

TECHNICAL PROVISIONS
&
STANDARD DRAWINGS



For
ROADS AND SEWERS

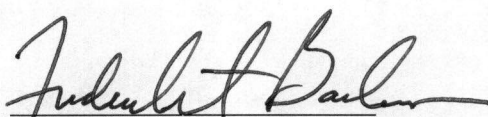
2008 EDITION

ENGINEERING DIVISION, PUBLIC WORKS DEPARTMENT

UNIFIED GOVERNMENT
TECHNICAL PROVISIONS AND STANDARD DRAWINGS
FOR ROADS AND SEWERS

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

Approved:


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County Engineer

4 / 17 / 08
Date

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SECTION 1000 – GENERAL REQUIREMENTS FOR UNIFIED GOVERNMENT PROJECTS

PART 1 - GENERAL

1.01 SCOPE: This Section covers the relationship of the Technical Provisions to the General Conditions and drawings, permit requirements, limits of construction, general requirements for measurement of installed quantities, water and electrical power, posting of no parking areas, mobilization, photographic record, site restoration, and clean up.

1.02 APPLICABILITY: Section 1000 applies only to construction contracts administered by the Unified Government Public Works Department.

1.03 RELATED WORK: The General Conditions contain other administrative and procedural requirements related to the sequencing and prosecution of the work. The location of specific topics is given below:

A.	Progress Schedules	GC - 3
B.	Shop Drawing Submittal Procedures (all submittals required by these Technical Provisions shall follow the form of the shop drawing submittal procedures.)	GC - 5
C.	Uncovering Untested Work	GC - 7
D.	Substitutions	GC - 8
E.	Staking	GC - 10 and SGC - 3
F.	Contractor's Superintendent	GC - 12
G.	Construction Methods	GC - 12
H.	Job Site Safety	GC - 11 and GC - 42
I.	Change Order Procedure	GC - 13
J.	Correction of Defective Work	GC - 20
K.	Duration of Performance Bond	GC - 37
L.	Weekend and Holiday Work	GC - 41 and GC - 50
M.	Utility Coordination	GC - 11 and GC - 45
N.	Record Documents	GC - 48

O. Historical and Archeological Deposits GC - 49

1.04 REFERENCE SPECIFICATIONS: Throughout the Technical Provisions and Special Conditions, the following abbreviations refer to the indicated documents:

- A. KDOT Standard Specifications shall mean the Standard Specifications for State Road and Bridge Construction by the Kansas Department of Transportation, current edition.
- B. ASTM shall mean a standard specification by the American Society for Testing and Materials, current edition.

1.05 PERMITS: Unified Government will obtain State of Kansas Department of Transportation permits. Contractor shall obtain Unified Government right-of-way use permit, haul permit, and Land Disturbance permits. Contractor shall obtain other permits pursuant to the General Conditions.

1.06 SUBMITTALS: The following shall be submitted by Contractor prior to starting construction:

- A. Superintendent's name and phone number.
- B. Progress Schedule, Schedule for Payments, Subcontractor list, including estimated values of the work to be provided by each Subcontractor.
- C. Copies of construction easement agreements between Contractor and private parties.

1.07 PROGRESS SCHEDULE, UPDATES, AND SITE MEETINGS: Contractor shall submit initial project schedule at the preconstruction meeting. Contractor shall update the schedule in writing when accumulated variance makes the initial schedule unusable, as determined by Engineer. Contractor shall give Engineer oral notification 48 hours in advance of changes in work location or activity. Contractor and his subcontractors shall attend site meetings as required to fully coordinate the project with Engineer. Failure to provide schedule, to give advance notification, or to fully coordinate the project may result in closure of the work site.

1.08 LIMITS OF CONSTRUCTION: Construction activity (including demolition, clearing, storage of equipment and materials, installation of materials and equipment, and employee parking) shall be restricted to the right-of-ways, easements, Unified Government-owned property indicated on the drawings, and other areas secured by Contractor by private agreement. Engineer shall be informed of Contractor's private arrangements for construction easements and shall be supplied a copy of the written agreement.

1.09 MEASUREMENT OF INSTALLED QUANTITIES: Contractor shall provide a responsible individual to work with a representative of Engineer to measure all quantities to be paid by unit price. Measurements of work completed shall be made at the end of each day's work. Said measurements shall be the basis of payment, as no remeasurement shall be made at completion of the project.

1.10 WATER AND ELECTRICAL POWER: Contractor shall provide water and electrical power required for the work. Cost of water and power shall be subsidiary to the work as a whole.

- 1.11 TECHNICAL PROVISIONS ON SITE:** Contractor shall have at least one copy of these Technical Provisions on the job site available for reference whenever the work is in progress.
- 1.12 NOTICE OF CONSTRUCTION:** Contractor shall send out a flyer for “Notice of Construction” as shown in *Attachment 1000-A* at least 48 hours in advance to the start of work. Flyers shall be posted on doorways of all residents and businesses within 200 feet of the proposed work zone.

PART 2 - PRODUCTS

- 2.01 PROJECT SIGN:** Project sign shall vary by duration of project. Sign shall be black on white of durable weatherproof construction with professional layout of information.
- A. For projects lasting longer than 45 calendar days at a single site:
1. Use attached Project Sign detail UG 1000-A.
- B. For projects of shorter duration or multiple site spot repair projects:
1. Use attached Project Sign detail UG 1000-B.

For emergency repair, no sign required.

PART 3 – EXECUTION

- 3.01 PROJECT SIGN:** Prominently place project sign, inspect regularly, clean, repair or replace as needed.
- 3.02 PARKING CONTROL:** Contractor shall identify where on-street parking must be temporarily prohibited. Engineer will provide temporary signs and direct the installation. Contractor shall provide labor and equipment for installation and subsequent removal of temporary signs. Temporary parking prohibitions shall be posted at least 48 hours in advance of the effective date of parking prohibition. Unified Government will assist in the removal of illegally parked cars.
- 3.03 PHOTOGRAPHIC RECORD:** The intent of this requirement is to protect Unified Government and Contractor from claims of inadequate restoration and to protect the property owner from less than complete restoration. Contractor shall maintain photographic records in good order throughout the term of the Contract surety bond or bonds. Photo record shall be delivered to Engineer only when so indicated in the Special Conditions, or when requested by the Engineer. Individual photos shall be made available to Engineer when damaged claims are alleged.
- A. Recorded items shall include private improvements scheduled to be removed and replaced; structures scheduled to remain that may be exposed to ground vibrations or settlement due to adjacent excavation; curbs, walks, and drives scheduled to remain that may be exposed to concentrated construction loads; and trees, shrubs, and turf scheduled to remain within the

limits of construction. Work limited to the paved areas within the public right-of-way shall not require a photographic record unless specifically required in the special conditions; such work includes grind and overlay, haydite seal, and pavement patching.

B. Each photograph shall:

1. Show sufficient detail to evaluate surface conditions.
2. Have sharp focus and proper exposure.
3. Include a reader board identifying project, approximate station, direction, and date of view.
4. Provide photographic record images in JPEG format, with minimum sensor size of 4.0 megapixels, on compact disc when requested by Engineer. Submit images with the same aspect ratio as the sensor, uncropped. Identify electronic media with date(s) photos were taken.

C. Contractor shall give Engineer 24 hours' notice of photographic work, so Unified Government representative can accompany Contractor during photography:

1. Prior to commencing work in an area to photographically record designated items.
2. 24-hour notice shall be waived for photographic record during emergency condition.

ATTACHMENTS:

Attachment 1000-A FLYER FOR ADJACENT OWNER NOTIFICATION

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 1000-A PROJECT SIGN

UG 1000-B PROJECT SIGN FOR PROJECTS OF SHORT DURATION

END OF SECTION 1000



Notice of Construction in Your Area

Construction work that may affect the curb, sidewalk, lawn or driveway adjacent to your property is scheduled by the Unified Government Engineering Division. Noise, congestion, and limits on automobile access are common inconveniences. Please bear with us. The contractor listed below is responsible to maintain a clean worksite and to restore property damaged due to construction.

Anticipated beginning date _____

Anticipated ending date _____

Contractor's Name _____

Contact _____

Phone _____

Unified Government Contact _____

FLYER FOR ADJACENT OWNER NOTIFICATION
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

SECTION 1100 - REMOVALS

PART 1- GENERAL

- 1.01 SCOPE:** This Section covers demolition activities. Topics included are disposal, salvage rights, cutting, clearing, removal of structures, and final condition of the site.
- 1.02 RELATED WORK:** Refer to the following sections for related work:
- | | |
|------------------------|---|
| Earthwork requirements | Section 2000-Earthwork |
| Pavement Removal | Section 2200-Subgrade Preparation and Pavement
Milling |
| Flowable Fill | Section 4000-Concrete Materials and Methods |
- 1.03 PERMITS:** Unified Government permits that may be required for demolition are: haul permit for on road transport of rock, earth, or used building materials; oversize load permit for transport of oversized or overweight equipment or salvaged materials; burn permit for on-site burning of trees and brush; land disturbance permit if area of operations exceeds 1 acre; and blasting permit for use of explosives. Off-site disposal sites located in Kansas City, Kansas require permit from Unified Government building inspection.
- 1.04 HAZARDOUS MATERIALS:** If potentially hazardous materials requiring special handling, such as asbestos, radioactive material, soil contaminated with petroleum or toxic chemicals, underground fuel tanks, or buried chemical drums, are encountered at locations not shown on or inferable from the drawings, Contractor shall stop work affected by the hazardous material and notify Engineer of the unexpected condition. Contractor shall not recommence work in the affected area until notified by the Unified Government that Contractor may proceed. Changes in contract price or time resulting from the discovery of hazardous materials shall be determined in accordance with the Price Adjustment clause of the General Conditions.
- 1.05 DISPOSAL:** Concrete, asphalt pavement, and brick, stone, concrete masonry and dried ready-mix washout may be buried on site where indicated on the drawings. Material with thickness to length ratios of 2.5 : 1 or less may be dumped. Large flat pieces shall be laid level and fully supported. Material buried on site shall be intermixed with sufficient small pieces and fines to fill voids. Placement shall be inspected by Engineer before covering. Material shall be covered by a minimum of 18 inches of clean earth.
- Other material shall be disposed of off site. Contractor shall make all arrangements necessary for disposal of materials.
- 1.06 SALVAGE:** Unless otherwise noted, the Unified Government retains the salvage rights for traffic barricades and traffic signage, guardrails and posts and impact attenuators, steel plates for utility patches, inlet grates and frames, and manhole covers and frames. Store these items securely on site and notify Engineer to arrange pick up. Unless modified in the Special Conditions or on the drawings, salvage rights for other material belong to Contractor.
- 1.07 BLASTING:** Unless permitted in the Special Conditions, explosives shall not be used.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

