2026 Edition Revisions to the SUDAS Standard Specifications

To updated your printed manual, print this packet. Then remove the old sheets and place the revised sheets in your manual. Some pages are completely new and do not replace an existing sheet. Also, some pages do not contain revisions, but are included due to changes on the other side or a change in the page number. **PLEASE READ CAREFULLY - PAY ATTENTION TO THE SECTION NUMBER!** Included shading to help distinguish between divisions. Questions can be directed to Beth Richards - brich@iastate.edu. The current edition of the manual, with the latest revisions incorporated, can be found at www.iowasudas.org.

Div	***Section***	***pg #***	***Summary of Revision(s)***
Manual introductory info			Updated the Contributors and Acknowledgments and general table of contents pages. *Note - if you want to replace the small business card for the spine of your manual, you can print a copy from our website.*
1	1090, 1.05, B	2	Revised due to a new law lowering the maximum amount of retainage from 5% to 3%.
2	Table of Contents	i	Updated table of contents based on revisions made in Division 2.
	2010, 3.06, B	17	Modified language to add expiration and conditions to require proof rolling to be performed again.
3	3010, 1.08, F-H and 2.01	3-4	Added bid items to pay for concrete pipe supports of new and existing utility lines. Corrected references.
4	Table of Contents	vi	Updated table of contents based on revisions made in Division 4.
	4010, 2.01, B and D	5	Modified language to increase allowable pipe size for PVC pipes.
	4060, 2.01 and 3.02	2-8	Added language to better ensure quality of video inspections being performed and to allow rejection by the Engineer.
5	5010, 1.08, C	2	Added "furnishing and installing fittings" and "anchor blocks" to the includes items.
	5010, 2.05, B	7-8	Changed "tensile strength" to "breaking strength"
	Figure 5010.101	1-2	Revised to address questions regarding restrained joints and thrust blocks. *Note - this figure will be listed as "interim" for Iowa DOT until their October letting; it is approved as part of the 2026 Edition of the SUDAS Specifications.*
6	6010, 1.08, B & G; 2.09 & 2.11	1-10	Clarified intake bid item and two other minor bid item clarifications. Removed language prohibiting the use of heat shrinkable infiltration barriers based on independent testing performed.
7	Figure 7010.101	1-8	Oval dowels accidentally removed from the figure; ends with Figure 7010.102 (sheet 1) on the back of sheet 8. *Note - this figure will be listed as "interim" for Iowa DOT until their October letting; it is approved as part of the 2026 Edition of the SUDAS Specifications.*
	7020, 1.02, B, 2	1	Deleted reference to the Design Manual; the Specifications should not reference the Design Manual.
	7030, 3.08, A, 2	11	Changed Design Manual link to Figure 7030.204.
	Figure 7040.106	1	Minor revisions to create a shared figure with the Iowa DOT. *Note - this figure will be listed as "interim" for Iowa DOT until their October letting; it is approved as part of the 2026 Edition of the SUDAS Specifications.*
9	9040, 1.08, X, 1, c	9	Deleted "concrete" before "anchor trenches."

Contributors and Acknowledgments

In 2025, SUDAS staff held many meetings to accomplish the various revisions reflected in the 2026 versions of the SUDAS manuals. These revisions would not have been possible without the efforts of the SUDAS technical committee members. The SUDAS program's success is also due to the dedication of the district committees and Board of Directors. Keeping the SUDAS manuals current is an ongoing, cooperative effort, involving hundreds of people who volunteer their time and expertise. It is not possible to acknowledge each of these volunteers individually, but we appreciate them all.

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MEASUREMENT AND PAYMENT

1.01 MEASUREMENT

The determination of quantities of work performed under the contract will be made by the Engineer, based upon the lines and grades as shown on the plans and as given during the progress of the work or as evidenced by approved tickets for weight or liquid measure or by measurements made by the Engineer. All items will be computed in the units shown in the contract.

1.02 SCOPE OF PAYMENT

A. The Contractor shall receive and accept the compensation provided in the contract at unit prices, if it be a unit price contract; or at the lump sum price, if it be a lump sum price contract, except as may be modified by change orders. The compensation provided for in the contract shall constitute full payment for furnishing all labor, equipment, tools, and materials and for performing all work contemplated and embraced under the contract; for all loss or damage arising out of the nature of the work or from the action of the elements; for all expenses incurred by, or in consequence of, the suspension or discontinuance of the said prosecution of the work or from any unforeseen difficulties or obstructions that may arise or be encountered during the prosecution of the work; and for all risks of every description connected with the prosecution of the work until the final acceptance of the work by the Jurisdiction.

B. Neither the payment of any progress payment nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material. Payment will be made only for materials actually incorporated in the work, except as provided in Section 1090, 1.05 - Progress Payments.

C. The contract price for any item shall be full compensation for all labor, materials, supplies, equipment, tools, and all things of whatsoever nature required for the complete incorporation of the item into the work the same as though the item were to read "in place," unless the contract documents shall provide otherwise.

1.03 LUMP SUM BREAKDOWNS

A. If the contract is based on a lump sum bid price, or contains one or more lump sum items for which progress payments are to be made, the Contractor shall prepare and submit a breakdown estimate covering each lump sum item to the Engineer for approval. The breakdown estimate shall show the estimated value of each kind or item of work. The sum of the lump sum items listed in the breakdown estimates shall equal the contract lump sum. Overhead and profit shall not be listed as separate items.

B. The breakdown estimate shall be approved by the Engineer before any progress payments are prepared. An unbalanced breakdown estimate providing for overpayment to the Contractor for items of work to be performed first will not be approved but shall be revised by the Contractor and resubmitted until acceptable to the Engineer.

1.04 PAYMENT FOR CHANGE ORDERS

A. The Contractor's claims for extra work will not be paid unless the extra work covered by such claims was authorized by a change order as specified in Section 1040, 1.07 - Change Orders.

B. Payment for extra work shall be made in one or more of the following ways as determined by the agreement between the parties to the contract prior to the starting of the work.

1.04 PAYMENT FOR CHANGE ORDERS (Continued)

1. Unit Prices: By unit prices contained in the Contractor's original proposal and incorporated in the construction contract, so far as the same may apply.

2. Supplemental Schedule: By supplemental schedule of prices to include costs of all equipment, material, labor, supervision, management, insurance, overhead, and incidentals, said schedule to be submitted by the Contractor upon request of the Engineer and to be accepted by the Jurisdiction.

3. Lump Sum: By an acceptable lump sum proposal from the Contractor.

C. The percentage markup to be allowed to the Contractor for extra work performed by a subcontractor shall be in accordance with the following:

1. 10% of the first $50,000 with a $100 minimum.

2. 5% of the portion over $50,000.

1.05 PROGRESS PAYMENTS

A. Limits: Progress payments made under the contract, unless provided otherwise by law, shall be made according to Iowa Code Chapter 573, and shall be made on the basis of monthly estimates of labor performed and material delivered and incorporated in to the work, as determined by the Engineer. Payment may be made for materials not incorporated into the project if they can be specifically identified and cost verified by invoice. Progress payment requests shall be accompanied by the documentation required in Section 1090, 1.07, B - Sales Tax and Use Tax.

B. Retainage: The Jurisdiction shall retain from each monthly progress payment 3% of the amount determined to be due according to the estimate of the Engineer.

C. Quantities: Quantities used for progress payments shall be considered as only approximate and provisional and shall be subject to recalculation, adjustment, and correction by the Engineer in subsequent partial payments and in the final payment. Inclusion of any quantities in a progress payment, or failure to disapprove the work at the time of any progress payment, shall not be construed as acceptance of the corresponding work or materials.

1.06 PAYMENT OF RETAINAGE

A. Retained funds shall be retained by the Jurisdiction for a period of 30 calendar days after the completion and final acceptance of the improvement by the Jurisdiction. If at the end of the 30 calendar day period claims are on file as provided, the Jurisdiction shall continue to retain from the unpaid funds, a sum equal to double the total amount of all claims on file. The remaining balance of the unpaid fund, or if no claims are on file, the entire unpaid fund, shall be released and paid to the Contractor.

B. The Jurisdiction, the Contractor, any claimant for labor or material who has filed a claim, or the surety on any bond given for the performance of the contract, may, at any time after the expiration of 30 calendar days, and not later than 60 calendar days, following the completion and final acceptance of said improvement, bring action in equity in the county where the improvement is located to adjudicate all rights to said fund, or to enforce liability on said bond, pursuant to Iowa Code Chapter 573. Upon written demand of the Contractor, served in the manner prescribed for original notices, on the person filing a claim, requiring the claimant to commence action in court to enforce the claim, an action shall be commenced within 30 calendar days, otherwise the retained and unpaid funds due the Contractor shall be released to the Contractor.

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3.06 SUBGRADE PREPARATION (Continued)

3. Remove stones over 3 inches from subgrade.

4. Construct to elevation and cross-section such that, after rolling, surface will be above required subgrade elevation.

B. Subgrade Stability:

1. Perform proof rolling no more than 7 days prior to paving operations with a truck loaded as approved by the Engineer using either:
   a. A single axle or tandem truck fully loaded with rock or soil to the top of the truck's sideboards; or
   b. A single axle truck loaded with a rear axle weight of 13,500 pounds and total vehicle weight of 20,000 pounds or a tandem axle truck loaded with rear axle weight of 34,000 pounds and a total weight of 46,000 pounds. Verify axle and truck weights by tickets from a certified scale.

2. Operate trucks at less than 10 mph. Make multiple passes for every lane. The subgrade will be considered to be unstable if, under the operation of the loaded truck, the surface shows yielding (soil wave in front of the loaded tires) or rutting of more than 2 inches, measured from the top to the bottom of the rut at the outside edges.

3. If soft or yielding areas are located, remove unstable materials and replace with suitable foundation materials as approved by the Engineer, meeting Section 2010, 2.04. Compact subgrade materials in cut sections as required by the Engineer. If stabilization material is used, place and compact as required for subbase.

4. If more than 7 days pass, unsuitable material was replaced, or if rain occurs before the paving operation begins, perform proof rolling again unless waived by the Engineer.

C. Final Subgrade: Complete final subgrade by excavation to grade by use of steel-shod template supported on side forms, support rollers, or by use of an automatically-controlled subgrade excavating machine.

D. Subgrade Check: Check subgrade elevation and grade by method approved by Engineer prior to paving.

E. Ruts: If ruts or other objectionable irregularities form in subgrade during construction, re-shape and re-roll subgrade before placing pavement. Fill ruts or other depressions with material similar to other subgrade material, and compact.

3.07 SUBGRADE TREATMENT

A. Lime, Cement, Fly Ash, or Asphalt:

1. Incorporate the subgrade treatment material uniformly during subgrade preparation to the depth and rate specified in the contract documents.

2. Place subgrade treatment in the areas specified in the contract documents for the width of the pavement, plus 2 feet on each side.

B. Geogrid or Geotextiles:

1. Install according to manufacturer's recommendations, on top of the prepared subgrade.

2. Place in the areas specified in the contract documents for the width of the pavement, plus 2 feet on each side.

3.08 SUBBASE

A. Subgrade: Compact subgrade and shape smooth before subbase material is placed.

B. Construction: Construct the specified type of subbase to the specified depth, plus 2 feet outside the pavement area.

C. Moisture and Density: Compact subbase and provide testing according to Section 2010, 3.09.

D. Final Elevation:

1. Trim to the design elevation and shape to the final template with an automatically-controlled trimming machine. Excess material may be salvaged and spread for use on any other approved project location or operation.

2. Conform to the design profile and cross-section to the extent that no point is higher than the designated elevation, and no point is lower than 0.05 foot below the design elevation.

3. Ensure that the top 1 inch of the subbase is uniformly moist prior to paving.

4. Do not allow hauling equipment and other traffic on completed subbase.

3.09 FIELD QUALITY CONTROL

A. Compaction Testing: If it is specified in the contract documents that the Contractor will conduct compaction testing, use the services of an independent testing laboratory approved by the Engineer.

B. Moisture Content and Density:

1. Ensure that moisture content falls within a range of optimum moisture to 4% above optimum moisture.

2. Compact cohesive soils to no less than 95% of maximum Standard Proctor Density; and cohesionless soils to no less than 70% of Relative Density.

C. Testing:

1. Lab Test: Determine laboratory density of material according to ASTM D 698 or AASHTO T 99 (Standard Proctor Density) or ASTM D 4253 and ASTM D 4254 (Maximum and Minimum Index Density for Cohesionless Soils). Provide at least one analysis for each material type used unless provided by the Engineer.

2. Field Test:
   a. Perform in-place field density and moisture testing according to ASTM D 6938 (nuclear) or ASTM D 1556 (sand cone) and ASTM D 2216 (moisture content).
   b. Frequency:
      1) Urban Section: Provide one test per lift per 150 feet. If section is less than 300 feet, perform at least two tests per lift.
      2) Rural Section: Provide one test for each 500 cubic yards of material placed, with at least two tests per lift.

3. Test only locations selected by the Engineer.

4. The Engineer may require additional testing if noncompliance or change in conditions occur.

D. Test Failure: Rework, recompact, and retest as necessary until required compaction is achieved.

END OF SECTION

1.08 MEASUREMENT AND PAYMENT (Continued)

D. Removal, Disposal, and Replacement of Unsuitable Backfill Material:

1. **Measurement:** Measurement will be in cubic yards for the quantity of backfill material required to replace unsuitable backfill material removed during standard trench excavation. Measurement will be based on compacted material in place.

2. **Payment:** Payment will be at the unit price per cubic yard for the quantity of the suitable replacement backfill material furnished.

3. **Includes:** Unit price includes, but is not limited to, removal, hauling, and disposal costs of the unsuitable material and the furnishing, hauling, and placing of the suitable replacement backfill material. Unit price does not include landfill costs for contaminated materials.

E. Special Pipe Embedment or Encasement:

1. **Measurement:** Measurement will be by the linear foot along the centerline of pipe for each type of special embedment or encasement.

2. **Payment:** Payment will be at the unit price per linear foot for each type of special pipe embedment or encasement.

3. **Includes:** Unit price includes, but is not limited to, furnishing and placing all required special pipe embedment or encasement materials.

F. PCC Pipe Support Over Existing Utility:

1. **Measurement:** Measurement will be by each location.

2. **Payment:** Payment will be at the unit price for each pipe support.

3. **Includes:** Unit price includes, but is not limited to, furnishing and placing PCC pipe supports and associated materials.

G. Reinforced PCC Beam Utility Line Support:

1. **Measurement:** Measurement will be by each location.

2. **Payment:** Payment will be at the unit price for each reinforced PCC beam utility line support.

3. **Includes:** Unit price includes, but is not limited to, furnishing and placing reinforced PCC beam utility line support and associated materials.

H. Trench Compaction Testing: If the contract documents specify that the Contractor is responsible for trench compaction testing, measurement and payment will be as follows.

1. **Measurement:** Lump sum item; no measurement will be made.

