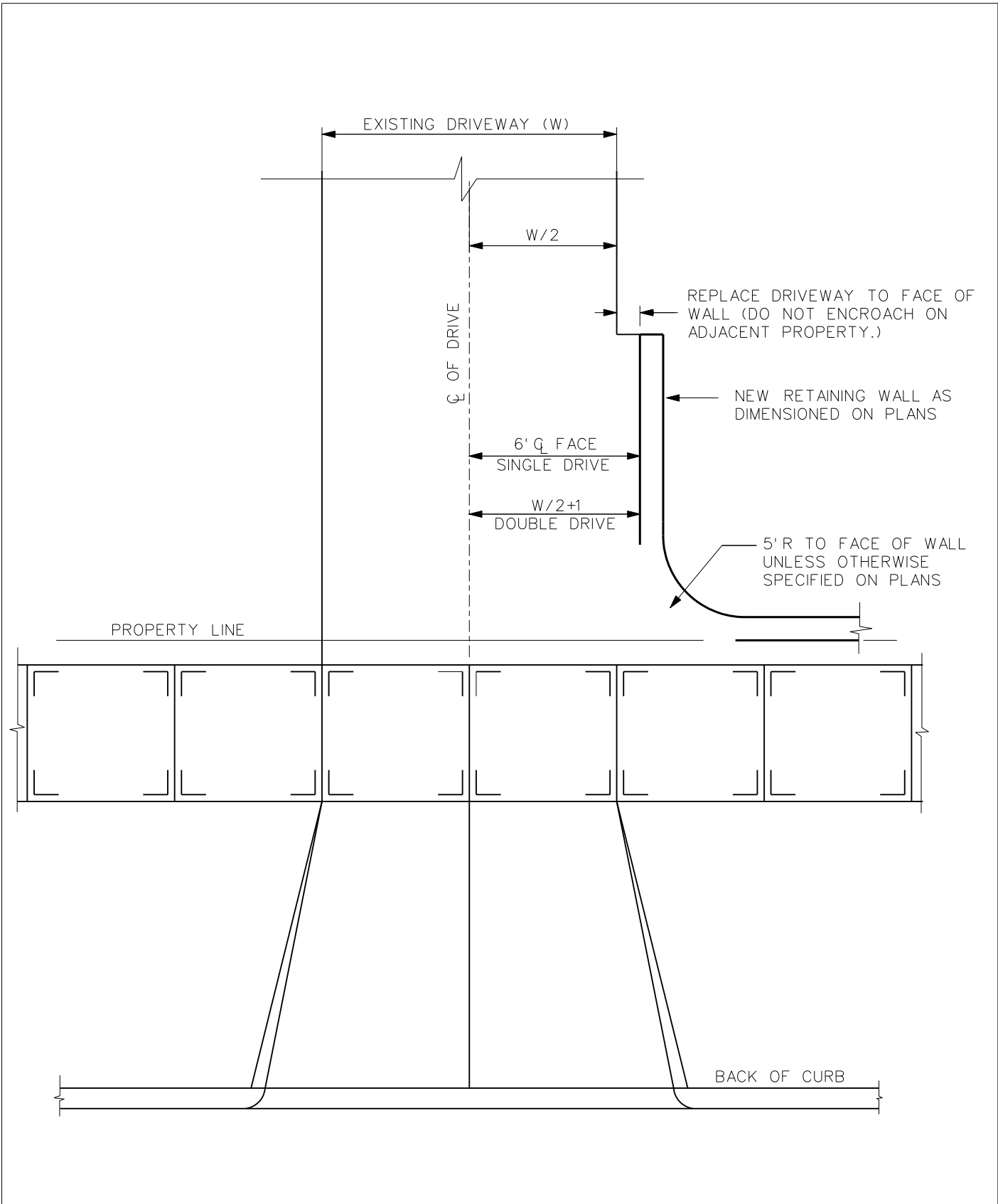
NOTE:

THE JURISDICTIONAL ENGINEER SHALL APPROVE SIZE AND SHAPE OF TREE WALL PRIOR TO CONSTRUCTION.