- 3.01 CLEARING:** Contractor shall remove all vegetative matter from the surface within the limits of grading. Phase clearing operations according to the Erosion Control Plan. Removals shall include turf, shrubs, and trees not shown as remaining; roots larger than 1-1/2 inches to a depth of one foot; fences, sheds, and outbuildings and their foundations; and debris, lumber, and trash dumps. If a falling tree would endanger traffic, structures, or plants to remain, removal shall be by experienced tree surgeon. Disposal of trees and brush by burning will be allowed only if permitted by the Unified Government. Air curtain destructor is required for permitted burning. Contractor shall be responsible for securing permits through the Unified Government Department of Air Quality.
- 3.02 REMOVAL OF STRUCTURES:** Structures shall be razed and foundations removed to a point 4 feet below the existing ground line or 2 feet below proposed finished grade, whichever is lower.
- 3.03 PROTECTION OF PUBLIC:** Areas with uneven driving surface shall be adequately signed, or if allowed, closed to traffic. Areas with uneven walking surfaces, open excavations, stockpile areas, and areas exposed to the possibility of falling debris or other potential hazards shall be secured from entry by the public and a safe alternate route provided.
- 3.04 EARTHWORK:** All excavation and fill shall conform to the earthwork requirements referenced in Part 1, this Section.
- 3.05 ABANDONING SEWER MAINS:** Contractor shall build masonry bulkhead at downstream end of abandoned main. If abandoned main is severed by excavation for proposed structures, cut abandoned main back 5 feet minimum from proposed structure. Bulkhead shall consist of standard 8-inch brick inserted lengthwise into the pipe and mortared in place. Cut bricks as necessary to create level courses. Fill the remaining pipe with flowable fill.
- 3.06 ABANDONING UTILITY LINES:** Utility services shall be disconnected and utility lines abandoned as directed by the utility company. Contractor shall coordinate disconnections and abandonments with the utility.
- 3.07 REMOVAL OF PAVEMENT MARKINGS:** Pavement markings to be removed shall be totally effaced by abrasion or cutting. Painting or tarring pavement markings will not be accepted.
- 3.08 FINAL SITE CONDITION:** Unless bulk earthwork or paving operations immediately follow demolition, the site shall be left in the following condition:
 - A. Areas that pond water shall be eliminated.

- B. Slopes shall be no steeper than 3 Horizontal to 1 Vertical.
- C. Debris, salvage, excess construction materials, and Contractor's equipment shall be removed from site.
- D. The site shall be seeded or sodded.

END OF SECTION 1100

SECTION 1200 - INCIDENTAL CONSTRUCTION

PART 1 - GENERAL

1.01 SCOPE: This Section covers construction incidental to the main work. Topics include Engineer's field office, the protection of existing improvements, survey monuments, trees and shrubs, removal and replacement of existing fences, temporary fencing, adjustment of utility valve and manholes, resetting utility valve and manholes, and temporary surfacing.

1.02 RELATED WORK: Refer to the following sections for related work:

Photographic Record	Section 1000-General Requirements
Utility Pavement Patch	Section 3300-Asphalt Repairs
Permanent Chain Link Fence	Section 6300-Chain Link Fence

1.03 PROTECTION OF EXISTING IMPROVEMENTS: Contractor shall provide photographic record of existing improvements scheduled to remain as referenced in Part 1. Existing improvements, shrubs, and trees to remain shall be clearly marked, and appropriate instructions shall be given to all workers on the site.

Existing improvements influenced by excavations shall be protected by underpinning or bracing of the improvement or shoring of the excavation. No parking or storage of equipment or materials shall be permitted within the drip line of existing trees. If verbal instructions to workers do not suffice to control parking or storage, Contractor shall install temporary construction fence or 4-foot high chain link fence.

1.04 REESTABLISHMENT OF SURVEY MONUMENTS: Survey monuments for real property shall be treated in the following manner:

- A. Government Corners: This paragraph applies to section corners, quarter section corners, and other government land corners within the limits of construction whether or not the corner is near excavation and demolition. Contractor shall retain a registered land surveyor licensed in the State of Kansas to identify, justify, and provide ties to the corner before any work and to reestablish it within a monument box after pavement construction is substantially complete.
- B. Other Platted Corners: This paragraph applies to platted survey monuments (both subdivision boundaries and lot corners) that may be affected by excavation, demolition, or construction traffic. Contractor shall identify, mark, and protect corner monuments. Minimum corner marking shall be two 1" x 2" posts wrapped with high visibility surveyors' tape. Survey monuments that are disturbed shall be reestablished by a registered land surveyor licensed in the State of Kansas.

PART 2 - PRODUCTS

2.01 FENCE MATERIALS: Fence materials shall match the application.

- A. Replacement materials for existing fence shall be the same type, the same or superior grade, and have the same original finish as the material removed.
- B. Temporary security or chain link fence shall be 9-gage, 2-inch mesh, galvanized, with knuckled selvedge, and shall meet the requirements of KDOT Standard Specifications Section 1619, except "U" channel posts may be used. Top wires may be used instead of bars. Height shall be six feet unless otherwise indicated in the drawings or specifications.
- C. Temporary construction fence shall be high visibility fencing, orange or yellow in color, minimum 42 inches high.
- D. Temporary stock fence shall be woven wire fabric a minimum of 42 inches high with graduated mesh pattern and shall meet the requirements of KDOT Standard Specifications sections 1619 and 2304. Pull posts shall be nominal 6-inch diameter wood posts. Every fourth line post shall be nominal 4-inch diameter wood post. Other line posts may be wood or "U" or "T" section steel posts.

2.02 TEMPORARY SURFACE MATERIAL: Type as directed by Engineer conforming to KDOT Standard Specifications Subsection 1102, CA-5; Subsection 1105, AB-3; or Subsection 1113, SS-3, crushed stone or gravel, meeting the following gradation:

CA-5		AB-3		SS-3	
Sieve Size	Percent Retained	Sieve Size	Percent Retained	Sieve Size	Percent Retained
1-inch	0	1-1/2-inch	0 - 5	1-1/2-inch	0
3/4-inch	0 - 5	3/4-inch	5 - 30	1-inch	0 - 15
3/8-inch	40 - 60	No. 4	35 - 60	3/8-inch	45 - 85
No. 8	95 - 100	No. 40	60 - 84	No. 30	90 - 100
		No. 200	80 - 92		

2.03 FIELD OFFICE: Field office shall be provided only when so indicated in the drawings or Special Conditions. Field office shall be for exclusive use of Engineer and his field representative. Field office shall conform to the requirements of KDOT Standard Specifications Section 805, Field Office and Laboratory, Type C (120 SF minimum); except a second 30"x 60" office desk may be substituted for the workbench. In addition, the office shall be supplied with electrical power and heating/cooling equipment. At Contractor's option, office space in a permanent structure within 300 feet of the project limits may be provided as field office.

2.04 MANHOLE EXTENSION RINGS: Extension rings for manhole adjustments shall be manufactured in accordance with ASTM A48, Class 35B for gray iron, shall have continuously machined horizontal and vertical bearing surfaces, and shall be rigidly attached to existing frames by set screws in the bearing leg of the ring.

Acceptable manufacturers and products are:

- A. Deeter Foundry, Inc.; Lincoln, Nebraska: 1848 to 1855 B series.

- B. Neenah Foundry Company; Neenah, Wisconsin: R-1979 Series.
- C. Clay & Bailey Manufacturing Company; Kansas City, Missouri: No. 3100 and 3101.
- D. American Highway Products, Ltd; Bolivar, Ohio: Manhole Riser (riser held in place by adjustable compression ring).

PART 3 - EXECUTION

- 3.01 REMOVE AND REPLACE EXISTING FENCE AND TEMPORARY FENCING:** Existing fence shall be removed where indicated on the drawings and stored for reinstallation. Material broken or damaged by removal and existing material too weathered for reinstallation shall be replaced. Unless specifically directed otherwise, temporary security fencing shall be placed to separate formerly secured areas from construction easements. Where indicated on the drawings, gates shall be included in the temporary fencing. Construction of temporary security and stock fence shall conform to KDOT Standard Specifications Section 806. No formerly secured area shall be left exposed unless Contractor's personnel are on guard duty.

Temporary construction fence and appropriate signs shall be installed where necessary to isolate open excavations, heavy equipment operations, uneven walking surfaces, and other potential hazards from access by the public.

- 3.02 ADJUSTMENT OF UTILITY VALVE AND MANHOLE COVERS:** Adjustments to utility valve or manhole covers shall be made where necessary to preserve the surface alignment on resurfacing or patch projects, as determined by Engineer. Adjustments shall be accomplished by raising the cover with metal extension rings. The rings shall be of an approved type and shall be rigidly secured to the existing frame. Adjustments shall be completed before the final asphalt lift is placed.