2. **Payment:** Payment will be at the lump sum price for trench compaction testing.

3. **Includes:** Lump sum price includes, but is not limited to, all payments associated with retesting resulting from failure of initial tests.

PART 2 - PRODUCTS

2.01 MATERIALS EXCAVATED FROM A TRENCH

A. Standard Trench Excavation: All materials encountered during trench excavation, except rock and over-excavation.

1. **Suitable Backfill Material:** Class II, Class III, Class IVA, or Class IVB as defined in Section 3010, 2.03.

2. **Unsuitable Backfill Material:** Includes, but is not limited to, the following materials:
   a. Soils not classified as suitable backfill material, as defined in Section 3010, 2.03.
   b. Individual stones or concrete chunks larger than 6 inches and averaging more than one per each cubic foot of soil.
   c. Frozen materials.
   d. Stumps, logs, branches, and brush.
   e. Trash, metal, or construction waste.
   f. Soil in clumps or clods larger than 6 inches, and without sufficient fine materials to fill voids during placement.
   g. Environmentally contaminated soils.
   h. Materials removed as rock excavation or over-excavation.

3. **Topsoil:** Class V material. Comply with Section 3010, 2.04.

B. Rock Excavation: Boulders or sedimentary deposits that cannot be removed in trenches without continuous use of pneumatic tools or blasting.

C. Over-excavation: Excavation of unsuitable or unstable material in trenches below the pipe zone, comply with Figure 3010.101.

2.02 BEDDING MATERIAL

A. Class I Material:

1. Crushed stone complying with the following gradation:

Sieve	Percent Passing
1 1/2”	100
1”	95 to 100
1/2"	25 to 60
No. 4	0 to 10
No. 8	0 to 5

2. The Engineer may allow the use of gravel or authorize a change in gradation subject to materials available locally at the time of construction.

3. The Engineer may authorize the use of crushed PCC for pipe sizes up to 12 inches.

4. Use aggregates having a percentage of wear, Grading A or B, not exceeding 50%, determined according to AASHTO T 96.

Section 4040 - Subdrains and Footing Drain Collectors (Continued)

PART 2 - PRODUCTS

2.01 SANITARY SEWER (Gravity Mains)

A. Solid Wall Polyvinyl Chloride Pipe (PVC) 8 inch to 15 inch:

1. Comply with ASTM D 3034, SDR 26, unless SDR 35 is specified.

2. Pipe stiffness per ASTM D 2412.
   a. SDR 26: Minimum pipe stiffness of 115 psi.
   b. SDR 35: Minimum pipe stiffness of 46 psi.

3. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364.

4. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and ASTM F 477.

B. Solid Wall Polyvinyl Chloride Pipe (PVC) 18 inch to 48 inch:

1. Comply with ASTM F 679.

2. Pipe stiffness per ASTM D 2412, 46 psi.

3. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364.

4. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and ASTM F 477.

C. Corrugated Polyvinyl Chloride Pipe (PVC) 8 inch to 36 inch:

1. Comply with ASTM F 949, smooth interior, corrugated exterior.

2. Pipe stiffness per ASTM D 2412.
   a. 8 inch to 10 inch: Minimum pipe stiffness of 115 psi, unless 46 psi is specified.
   b. 12 inch to 36 inch: Minimum pipe stiffness of 46 psi.

3. PVC resin meeting ASTM D 1784, Cell Classification 12454.

4. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and ASTM F 477.

D. Closed Profile Polyvinyl Chloride Pipe (PVC) 21 inch to 60 inch:

1. Comply with ASTM F 1803.

2. Pipe stiffness per ASTM D 2412, 46 psi.

3. PVC plastic meeting ASTM D 1784, Cell Classification 12364.

4. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and ASTM F 477.

2.01 SANITARY SEWER (Gravity Mains) (Continued)

E. Polyvinyl Chloride Composite Pipe (truss type PVC) 8 inch to 15 inch:

1. Comply with ASTM D 2680. Pipe constructed with truss-type structure between inner and outer PVC walls with voids filled with lightweight concrete.

2. Pipe stiffness per ASTM D 2412, 200 psi.

3. PVC plastic meeting ASTM D 1784, Cell Classification 12454.

4. Integral bell and spigot joints with elastomeric seals complying with ASTM D 3212 and F 477.

F. Reinforced Concrete Pipe (RCP) 18 inch to 144 inch:

1. General:
a. Comply with ASTM C 76 (AASHTO M 170).
b. Minimum Class IV (3000D), Wall B.
c. Tongue and groove joints.
d. Rubber O-ring or profile gasket flexible joint complying with ASTM C 443.

2. Pipe Lining:
a. Epoxy Coal Tar:
1) Coat interior pipe barrel and all joint surfaces with two-component coal-tar epoxy-polyamide black paint or approved equal.
2) Lining Material: Steel Structures Painting Council (SSPC) Specification No. 16, Table 1.
a) Minimum epoxy resin content 34% to 35% by dry film weight.
b) Minimum sag resistance 40 mils.
c) Minimum solids 80% by volume.
3) Apply according to lining material manufacturer's recommendations.
b. PVC:
1) Minimum thickness of 0.65 inch.
2) Locking extensions extruded from the same material as the liner a minimum of 0.375 inches tall spaced a maximum of 2.5 inches.
3) Liner to cover the entire interior of the concrete pipe.
4) Minimum tensile strength of liner is 2200 psi with a minimum elongation of 200% at breaking.
5) Meet EPA 9090 for chemical resistance.
6) Free of cracks, cleavages, pinholes, or other defects.
7) Joint sealer strip to be from the same material as the liner.
c. HDPE:
1) Minimum thickness of 0.064 inches according to ASTM D5199.
2) Minimum density of 0.90 g/cm^3.
3) Meet EPA 9090 for chemical resistance.
4) Locking extensions made from the same material as the liner with minimum pullout strength of 14,000 pounds per square foot.
5) Free of cracks, cleavages, pinholes, or other defects.
6) Joint sealer strip to be from the same material as the liner.
7) If gasketed joints, comply with ASTM F 477 and ability to withstand a minimum groundwater pressure equal to that of the pipe liner or 20 psi, whichever is greater.

G. Ductile Iron Pipe (DIP) 8 inch to 54 inch:

1. General:
a. Comply with AWWA C151.
b. Minimum thickness Class 52.

CLEANING, INSPECTION, AND TESTING OF SEWERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cleaning, Inspecting, and Testing Sanitary Sewers

B. Cleaning, Inspecting, and Testing Storm Sewers

C. Cleaning and Inspecting Pipe Culverts

D. Cleaning and Inspecting Rehabilitated Pipes

1.02 DESCRIPTION OF WORK

A. Clean, inspect, and test sanitary sewer gravity mains, sanitary sewer force mains, and sanitary sewer service stubs.

B. Clean, inspect, and test storm sewers.

C. Clean and inspect pipe culverts.

D. Clean, inspect, and test rehabilitated pipe.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Notify Engineer at least 24 hours prior to performing testing.

B. The Engineer must be present to review testing procedures and to record results.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

Cleaning, inspecting, and testing sanitary sewers, storm sewers, pipe culverts, and rehabilitated pipes (including video inspection) are incidental to other project costs and will not be paid for separately.

PART 2 - PRODUCTS

2.01 TESTING EQUIPMENT

A. General: Comply with applicable sections of ASTM, NASSCO Specifications, and other applicable industry standards and codes.

B. Video Inspection:

1. Camera:
   a. High-resolution color with adjustable iris focus.
   b. Pan and tilt capabilities.
   c. Integral lighting suitable to provide proper illumination and a clear video image of the entire periphery of the pipe.
   d. Capable of operating in 100% humidity conditions.
   e. Produce a high quality video image.

2. Provide closed-circuit video inspection equipment capable of displaying on-screen footage of distance measured to within 1% of actual distance.

3. Record the inspection in color in the recording media specified by the Engineer. Forward the recording to the Engineer.

PART 3 - EXECUTION

3.01 CLEANING

A. Clean all sanitary sewers, storm sewers, and pipe culverts prior to testing by flushing with high pressure water and removing debris by vacuum extraction, and by removing sheeting, bracing, shoring, forms, soil sediment, concrete, or other debris.

B. Do not discharge soil sediment or debris to drainage channels, existing storm sewers, or existing sanitary sewers.

3.02 VIDEO INSPECTION

A. General:

1. Unless otherwise specified in the contract documents, conduct video inspection of all new and rehabilitated sanitary and storm sewers after all backfill and compaction operations are completed, but prior to paving.

2. Notify the Engineer the day prior to inspection so the Engineer may be present during the inspection.

3. Complete inspections under the supervision of a competent employee who has completed NASSCO's Pipeline Assessment Certification Program (PACP).

4. Notify the Engineer of the extent of noncompliance with the low spot depth tolerances in Section 4010 for sanitary sewers and Section 4020 for storm sewers.

5. Re-inspect sewers after any corrective action has been completed.

B. Inspection Procedure:

1. Prior to video inspection, run sufficient water through the pipe to saturate potential low spots so they may be detected during inspection.

2. Inspect each pipe segment between manholes or access points in a single, continuous run. Progress through the entire project in a uniform direction.

3. Pan camera around the circumference of each joint per NASSCO requirements.

4. Inspect all lateral connections and other observations at right angles utilizing the pan and tilt capabilities of the camera.

5. Center the video camera in the pipe during the inspection.

6. Do not exceed 30 feet of inspection per minute.

C. Inspection Reporting:

1. Provide a copy of the video inspection including on-screen continuous footage, pipe diameter, direction of viewing, and manhole and street location references in the recording. Affix labels to the recording media to include the name of the project, the date, and the location of the inspection.

2. Provide a written report of the inspection. In the report, include true-to-scale drawings of all sewer defects and observation locations. Reference the time stamp on each line item entry on the written report.

3.02 VIDEO INSPECTION (Continued)

D. Inspection Acceptance: The Engineer may reject videos failing to meet specifications. Any reinspection will be conducted at the Contractor's expense.

1. Videos can be rejected if the speed or comprehensiveness of the pan and tilt provided in the video does not allow full inspection of a lateral connection and joints.

2. Full observation of the new or rehabilitated pipe is required in the video provided after the inspection. If the amount of water, debris within the pipe, equipment present in the pipe, or other circumstances during the inspection results in a video not allowing the full observation of new or rehabilitated sewer pipe, the inspection can be rejected.

3.03 SANITARY SEWER LEAKAGE TESTING

Perform one or more of the following tests on new sanitary sewer gravity mains and sanitary sewer service stubs. Conduct tests only if service lines to any private properties are plugged and not active. Test sanitary sewer manholes separately as specified in Section 6030.

A. Sanitary Sewer Infiltration Testing:

1. Use only where ground water is more than 2 feet above top of pipe at highest point in section being tested.

2. Provide documented verification of ground water elevations for no less than 24 hours before measurement of infiltration.

3. Measure infiltration in sanitary sewer with a V-notch weir in a downstream manhole.

4. The maximum allowable infiltration for new sanitary sewers, including manholes, is 200 gallons per inch of diameter per mile of pipe per day.

B. Sanitary Sewer Exfiltration Testing:

1. General: Use an exfiltration test when ground water level is less than 2 feet above top of pipe at highest point in section being tested. Sectionalize the test section so the internal pressure in the pipe does not exceed 5 feet of water.

2. Test Procedures:

a. Install a watertight plug in the inlet of the upstream and downstream manhole of sewer section being tested.
b. Fill the sewer and upstream manhole with potable water until the water elevation in the upstream manhole is 2 feet higher than outside top of pipe in section being tested or 2 feet above existing ground water level, whichever is highest elevation.
c. Allow the water level to stabilize for 30 minutes, then refill the upstream manhole with water to the original level and begin the test.
d. Measure the amount of water lost in the upstream manhole in 1 hour. Use that amount to determine exfiltration in a 24 hour period.

3. Exfiltration Rate: The following table may be used to determine exfiltration in gallons per 24 hours by measuring the loss that occurs in 1 hour. The table is applicable only for 48 inch diameter manholes.

The maximum allowable exfiltration for new sanitary sewer, including manholes, is 200 gallons per inch of diameter per mile of pipe per day.

3.03 SANITARY SEWER LEAKAGE TESTING (Continued)

Table 4060.01: Loss in Gallons per 24 Hours for Drop in Water Level per Hour in 48 Inch Diameter Manhole (table may be interpolated to the nearest 1/4" drop)

Drop	0"	1"	2"	3"	4"	5"	6"	7"	8"	9"
	0	188	376	564	752	940	1128	1316	1504	1692

For manholes larger than 48 inch diameter use the following formula:

$G = 0.0816(H)(D^2)$

Where:
G = loss in gallons.
D = diameter of manhole in inches.
H = water level drop in manhole in inches.

C. Sanitary Sewer Low Pressure Air Testing:

1. General:

a. A low pressure air test may be used in lieu of an exfiltration test except as noted.
b. Air test is not recommended when ground water elevation is 2 feet or greater above the top of the pipe, and cannot be used when ground water is greater than 6 feet above the top of the pipe.
c. Use extreme care and follow safety precautions during testing operations. No one is allowed in manholes during testing.

2. Test Procedures:

a. Clean entire line of all debris. Flush or wet line to produce consistent results.
b. Plug all inlets and outlets to resist the test pressure. Special attention must be given to stoppers and laterals.
c. Determine the test duration for the section being tested from the following table. This table ignores pipe length and uses the factor 0.472 x d, with “d” being in inches. Pressure holding time is based on average holding pressure of 3.0 psi or drop from 3.5 psi to 2.5 psi.

Table 4060.02: Test Duration

Size Pipe (inches)	Test Period Duration (minutes)
8	4.0
10	5.0
12	6.0
15	7.0
18	8.5
21	10.0
24	11.5
27	13.0
30	14.0
36	17.0
42	20.0
48	23.0
54	25.5
60	28.5

3.03 SANITARY SEWER LEAKAGE TESTING (Continued)

d. Add air to the line segment being tested until the internal air pressure of the sewer line is raised to approximately 4.0 psi greater than the average back pressure of any ground water that may be over the top of the pipe. Pressure in the sewer should not exceed 5.0 psi. Allow at least 2 minutes for air pressure to stabilize.
e. When pressure has stabilized and is at or above the starting test pressure of 3.5 psi, commence the test. Record the drop in pressure for the test period. The test may be discontinued when the prescribed test time has been completed, even though 1.0 psi drop has not occurred.
f. If the ground water level at the time of testing is above the pipe invert, add 0.43 psi of air per foot of water above the invert to the test air pressure range of 2.5 psi to 3.5 psi stated above.
g. If the pressure drop exceeds 1.0 psi during the test period, the test will be considered to have failed. Repair and retest the line.

D. Sanitary Sewer Vacuum Testing: Comply with ASTM C 1244.

1. General:
a. Vacuum testing may be used in lieu of other specified test methods.
b. Use extreme care and follow safety precautions during testing operations. Keep personnel out of and away from manholes during testing.
c. Where practical, clean the pipe prior to testing and wet the pipe surface. Isolate the test segment as necessary, including closing service connections.