Archive Current Figure

			Archive Current Figure	
REV.	DATE	BY	TREE DRY WELLS	FIGURE: 9070.2
DATE: 01-01-98				SHEET 1 OF 1

SUDAS STANDARD SPECIFICATIONS



Archive Current Figure

			RETAINING WALLS ADJACENT TO DRIVEWAYS		FIGURE: 9070.3
REV.	DATE	BY			
DATE: 01-01-98					SHEET 1 OF 1

Section 9072 Figures

Combined Concrete Sidewalk and Retaining Wall

**Summary of Revisions to 9072 Figures
Combined Concrete Sidewalk and Retaining Walls**

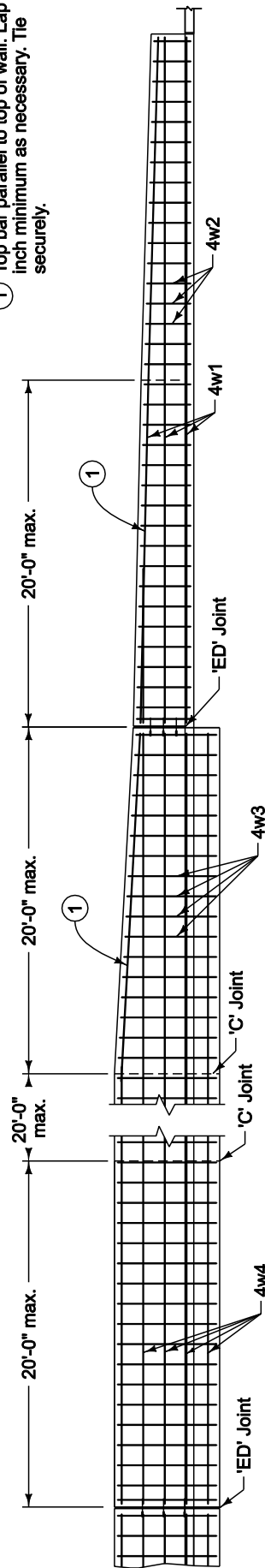
Revised Figures:

New #	Proposed Name	Current #	Summary of Changes
9072.101	Combined Retaining Wall-Sidewalk	9070.6	Porous backfill was added behind Type A wall. The existing figure indicates the width of the sidewalk is 5'. An allowance, including a possible longitudinal joint, was made for wider sidewalks or trails. The typical longitudinal section was expanded to better detail the placement of expansion joints.

Provide a minimum concrete cover to near reinforcement of 1 1/2 inches. Provide 3 inches minimum cover at the ends of bars.

If the contract documents require fence or safety rail along the top of the retaining wall, comply with Section 9060 or Section 9080.

- ① Top bar parallel to top of wall. Lap 6 inch minimum as necessary. Tie securely.

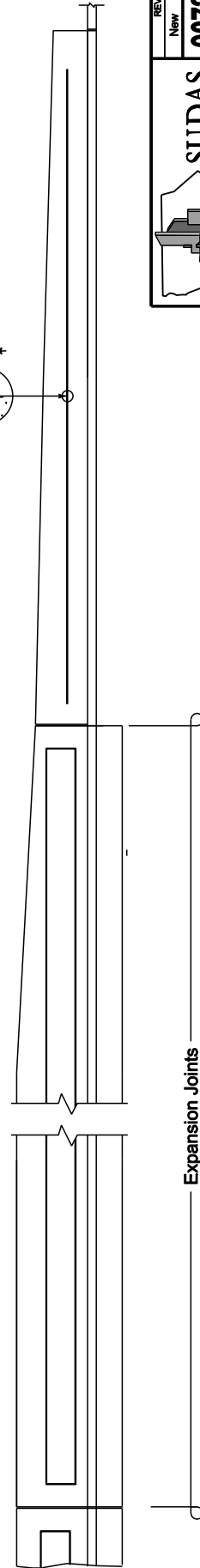


TYPE B WALL

TYPE A WALL

TYPICAL LONGITUDINAL SECTION OF RETAINING WALL

Use 1" half-round beveled 1"x1" or other approved device.