- 3.03 RESETTING UTILITY VALVE AND MANHOLE COVERS:** Where Engineer determines that adjustments may not produce an acceptable final product, utility valve boxes and manhole covers shall be reset. Resetting valve boxes shall include removal and replacement of fixed height valve boxes, or physical adjustment of frame section of adjustable height valve box. Resetting manhole covers shall include the removal and resetting of concrete collar, grade rings, frame, and cover. If adjustment would cause total stack height of grade rings to exceed 18 inches, the cone shall be removed and a barrel section added.

Full courses of brick set in mortar shall be used for resetting of brick manhole covers. Completely fill brick joints and provide a 1/2-inch mortar coating to outside face of brick grade courses. Brick for resetting shall conform to ASTM C32, Grade SS or SM, and shall be nominal 2-1/4" x 4" x 8".

Pavement removed for resetting operations shall be patched according to the utility patch requirements listed in Part 1. Valve boxes and manhole frames and covers may be reused only if they meet current standards and are in sound condition; otherwise, they shall be replaced. Resetting shall be completed before the final asphalt lift is placed.

- 3.04 TEMPORARY SURFACING:** Temporary surface material shall be promptly placed, bladed, and rolled in areas designated by Engineer such as temporary crossings and temporary routes of ingress and egress to adjacent residences and businesses. Performance standard shall be a stable, mud free pedestrian and vehicle route relatively free of ruts, drop-offs, and bumps.
- 3.05 SITE RESTORATION:** In the case that damage occurs to any property or improvement, public or private, on or off the site, as a result of Contractor's use of the site, Contractor shall repair or replace damaged property or improvement to a condition equal to or better than the undamaged condition.
- 3.06 CLEAN UP:** Contractor shall keep the work site free of trash and mud and in orderly appearance at all times. Debris and unsuitable material shall be promptly removed. Adjacent streets and lanes open to traffic through the work site shall be kept free of mud, trash, and material stockpiles. Final clean up shall be completed immediately after completion of work within an area. All equipment, trash, and unused material shall be removed, and the entire limits of construction left in a neat and finished condition.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 1200-A REPLACEMENT OF GOVERNMENT CORNER MONUMENT IN PAVED AREA

END OF SECTION 1200

SECTION 1300 - TRAFFIC CONTROL

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers Contractor's traffic control. Topics included are equipment standards, minimum traffic control, and Unified Government remedy of deficient traffic control.
- 1.02 REFERENCE STANDARDS:** In this Section, the "Manual on Uniform Traffic Control Devices", U.S. Department of Transportation, Federal Highway Administration is referred to as "MUTCD". The most recent version as adopted by the KDOT shall apply.
- 1.03 SUBMITTALS:** The following shall be submitted prior to starting construction:
- A. Name and phone number of party responsible for emergency maintenance of traffic control.
 - B. Traffic Control Plan.
- 1.04 STREET CLOSURE PERMITS:** A separate permit is required from the Unified Government when a street is closed to through traffic. Contact the Public Works office a minimum of 3 business days in advance for a permit.
- 1.05 TRAFFIC SAFETY RESOURCES:** The contractor shall either:
- Have on staff a work zone traffic safety officer who has either an American Traffic Safety Services Association traffic control technician certification or International Municipal Signal Association certification in work zone traffic safety and who has oversight responsibility of traffic control and work zone safety or
 - Contract all traffic control setup, maintenance and removal to a firm specializing in traffic control that has a technician on each crew that has either an American Traffic Safety Services Association traffic control technician certification or International Municipal Signal Association certification in work zone traffic safety.
- 1.06 TRAFFIC ENFORCEMENT:** If Engineer determines adequate traffic control cannot be achieved by application of standard traffic control devices (including advance signing, barricades, channelizing devices, barriers, flashers, signed detours, arrow boards, temporary pavement markings, message boards, flaggers, and pilot cars), Contractor shall procure the services of off-duty, sworn police officers and patrol cars to enforce the traffic control measures.

PART 2 - PRODUCTS

- 2.01 CONSTRUCTION TRAFFIC CONTROL DEVICES:** Signs, barricades, channelizing devices, lights, and pilot cars shall meet the MUTCD requirements for type, size color, reflectivity, light intensity, flashing rate and sequence, material, lettering style, and standardization of wording and symbols for the street classification and design speed on which they are used. Signs shall not have handwritten or otherwise distracting messages on the reverse side, except for professionally prepared

ownership identification labels. Flaggers shall meet minimum qualifications, including knowledge of regulations, use of hand signals, and standards for clothing and conduct established in the MUTCD.

Barricades and advance warning signs in place at night shall have a Type A (low intensity flashing) warning light. Other warning lights may be required in the Special Conditions or drawings.

PART 3 - EXECUTION

3.01 TRAFFIC CONTROL: All traffic control for construction shall conform to the standards of the MUTCD. Contractor shall provide, install, check daily, and maintain devices required by the traffic control plan, shall cover conflicting permanent signs, and shall remove devices when no longer needed. Contractor shall identify a party responsible for emergency maintenance of traffic control equipment. Such party shall be on continuous call for the duration of the traffic control operations.

Where a traffic control plan is included in the drawings, Contractor shall follow it as closely as possible. Sign messages shall not be changed without approval of Engineer, and actual placement of the devices may be adjusted to optimize effectiveness. If no traffic control plan is included in the documents, Contractor shall submit a traffic control plan relative to advance warning, street and lane closure, detouring, and separation of traffic from workers, equipment, and road hazards. Contractor's traffic control plan shall meet the minimum standards established in this Section.

3.02 MINIMUM TRAFFIC CONTROL: Minimum traffic control shall consist of the following applications:

- A. "Construction Ahead" advance warning signs shall be posted on the street under construction and all side streets entering between the advance warning signs. "End Construction" signs shall be posted on all routes leaving the construction area. "End Construction" signs are not required for construction zones less than 500 feet in length. Where appropriate, the general advance warning signs may be followed by a sign identifying the conditions likely to be encountered, such as uneven pavement, lane or street closures, flaggers, or fresh oil.
- B. The work zone shall be separated from traffic by acceptable channelizing devices placed a maximum of every 30 feet. Separation shall include tapered sections to shift traffic. Taper shall be 8:1 or flatter for local streets. Taper lengths for collectors and arterials shall be as designated on the traffic control plan.
- C. Where traffic is required to cross the centerline, traffic directions shall be separated with acceptable channelizing devices or flaggers used to direct one-way traffic.
- D. The requirements for separation in items 3.02C. may be waived if the following conditions are met:
 - 1. Daily traffic counts are below 400 cars a day. (Traffic counts of 400 and below are characterized by long gaps between cars and infrequent occurrences of cars converging on the work zone from opposite directions.)
 - 2. The 85th percentile approach speed is below 25 mph.

3. Work zone is short.
 4. Duration of work is one day or less.
 5. Approach sight distance is over 300 feet.
 6. Approaching drivers have clear view of oncoming traffic and entering traffic beyond the work zone.
- E. Excavations, stockpiles, drop offs, other items not at the grade of the travel lane, and work zones not separated from traffic by acceptable channelizing devices shall be marked with Type 1 barricades.
- F. A lane closure of an arterial road shall have a lighted arrow board placed behind the taper.
- G. Contractor may employ other devices and methods as he deems necessary to provide a safe work zone for workers and traffic.
- H. Unified Government may order work ceased until deficient traffic control is remedied.

END OF SECTION 1300

SECTION 1400 - CONSTRUCTION PERIOD POLLUTION PREVENTION

PART 1 - GENERAL

- 1.01 SCOPE:** This section covers construction phase erosion control and pollution prevention. Topics included are permit requirements, material for and installation of best management practices, and best management practices for pollution prevention and spill response.
- 1.02 RELATED WORK:** Refer to the following sections for related work:
- | | |
|-------------------------------|--|
| Temporary construction fence | Section 1200-Incidental Construction |
| Grading | Section 2000-Earthwork |
| Seed mixes and seed placement | Section 7000-Seeding, Sodding and Mulching |
- 1.03 REFERENCE STANDARDS:** In this section, the following abbreviations stand for the indicated documents:
- A. ECTC shall mean the Standard Specification for Rolled Erosion Control Products published by the Erosion Control Technology Council.
- 1.04 PERSONNEL QUALIFICATIONS:** The job site superintendent and the person responsible for directing installation and maintenance of erosion control measures shall have completed within the previous 24 months a minimum of 7 hours (or 14 hours lifetime) of training in construction site erosion and sediment control.
- 1.05 LOCAL PERMIT:** For sites greater than one acre in size, Owner will obtain a land disturbance permit from the UG prior to grading operations. Contractor shall comply with all the provisions of the permit.
- 1.06 STATE PERMITS:** For sites greater than one acre in size, Owner will apply for NPDES erosion and sediment control permit from KDHE prior to grading operations. Contractor shall comply with all the provisions of the permit.

PART 2 - PRODUCTS

- 2.01 ROLLED EROSION CONTROL PRODUCTS:** Blankets, netting and mats shall comply with ECTC requirements for the product type as indicated below:
- A. Netting shall be ECTC type 2.A, mulch control net with 12 month longevity.
- B. Blankets or Erosion Control Blankets shall be ECTC type 2.C or type 2.D, single-net or double net erosion control blanket with 12 month longevity.
- C. TRM or Turf Reinforcement Mat: unless a stronger mat is specified in the special conditions or project drawings TRM shall be ECTC type 5.A, permanent turf reinforcing mat with 6.0

lb/sf maximum shear stress.

2.02 STRAW FOR MULCH: Cereal straw from stalks of oats, rye, wheat or barley, free of prohibited and noxious weed seeds.

2.03 COMPOST: Compost for erosion control applications shall be a mixed of finely divided aged, compost and larger chopped or shredded woody material.