2. Test Procedures:
a. Determine the test time for the size of pipe being tested using the following table.

Table 4060.03: Minimum Test Time

Nominal Pipe Size (inches)	Time (Minutes/100 feet of pipe)
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
33	5.4
36	6.0

b. Test time is the time required for vacuum to drop from 3.5 to 2.5 psi.
c. Use a vacuum pump with the capacity to evacuate the sewer test section in time equal or less than that shown in Table 4060.03 for the size of pipe being tested.
d. Evacuate air until the internal air pressure of the sewer line is lowered by approximately 4.0 psi. Allow the air pressure to stabilize.
e. When the air pressure is stabilized near the starting test vacuum of 3.5 psi, commence the test by allowing gage pressure to drop to 3.5 psi, then commence time recording. Record the drop in vacuum for the test period.
f. If the drop in vacuum is 1.0 psi or less during the test period, the test will be considered successfully passed.
g. If the drop in vacuum is greater than 1.0 psi during the test period, inspect, evaluate, repair, and retest.

3.04 DEFLECTION TESTING

A. Perform deflection tests on all flexible sanitary sewer mains, excluding ductile iron pipe. Also perform deflection tests on all flexible storm sewer or culvert pipe 12 inches in diameter or greater.

B. Perform deflection tests after backfill has been in place at least 30 calendar days and before paving activity takes place, or as per appropriate sections of these specifications.

C. Pull 9 arm deflection mandrel, complying with applicable ASTM Standards, through sewer by hand.

D. Ensure pipe deflection does not exceed 5% of average inside diameter as established by ASTM Standards.

E. Remove and replace pipe exceeding deflection limits.

F. Handle and divert existing flows during deflection testing.

3.05 FORCE MAIN TESTING

A. Provide test pumps, test plugs, pipe, and gages. Make necessary piping connections.

B. Fill the force main with potable water and flush before testing to remove entrapped air. Other water sources may be used if approved by the Engineer.

C. Insert taps as required to remove air. Plug taps after the completion of tests.

D. Use a test pressure of 1.5 times the working pressure at the lowest point along the test section, but not less than 50 psi.

E. Pressurize the test section and allow it to stabilize prior to beginning the leakage test.

F. Maintain pressure to within 5 psi of the test pressure by pumping in potable water as required.

G. Leakage is the quantity of water that must be supplied into the test section to maintain pressure within 5 psi of the specified test pressure during a 2 hour test period.

H. The maximum allowable leakage is determined by the following formula:

$$L = \frac{(S)(D)(P)^{0.5}}{148{,}000}$$

Where:
L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal pipe diameter, in inches
P = average test pressure, in pounds per square inch

The following table assumes an average test pressure (P) of 50 psi and length of pipe (S) of 1,000 feet.

Table 4060.04: Maximum Allowable Leakage Rate

Pipe Diameter (inches)	Allowable Leakage Rate (gallons/hour/1,000 feet of pipe)
4	0.19
6	0.29
8	0.38
10	0.48
12	0.57
14	0.67
16	0.76

I. Examine exposed pipe and fittings during testing. Repair all visible leaks.

J. If the test indicates leakage greater than allowed, locate, repair, or replace damaged or defective pipe, and repeat tests until the requirements are met.

END OF SECTION

PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe

B. Fittings

C. Special Fittings

D. Pipeline Accessories

1.02 DESCRIPTION OF WORK

Construct water mains and building service pipes.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Submit product information sheet for joint restraint system to be used.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Remove pipe and fittings contaminated with mud and surface water from the site; do not use in construction unless thoroughly cleaned, inspected, and approved by the Engineer.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Water Main:

1. Trenched:

a. Measurement: Each type and size of pipe installed in an open trench will be measured in linear feet along the centerline of the pipe, including the length through the fittings.

b. Payment: Payment will be made at the unit price per linear foot for each type and size of pipe.

c. Includes: Unit price includes, but is not limited to, trench excavation; dewatering; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; tracer system; testing; disinfection; and polyethylene wrap for ductile iron pipe and for fittings.

1.08 MEASUREMENT AND PAYMENT (Continued)

2. Trenchless:
- **a. Measurement:** Each type and size of pipe installed by trenchless methods will be measured in linear feet along the centerline of the pipe.
- **b. Payment:** Payment will be made at the unit price per linear foot for each type and size of pipe.
- **c. Includes:** Unit price includes, but is not limited to, furnishing and installing pipe; trenchless installation materials and equipment; pit excavation; dewatering; placing and compacting backfill material; tracer system; testing; and disinfection.

B. Water Main with Casing Pipe:

1. Trenched:
- **a. Measurement:** Each type and size of pipe with a casing pipe installed in an open trench, will be measured in linear feet along the centerline of the casing pipe from end of casing to end of casing.
- **b. Payment:** Payment will be made at the unit price per linear foot for each type and size of carrier pipe.
- **c. Includes:** Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe; trench excavation; dewatering; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; casing spacers; furnishing and installing annular space fill material; tracer system; testing; and disinfection.

2. Trenchless:
- **a. Measurement:** Each type and size of pipe installed by trenchless methods with a casing pipe will be measured in linear feet along the centerline of the casing pipe.
- **b. Payment:** Payment will be made at the unit price per linear foot for each type and size of carrier pipe.
- **c. Includes:** Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe; trenchless installation materials and equipment; pit excavation; dewatering; placing and compacting backfill material; casing spacers; furnishing and installing annular space fill material; tracer system; testing; and disinfection.

C. Fittings: One of the following methods will be specified for measurement and payment of water main fittings.

1. Fittings by Count:
- **a. Measurement:** Each type and size of fitting installed as specified in the contract documents or as required for proper installation of the water main will be counted.
- **b. Payment:** Payment will be made at the unit price for each type and size of fitting.
- **c. Includes:** Unit price includes, but is not limited to, furnishing and installing fittings, restrained joints, anchor blocks, and thrust blocks.

2. Fittings by Weight:
- **a. Measurement:** Each type and size of fitting installed as specified in the contract documents or as required for proper installation of the water main will be counted. Determine the total weight of fittings counted, in pounds, based on the standard fitting weights published in AWWA C153 for ductile iron compact fittings.
- **b. Payment:** Payment will be made at the unit price per pound for each type and size of fitting.
- **c. Includes:** Unit price includes, but is not limited to, furnishing and installing fittings, restrained joints, anchor blocks, and thrust blocks.

2.03 FITTINGS (Continued)

C. Pipe Coupling:

1. Center Sleeve (Center Ring): Steel pipe or tubing complying with ASTM A 53 or ASTM A 512, or formed carbon steel with a minimum yield of 30,000 psi.

2. End Ring (Follower Ring): Ductile iron complying with ASTM A 536, or steel meeting or exceeding the requirements of ASTM A 576, grade 1010-1020.

3. Gaskets: New rubber compounded for water service and resistant to permanent set.

4. Bolts and Nuts: High strength, low alloy corrosion resistant steel.

2.04 CONCRETE THRUST BLOCKS

A. Use Iowa DOT Class C concrete.

B. Comply with the contract documents for dimensions and installation of thrust blocks. Comply with Figure 5010.101.

C. Use for all pipe sizes 16 inches in diameter or smaller or when specified.

2.05 PIPELINE ACCESSORIES

A. Polyethylene Wrap:

1. Comply with AWWA C105.

2. Provide tubes or sheets with 8 mil minimum thickness.

B. Tracer System: Comply with Figure 5010.102.

1. Tracer Wire:
- **a. Open Cut:**
  - **1) Solid Single Copper Conductor:**
    - **a) Size:** #12 AWG
    - **b) Insulation Material:** Linear low-density polyethylene (LLDPE) insulation suitable for direct burial applications
    - **c) Insulation Thickness:** 0.030 inches, minimum
    - **d) Breaking Strength:** 150 pounds, minimum
    - **e) Operating Voltage:** Rated for 30 volts
  - **2) Bimetallic Copper Clad Steel Conductor:**
    - **a) Size:** #14 AWG
    - **b) Rating:** Direct burial
    - **c) Operating Voltage:** Rated for 30 volts
    - **d) Conductivity:** 21%
    - **e) Copper Cladding:** 3% of conductor diameter, minimum
    - **f) Insulation Material:** High density, high molecular weight polyethylene
    - **g) Insulation Thickness:** 0.030 inches, minimum
    - **h) Breaking Strength:** 175 pounds, minimum
- **b. Directional Drilling/Boring:**
  - **1) Bimetallic Copper Clad Steel Conductor:**
    - **a) Size:** #12 AWG
    - **b) Rating:** Direct burial
    - **c) Operating Voltage:** Rated for 30 volts
    - **d) Conductivity:** 21%

2.05 PIPELINE ACCESSORIES (Continued)

e) Copper Cladding: 3% of conductor diameter, minimum
f) Insulation Material: High density, high molecular weight polyethylene
g) Insulation Thickness: 0.045 inches, minimum
h) Breaking Strength: 1,100 pounds, minimum

2. Ground Rod: 3/8 inch diameter, 60 inch steel rod uniformly coated with metallically bonded electrolytic copper.

3. Ground-rod Clamp: High-strength, corrosion-resistant copper alloy.

4. Splice Kit: Inline resin splice kit with split bolt (1 kV and 5 kV) for use with single conductor and unshielded cable splices in direct bury and submersible applications.

5. Tracer Wire Station: Comply with the contract documents.

2.06 SPECIAL GASKETS

A. For soils contaminated with gasoline, use neoprene or nitrile gaskets.

B. For soils contaminated with volatile organic compounds, use nitrile or fluorocarbon gaskets.

C. For other soil contaminants, contact the Engineer for the required gasket.

2.07 WATER SERVICE PIPE AND APPURTENANCES

A. Controlling Standards: Local plumbing and fire codes.

B. Materials (as allowed by Jurisdiction or specified in contract documents)**:**

1. Copper Pipe:
a. Comply with ASTM B 88.
b. Wall Thickness: Type K.

2. DIP: As specified in Section 5010, 2.01. Polyethylene wrap is required.

3. PVC Pipe: ASTM D 1785, Schedule 80 or ASTM D 2241, SDR 21. Provide solvent weld joints for all pipes.

4. Brass Pipe: Red, seamless, according to ASTM B 43.

5. Polyethylene Pipe: Class 200, according to AWWA C901.

C. Corporations, Stops, and Stop Boxes: Contact the Jurisdiction for requirements.

2.08 NON-SHRINK GROUT

Comply with Iowa DOT Materials I.M. 491.13.

2.09 CASING PIPE

Comply with Section 3020.

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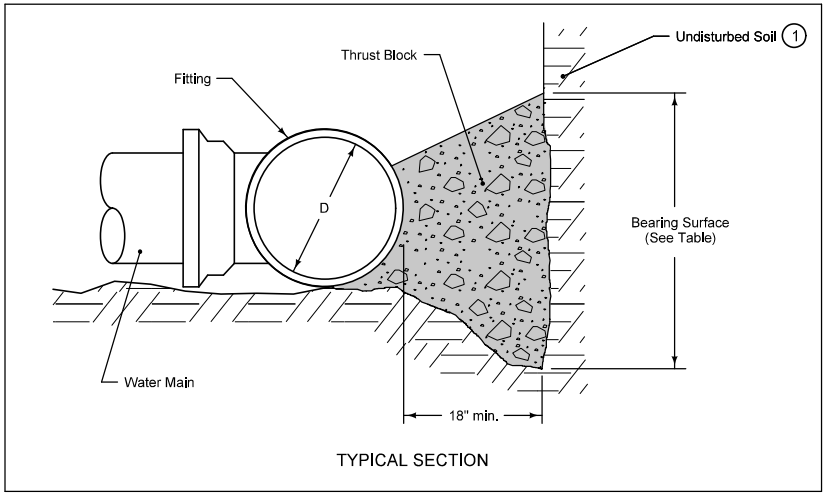
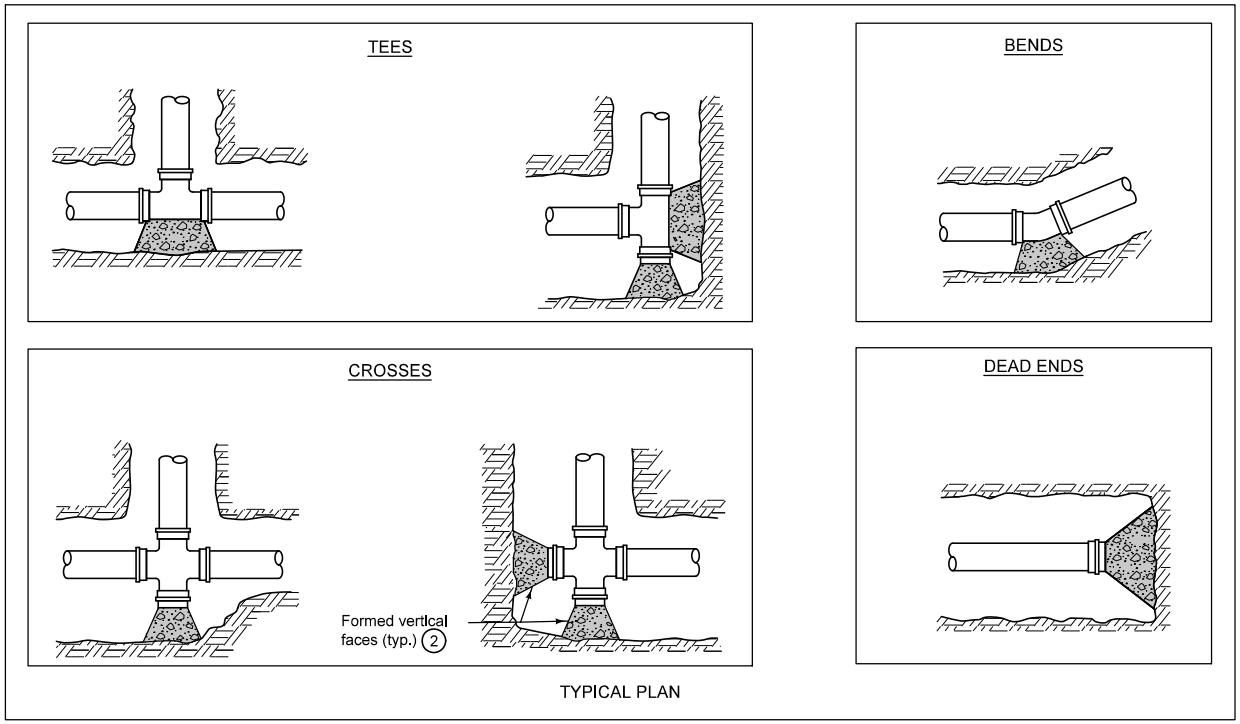


TYPICAL SECTION

Encase all fittings in polyethylene wrap. Do not allow concrete to directly contact joints or fitting bolts.

(1) Extend thrust blocks to undisturbed soil. Excavation into trench wall may be necessary.