TYPICAL RUSTICATION DETAIL

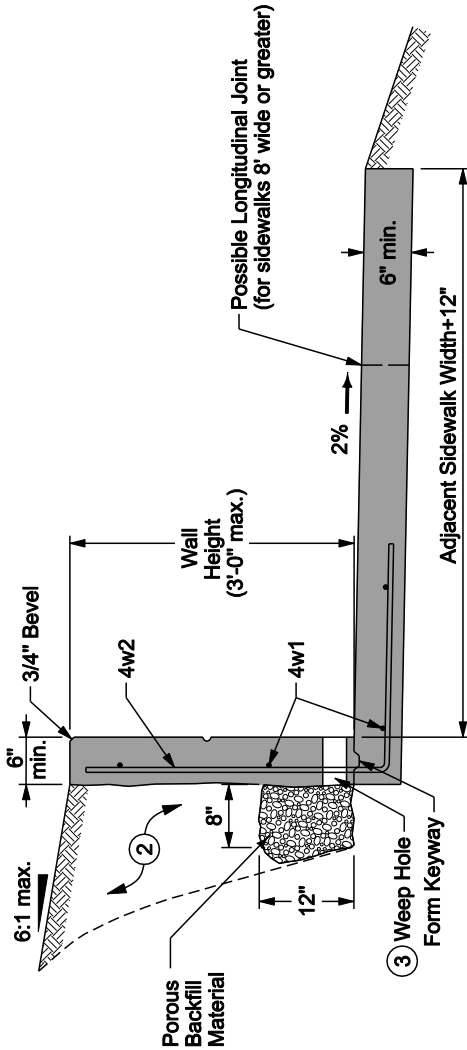
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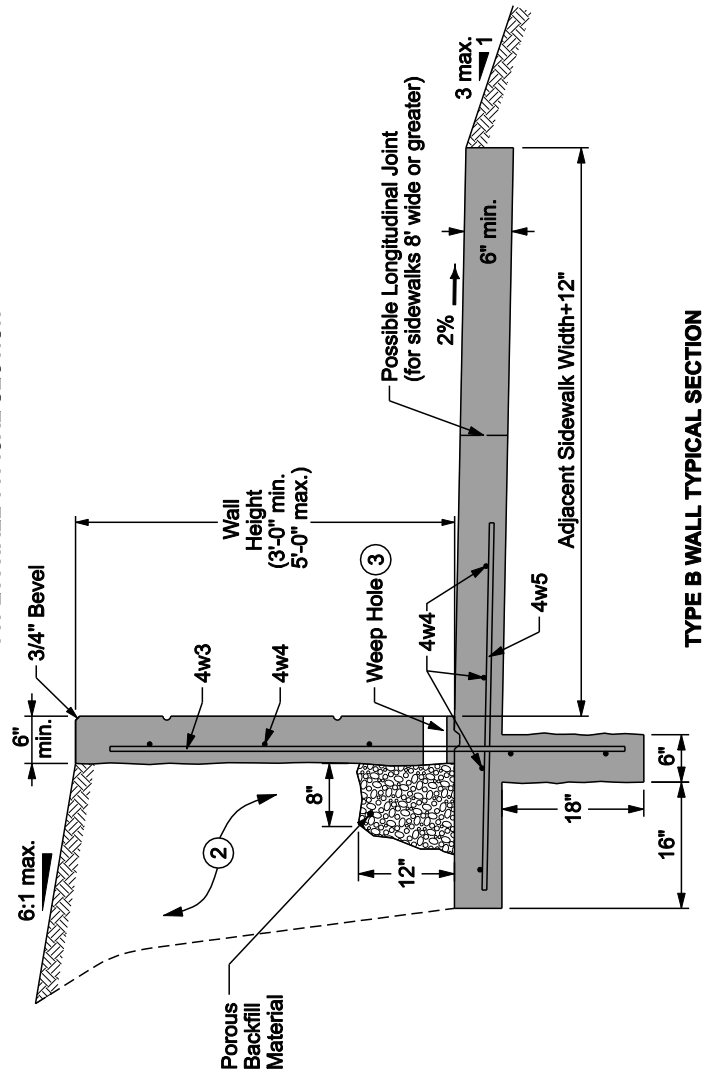
COMBINED RETAINING WALL - SIDEWALK