A. The compost fraction shall meet the following composition criteria:

<u>Parameter</u>	<u>Criteria</u>
Odor	Earthy, not sour or boozy
Color	Dark brown or black
Organic matter, % dry weight	40 - 70
Moisture content, % wet weight, organic fraction only	30 - 60
Manmade inerts, % dry weight	<1
Passing 1/2-inch sieve, %	90 - 100

B. The chopped wood fraction shall meet the following composition criteria:

<u>Parameter</u>	<u>Criteria</u>
Organic matter, % dry weight	90 - 100
Manmade inerts, % dry weight	<1
Passing 3-inch sieve, %	90 - 100
Passing 1-inch sieve, %	0 - 10

C. Mixture by use:

	<u>Blanket or Berm, vegetated</u>	<u>Application Blanket or Berm, unvegetated</u>	<u>Sock</u>
Ratio of compost to chopped wood	3:1	1:1	Limits per blower manufacturer.

2.04 COMPOST SOCK: Tubes for compost sock shall be produced from a 5 mil continuous HDPE filament, woven into tubular netting, with 3/8 inch openings. Unless otherwise required by the special conditions or project drawings a 12-inch diameter tube shall be used. Stakes shall be 2x2 hardwood.

2.05 SILT FENCE: Except for areas inaccessible to slicing machines, fabric shall be provided separate from post.

A. Fabric: Fabric for silt fence shall comply with AASHTO M 288. Regardless of actual support conditions, fabric shall meet the requirements given for the “unsupported temporary silt fence, 4 foot maximum post spacing”

- B. Posts: Posts shall be either 2x2 hardwood or rolled-shape steel post weighing 1.33 lbs/ft minimum.

- 2.06 GRAVEL FOR FILTERS:** Gravel for gravel berms, gravel bags, inlet filters, filters at sediment basin riser, facing of sediment trap rock outlets, and facing of rock check dams shall be clean gravel, maximum dimension of 1-1/4 inches and 5% maximum by weight less than 3/8 inches.
- 2.07 GRAVEL BAGS:** Bags shall be woven synthetic or natural burlap fabric with a minimum weight of 4 ounces per square yard and Mullen burst strength greater than 300 psi, ASTM D3786. Bags shall be loosely filled. Bag may be of any size suitable for hand placement.
- 2.08 STONE:** Stone for erosion control shall be crushed limestone, shall have no durability requirement and shall be graded as follows:

<u>Sieve Size</u>	<u>% passing by weight</u>	
	<u>Construction Entry</u>	<u>Check Dams & Sediment Trap</u>
1 inch	0 - 2	0 - 2
4 inch	45 - 70	35 - 55
9 inch	100	--
12 inch	--	100

- 2.09 RECYCLED CONCRETE:** Recycled concrete meeting the gradations for gravel or stone, may be used in place of gravel or stone specified in this section.
- 2.10 TEMPORARY SLOPE DRAIN:** Slope drain shall be rigid or flexible tubing. Manufactured elbow shall be used for sharp change in grade. Unless otherwise identified in the special conditions or project drawings a 6-inch diameter is the minimum size.
- 2.11 SPRAY APPLIED MULCH:** Mulches suitable for application by Hydroseeding. Spray applied mulches shall include a temporary dye to provide indication of coverage.
- A. Hydraulic mulch: A product specifically manufactured to be hydraulically-applied that consists of defibrated paper, wood and/or natural fibers that may or may not contain tackifiers used to facilitate vegetation establishment on mild slopes and designed to be functional for up to 3 months.
- B. Bonded Fiber Matrix: A product specifically manufactured to be hydraulically-applied that consists of organic defibrated fibers and cross-linked insoluble hydro-colloidal tackifiers to provide erosion control and facilitate vegetation establishment on steep slopes and designed to be functional for a minimum of 6 months.

PART 3 – EXECUTION

- 3.01 PLANNING AND SCHEDULING:** Comply with the sequence of the erosion control plan. If no sequence is included in plans comply with the following sequence:

- A. Implement pre-construction plan: All structural BMPs shown on the pre-construction, including access controls and downstream perimeter treatment BMPs, must be in place before general clearing operations. Permissible clearing to place structural BMPs is minimum required for the installation. Coordinate placement of structural BMPs with local weather forecast so that limited clearing and placement may be completed within a forecast dry period.
- B. Implement steep slope protection (slopes steeper than 15%): During grading operations, place steep slope protection shown on the interim stabilization drawing as soon as practicable.
- C. Implement interim stabilization: The ground cover and other structural BMPs shown on the interim stabilization drawing must be placed within 14 days of substantial completion of grading operations. Substantial completion of grading will be evidenced by cessation of grading operations or by commencement of construction of curb, pavement, building foundations or utilities other than sanitary or storm sewer. Install site improvements: Construct the utilities, roads, buildings and other site improvements depicted on the construction plans.
- D. Implement final stabilization: Coordinate removal of construction phase BMPs necessary to place final stabilization with local weather forecast so that removal and placement may be completed within a forecast dry period. Downhill perimeter controls not be removed until final stabilization is placed and vegetative cover is established over the remainder of the site.
- E. Establishment and final construction: Once the remainder of the site is stabilized and vegetative cover is established, construct permanent water quality BMPs and remove the downhill perimeter sediment controls.

3.02 INSPECTION, MAINTENANCE AND SEDIMENT REMOVAL: Inspect all BMPs weekly or after each rain in excess of ½ inch. Note deficiencies on log and correct promptly. Remove accumulated silt at levels called for on the standard details or project drawings. Dispose of silt in a location where it will not be re-suspended by precipitation, typically by incorporating into an equal volume of soil and spreading near the crown of a mild slope.

3.03 PLAN ADJUSTMENTS: Whenever failure of a BMP occurs, evaluate the causes and, propose additions and adjustments to the erosion control plan to prevent future failures. Implement approved changes.

3.04 MULCHES: Mulches are non-vegetative covers applied on vegetated areas to resist erosion and retain soil moisture during germination and establishment of the vegetative cover.

A. Coverage rates shall be:

<u>Mulch type:</u>	<u>Best use:</u>	<u>Coverage:</u>
Erosion Control Blanket	Steep slope, all-year	100% area coverage, 6 inch overlap
Compost Cover, seeded	Steep slope, growing season	¾ inch to 1-½ inch

Compost Cover, non-seeded	Steep slope, winter	>2 inches
Crimped Straw, seeded	Mild and moderate slopes, growing season	>1.5 Tons/acre (70lbs/1000)
Crimped Straw with netting, non-seeded	Mild and moderate slopes, winter	>3.0 Tons/acre (140lbs/1000)
Hydraulic Mulch	Mild and moderate slopes, growing season	1,500 lb/acre
Bonded Fiber Matrix	Steep slope, growing season	3,000 lb/acre

- B. Installation: Erosion control blanket shall be staked to manufacturer's recommendation. Compost and seeded crimped straw applied during the growing seasons do not need netting in the original installation. If washout or blowing occurs, reinstall with netting. Winter applied crimped straw requires netting.
- C. Coordinate with seed placement: Apply seed under straw mulch and blankets, but over or mixed with compost mulch.
- D. Spray applied mulches shall be applied in two passes with different angles of application to eliminate shadowing. Seed may be drilled prior to application of the spray applied mulch or may be mixed with the mixture for the first pass. When mixed with the spray application, seed shall be added after water and mulch.

3.05 GROUND PREPARATION FOR SEEDING NON-LAWN AREAS: Ground shall be loosened to a 4-inch depth prior to application of seed and mulch. Do not back drag with bucket; this increases runoff and erosion. Leave rough, or level with rake or chain drag. Unless otherwise required in the special conditions or project drawings, no fertilizer is required.

3.06 SEED PLACEMENT: See related work Part 1.

3.07 INSTALLATION DETAILS: Other BMPs shall be placed as shown on the standard details and project drawings.

3.08 DEWATERING: Discharges from dewatering trenches and other excavations shall be treated before release by passing through a sediment control BMP.

3.09 POLLUTION PREVENTION:

- A. Do not dispose of excess products or solid waste in sanitary or storm sewers nor bury on site. Inert waste (stone, brick, or broken concrete) may be buried at locations indicated on drawings or approved by Engineer.
- B. On-site disposal of fuels, oils, lubricants, solvents, or other hazardous materials is not permitted under any circumstances.
- C. Maintain equipment in good order. Provide for proper containment, collection and disposal of materials in instances requiring on-site maintenance of equipment.

- D. Perform fueling, repair, and servicing of equipment a minimum of 50 feet from streams.
- E. Provide toilet facilities to control sanitary waste.
- F. Store on site only the quantity of materials and products necessary to complete the work.
- G. Store products in original containers. If original containers are not resealable, transfer containers shall be labeled clearly. Original material safety data sheets (MSDS) shall be maintained on site.

3.10 SPILL RESPONSE:

- A. Stop source of spill if safe to do so.
- B. Contain runoff from spill if safe to do so.
- C. Follow all MSDS recommendations relating to containment, cleanup, and requirements of protective clothing.
- D. Contact HAZMAT at 911 if assistance is needed in stopping or containing spill.
- E. Report all significant spills to KDHE.
- F. Dispose of contaminated materials as directed by KDHE. Temporary permit for transporting hazardous materials shall be obtained from KDHE.