(2) Form vertical surfaces of poured concrete thrust blocks except on bearing surface.



TYPICAL PLAN

Diameter of Pipe, D (inches)	MINIMUM BEARING SURFACE (sf)				
	Bends				Tees and Dead Ends
	$11\frac{1}{4}^{\circ}$	$22\frac{1}{2}^{\circ}$	45°	90°	
4	1	2	3	4	3
6	2	3	5	8	6
8	2	4	8	14	10
10	3	6	12	21	15
12	5	9	16	30	21
14	6	11	22	40	28
16	7	14	28	51	36
18	9	18	35	64	45
20	11	22	42	78	55
24	16	31	61	111	79
30	24	48	93	171	121
36	34	68	133	245	173

Minimum surface area based on water pressure of 150 psi and allowable soil pressure of 1,000 psf.

SUDAS

INTERIM

REVISION 2 01-01-26

FIGURE 5010.101 | **STANDARD ROAD PLAN** | **WM-101**

SHEET 1 of 2

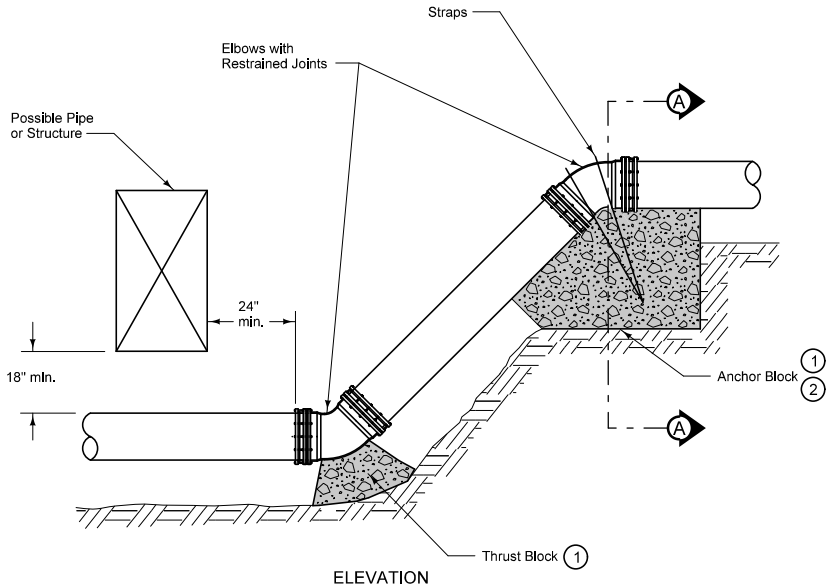
REVISIONS: Updated table and notes to match SUDAS.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

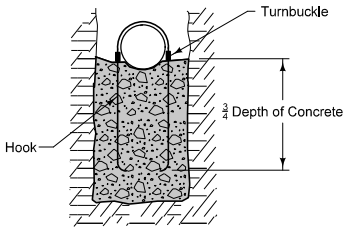
THRUST BLOCKS

FIGURE 5010.101 | SHEET 1 OF 2

CHANGES IN PIPE DEPTH



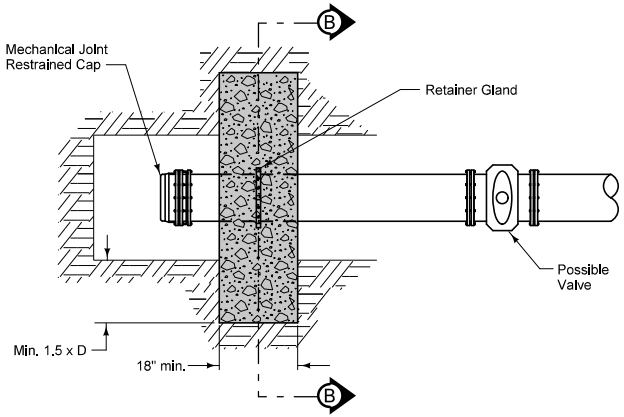
ELEVATION



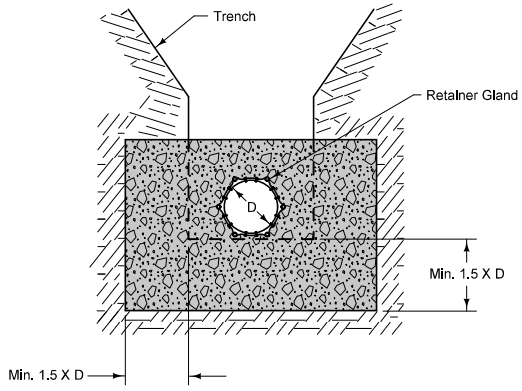
SECTION A-A

DEAD ENDS (ALTERNATE METHOD)

Use only when allowed by the Engineer, or when specified in the contract documents.



PLAN



SECTION B-B

Encase all fittings in polyethylene wrap. Do not allow concrete to directly contact joints or fitting bolts.

1. Fittings are shown with both restrained joints and thrust/anchor blocks. These methods can be used independently or in conjunction with each other. Install as specified.
2. Anchor block sizes and shapes are detailed on individual plan sheets.

SUDAS	INTERIM	REVISION 2 01-01-26
FIGURE 5010.101	STANDARD ROAD PLAN	WM-101
		SHEET 2 of 2

REVISIONS: Updated table and notes to match SUDAS.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

THRUST BLOCKS

FIGURE 5010.101 | SHEET 2 OF 2

STRUCTURES FOR SANITARY AND STORM SEWERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manholes and Intakes for Storm Sewers

B. Manholes for Sanitary Sewers

C. Adjustment of Existing Manholes and Intakes

D. Connection to Existing Manholes and Intakes

E. Removal of Manholes and Intakes

F. Special Structures for Storm Sewers

G. Excavation and Backfill of Structures

1.02 DESCRIPTION OF WORK

A. Construct sanitary and storm sewer manholes to provide access to sewer systems for maintenance and cleaning purposes.

B. Construct storm sewer intakes for collection of surface water and conveyance to the storm sewer system.

C. Modify existing manholes and intakes as necessitated by other improvements adjacent to the manholes or intakes.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Shop drawings of steel reinforcement, showing sizes, lengths, bends, and counts, if required.

B. Concrete mix design, if required by Engineer.

C. Shop drawing schedule of new manholes and/or intakes showing total depth, relative elevations of all connecting sanitary or storm sewer lines, all drops, and orientation of connecting lines.

D. Results of required testing.

E. Catalog cuts of iron castings and sewer line connection gaskets.

F. Gradation and soil classification reports for structure bedding and backfill materials.

G. Dewatering plan.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Store reinforcing steel only on pallets or lagging.

B. Follow the aggregate storage and concrete transport requirements in Iowa DOT Article 2301.02, C.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

A. Do not place concrete when stormy or inclement weather will prevent good quality work.

B. Cold weather placement is restricted per Iowa DOT Article 2403.03, F.

1.08 MEASUREMENT AND PAYMENT

A. Manhole:

1. **Measurement:** Each type and size of manhole will be counted.

2. **Payment:** Payment will be at the unit price for each type and size of manhole.

3. **Includes:** Unit price includes, but is not limited to, excavation; furnishing and installing pipe; lining (if specified); furnishing, placing, and compacting bedding and backfill material; base; structural concrete; reinforcing steel; precast units (if used); concrete fillets; pipe connections; infiltration barriers (sanitary sewer manholes only); castings; and adjustment rings.

B. Intake:

1. **Measurement:** Each type and size of intake will be counted.

2. **Payment:** Payment will be at the unit price for each type and size of intake.

3. **Includes:** Unit price includes, but is not limited to, excavation; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; base; structural concrete; reinforcing steel; precast units (if used); concrete fillets; pipe connections; castings; adjustment rings; and the insert/boxout.

C. Drop Connection:

1. **Internal Drop Connection:**
   a. **Measurement:** Each size of internal drop connection will be counted.
   b. **Payment:** Payment will be at the unit price for each size of internal drop connection.
   c. **Includes:** Unit price includes, but is not limited to, cutting the hole and installing a flexible watertight connector, providing and installing the receiving bowl, flexible coupler between the bowl and the drop pipe, the PVC drop pipe, pipe brackets and bolts, the bottom elbow, repair of fillet if required, and a splash guard if required.

2. **External Drop Connection:**
   a. **Measurement:** Each size of external drop connection will be counted.
   b. **Payment:** Payment will be at the unit price for each size of external drop connection.
   c. **Includes:** Unit price includes, but is not limited to, the connection to the manhole and all pipe; fittings; concrete encasement; and furnishing, placing, and compacting bedding and backfill material.

1.08 MEASUREMENT AND PAYMENT (Continued)

D. Casting Extension Rings:

1. **Measurement:** Each casting extension ring will be counted.

2. **Payment:** Payment will be at the unit price for each casting extension ring.

3. **Includes:** Unit price includes, but is not limited to, furnishing and installing each casting extension ring and reinstalling the casting lid.

E. Manhole or Intake Adjustment, Minor:

1. **Manhole Adjustment, Minor:**
   a. **Measurement:** Each existing manhole adjusted to finished grade by addition or removal of adjustment rings or adjustment of adjustable casting will be counted.
   b. **Payment:** Payment will be made at the unit price for each minor manhole adjustment.
   c. **Includes:** Unit price includes, but is not limited to, removing existing casting and existing adjustment rings, furnishing and installing adjustment rings, furnishing and installing new casting, and installing new infiltration barrier (sanitary sewer manholes only).

2. **Intake Adjustment, Minor:**
   a. **Measurement:** Each existing intake adjusted to finished grade by addition or removal of adjustment rings or adjustment of adjustable casting will be counted.
   b. **Payment:** Payment will be made at the unit price for each minor intake adjustment.
   c. **Includes:** Unit price includes, but is not limited to, removing existing casting and existing adjustment rings, furnishing and installing adjustment rings, and furnishing and installing new casting.

F. Manhole or Intake Adjustment, Major:

1. **Manhole Adjustment, Major:**
   a. **Measurement:** Each existing manhole adjusted to grade by addition or removal of riser, cone or flat top sections, or the exchange of existing riser sections with sections having different vertical dimensions will be counted.
   b. **Payment:** Payment will be at the unit price for each major adjustment.
   c. **Includes:** Unit price includes, but is not limited to, removal of existing casting, adjustment rings, top sections, and risers; excavation; concrete and reinforcing steel or precast sections; furnishing and installing new casting; installing new infiltration barrier (sanitary sewer manholes only); placing backfill material; and compaction.

2. **Intake Adjustment, Major:**
   a. **Measurement:** Each existing intake adjusted to grade by addition or removal of riser, cone or flat top sections, or the exchange of existing riser sections with sections having different vertical dimensions will be counted.
   b. **Payment:** Payment will be at the unit price for each major adjustment.
   c. **Includes:** Unit price includes, but is not limited to, removal of existing casting, adjustment rings, top sections, and risers; excavation; concrete and reinforcing steel or precast sections; furnishing and installing new casting; placing backfill material; and compaction.

1.08 MEASUREMENT AND PAYMENT (Continued)

G. Connection to Existing Manhole or Intake:

1. Connection to Existing Manhole:
- **a. Measurement:** Each connection made to an existing manhole will be counted.
- **b. Payment:** Payment will be made at the unit price for each sewer connection.
- **c. Includes:** Unit price includes, but is not limited to, coring or cutting into the existing manhole, removal of existing fillet, pipe connections, replacement of fillet, grout, and waterstop (when required).

2. Connection to Existing Intake:
- **a. Measurement:** Each connection made to an existing intake will be counted.
- **b. Payment:** Payment will be made at the unit price for each sewer connection.
- **c. Includes:** Unit price includes, but is not limited to, coring or cutting into the existing intake, removal of existing fillet, pipe connections, replacement of fillet, grout, and waterstop (when required).

H. Remove Manhole or Intake:

1. Remove Manhole:
- **a. Measurement:** Each manhole removed will be counted.
- **b. Payment:** Payment will be made at the unit price for each manhole.
- **c. Includes:** Unit price includes, but is not limited to, removal of casting, concrete, and reinforcement; plugging pipes; filling remaining structure with flowable mortar; and placing compacted fill over structure to finished grade.

2. Remove Intake:
- **a. Measurement:** Each intake removed will be counted.
- **b. Payment:** Payment will be made at the unit price for each intake.
- **c. Includes:** Unit price includes, but is not limited to, removal of casting, concrete, and reinforcement; plugging pipes; filling remaining structure with flowable mortar; and placing compacted fill over structure to finished grade.

PART 2 - PRODUCTS

2.01 MANHOLE AND INTAKE TYPES

Table 6010.01: Manhole and Intake Types

	Figure No.	Type	Description
Sanitary Sewer Manholes	6010.301	SW-301	Circular Sanitary Sewer Manhole
	6010.302	SW-302	Rectangular Sanitary Sewer Manhole
	6010.303	SW-303	Sanitary Sewer Manhole Over Existing Sewer
	6010.304	SW-304	Rectangular Base/Circular Top Sanitary Sewer Manhole
	6010.305	SW-305	Tee-section Sanitary Sewer Manhole
Storm Sewer Manholes	6010.401	SW-401	Circular Storm Sewer Manhole
	6010.402	SW-402	Rectangular Storm Sewer Manhole
	6010.403	SW-403	Deep Well Rectangular Storm Sewer Manhole
	6010.404	SW-404	Rectangular Base/Circular Top Storm Sewer Manhole
	6010.405	SW-405	Tee-section Storm Sewer Manhole
	6010.406	SW-406	Shallow Rectangular Storm Sewer Manhole
Intakes	6010.501	SW-501	Single Grate Intake
	6010.502	SW-502	Circular Single Grate Intake
	6010.503	SW-503	Single Grate Intake with Manhole
	6010.504	SW-504	Single Grate Intake with Flush-top Manhole
	6010.505	SW-505	Double Grate Intake
	6010.506	SW-506	Double Grate Intake with Manhole
	6010.507	SW-507	Single Open-throat Intake, Small Box
	6010.508	SW-508	Single Open-throat Intake, Large Box
	6010.509	SW-509	Double Open-throat Intake, Small Box
	6010.510	SW-510	Double Open-throat Intake, Large Box
	6010.511	SW-511	Rectangular Area Intake
	6010.512	SW-512	Circular Area Intake
	6010.513	SW-513	Open-sided Area Intake
	6010.515	SW-515	Triple Rectangular Area Intake
	6010.541	SW-541	Open-Throat Curb Intake Under Pavement
	6010.542	SW-542	Extension Unit for Open-Throat Curb Intake Under Pavement
	6010.545	SW-545	Single Open-Throat Curb Intake with Extended Opening

2.02 PRECAST

Comply with ASTM C 478 (circular) and ASTM C 913 (rectangular).