Provide a minimum concrete cover to near reinforcement of 1 1/2 inches. Provide 3 inches minimum cover at the ends of bars.

- ② Excavate and place backfill material as necessary. May use suitable soil or granular material.
- ③ Provide 3 inch diameter weep holes at 8 foot intervals.



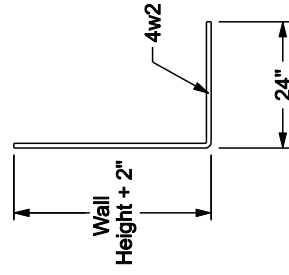
TYPE A WALL TYPICAL SECTION

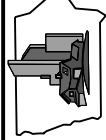


TYPE B WALL TYPICAL SECTION

REINFORCING BAR LIST					
Wall Type	Mark	Size	Shape	Length	Spacing
Type A	4w1	4	—	Variable	15"
	4w2	4	L	Variable	14"
Type B	4w3	4	—	Wall Height + 18"	14"
	4w4	4	—	Variable	15"
	4w5	4	—	3'-10"	14"

BENT BARS





SUDAS

REVISION
New 10-17-11

9072.101

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SUDAS Standard Specifications

COMBINED RETAINING WALL - SIDEWALK

Section 9080 Figures

Concrete Steps, Handrail, and Safety Rail

Summary of Revisions to 9080 Figures Concrete Steps, Handrail, and Safety Rail

Revised Figures:

New #	Proposed Name	Current #	Summary of Changes
9080.101	Type A Concrete Steps with Handrail	9080.1	Completely redesigned steps to meet ADA requirements including: limiting riser height to meet ADA regulations and modifying handrail to meet PROWAG requirements. Made landing at the bottom of the stairs integral to the stairs to accommodate handrail requirements. Added an isometric view. Added a 4:1 slope to the rise:run table.
9080.102	Type B Concrete Steps with Handrail	9080.2	Same revisions as for Type A steps. Showed the retaining wall
9080.103	Safety Rail	None	Developed a new figure detailing pedestrian safety rail for use along retaining walls or other drop offs. New figure complies with current building codes.