3.11 DUST CONTROL: Contractor shall take effective measures to prevent blowing dust:

- A. Appropriate moisture content shall be maintained in all exposed soils by application of water or, in areas to be subsequently paved, by application of asphalt emulsion.
- A. When dust produced by operations such as sand blasting, concrete grinding, and sawing of concrete or masonry would create a public nuisance, they shall be performed under a water spray, or an alternate construction method shall be used.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 1400-A CONSTRUCTION VEHICLE ENTRY
UG 1400-B STEEP SLOPE PROTECTION
UG 1400-C DIVERSION DIKE
UG 1400-D COMPOST BERM AND COMPOST SOCK
UG 1400-E SILT FENCE INSTALLATION
UG 1400-F SLOPE DRAIN
UG 1400-G MINIMUM EROSION CONTROL FOR SINGLE FAMILY RESIDENTIAL LOT
UG 1400-H ROPE BARRIER
UG 1400-I SEDIMENT BASIN OUTLET – SHEET 1 OF 2
UG 1400-J SEDIMENT BASIN OUTLET – SHEET 2 OF 2

END OF SECTION 1400

SECTION 1500 - INSPECTION OF LAND DEVELOPMENT

PART 1 - GENERAL

- 1.01 SCOPE:** This section covers third party inspection of developer-installed improvements to be accepted for public maintenance. Topics included are inspector and laboratory qualifications, responsibility for cost of inspection, reporting requirements, pavement mix design, required tests and inspections, remedial tests, corrective actions and extended maintenance bonds.
- 1.02 APPLICABILITY:** These minimum inspection requirements apply to all sanitary sewer, storm sewer, and pavements built by private parties with the intent to dedicate such facilities to the Unified Government for ownership and maintenance. Also covered are all curb, gutter and sidewalk located in public rights-of-way built as part of land development. Construction not subject to these requirements are: driveway installation and repair of curb or walk on previously developed lots, repairs by franchised utilities and projects administered by the Unified Government Public Works Department and the Board of Public Utilities.
- 1.03 RELATED WORK:** Refer to the following sections for related work:
- | | |
|-----------------------------------|---|
| Roadway Embankment | Sec 2000 Earthwork |
| Utility Trench Backfill | Sec 2100 Trenching and Tunneling |
| Subgrade Preparation | Sec 2200 Pavement Removal & Subgrade Prep |
| Asphalt Pavement Placement | Sec 3100 Asphalt Paving |
| Pavement Trueness Test Criteria | Sec 3200 Asphalt Pavement Trueness |
| Curbs, Walk and Concrete Pavement | Sec 4100 Concrete Pavement and Flatwork |
| Manholes | Sec 5000 Manhole Construction |
| Sanitary Sewer | Sec 5100 Sanitary Sewer Main |
| Storm Sewer | Sec 5200 Storm Sewer |
- 1.04 COUNTY ENGINEER:** Throughout this section County Engineer shall mean the Unified Government County Engineer or his designee.
- 1.05 RESPONSIBILITY FOR COSTS:** The developer of the property will pay costs of inspection except the Unified Government will pay cost of the first TV inspection of sanitary sewer lines and storm sewer lines. The developer will pay cost of re-televising lines that fail TV inspection.
- 1.06 CONSTRUCTION ENGINEER:** A professional engineer licensed in the State of Kansas, experienced in civil site design and construction, whose relationship to the Owner is that of independent contractor, and who is familiar with the design. Construction Engineer may be an employee of the inspection firm or may be independent of it. Proposed Construction Engineer and all changes in Construction Engineers shall be subject to the approval of the County Engineer.
- 1.07 INSPECTION FIRM:** Inspection firm shall be either an independent civil engineering firm with principals as licensed professional engineers in the State of Kansas or a materials testing firm meeting the laboratory qualification of this specification. Construction inspection services shall constitute a regular and substantial part of the inspection firm's business. Proposed inspection firm and all changes in inspection firms shall be subject to the approval of the County Engineer.

- 1.08 FIELD INSPECTOR:** Person actually performing the inspections in the field shall have at least one of the following registrations or certifications:
- A. Professional engineer licensed in the State of Kansas or EIT licensed in the State of Kansas acting under the supervision of a licensed professional engineer,
 - B. CIT certification from the Kansas Department of Transportation in soils, asphalt and concrete,
 - C. NICET level one certification in soils, asphalt and concrete.
- 1.09 LABORATORY QUALIFICATIONS:** Tests shall be conducted by an independent construction materials testing laboratory certified in soils, asphalt and concrete by AASHTO or A2LA, and subject to approval by the County Engineer. The laboratory shall have the staff, equipment, qualifications, and experience to perform the tests in accordance with the specified standards. Laboratory may be part of the inspection firm or may be independent of it.
- 1.10 COUNTY ENGINEER'S APPROVAL OF CONSTRUCTION OBSERVERS:** At any time during the construction of the development or review of the construction, the County Engineer may disqualify the Construction Engineer, the inspection firm, the field inspector, or the laboratory based on failure to demonstrate qualifications, or upon failure to provide timely inspection, or upon discovery of a misrepresentation by the Construction Engineer, the inspection firm, the field inspector or the laboratory in the report prepared for this or any other development in Kansas City, Kansas. In the event of disqualification after the start of the project, all inspection performed by the disqualified firm or individual shall be considered null and void; and the work shall be inspected by alternate means or the remedial inspections and extended maintenance bond provisions shall apply.
- 1.11 MIX DESIGN:** Both paving contractor and inspection firm shall review and indicate by their signatures that mix designs for asphalt and concrete meet the minimum construction standards. Mix designs shall be tested by a laboratory independent of the asphalt supplier and shall have been prepared within 12 months prior to construction.
- 1.12 CONSTRUCTION STANDARDS:** Construction shall conform to the Unified Government's minimum construction standards printed as "Technical Provisions and Standard Drawings for Roads and Sewers". Copies are available at the office of the County Engineer and the Unified Government's website. Design and construction shall also conform to the separation and protection standards of the Kansas Department of Health and Environment.
- 1.13 MAINTENANCE BOND:** Prior to the Unified Government acceptance of private development construction, a single performance and maintenance bond from a surety company authorized to do business in the State of Kansas, as Surety, shall be submitted to the County Engineer. Amount of maintenance bond shall be 100 percent of construction cost. Bond shall indemnify the Unified Government of Wyandotte County/Kansas City Kansas for losses arising from defective materials and installation during the term of the bond. Process agent for the Surety must be named and address provided: Process agent must be a resident of the State of Kansas. Terms and conditions shall be as printed on *Attachment B* Maintenance Bond form following this section.

- 1.14 EXTENDED MAINTENANCE BOND:** Where required due to failure to inspect, surety for extended maintenance shall consist of some combination of the following:
- A. Bond equal to the estimated reconstruction costs from a surety company authorized to do business in the State of Kansas;
 - B. Lien against unencumbered real property located in the State of Kansas whose appraised value is equal to the value of the estimated reconstruction costs;
 - C. Cash or cash equivalents equal to the value of the estimated reconstruction costs to be held in escrow by an escrow company located in Wyandotte County.
- 1.15 OTHER ENFORCEMENT:** No certificate of occupancy for any structure in the development will be issued until both the Construction Engineer's certification and a complete inspection firm's report have been reviewed and approved by the County Engineer and all corrective actions have been completed.
- 1.16 REPAIR OF PAVEMENT CORES:** Pavement cores shall be repaired by the paving contractor and observed by the inspection firm. Cores in both concrete and asphalt pavements shall be filled full depth with street pavement mix Portland cement concrete. Mix shall be rodded for consolidation, struck off flush with pavement and cured with a curing compound.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

- 3.01 CONSTRUCTION ENGINEER'S RESPONSIBILITY:** Construction Engineer shall:
- A. Be familiar with the design and design intent of the proposed construction,
 - B. Review adequacy of construction staking and take relative measurements of installed features,
 - C. Review, approve and record minor deviations from the design,
 - D. Review, correct and deliver to the Unified Government sanitary and storm sewer record drawings,
 - E. Observe sewer and manhole tightness tests. After pipe passes tightness tests, notify the County Engineer that the system is ready for TV inspection. Review TV inspection report; propose corrective actions to County Engineer for approval and to direct corrections.
 - F. Conduct prepaving inspection to accept street width, subgrade elevation and cross slope, curb dimensions, and confirm manhole and valve box adjustments.

- G. Conduct paving inspection or review inspection firm's logs of paving inspection to confirm pavement thickness.
- H. Observe pavement trueness tests for arterial and collector roads. Observe water ponding depths on all pavements with minimum slope. See Part 1 for reference to pavement trueness testing criteria and corrective action.
- I. Review inspection firm's report for uncorrected deficiencies; propose corrective actions to County Engineer for review and direct corrections.
- J. Complete and sign the following compliance statement. Proposed amendments to the compliance statements shall be explained in writing and are subject to review of the County Engineer.

"Based on familiarity with the design concept and requirements of the Unified Government, on site observations, review of construction staking by others and measurements made personally, review of the inspection firm's report, and on prior review and approval of design deviations all conducted by me or by my qualified staff, it is my professional opinion that for the development known as Name of Development:

- A. Corrective actions for deficiencies listed in the inspection firm's report have been taken as directed by the County Engineer, documentation is attached.
- B. Deviations from plan deliver the intended system performance, deviations are marked on record drawings; one copy of the street, storm sewer, and sanitary sewer record drawings has been submitted with an approved digital format to the County Engineer, one copy of the street and storm sewer record drawings has been submitted on Mylar to the County Engineer.
- C. Sewers and manholes meet tightness requirements, lines have been televised by Unified Government and passed, and reports are attached.
- D. The installed locations of public improvements are in substantial conformance to the construction plans; road widths are within 2 inches of plan dimension; manhole covers and valve boxes are adjusted to the grade and cross slope of the street; collector and arterial roads meet pavement trueness standards; water ponding depth is within specified tolerance; curb, walk and pavement dimensions are within tolerance; concrete joints are located, prepared, and sealed within tolerance; and all disturbed survey monuments are re-established.
- E. All exceptions to the forgoing location, dimension and tolerance statements are listed as follows:

List exceptions

Signature of Construction Engineer

Typed name

P.E. seal

Attachments: Record Drawings
 Tightness test results
 TV reports”

3.02 INSPECTION FIRM’S REPORT: The inspection firm shall submit a final inspection report to the County Engineer and the Construction Engineer. The report shall consist of a compliance statement, a list of uncorrected deficiencies, a statement identifying what if any items are required to have extended maintenance bonds, inspector's logs documenting all site visits, test results, and mix designs bearing acceptance signatures of both the paving contractor and the inspecting firm.