2.03 CAST-IN-PLACE

A. Concrete: Use Class C concrete. Comply with the following Iowa DOT Specifications and Materials I.M.s.

1. Iowa DOT Specifications Sections:

a. 2403 – Structural Concrete
b. 4101 – Portland Cement
c. 4102 – Water for Concrete and Mortar
d. 4103 – Liquid Admixtures for Portland Cement Concrete
e. 4104 – Burlap for Curing Concrete
f. 4106 – Plastic Film and Insulating Covers for Curing Concrete
g. 4108 – Supplementary Cementitious Materials
h. 4109 – Aggregate Gradations
i. 4110 – Fine Aggregate for Portland Cement Concrete
j. 4115 – Coarse Aggregate for Portland Cement Concrete

2.03 CAST-IN-PLACE (Continued)

2. Iowa DOT Materials I.M.s:
a. 316 – Flexural Strength of Concrete
b. 318 – Air Content of Freshly Mixed Concrete by Pressure
c. 403 – Chemical Admixtures for Concrete
d. 528 – Structural Concrete Plant Inspection
e. 529 – Portland Cement Concrete Proportions
f. 534 – Mobile Mixture Inspection

B. Reinforcement: Comply with Iowa DOT Section 4151 for epoxy coated reinforcement.

2.04 NON-SHRINK GROUT

Comply with Iowa DOT Materials I.M. 491.13.

2.05 PRECAST RISER JOINTS

A. Joint Ends:

1. Use tongue and groove ends.

2. If cast-in-place base is used, provide bottom riser with square bottom edge.

B. Joint Sealant:

1. Sanitary Sewers:
a. Rubber O-ring or Profile Gasket: Flexible joint, complying with ASTM C 443.
b. Bituminous Jointing Material: Use a cold-applied mastic sewer joint sealing compound recommended by the manufacturer for the intended use and approved by the Engineer. Comply with ASTM C 990.
c. Butyl Sealant Wrap: Comply with ASTM C 877.

2. Storm Sewers: All joint sealants used on sanitary sewers may also be used for storm sewers. The following may also be used.
a. Rubber Rope Gasket Jointing Material: Comply with ASTM C 990.
b. Engineering Fabric Wrap: If specified in the contract documents, supply engineering fabric wrap complying with Iowa DOT Article 4196.01, B.

2.06 MANHOLE OR INTAKE TOP

A. Capable of supporting HS-20 loading.

B. Use eccentric cone on sanitary sewer manholes unless otherwise specified or allowed.

2.07 BASE

A. Sanitary Sewer Manhole:

1. Circular Manhole: Integral base and lower riser section according to ASTM C 478.

2. All Other Manholes: Use precast or cast-in-place concrete base.

B. Storm Sewer Manhole: Use precast or cast-in-place concrete base.

C. Intake: Use precast or cast-in-place concrete base.

2.08 PIPE CONNECTIONS

A. Flexible, Watertight Gasket: Comply with ASTM C 923.

B. Non-Shrink Grout: Comply with Section 6010, 2.04.

C. Waterstop: Provide elastomeric gasket that surrounds pipe and attaches with stainless steel bands and is designed to stop the movement of water along the interface between a pipe and a surrounding concrete collar.

D. Concrete Collar: Comply with Section 6010, 2.02 and 2.03.

2.09 MANHOLE OR INTAKE ADJUSTMENT RINGS (Grade Rings)

A. Use one of the following materials for grade adjustments of manhole or intake frame and cover assemblies:

1. Reinforced Concrete Adjustment Rings: Comply with ASTM C 478. Provide rings free from cracks, voids, and other defects.

2. High Density Polyethylene Adjustment Rings: Comply with ASTM D 1248 for recycled plastic.
   a. Test and certify material properties by the methods in the following table.

Table 6010.02: Test Methods

Property	Test Method	Acceptable Value
Melt Flow Index	ASTM D 1238	0.30 to 30 g/10 min.
Density	ASTM D 792	0.94 to 0.98 g/cm^3
Tensile Strength	ASTM D 638	2,000 to 5,000 lb/in^2

   b. Do not use polyethylene grade adjustment rings when they are exposed to heat shrink infiltration barriers.
   c. When used in a single configuration, provide tapered adjustment ring with thickness that varies from 1/2 inch to 3 inches.
   d. Install adjustment rings on clean, flat surfaces according to the manufacturer's recommendations. Comply with ASTM D 36 with minimum 350°F softening point for butyl rubber sealant.

3. Expanded Polypropylene Adjustment Rings: Comply with ASTM D 4819 for expanded polypropylene when tested according to ASTM D 3575.
   a. Use adhesive meeting ASTM C 920, Type S, Grade N5, Class 25.
   b. Provide finish rings with grooves on the lower surface and flat upper surface.
   c. If a heat shrinkable infiltration barrier is used, ensure surface temperature does not exceed 300° during installation process.

B. Ensure the inside diameter of the adjustment ring is not less than the inside diameter of the manhole frame or not less than the inside dimension of the intake grate opening.

2.10 CASTINGS (Ring, Cover, Grate, and Extensions)

A. Gray Cast Iron: AASHTO M 306.

B. Ductile Iron: ASTM A 536, Grade 80-55-06 or 70-50-05.

2.10 CASTINGS (Ring, Cover, Grate, and Extensions) (Continued)

C. Composite: AASHTO M 306.

1. Hardware: Attach lid to frame with 316 stainless steel hardware.

2. Slip Resistance: Greater than 0.6 when tested according to ASTM C 1028.

3. Ultraviolet Resistance: Meet ASTM G 154 Cycle 1 for a minimum of 1,000 hours.

4. Detection: Must be detectable using standard detection equipment.

D. Load Capacity: Standard duty unless otherwise shown on the casting figures.

1. Standard Duty: Casting certified for 40,000 pound proof-load according to AASHTO M 306.

2. Light Duty: Casting certified according to requirements of AASHTO M 306 for a 16,000 pound proof-load (HS-20). 40,000 pound proof-load is not required.

E. Casting Types:

1. Manholes: The following table lists the manhole casting types.

Table 6010.03: Manhole Casting Types

	Figure No.	Casting Type	Number of Pieces	Ring/ Cover	Bolted Frame	Bolted Cover (Floodable)	Gasket
Sanitary Sewer	6010.601	SW-601, A	2	Fixed	Yes	No	Yes[1]
	6010.601	SW-601, B	3	Adjustable	No	No	Yes[1]
	6010.601	SW-601, C	2	Fixed	Yes	Yes	Yes[1]
	6010.601	SW-601, D	3	Adjustable	No	Yes	Yes[1]
Storm Sewer	6010.602	SW-602, E[2]	2	Fixed	Yes	No	No
	6010.602	SW-602, F[2]	3	Adjustable	No	No	No
	6010.602	SW-602, G[2]	2	Fixed	No	No	No

[1] Machine bearing surfaces required.

[2] Storm sewer casting may include environmental symbols and/or messages such as “DUMP NO WASTE, DRAINS TO RIVER.”

2. Intakes:

a. Comply with Figures 6010.602, 6010.603, 6010.604, and the contract documents.

b. Castings may include environmental symbols and/or messages such as “DUMP NO WASTE, DRAINS TO RIVER.”

3. Manhole Casting Extension Ring:

a. Match the dimensions of the existing ring and cover with an allowable diameter tolerance of -1/4 inch for the frame ridge and +1/4 inch for the cover recess.

b. Provide extension ring with height as required to raise the top of the casting to make it level or no more than 1/4 inch below the finished pavement surface. Maximum ring height is 3 inches.

2.11 ADDITIONAL MATERIALS FOR SANITARY SEWER MANHOLES

A. Infiltration Barrier:

1. External Chimney Seal:

a. Rubber Sleeve and Extension:

1) Corrugated; minimum thickness of 3/16 inches, according to ASTM C 923.
2) Minimum allowable vertical expansion of at least 2 inches.

b. Compression Bands:

1) One-piece band assembly to compress sleeve or extension against manhole and casting surfaces.
2) 16 gauge ASTM C 923, Type 304 stainless steel, minimum 1 inch width, minimum adjustment range of 4 inches more than the manhole outside diameter.
3) For standard two-piece castings, shape top band to lock sleeve to manhole frame's base flange. For three-piece adjustable castings, shape top band to lock sleeve to upper piece of adjustable frame.
4) Stainless steel fasteners complying with ASTM F 593 and 594, Type 304.

2. Internal Chimney Seal:

a. Rubber Sleeve and Extension:

1) Double pleated, minimum thickness 1/8 inch thick, according to ASTM C 923.
2) Minimum allowable vertical expansion of at least 2 inches.
3) Integrally formed expansion band recess top and bottom with multiple sealing fins.

b. Expansion Bands:

1) One-piece band assembly to compress sleeve or extension against manhole and casting surfaces to make a watertight seal.
2) 16 gauge ASTM C 923, Type 304 stainless steel, minimum 1 inch width, minimum adjustment range of 2 inches more than the manhole inside diameter.
3) Positive stainless steel locking mechanism permanently securing the band in its expanded position after tightening.

3. Molded Shield:

a. Barrier Shield:

1) Medium density polyethylene, according to ASTM D 1248.
2) Certified for 40,000 pound proof-load according to AASHTO M 306.
3) Diameter to match cone section and internal dimension of casting.

b. Sealant: Butyl material meeting ASTM C 990.

4. Heat Shrink Sleeve: Heat-shrinkable wrap around sleeve designed for protection of buried and exposed sanitary sewer manholes. Do not use with polyethylene adjustment rings.

a. Primer: Compatible with concrete, ductile and cast iron, and sleeve material.

b. Sleeve and Backing:

Property	Standard	Value
Water Absorption	ASTM D 570	0.05% maximum
Low Temperature Flexibility	ASTM D 2671	-40° F
Tensile Strength	ASTM D 638	2,900 psi minimum
Elongation	ASTM D 638	600% minimum
Hardness	ASTM D 2240	Shore D: 46
Shrink Factor	---	40% minimum
Thickness	---	0.1 inch minimum

c. Adhesive: Softening point of 212° F maximum meeting ASTM E 28.

2.11 ADDITIONAL MATERIALS FOR SANITARY SEWER MANHOLES (Continued)

B. Riser Section Coating:

1. Exterior: When exterior waterproof coating is specified, provide bituminous or coal tar coating.

2. Interior: When interior manhole lining is specified, provide lining according to Section 4010, 2.01 (lined, reinforced concrete pipe).

2.12 CONCRETE FILLET

A. Cast-in-place Base: Provide a cast-in-place concrete fillet with concrete complying with the requirements of Section 6010, 2.03.

B. Precast Base Section:

1. For sanitary sewers, provide a precast concrete fillet, unless otherwise allowed by the Engineer. Comply with Section 6010, 3.01.

2. For storm sewers, provide a cast-in-place concrete fillet with concrete complying with the requirements of Section 6010, 2.03.

2.13 STEPS

A. Depths:

1. For manholes and intakes less than 20 feet deep, do not install steps unless otherwise specified in the contract documents.

2. For manholes and intakes deeper than 20 feet, install steps to meet OSHA regulations.

B. Requirements:

1. ASTM C 478.

2. Manufacture using polypropylene encased steel.

3. Uniformly space steps at 12 to 16 inches.

4. Align with vertical side of eccentric top section.

5. Place first step no more than 36 inches from top of casting.

2.14 PRECAST CONCRETE TEE

A. Tee and Eccentric Reducers: ASTM C 478.

B. Composite Tee: Comply with Figure 6010.305. May be substituted for pipe diameters less than 48 inches.

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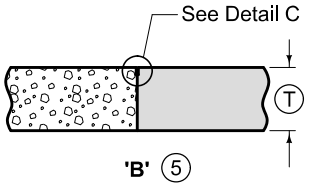
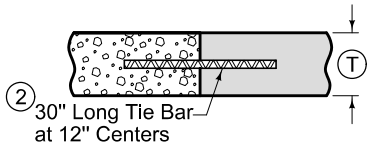
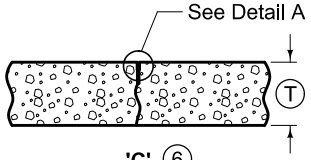


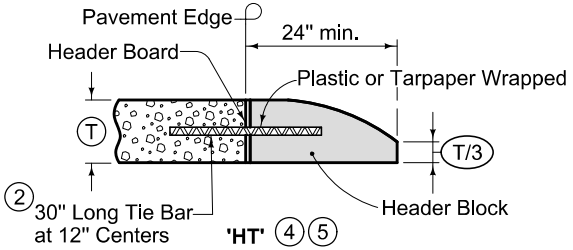
'B' (5)
PLAIN JOINT
(Abutting Pavement Slabs)



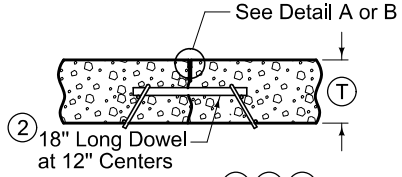
'DW' (3)(4)(7)
DAY'S WORK JOINT(Non-working)



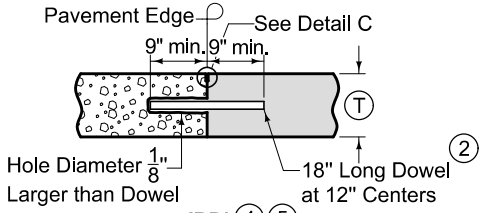
'C' (6)
CONTRACTION JOINT



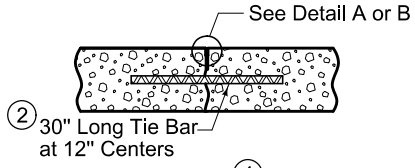
'HT' (4)(5)
HEADER JOINT
(End Rigid Pavement)



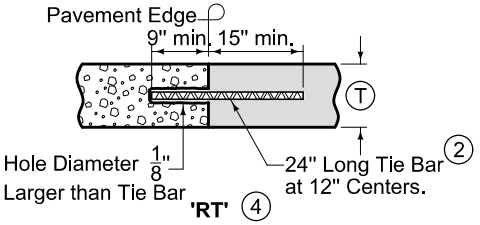
'CD' (1)(4)(6)
DOWELED CONTRACTION JOINT



'RD' (4)(5)
ABUTTING PAVEMENT JOINT



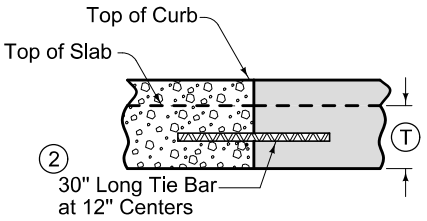
'CT' (4)
TIED CONTRACTION JOINT



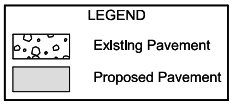
'RT' (4)
ABUTTING PAVEMENT JOINT
RIGID TIE

TRANSVERSE CONTRACTION

1. See dowel assemblies for fabrication details.
2. See Bar Size Table for Contraction Joints on Sheet 2.
3. Locate 'DW' joint at a mid-panel location between future 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.
4. Place bars within the limits shown under dowel assemblies.
5. Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.
6. Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when (T) is greater or equal to 8 inches. Use 'C' joints when (T) is less than 8 inches.
7. 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged due to the drilling at no additional cost to the Contracting Authority.