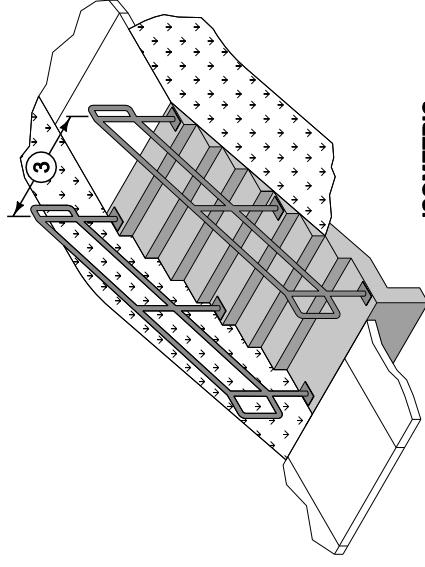
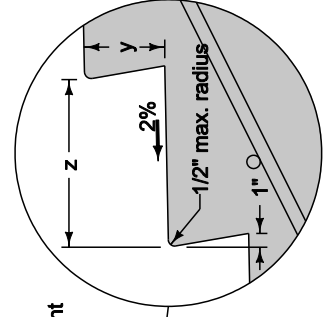
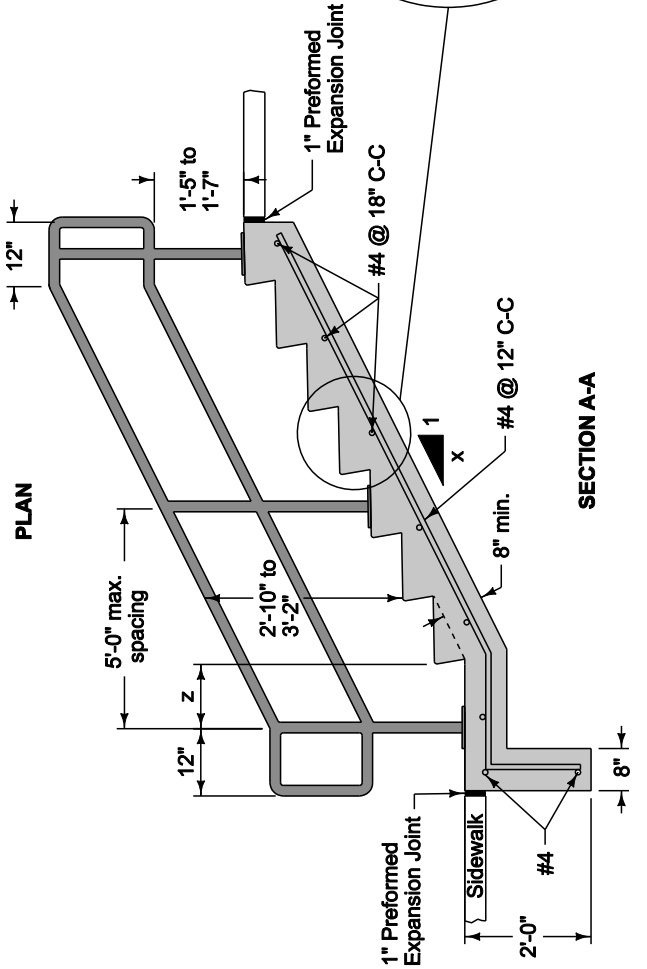
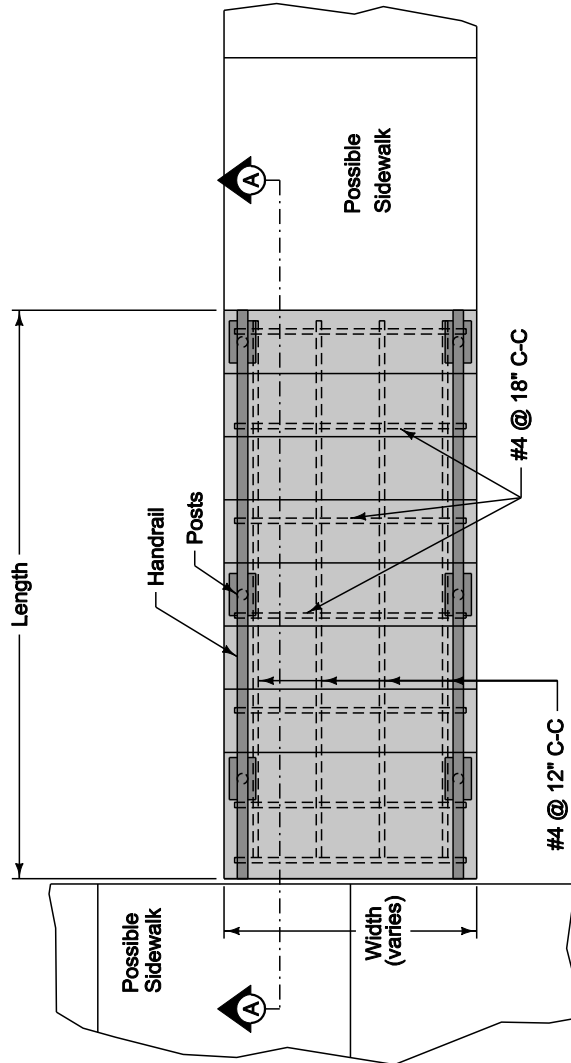
Note: highlighting is only for ease of reading

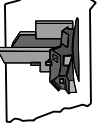
Provide a minimum of 2 inches of cover for all reinforcing.