Compliance statement is printed below. Proposed amendments to the compliance statements shall be explained in writing and are subject to review of the County Engineer.

"Based on the required field observations or remedial tests, along with the required field and laboratory tests, all conducted by me or by my qualified staff, it is my professional opinion that the specific items of work listed below and completed as part of Name of Development meet the minimum construction standards of the Unified Government of Wyandotte County/Kansas City, Kansas or that the uncorrected deficiencies are prominently listed at the front of this report.

1. Roadway embankments were constructed from acceptable material and meet the embankment foundation, placing, and compaction requirements.
2. Roadway subgrades meet the preparation, compaction and moisture content requirements. Subgrade stabilization was either not required or properly executed.
3. Utility trenches and inlet and manhole excavations under and adjacent to pavements were backfilled with the required granular material and the backfill meets the compaction requirements. Utility trenches in non-paved areas were backfilled with acceptable materials and meet the compaction requirements.
4. Concrete curbs gutter and sidewalk meet the mix, thickness, and environmental limits at time of placing, finish, jointing, and curing requirements.
5. Sanitary and storm sewer mains meet the material, bedding, tapping and alignment requirements.
6. Manholes and inlets meet the material, backfill, and compaction requirements.

7. Asphalt job mix complies with the Unified Government Technical Provisions. Asphalt pavements meet the requirements for job mix, total thickness, lift thickness, machine placement requirements, environmental limits and mix temperatures at time of placement, and compaction requirements.
8. Concrete pavements meet mix, base, thickness, reinforcement and doweling, environmental limits, finish, and curing requirements.
9. All items requiring extended maintenance bond due to lack of timely testing are listed prominently at the front of this report.

Signature by principal of inspection firm

Typed name and title

Name of inspection firm

Attachments: List of uncorrected deficiencies
 List of items requiring extended maintenance bonds
 Mix design
 Inspector's log
 Test results"

Extended maintenance bond requirements are included in Part 3 of this Specification.

Inspector's log shall at a minimum show the date and time of each visit on the site, record work observed, note deficiencies and corrective actions taken, and record environmental conditions applicable to the current work effort. The record of each visit shall be initialed by the inspector. Test results shall indicate location of the work sampled, specified limits, and tested values. Failed tests shall be highlighted and annotated to indicate remedial action. The reviewer in the inspection firm shall initial each laboratory report.

3.03 INSPECTION FIRM'S OBSERVATIONS AND TESTS: The concurrent and alternate, post-construction observations and inspections listed below shall be conducted by the inspecting firm. Inspection and testing frequencies are listed. Observations shall cover all applicable requirements of the current work. Where daily, but not continuous, observation is required, times of inspection shall vary randomly. Work that fails a concurrent inspection shall be corrected and retested.

- A. Review job mixes for asphalt and concrete.
- B. Embankment Foundation: Observation of the prepared embankment foundation shall be made for all roadway fill sections prior to the placement of fill. Verify clearing, topsoil stripping, foundation scarification and compaction. Identify and establish stabilization method for unsuitable foundation material.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

- C. Roadway Embankment: Daily, but not continuous, observation and compaction testing

shall be made for roadway embankments over 4 feet deep. Observe that soil moisture, lift thickness and compaction effort is appropriate for the soil. Observe embankment is benched where required. Perform in-place moisture and density test at a spacing not to exceed 600 foot per lane and at vertical intervals not to exceed 2 foot.

Alternate post-construction test for embankments: Bore, obtain split tube sample and perform density tests at the required sample spacing. Bores shall be made at the edge of the pavement; or conduct a falling weight deflectometer tests at spacing not to exceed 100 feet along the each lane, alternating wheel paths. Analyze for pavement durability. Pavement durability shall meet or exceed 20 years.

- D. Utility Lines: Continuous observation of sanitary and storm pipe materials and pipe laying procedures shall be made. Continuous observation of sanitary and storm trench backfill shall be made.

Daily, not continuous, observation of other utility trench backfill shall be made.

Observe that appropriate granular material or embankment compaction techniques are used under pavements in all trenches. Where backfill material is AB-3 or excavated material, perform in-place moisture and density of the trench every 300 feet and at vertical intervals not to exceed 2 feet to a depth of 6 feet.

Alternate post-construction test for utility trench backfill in trenches not under pavement: Expose and test backfill of the trench every 300 feet and at vertical intervals not to exceed 2 feet to a depth of 6 feet. Pull mandrel through PVC sewer main to demonstrate less than 3% initial deflection.

Alternate post-construction test for utility trench backfill in trenches under pavement: Conduct falling weight deflectometer tests at spacing not to exceed 100 feet along the centerline of the trench and analyze for pavement durability. Pavement durability shall meet or exceed 20 years. Pull mandrel through PVC sewer main to demonstrate less than 3 percent initial deflection.

- E. Manholes and Inlets: Observation of all manholes and inlets shall be made prior to backfill. Visually inspect invert shape, wall embedment in base, pipe connection, exterior damp proofing, finish quality of barrels and boxes and tops, installation of gaskets, sealant for manhole casting, grout bed for inlet top, and weight and wording of covers.

Alternate post-construction test for manholes and inlets: Conduct hydrostatic test and visual inspection of invert, pipe penetration and cover casting.

- F. Subgrade: Observation of prepared subgrade shall be made within 48 hours of paving operations. If precipitation occurs between the prepaving inspection and paving operations the prepared subgrade shall be observed for standing water or soft spots immediately before paving. Prepaving inspection shall include the following:

1. Proof-roll subgrade with fully loaded dump truck, or equivalent, to

identify soft areas.

2. One nuclear density test at subgrade surface not to exceed 200 feet per lane (not required for city – capital projects).
3. If observation of trenches required to have granular fill was not completed concurrent with the work, expose and test at required spacing.
4. Verify Construction Engineer has made prepaving measurements.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

- G. Asphalt Paving: Continuous observation of paving operations shall be made. For asphalt observe tack coat, color of delivered asphalt, placement and strike off procedure, lift thickness, and compaction effort. Tests on asphalt shall include density tests, stability tests, flow tests, extraction-gradation tests, and 2 nuclear density tests for each 2000 tons cumulative.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

- H Concrete Curb and Walk: Continuous observation of each concrete placement for curb and walk shall be made. Observe form support, form release agent, material placement, fiber reinforcing, shaping, finishing, jointing and application of curing material. Tests shall include examination of ticket for mix design, air content, slump and temperature and one set of 4 cylinders for each 25 cubic yards (500 linear feet of curb or 220 square yards of sidewalk) or fraction thereof for each day's placement. One cylinder shall be broken at 7 days, and two at 28 days with one as reserve. Confirmation that curing material is in place shall be made within 24 hours of the concrete placement.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

- I. Concrete Paving: For concrete observe form support and bond break, placement of dowel baskets and reinforcing, prewetting of subgrade, material placement, strike off and consolidation, finishing, jointing and application of curing membrane. Tests on concrete pavement shall include examination of ticket for mix design; determination of unit weight, air content, slump and temperature; and casting one set of 4 cylinders for each sample lot. A sample lot is the first 25 CY placed and each additional 400 CY or fraction thereof for each day's placement. One cylinder shall be broken at 7 days, and two at 28 days. One cylinder shall be held in reserve.

No equivalent post-construction tests. See remedial tests and extended maintenance bond,

below.

- J. Major Structures: Acceptance sample testing frequencies for Portland Cement Concrete for Bridges and Major structures: one set for approximately every 300 cubic yards concrete or as required for acceptance. Minimum of 1 set per job and class of concrete.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

3.04 REMEDIAL TESTS AND EXTENDED MAINTENANCE BOND: If the required inspections, for which no equivalent post-construction tests exist, were not performed during the work the remedial tests and maintenance bond extensions listed below shall apply. The extension of the maintenance bond shall be in addition to the normal length of maintenance bond for new development.

- A. Failure to observe embankment foundation has no remedial action. A one-year extension of maintenance bond shall apply. Amount of extended of maintenance bond shall cover cost of all work.
- B. Failure to observe and test curb and walk placement shall be abated by examination of finish, shape, presence of fiber reinforcing. A two-year extension of maintenance bond shall also apply. Amount of extended maintenance bond shall cover cost of all concrete curb and walk.
- C. Failure to make prepaving inspection or to observe paving operations in asphalt pavements shall be abated by conducting a falling weight deflectometer test at spacing not to exceed 100 feet along the each lane, alternating wheel paths. Analyze for pavement durability. Pavement durability shall meet or exceed 20 years. A two-year extension of maintenance bond shall also apply. Amount of extended maintenance bond shall cover cost of all asphalt pavements.
- D. Failure to make prepaving inspection or to observe paving operations in concrete pavements shall be ameliorated by sampling concrete cores at a spacing not to exceed 600 feet per lane, staggered, measuring pavement and base thickness, conducting a compressive strength test on the core, and visually confirming fiber content. Cores shall be replaced with road mix concrete. A two-year extension of the maintenance bond shall also apply. Amount of extended maintenance bond shall cover cost of all concrete pavements.

3.05 CORRECTIVE ACTION FOR FAILURE OF CONCURRENT TESTS: If any part of the work fails a concurrent test, the contractor shall take action to correct the failed work and shall adjust methods and materials to avoid additional failures. Appropriate corrective action may include adjustment of forms, lines and grades, removal of rejected material from the job site, adjustment of mixes, postponing work until environmental conditions are favorable, moisture control of soil, tillage and recompaction of soil, stabilization of subgrade with rock or fly ash, identification and sealing of leaks, removal and replacement of work, or other actions as directed

by the Construction Engineer.