'DW - CG' (3)(4)
DAY'S WORK JOINT
CURB AND GUTTER UNIT



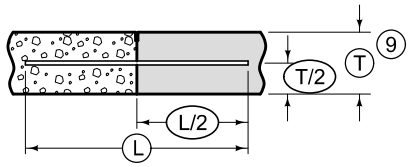
SUDAS | **INTERIM** | REVISION 13 01-01-26
FIGURE 7010.101 | STANDARD ROAD PLAN | **PV-101** | SHEET 1 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

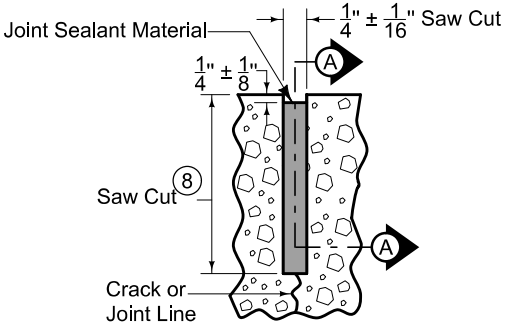
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

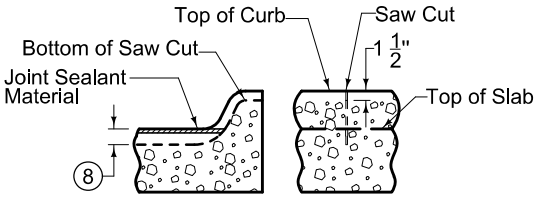
FIGURE 7010.101 SHEET 1 OF 8



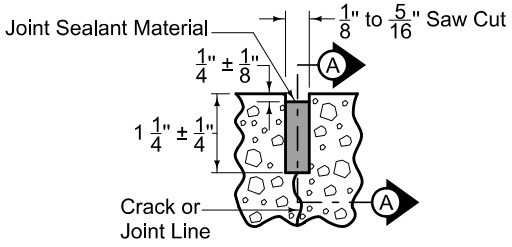
BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



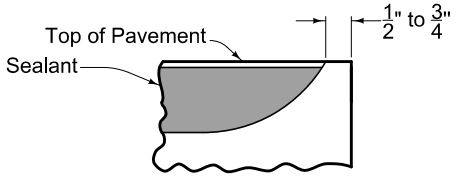
DETAIL A
(Saw cut formed by conventional concrete sawing equipment.)



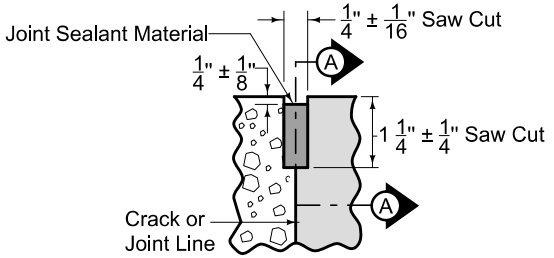
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' joint in pavement.)



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



SECTION A-A
(Detail at Edge of Pavement)

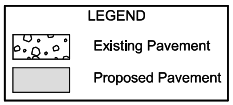


DETAIL C

8 Saw 'CD' joint to a depth of T/3 ± 1/4"; saw 'C' joint to a depth of T/4 ± 1/4".

9 When tying into old pavement, (T) represents the depth of sound PCC.

BAR SIZE TABLE FOR CONTRACTION JOINTS				
(T)	Solid Dowel Diameter	Tubular Dowel Diameter	Elliptical	Tie Bar Size
< 8"	3/4"	7/8"	N/A	#6
≥ 8" but < 10"	1 1/4"	1 3/8"	Small	#10
≥ 10"	1 1/2"	1 5/8"	Medium	#11
Tubular and Elliptical Dowel Bars will not be allowed for RD joints.				



SUDAS | INTERIM | REVISION 13 01-01-26
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 2 of 8

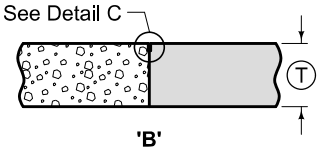
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

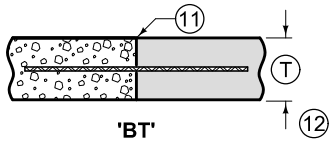
JOINTS

FIGURE 7010.101 | SHEET 2 OF 8

TRANSVERSE CONTRACTION

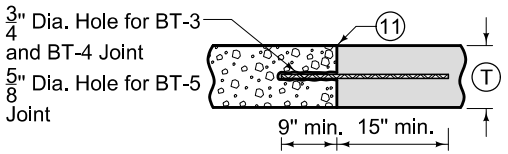


'B'
PLAIN JOINT
(Abutting Pavement Slabs)



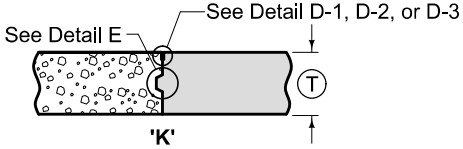
'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE

(T)	Joint	Bars	Bar Length and Spacing
< 8"	'BT-1'	#4	36" Long at 30" Centers
		#5	30" Long at 30" Centers
≥ 8"	'BT-2'	#5	36" Long at 30" Centers
	'BT-6'	#5	36" Long at 15" Centers

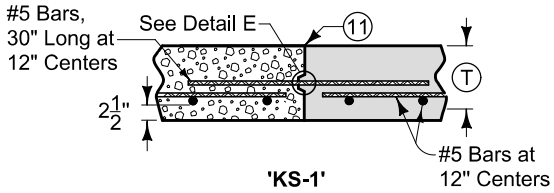


'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (Drilled)

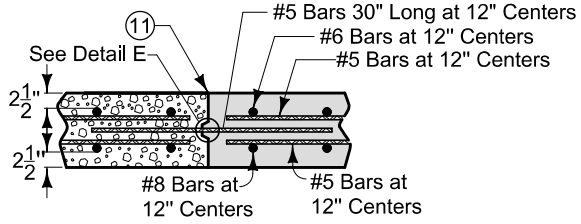
(T)	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers



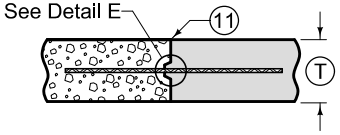
'K'
KEYED JOINT FOR ADJACENT SLABS
(Where T is 8" or more)



'KS-1'
[Single Reinforced Pavement (Bridge Approach)]



'KS-2'
[Double Reinforced Pavement (Bridge Approach)]



'KT' (10)(12)
ABUTTING PAVEMENT JOINT - KEYWAY TIE

(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

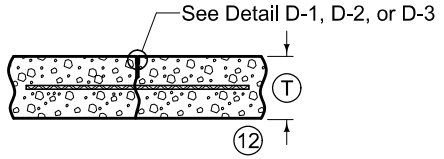
LONGITUDINAL CONTRACTION

(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.

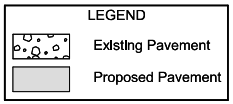
(12) The following joints are interchangeable, subject to the pouring sequence:
'L-1', 'BT-1', and 'KT-1'
'L-2', 'BT-2', and 'KT-2'
'L-3', 'BT-6', and 'KT-3'

KT joints should not be used when DOT is contracting authority.



'L'
CONTRACTION JOINT

(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



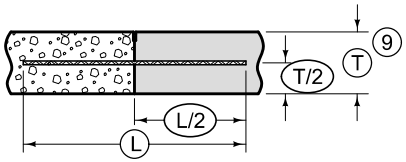
SUDAS
INTERIM
REVISION 13 01-01-26
FIGURE 7010.101
STANDARD ROAD PLAN
PV-101
SHEET 3 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

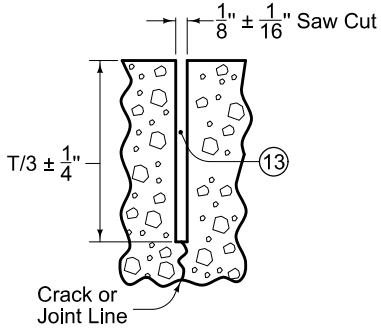
SUDAS DIRECTOR
DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101
SHEET 3 OF 8



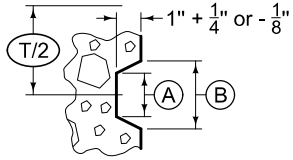
TIE BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



DETAIL D-1
(Required when specified in the contract documents.)

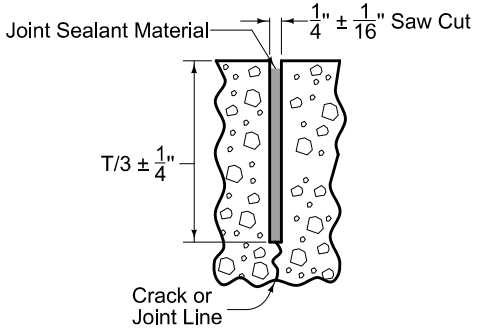
9 When tying into old pavement, T represents the depth of sound PCC.

13 Sealant or cleaning not required.

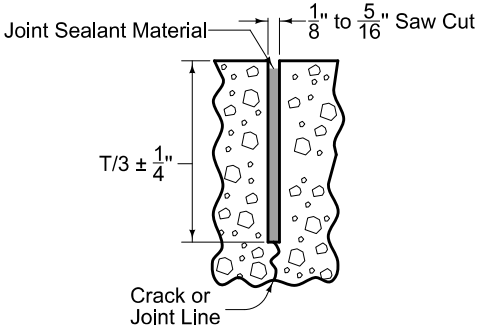


DETAIL E

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



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



DETAIL D-3
(Required when the Department of Transportation is the Contracting Authority, or when specified in the contract documents)

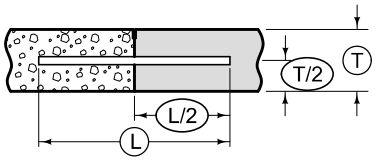
LEGEND
Existing Pavement
Proposed Pavement

SUDAS
INTERIM
REVISION 13 01-01-26
FIGURE 7010.101
STANDARD ROAD PLAN
PV-101
SHEET 4 of 8
REVISIONS: Updated SUDAS and IDOT Logo.
SUDAS DIRECTOR
DESIGN METHODS ENGINEER

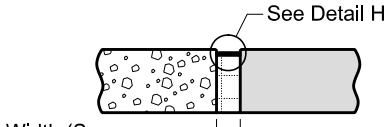
LONGITUDINAL CONTRACTION

JOINTS

FIGURE 7010.101 SHEET 4 OF 8

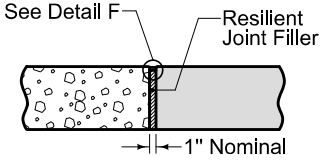


DOWEL PLACEMENT
(Applies to all joints unless otherwise detailed.)

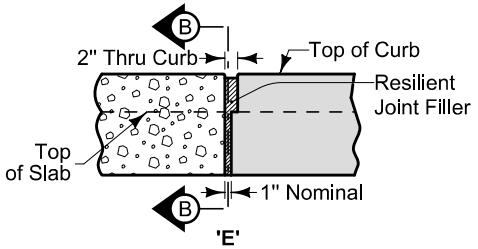


'CF' JOINT

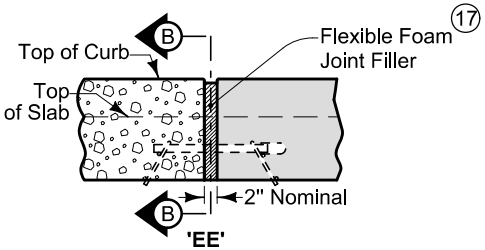
TYPE	WIDTH
CF-1	2"
CF-2	$2\frac{1}{2}$"
CF-3	3"
CF-4	$3\frac{1}{2}$"



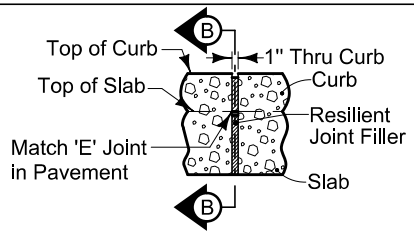
'E'
1" EXPANSION JOINT



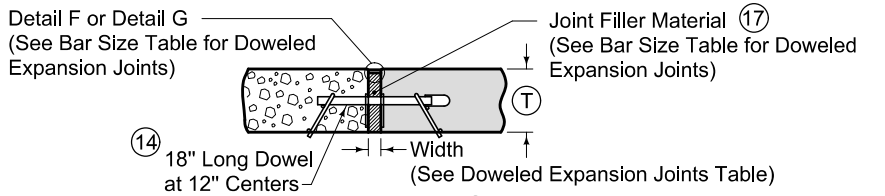
'E'
JOINT IN CURB
(View at Back of Curb)



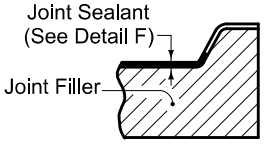
'EE'
JOINT IN CURB
(View at Back of Curb)



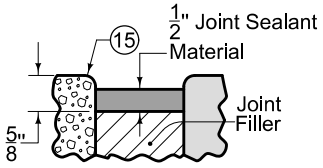
'ES'
JOINT IN CURB
(View at Back of Curb)



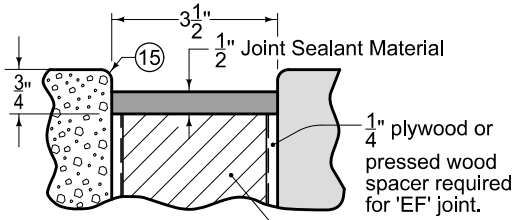
'ED', 'EE', 'EF' 16
DOWELED EXPANSION JOINT



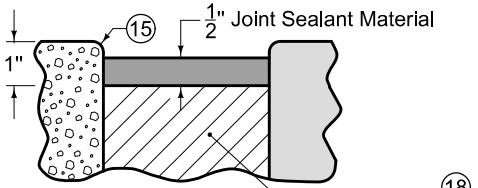
SECTION B-B



DETAIL F



DETAIL G



DETAIL H

EXPANSION

14 See Bar Size Table for Doweled Expansion Joints.

15 Edge with 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond blade saw.

16 See Dowel Assemblies for fabrication details and placement limits. Coat the free end of dowel bar to prevent bond with pavement. At intake locations, dowel bars may be cast-in-place.

17 Predrill or preform holes in joint material for appropriate dowel size.

18 Compact tire buffings by spading with a square-nose shovel.

DOWELED EXPANSION JOINTS		
TYPE	WIDTH	FILLER MATERIAL 17
ED	1"	Resilient (Detail F)
EE	2"	Flexible Foam (Detail F)
EF	$3\frac{1}{2}$"	Flexible Foam (Detail G)

BAR SIZE TABLE FOR DOWELED EXPANSION JOINTS			
T	< 8"	≥ 8" but < 10"	≥ 10"
Dowel Diameter	$\frac{3}{4}$"	$1\frac{1}{4}$"	$1\frac{1}{2}$"
Tubular, GFRP, and Elliptical Dowel Bars will not be allowed for expansion joints.			