Ensure all risers are an equal height and all treads are an equal depth within a flight of stairs.

- ① Minimum riser height is 4 inches.
Maximum riser height is 7 inches.
- ② Minimum tread depth is 11 inches.
- ③ Match existing sidewalk width.

	Rise ①	Tread ②
x	y	z
2	6"	12"
3	5"	15"
4	4"	16"





SUDAS

REVISION
New 10-17-11

9080.101

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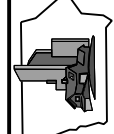
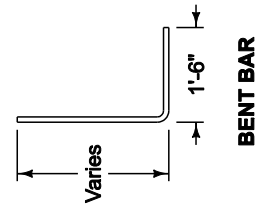
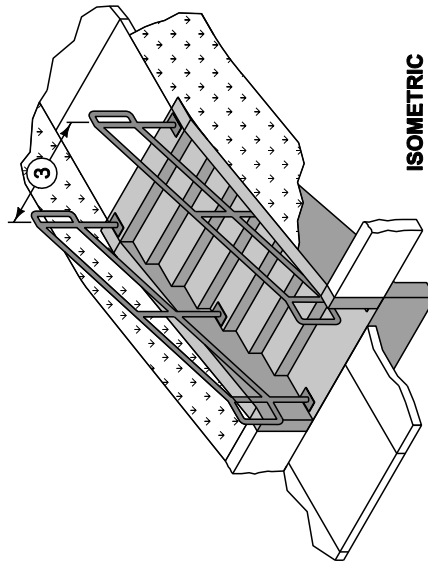
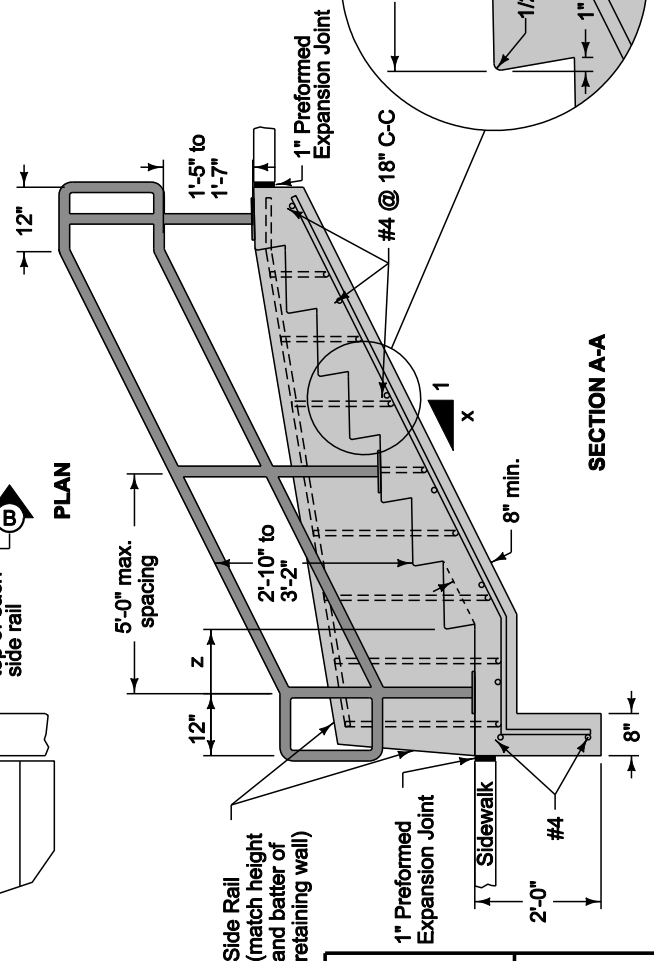
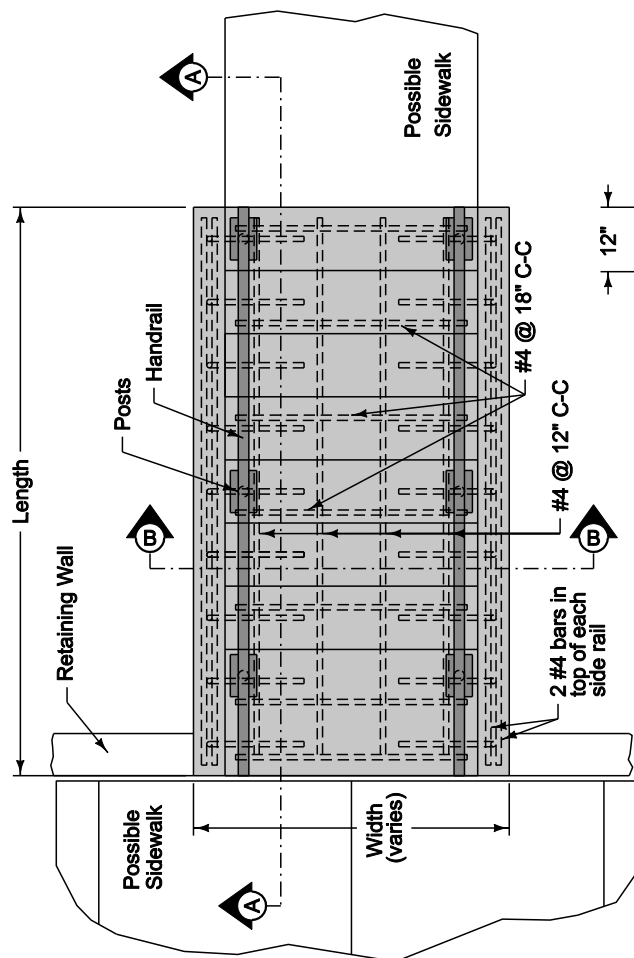
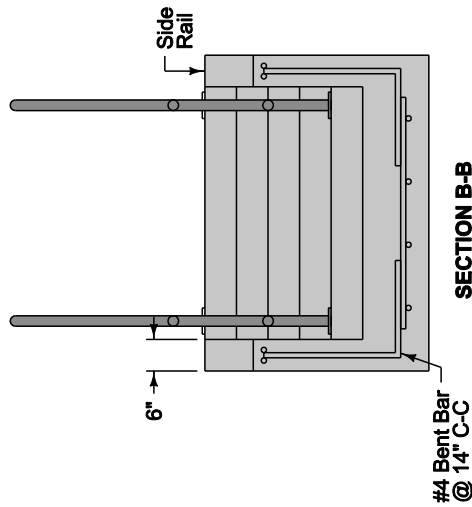
SUDAS Standard Specifications