- 3.06 CORRECTIVE ACTION FOR FAILURE OF POST-CONSTRUCTION TESTS:** If any part of the work fails a post construction alternative test or post construction remedial test, the Construction Engineer shall propose corrective action for review by the County Engineer. Appropriate corrective actions may include removal and replacement of work, addition of asphalt overlays, diamond grinding for pavement smoothness, lining or spot repair of sewers manholes or inlets, negotiated payment to offset cost of accelerated maintenance and replacement by the Unified Government, or other actions as approved by the County Engineer. KDOT performance price adjustments for pavement thickness and smoothness may be a starting point for price negotiations.

ATTACHMENTS:

Attachment 1500-A MAINTENANCE BOND

END OF SECTION 1500

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT WE,

(Name of Contractor)

as Principal, and

(Name of Surety Company)

a corporation duly organized under the laws of the State of _____, and authorized to do business in Kansas, as Surety, are held and firmly bound unto the Unified Government of Wyandotte County/Kansas City, Kansas, as Obligee, in the amount of _____

Dollars (\$ _____), for the payment of the full cost of improvements whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has undertaken, with the approval of the Unified Government, to construct public infrastructure within

(Name of Development)

for the purpose of dedication of said infrastructure to the Unified Government.

NOW THEREFORE, if the said Principal shall construct or cause to be constructed and completed the entire improvements in accordance with the Unified Government's current Technical Provisions, and to the lines and grades shown on the plans, all to be done subject to the approval and acceptance of the County Engineer, and shall construct said improvement with such materials and in such manner that the same shall endure without need of any repairs for a period of two years from and after the completion of said improvement and acceptance thereof; and if said improvement shall endure without the need of repairs for the period of two years from and after the completion and acceptance thereof as aforesaid, then the obligation shall be void; otherwise to be in full force and effect.

Signed and sealed this _____ day of _____, 20____

PRINCIPAL:

SURETY:

(Name of Contractor)

(Name of Surety)

(Seal)

(Seal)

By _____

By _____

(Name)

(Name)

(Title)

Attorney in Fact

(Witness)

(Witness)

Approved:

(Assistant U.G. Attorney)

SECTION 2000- EARTHWORK

PART 1- GENERAL

1.01 SCOPE: This Section covers excavation, fill, and compaction of earth and rock for roadway, embankments, structural foundations, and planted areas. Topics include acceptable materials, imported materials, topsoil stripping, dewatering, disposal of excess material, cleanup, grading tolerances, embankment subgrade, placement of fill, compaction requirements, settlement plates, and porous backfill for structures.

1.02 RELATED WORK: Refer to the following sections for related work:

Flowable Fill	Section 4000-Concrete Materials and Methods
Photographic Record	Section 1000-General Requirements
Topsoil Material and Placement	Section 7000-Seeding and Sodding
Filter Fabric for Underdrains	Section 5200-Storm Sewer

1.03 SUBMITTALS: Submit the following for review:

- A. Soil samples for moisture-density tests. One sample required for each soil type encountered.

1.04 DEFINITIONS: In this Section, the following words shall have the meanings specified:

- A. Structure: Bridges and their foundations and abutments, box culverts and arch culverts and their headwalls and wingwalls, retaining walls, manholes, drainage inlets and catch basins, and other below-grade cast-in-place concrete construction. The requirements of this Section apply to these structures even though the work may be subsidiary to other pay items.
- B. Rock: Rock ledges 6 inches or more in thickness with interbedded seams of soft materials less than 12 inches thick, or detached boulders 1-1/2 cubic yards or greater in volume.
- C. Overexcavation: Excavation below the elevation of the bottom surface of footings, or below the elevation of pavement and embankment subgrades. Overexcavation will be considered authorized when directed by Engineer to remove unsuitable material. All other overexcavation, including unsuitable material removed without Engineer's direction, shall be considered unauthorized. Payment will not be made for unauthorized overexcavation or its repair.

1.05 PERMITS: Contractor shall obtain a haul permit from the Unified Government if operations require on-street transportation of earth or rock.

1.06 SCHEDULING AND PHASING: Comply with phasing and timing requirements of the Erosion Control Plan.

PART 2 - PRODUCTS

2.01 ACCEPTABLE FILL MATERIAL: On-site or imported material free of muck, frozen material, excess moisture, organic material, topsoil, rubbish, construction debris, and rock larger than 8 inches.

2.02 POROUS FILL MATERIAL: KDOT Standard Specifications Subsection 1102, CA-5 or Subsection 1108, BD-1, crushed stone or gravel, meeting the following gradation.

CA-5		BD-1	
<u>Sieve Size</u>	<u>Percent Retained</u>	<u>Sieve Size</u>	<u>Percent Retained</u>
1-inch	0	1-1/2-inch	0
3/4-inch	0 - 5	1-inch	0 - 10
3/8-inch	40 - 60	3/4-inch	10 - 40
No. 8	95 - 100	No. 4	80 - 100
		No. 16	90 - 100
		No. 100	98 - 100

2.03 SOIL STABILIZATION MATERIALS: Stabilization materials shall meet the following requirements, and application shall be as specified in Part 3:

- A. Flowable fill as referenced in Part 1.
- B. AB-3: Aggregate for Aggregate Base Construction, gradation AB-3, KDOT Standard Specifications Subsection 1105.
- C. Surge rock: Stone for Aggregate Ditch Lining, $D_{50} = 5$ inches, KDOT Standard Specifications Subsection 1116.

2.04 FILTER FABRIC: Filter fabric for separation of soil strata and general use shall be a geotextile fabric meeting the requirements of KDOT Standard Specifications Subsection 1710. An abbreviated summary of those requirements is given below:

<u>Property</u>	<u>Limit</u>	<u>Method</u>
Tensile Strength	Min 150 lbs.	ASTM D4632
Puncture Strength	Min 80 lbs.	ASTM D4833
Apparent Opening Size	100 to 40	ASTM D4751
Trapezoidal Tear	Min 60 lbs.	ASTM D4533

2.05 COMPACTION EQUIPMENT: Equipment for compaction shall be sheepfoot roller with minimum 200 psi bearing pressure for fine grained soils, or a pneumatic tire roller with a minimum of 225 lb. per linear inch bearing pressure for coarse sand and gravel. Confined areas and backfill adjacent to structures shall be compacted with mechanical rammers or tampers.

PART 3 - EXECUTION

3.01 GENERAL: The following requirements apply to all earthwork:

- A. General: Contractor shall complete all grading, excavation, and filling to the lines, grades, cross sections, and contours shown on the drawings.
- B. Utilities: Utilities shown on the drawings are approximate only. Contractor shall verify location of all underground utilities before beginning work.
- C. Photographic record: Whenever excavation will be closer to an existing improvement to remain than a plane descending at 1.5 Horizontal to 1 Vertical from a point on the original ground line at the existing improvement, Contractor shall make a photographic record of the existing improvement.
- D. Verification: Prior to construction, Contractor shall verify that original ground surface is as shown in the drawings and that plan quantities are accurate. Starting work is acceptance of drawing cross sections as the basis of measurement.
- E. Clearing and Topsoil Stockpile: Site shall be cleared of vegetative matter not identified to remain. Topsoil shall be stripped and stockpiled for later reuse. Depth of topsoil stockpile shall not exceed 5 feet to minimize anaerobic conditions and loss of soil fauna.
- F. Cutting Roots: When excavating within a distance of 6 times the diameter at chest height of a tree to remain, cut roots by either of the following methods:
 - 1. Expose large roots without tugging, hacking, or scraping on root. Cut with sharp axe or saw.
 - 2. Prior to excavation, make a narrow vertical cut at limits of excavation using a utility trencher. Cut shall be at least 3 feet deep.

This requirement does not apply to small roots that are severed with the first advance of the excavator bucket.
- G. Dewatering: Water shall be prevented from entering or standing in the excavated areas. Dewatering methods shall include pumping, sheeting and shoring, and control of runoff by ditching and berming as appropriate to the site conditions.
- H. Unsuitable Subgrade: No fill or structure shall be placed in water or on frozen, unstable, or otherwise unsuitable subgrade.
- I. Rock: If rock is encountered, Contractor shall inform Engineer and shall not commence excavation of rock until the upper limits of the rock strata have been defined. On Engineer's direction, overexcavate 6 inches and backfill with soil stabilization material as required for the type of excavation. A blasting permit is required for use of explosives on a construction site.

- J. Disposal: Excess material shall be disposed of on site only as permitted by the drawings or as directed by Engineer; such directions shall control the location, shape, method of placement, and types of material disposed. If on-site disposal is not permitted, Contractor shall make his own arrangements for off-site disposal.
- K. Borrow and Imported Fill: On-site borrow shall be taken only from the locations shown on the drawings, and shall conform to the requirements for excavation. At the completion of grading, borrow areas shall be regular in shape with graded sides and bottom slopes. Side slopes of borrow areas shall not be steeper than 2 Horizontal to 1 Vertical and shall be uniform for the entire length. Contractor shall make all arrangements necessary to provide the volume of imported fill required for the work.
- L. Topsoil Placement: Coordinate elevation of topsoil subgrade to allow for topsoil depth within the final elevations shown on the plans. Topsoil placement shall conform to the Section referenced in Part 1. Dispose of excess topsoil.
- M. Tolerances: Earthwork elevations shall be true to drawing elevations within the following tolerances:
 - 1. Topsoil or soil adjacent to curbs, walks, or inlets - within 1/2-inch of the elevation of the curb, walk, or inlet.
 - 2. Drainage channel flowlines, earth adjacent to structures, and topsoil for maintained lawns - within 0.1 foot.
 - 3. Intermediate subgrades, topsoil in low maintenance areas, and other items not listed above - within 0.2 foot.