LEGEND
Existing Pavement
Proposed Pavement

SUDAS
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FIGURE 7010.101
STANDARD ROAD PLAN
PV-101
SHEET 5 of 8

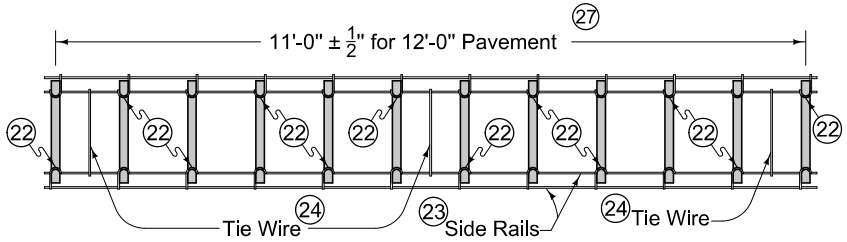
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR
DESIGN METHODS ENGINEER

JOINTS

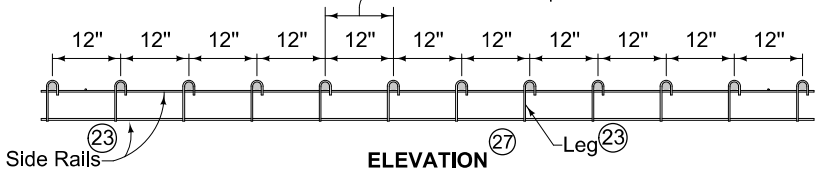
FIGURE 7010.101
SHEET 5 OF 8

CONTRACTION JOINTS

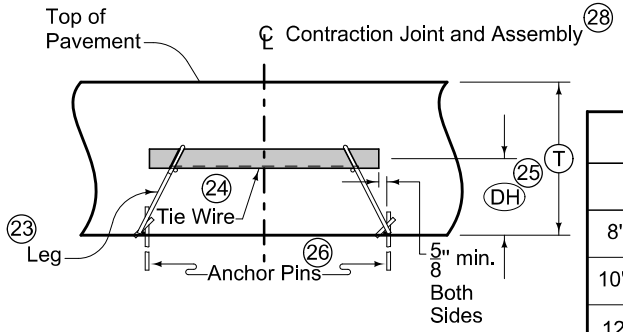


PLAN

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



ELEVATION



LONGITUDINAL SECTION

DOWEL ASSEMBLIES (19) (20) (21)

DOWEL HEIGHT AND DIAMETER FOR DOWELED CONTRACTION JOINTS				
(T)	(DH) (25)	Diameter (Solid)	Diameter (Tubular)	Elliptical
8" to $9\frac{1}{2}$"	$4\frac{1}{4}$"	$1\frac{1}{4}$"	$1\frac{3}{8}$"	Small
10" to $11\frac{1}{2}$"	$5\frac{1}{4}$"	$1\frac{1}{2}$"	$1\frac{5}{8}$"	Medium
12" to 13"	$6\frac{1}{4}$"	$1\frac{1}{2}$"	$1\frac{5}{8}$"	Medium
Tubular, Elliptical Dowel Bars will not be allowed for RD joints.				

(19) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(20) Use wires with a minimum tensile strength of 50 ksi.

(21) Details apply to both transverse contraction and expansion joints.

(22) Weld alternately throughout.

(23) 0.306 inch diameter wire. Wire sizes shown are the minimum required.

(24) Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

(25) Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

(26) 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.

(27) If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

(28) Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

FIGURE 7010.101 | SHEET 6 OF 8

SUDAS | INTERIM | REVISION 13 01-01-26

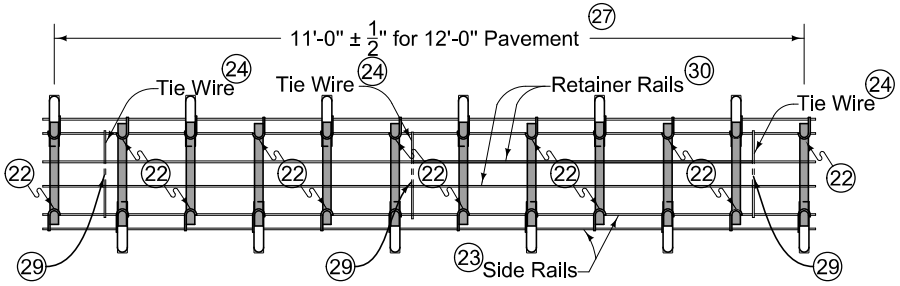
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 6 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

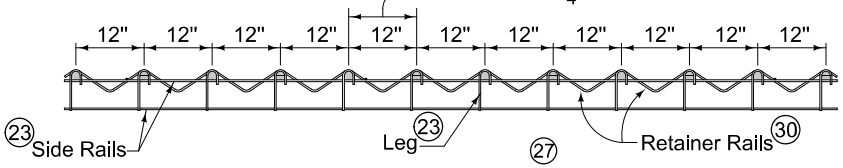
JOINTS

EXPANSION JOINTS

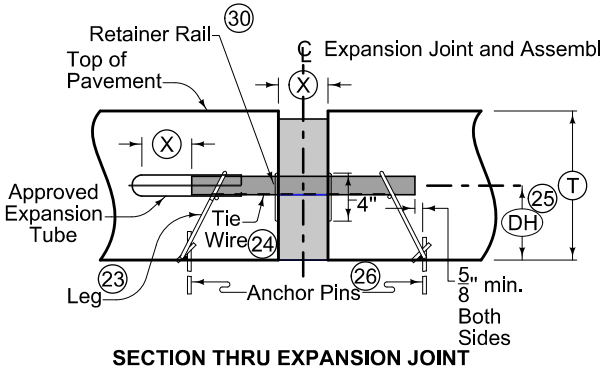


PLAN

Spaces between dowel bars are nominal dimensions with a 1/4" allowable tolerance.



ELEVATION



SECTION THRU EXPANSION JOINT

JOINT OPENING AND EXPANSION TUBE EXTENSION		
Joint Type	(X)	Minimum Tube Length
"ED"	1"	6"
"EE"	2"	7"
"EF"	3 1/2"	9"

DOWEL HEIGHT AND DIAMETER FOR DOWELED EXPANSION JOINTS		
(T)	(DH) (25)	Diameter
8" to 9 1/2"	4 1/4"	1 1/4"
10" to 11 1/2"	5 1/4"	1 1/2"
12" to 13"	6 1/4"	1 1/2"
Tubular, GFRP, and Elliptical Dowel Bars will not be allowed for expansion joints.		

DOWEL ASSEMBLIES (19) (20) (21)

(19) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(20) Use wires with a minimum tensile strength of 50 ksi.

(21) Details apply to both transverse contraction and expansion joints.

(22) Weld alternately throughout.

(23) 0.306 inch diameter wire. Wire sizes shown are the minimum required.

(24) Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

(25) Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

(26) 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.

(27) If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

(28) Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

(29) Clip and remove center portion of tie during field assembly.

(30) 1/4 inch diameter wire.

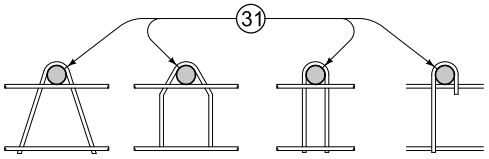
SUDAS	INTERIM	REVISION 13 01-01-26
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101
		SHEET 7 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

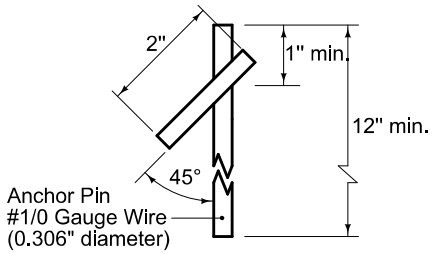
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101 SHEET 7 OF 8



OPTIONAL LEG SHAPES



ANCHOR PIN

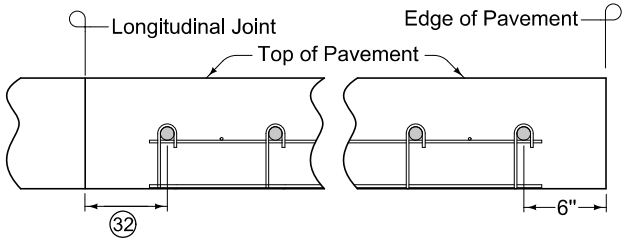
19 Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

20 Use wires with a minimum tensile strength of 50 ksi.

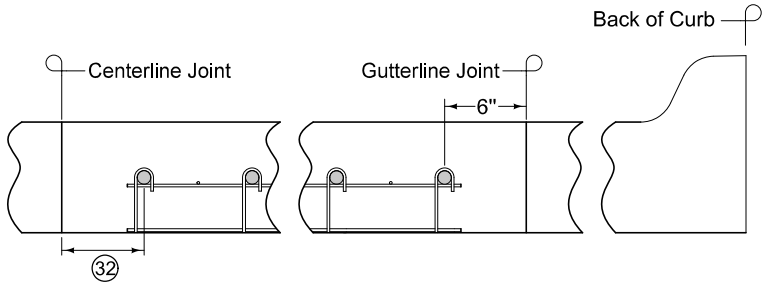
21 Details apply to both transverse contraction and expansion joints.

31 Diameter of bend around dowel is dowel diameter + 1/8 to 3/16 inches.

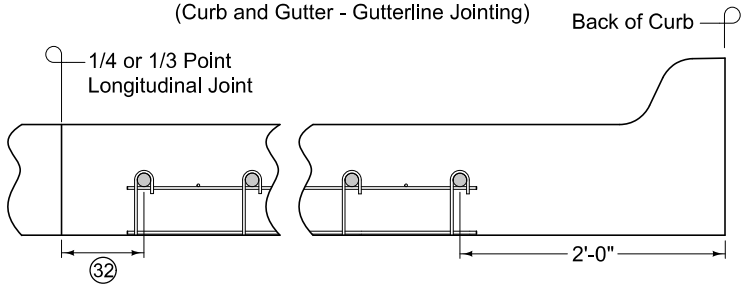
32 For uniform lane widths: 3 to 6 inches. For taper and variable width pavements: 3 to 12 inches.



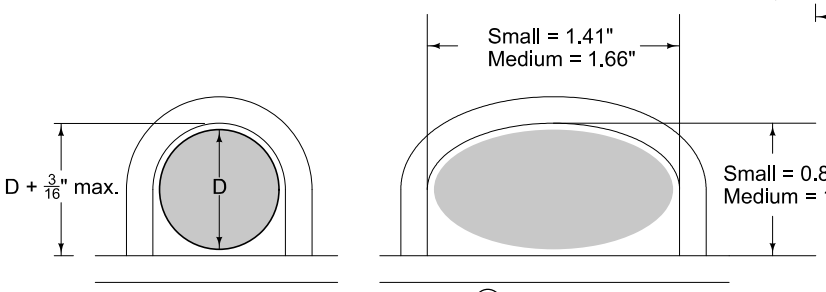
PLACEMENT LIMITS
(Rural Section)



PLACEMENT LIMITS
(Curb and Gutter - Gutterline Jointing)



PLACEMENT LIMITS
(Curb and Gutter - 1/4 or 1/3 Point Jointing)



BEND AROUND DOWEL 31

DOWEL ASSEMBLIES 19 20 21

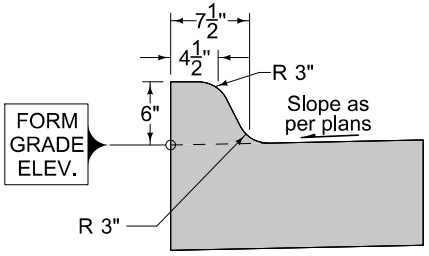
FIGURE 7010.101 | SHEET 8 OF 8

SUDAS	INTERIM	REVISION 13 01-01-26
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101 SHEET 8 of 8

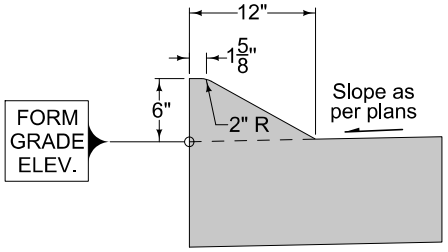
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

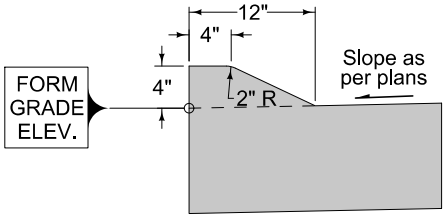
JOINTS



6" STANDARD CURB



6" SLOPED CURB



4" SLOPED CURB

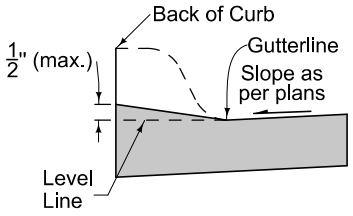
For joint details, see PV-101.

① 6 inch Standard Curb, 6 inch Sloped Curb, or 4 inch Sloped Curb as specified.

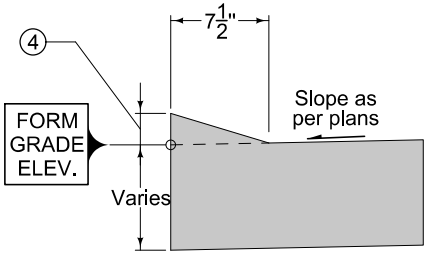
② ⅛ inch if Proposed Pavement is HMA. No elevation difference if Proposed Pavement is PCC.

③ 'BT' , 'KT', or 'L' joint if Proposed Pavement is PCC. 'B' joint if Proposed Pavement is HMA.

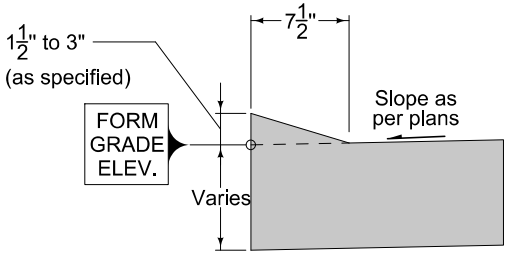
④ 0 to 2 inches for residential entrances. 1½ to 3 inches for industrial or commercial entrances.