**TYPE A CONCRETE STEPS
WITH HANDRAIL**

Ensure all risers are an equal height and all treads are an equal depth within a flight of stairs.

- ① Minimum riser height is 4 inches. Maximum riser height is 7 inches.
- ② Minimum tread depth is 11 inches.
- ③ Match existing sidewalk width.

	Rise ①	Tread ②
x	y	z
2	6"	12"
3	5"	15"
4	4"	16"



REVISION

New

9080.102

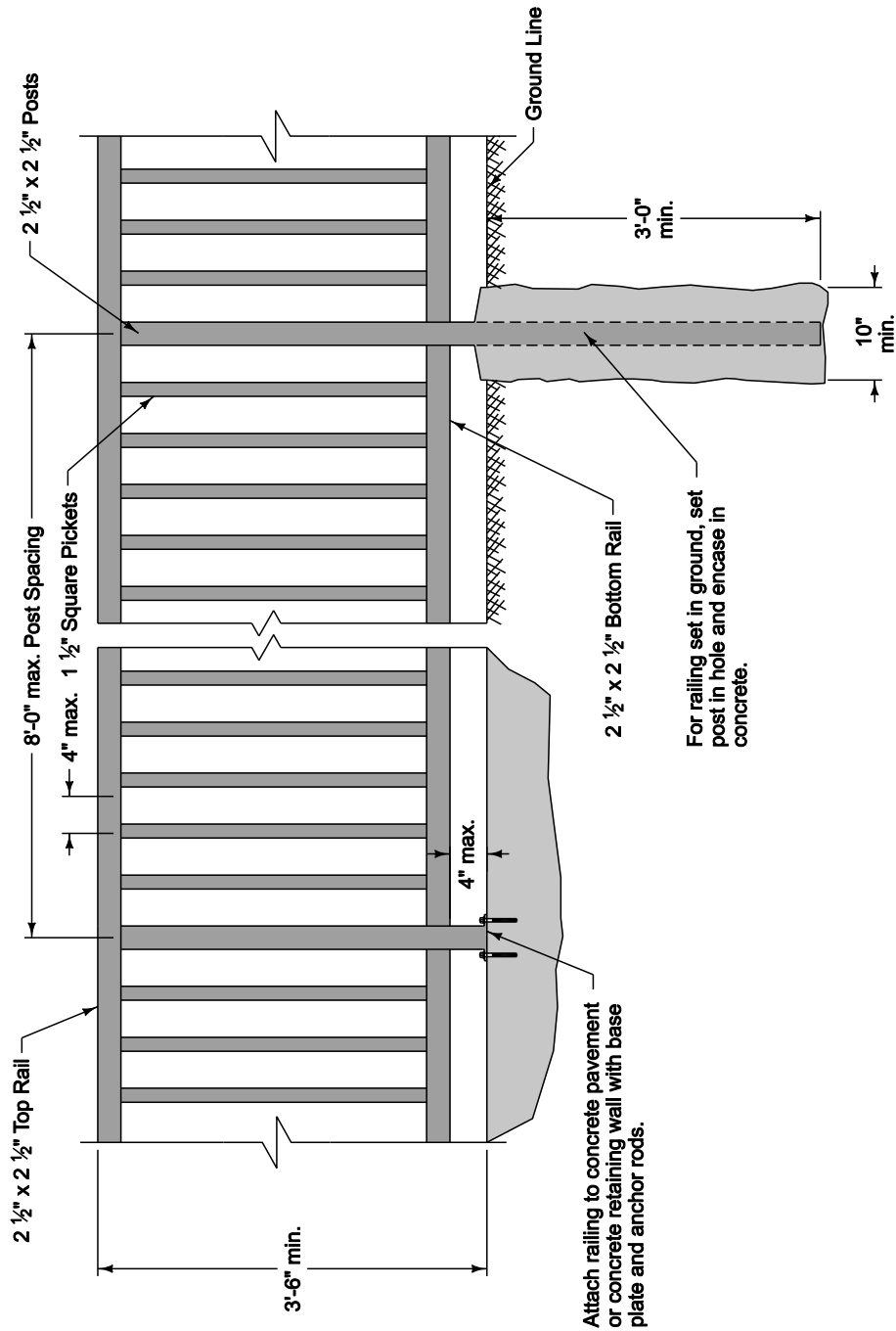
SHEET 1 of 1

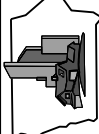
SUDAS Standard Specifications

TYPE B CONCRETE STEPS WITH HANDRAIL

Weld all components with 1/4 inch fillet welds. Grind welds and connections as required to provide a smooth surface, free of burrs.

Field paint safety rail after installation as specified in the contract documents.



	REVISION		
	New	10-18-11	
	9080.103		
SUDAS		SHEET 1 of 1	
SUDAS Standard Specifications			
SAFETY RAIL			