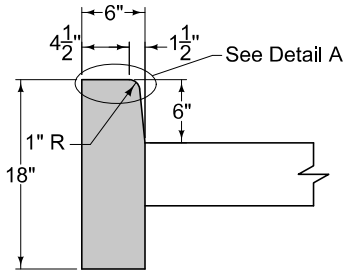
DROP CURB AT SIDEWALK



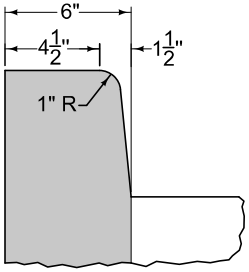
DRIVEWAY DROP CURB (IowaDepartment of Transportation is not the Contracting Authority)



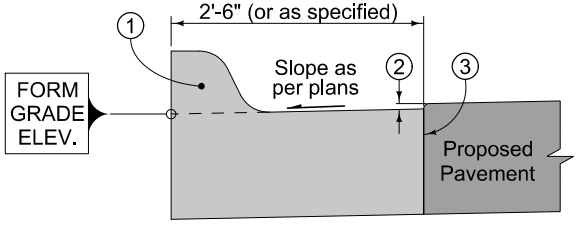
DRIVEWAY DROP CURB (Iowa Department of Transportation is the Contracting Authority)



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



DETAIL A



CURB AND GUTTER UNIT

FIGURE 7010.102

SHEET 1 OF 2

SUDAS | IOWA DOT

REVISION 5 04-21-20

PV-102

FIGURE 7010.102 | STANDARD ROAD PLAN | SHEET 1 of 2

REVISIONS: Split DRIVEWAY DROP CURB detail into two details. Added new circle note 4 on Sheet 1. Renumbered circle note on Sheet 5.

Paul D. Wigant
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

PCC CURB DETAILS

ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asphalt Pavement

B. Base Widening

1.02 DESCRIPTION OF WORK

A. Includes the requirements for the construction of asphalt surface, intermediate, and base courses placed upon a prepared subgrade, subbase, base, or pavement and asphalt base widening.

B. Comply with Iowa DOT Section 2303 for construction of asphalt pavement and base widening, except as modified herein.

1. Provide Quality Management - Asphalt (QM-A) for bid items with asphalt quantities exceeding 1,000 tons. Provide quality control for bid items with asphalt quantities of 1,000 tons or less according to Section 7020, 3.06.

2. Refer to Table 7020.01 for gyratory mixture design criteria.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Prepare and submit the job mix formula to the Engineer for approval prior to asphalt production.

B. Provide quality control test results.

C. Submit all pavement smoothness testing and certifications according to Section 7020, 3.05.

D. Upon request, provide material certifications to the Engineer.

E. Submit asphalt certifications for all bid items with asphalt quantities of 1,000 tons or less, according to Section 7020, 3.06.

F. Weight receipts should include mix size and type and/or correlate to the bid item.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Table 7020.01: Mixture Design Criteria
(derived from Iowa DOT Materials I.M. 510)

Mix	Layer Designation	Gyratory Density		Film Thickness	Aggregate[2]			
		N_{des}	Design % G_{mm} (target)		Quality Type	Crush (min)	FAA (min)	Sand Equivalent (min)
LT	0.3 M S	50	96.0	8.0 - 15.0	A[1]	60[1]	---	40
	0.3 M I							
	0.3 M B		97.0		A[1]	45		
ST	1M S	50	96.0	8.0 - 15.0	A	75[1]	40	40
	1M I				A[1]	60[1]		
	1M B		97.0				---	
HT	10M S	75	96.0	8.0 - 15.0	A	75	43	45
	10M I							
	10M B		96.5		A[1]	60		
For mix design levels exceeding 10M ESALs, see Iowa DOT Materials I.M. 510.								

[1] Requirements differing from Iowa DOT Materials I.M. 510; for base mixes, aggregate quality improved from B to A and percent crushed aggregate increased by 15%.

[2] Flat & Elongated 10% maximum at a 5:1 ratio

1.05 DELIVERY, STORAGE, HANDLING, AND SALVAGING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Aggregate Storage: Prevent contamination and intermingling per Iowa DOT Section 2303.

B. Salvaged or Reclaimed Materials: Classification of RAP will be as determined by the Iowa DOT. If RAP stockpile classification has not been determined by the Iowa DOT, the Contractor is responsible for obtaining the classification from an outside testing firm using the same tests as the Iowa DOT.

C. Disposal: Dispose of excess asphalt according to applicable local, state, and federal regulations in a manner that does not cause damage or harm to adjacent properties or public facilities.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

Complete elements of the work that can affect line and grade in advance of other open cut construction unless noted on plans.

1.07 SPECIAL REQUIREMENTS

None.

3.06 BRICK/PAVER SIDEWALKS WITH A PAVEMENT BASE (Continued)

D. Bricks/Pavers:

1. Place the bricks/pavers by hand in straight courses with hand tight joints and uniform top surface.

2. Sweep dry joint filler into joints until the joints are completely filled.

3. Fog surface lightly with water to cure cement.

4. Clean any cement stains from bricks/pavers surface. Remove stains from other concrete surfaces.

E. Protection: Protect newly laid bricks/pavers at all times using panels of plywood. Panels can be advanced as work progresses; however, keep the plywood protection in areas that will be subjected to movement of materials, workers, and equipment. Take precautions in order to avoid depressions and protect brick/paver alignment until cured and ready for pedestrian or vehicle traffic.

3.07 DETECTABLE WARNING INSTALLATION

Set detectable warning panels in fresh concrete according to the manufacturer's recommendations and Figure 7030.210.

3.08 SLOPE AND SMOOTHNESS TESTING

A. Slope for Sidewalks, Curb Ramps, Turning Spaces, and Shared Use Paths:

1. Complete slope measurements and documentation according to Iowa DOT Materials I.M. 363.

2. At no additional cost to the Contracting Authority, remove and replace all sections not meeting PROWAG requirements as detailed on Figure 7030.204.

B. Smoothness for Shared Use Paths and Driveways:

1. Check finished surface with a 10 foot straightedge placed parallel to the centerline. Mark areas showing high spots of more than 1/4 of an inch in 10 feet.

2. If directed by the Engineer, correct marked areas by grinding down with an approved grinding tool to an elevation where the area will not show deviations in excess of 1/8 inch.

3.09 GRANULAR DRIVEWAY SURFACING

Comply with Iowa DOT Section 2315.

3.10 CLEANING

A. Remove all litter and construction materials or tools immediately after the end of the curing period.

B. Remove excess dirt from the site.

C. Broom clean completed sidewalks, shared use paths, and driveways.

3.11 MATERIAL TESTING

A. General: When testing is specified in the contract documents as the Contractor's responsibility, provide testing using the services of an independent testing laboratory approved by the Engineer.

B. Concrete Compression Tests: When the concrete volume placed on a single day exceeds 20 cubic yards, comply with the following test requirements. When deficiencies are encountered, comply with Section 7010, 3.07, E.

1. Prepare at least two test cylinders per day.

2. If the concrete volume placed on a single day exceeds 200 cubic yards, prepare two test cylinders for each 200 cubic yards placed.

3. Provide 7 and 28 calendar day tests according to ASTM C 39. Minimum compressive strength is 2,000 psi at 7 days and 4,000 psi at 28 days.

C. Asphalt Density and Thickness Tests: When the area of asphalt placed on a single day exceeds 100 square yards, comply with the following test requirement. When deficiencies are encountered, comply with Section 7020, 3.04, A.

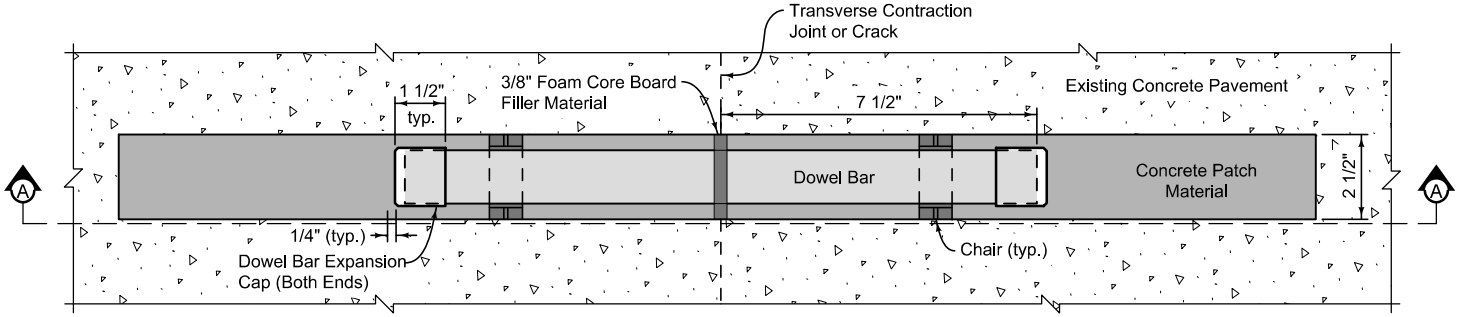
1. Prepare at least two cores per day.

2. If the area of asphalt placed on a single day exceeds 2,000 square yards, prepare two cores for each 2,000 square yards placed.

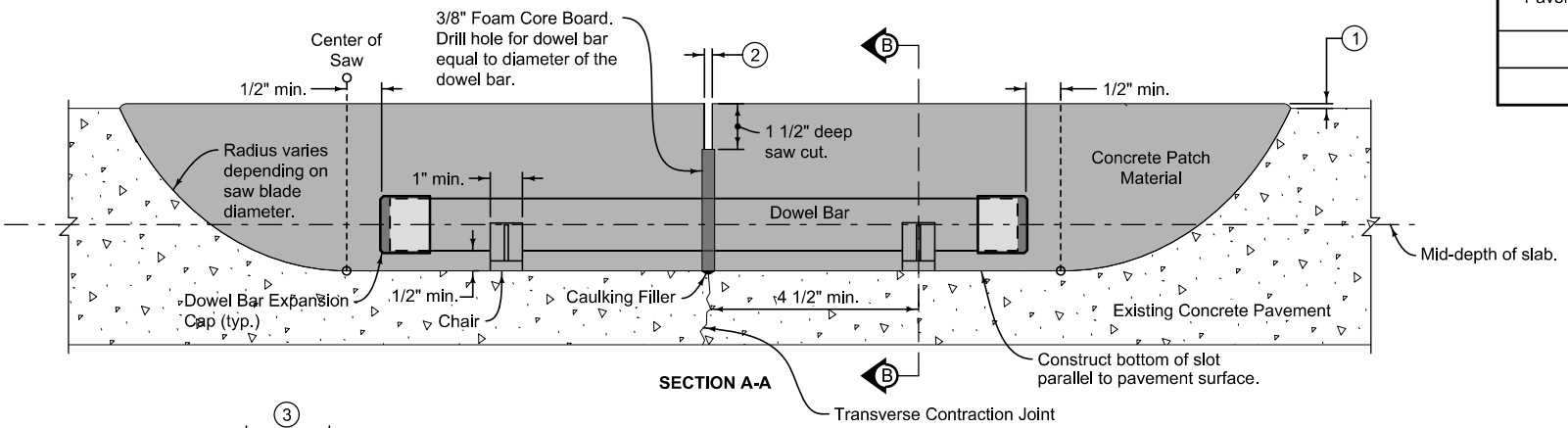
3.12 SIDEWALK AND CURB RAMP COMPLIANCE

Compliance with cross slopes and grades, as well as all other elements, for sidewalks and curb ramps is crucial. If the construction cannot be completed as specified in the contract documents, it may be necessary to adjust slopes within the accepted legal limitations. Contact the Engineer prior to placement of the concrete if changes from the values specified in the contract documents are being made.

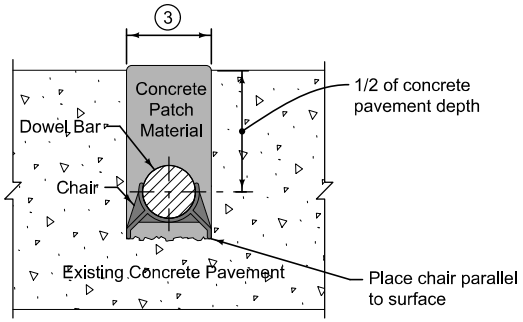
END OF SECTION



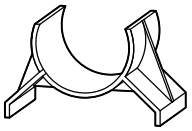
PLAN VIEW



SECTION A-A



SECTION B-B



CHAIR DETAIL

1. Extend concrete patch material 1/8" above existing concrete surface for projects to be diamond ground; construct flush if diamond grinding is not required.
2. Sawcut joint width 3/16" min to 5/16" max. Saw after concrete patch material has set.
3. Cut slot width equal to chair width (min) to chair width + 1/8" (max).

DOWEL BAR DIAMETER	
Pavement Thickness (inches)	Diameter (inches)
8 to 9½	1¼
>10	1½

FIGURE 7040.106 | SHEET 1 OF 1

SUDAS | INTERIM | REVISION NEW 01-01-26

FIGURE 7040.106 | STANDARD ROAD PLAN | PR-106 | SHEET 1 of 1

REVISIONS:

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

DOWEL BAR RETROFIT

1.08 MEASUREMENT AND PAYMENT (Continued)

X. Grid-Tied Concrete Block Mat (GTCBM):

1. Grid Tied Concrete Block Mat:

a. Measurement: Measurement will be the plan quantity in square yards of the finished surface of GTCBM. Areas of GTCBM placed in edge trenches, anchor trenches, or overlapped at mat seams will not be measured.

b. Payment: Payment will be at the unit price per square yard of grid-tied concrete block mat installed.

c. Includes: Unit price includes, but is not limited to, anchor trenches, underlayments, ground anchors, ties, and splicing.

2. GTCBM Concrete Anchor Trench:

a. Measurement: Measurement will be in linear feet of GTCBM concrete anchor trench.

b. Payment: Payment will be at the unit price per linear foot of GTCBM concrete anchor trench.

c. Includes: Unit price includes, but is not limited to, excavation, concrete, and installation.

PART 2 - PRODUCTS

2.01 COMPOST BLANKETS

Comply with Section 9010, 2.07, C for compost material requirements for compost blankets.

2.02 COMPOST BLANKET TACKIFIER

A. Use a biodegradable, organic binding agent or polyacrylamide that can be mixed with, or injected into, compost as it is placed, which is not detrimental to the establishment of vegetation.

B. Use in compost blankets when specified in the contract documents.

C. Apply at the rate recommended by the manufacturer.

2.03 FILTER MATERIAL

Material for use in filter socks and other areas, as specified in the contract documents.

A. Use material derived from wood, bark, or other, non-toxic vegetative feedstocks.

B. Use material with no visible admixture of refuse or other physical contaminants, nor any material toxic to plant growth.

C. Use material meeting the following particle sizes:

Table 9040.01: Filter Material Size

Sieve Size	Percent Passing[1]
2”	100
1”	90-100
3/8”	0-30

[1] The target flow rate of in-place material is 10 gal/min/lf. The Engineer may approve use of alternate materials meeting the target flow rate.

2.04 SLASH MULCH

Material for use in filter berms, and other areas as specified in the contract documents, to slow, filter, and divert stormwater runoff.

A. Raw wood slash from hard or soft timber harvested during clearing and grubbing operations within the project area.

B. Product of a mechanical chipper, hammermill, or tub grinder.

C. Maximum length of individual pieces shall not exceed 20 inches.

D. Maximum width of individual pieces shall not exceed 2 inches.