3.02 BULK EARTHWORK: The following requirements apply to overlot grading, grading of drainage channels and detention areas, street cuts and embankments, and similar work where excavated areas are not subsequently backfilled and embankments are constructed above original ground surface:

- A. Preparation of Original Surface: After topsoil stripping, embankment subgrade shall be scarified a minimum of 6 inches and compacted to 90 percent of maximum density as determined by ASTM D698. If the original surface is an existing pavement and the embankment would be less than 2 feet deep, the pavement shall be removed. If the original surface is an existing pavement and embankment will be at least 2 feet deep, the pavement may be broken into pieces not longer than 24 inches and left in place.
- B. Unsuitable Foundation: If material encountered at the embankment subgrade in fill sections or at the future pavement subgrade elevation in cut sections cannot be compacted to the required limits, Engineer shall be called for identification and directions. Engineer's directions to remedy unsuitable foundations shall be followed. Remediation directed by Engineer may be drying in place; excavating, spreading to dry, re-placing, and recompacting the soft material; or overexcavation and disposal of the soft material.

- C. **Placing and Compacting Embankments:** If embankment is placed against an existing surface with a slope steeper than 4 Horizontal to 1 Vertical, the existing surface shall be benched with approximately 24-inch rises. Embankment shall be built up in approximately horizontal lifts over the full width of the embankment area. Maximum lift thickness shall be 8 inches of loose material. Lifts shall be continuously bladed or dozed to ensure uniform distribution of fill. Hauling tracks shall be varied to eliminate ruts and uneven compaction. Each lift shall be compacted to the required density before the next lift is placed. Compaction for the body of the embankment shall be such that a tamping or sheepsfoot roller will walk-out of the material and ride the top of the lift (KDOT Type B, MR-90).

Compaction of the final two feet of the embankment immediately below pavements shall be at least 95 percent of maximum density as determined by ASTM D698; moisture content shall be within 3 percent of optimum (KDOT Type AA, MR-3-3). Water shall be added or removed as necessary to maintain specified moisture.

- D. **Subgrade in Cut Sections:** Final subgrade in cut areas outside the pavement limits described above shall be prepared for topsoil placement as described in the Section referenced in Part 1.
- E. **Protection of Completed Grading:** Contractor shall protect earthwork and repair damage from erosion, blowing, settlement, drying of pavement subgrade, unauthorized excavation, sliding, or changes in position or density from other causes.

3.03 EARTHWORK FOR STRUCTURES: The following requirements apply to earthwork for defined structures and similar work where excavated volumes are subsequently replaced with backfill and where backfill is placed against walls, foundations, abutments, or arches. Also included are supplemental requirements for embankments built over the top of these structures.

- A. **Unsuitable Foundation:** If material encountered at the foundation or slab subgrade is frozen, saturated, or softer than indicated by the drawings, Engineer shall be called for identification and directions. Engineer's directions to remedy unsuitable foundations shall be followed. Remediation directed by Engineer may include resizing/redesigning of the foundation; rescheduling to avoid severe weather; or overexcavation and disposal of the soft foundation.
- B. **Overexcavation:** All overexcavation in structural excavation areas shall be filled with flowable fill or AB-3 compacted to 95 percent standard.
- C. **Porous Fill:** Methods of placement and compaction of porous fill shall be the same as for common structural fill. A minimum of 2 cubic feet of porous fill shall be placed at each weep hole.
- D. **Timing and Sequence of Backfill:** Backfill against a cast-in-place structure shall not begin until 80 percent of the 28-day design strength has been reached, except such time shall not be shorter than the minimum curing period. Verify timing and that dampproofing is in place. Fill shall be brought up uniformly on both sides of culverts, abutments, and piers. Back slopes shall be benched if necessary to avoid wedge action against the structure. Unless specified in the Special Conditions, heavy equipment shall not be allowed on the top of buried structures until at least 2 feet of earth cover is in place.

- E. Compaction: Fill within 2 feet of a structure shall be compacted with hand operated mechanical tampers. Compaction shall be at least 95 percent of maximum density as determined by ASTM D698; moisture content shall be within 3 percent of optimum. Water shall be added or removed as necessary to maintain specified moisture.

END OF SECTION 2000

SECTION 2100 - TRENCHING AND TUNNELING

PART 1- GENERAL

1.01 SCOPE: This Section covers excavation, fill, and compaction of earth and rock for utility trenches in public right-of-way and in sewer easements. Topics include acceptable materials, imported materials, topsoil stripping, dewatering, disposal of excess material, cleanup, placement of fill, preparation of pavement subgrade, plating, and compaction requirements.

1.02 RELATED WORK: Refer to the following sections for related work:

Photographic Record	Section 1000-General Requirements
Construction Fence	Section 1200-Incidental Construction
Embankment Construction	Section 2000-Earthwork
Final Surface Preparation	Section 2000-Earthwork
Flowable Fill	Section 4000-Concrete Materials and Methods
Filter Fabric	Section 2000-Earthwork
Trench Width, Pipe Bedding	Section 5100-Sanitary Sewer Main and
	Section 5200-Storm Sewer
Topsoil Placement	Section 7000-Seeding, Sodding, and Mulching

1.03 OSHA STANDARD: Contractor is notified that the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) has standards for excavations and trenches that affect the work covered by this Section.

1.04 TUNNELER'S QUALIFICATIONS: Installation of casing and carrier pipe and fill mixture shall be by an installer with at least three successful installations of similar scope.

1.05 SUBMITTALS: Submit the following for review:

- A. Soil samples for moisture-density tests. One sample required for each soil type encountered.
- B. Tunneler's references.

1.06 DEFINITIONS: In this Section, the following words shall have the meanings specified:

- A. Rock: Rock ledges 6 inches or more in thickness with interbedded seams of soft materials less than 12 inches thick, or detached boulders 1-1/2 cubic yards or greater in volume.
- B. Overexcavation: Excavation beyond the normal trench limits as defined by the appropriate utility specification. Overexcavation will be considered authorized when directed by Engineer to remove unsuitable material. All other overexcavation, including unsuitable material removed without Engineer's direction, shall be considered unauthorized. Payment shall not be made for unauthorized excavation or its repair.

1.07 PERMITS: Contractor shall obtain a haul permit from the Unified Government if operations require on-street transportation of earth or excavated rock.

- 1.08 PHOTOGRAPHIC RECORD:** Whenever excavation will be closer to an existing improvement to remain than a plane descending at 1.5 Horizontal to 1 Vertical from a point on the original ground line at the existing improvement, Contractor shall make a photographic record of the existing improvement.

PART 2 - PRODUCTS

- 2.01 ACCEPTABLE FILL MATERIAL:** On-site or imported material free of muck, frozen material, excess moisture, organic material, topsoil, rubbish, construction debris, and rock or brick larger than 8 inches. Excavated trench material generally meets this standard.
- 2.02 BACKFILL UNDER PAVEMENT:** KDOT Standard Specifications Subsection 1105, AB-3, aggregate for aggregate base construction. For convenience the following graduation is reprinted from the KDOT standard:

<u>Sieve Size</u>	<u>Percent Retained</u>
1½ inch	0 - 5
¾ inch	5 - 30
No. 4	35 - 60
No. 8	45 - 70
No. 40	70 - 84
No. 80	80 - 92

- 2.03 SURGE ROCK:** Stone for Aggregate Ditch Lining, $D_{50} = 5$ inches, KDOT Standard Specifications Subsection 1116.
- 2.04 CASING PIPE:** Casing pipe for small diameter tunneling shall conform to ASTM A139, and wall thickness shall be as listed below.

<u>Diameter (in)</u>	<u>Under Railroads (in)</u>	<u>Other Locations (in)</u>
Less than 14	0.188	0.188
14 to 18	0.250	0.219
20 to 24	0.344	0.281
26 to 30	0.406	0.312
32 to 36	0.469	0.344

Waterproof caps shall be provided for each end. A 17-pound magnesium anode shall be installed at each end of the casing.

- 2.05 TUNNEL LINER:** Where segmented tunnel liner system is used, it shall be designed and stamped by a professional engineer. The minimum factors of safety shall be as follows:

<u>Critical element</u>	<u>F.S.</u>
Seam strength	3.0

Wall buckling	2.0
Installation stiffness	3.0

2.06 SAND - CEMENT FILL: Fill between carrier and casing pipe shall be a dry mixture of 10 parts clean sand and 1 part portland cement, unless otherwise required on drawings or in Special Conditions.

2.07 SKIDS: Furnish skids for pipe alignment guides as indicated for all carrier pipe to be installed in casing.

- A. Minimum spacing of skids shall be 10 feet or every pipe joint, whichever is the lesser.
- B. Size to fit outside diameter of carrier pipe and inside diameter of casing pipe.
- C. Skids to be size slightly larger than carrier pipe's outside joint diameter.

Provide the following:

- A. Stainless steel casing spacers with plastic runners, Cascade Waterworks Style CCS or Engineer-approved equal.

2.08 PLATES FOR TEMPORARY TRAFFIC SUPPORT: Plates shall be ASTM A36 structural steel, minimum 3/4-inch thick and of sufficient length to provide adequate bearing surface on solid pavement.

PART 3 - EXECUTION

3.01 TRENCHING: The following requirements apply to all trenching:

- A. Avoid embankment loading of exposed pipe: If the elevation of the ground at time of the trenching would be result in less than 2 foot of cover over the top of the pipe, then construct a platform of compacted fill to the dimensions shown in the standard detail. Proceed to trench into the compacted platform for pipe installation.
- B. Exposed Trench / Public Protection: No more than 175 feet of trench shall be excavated in advance of the laying crew. Except as approved by Engineer, trench shall be filled or plated when workers are not present. Excavations left overnight and all excavations in areas of high pedestrian traffic shall be surrounded by high visibility construction fence. Excavations left overnight in areas subject to vehicular traffic shall be further marked by reflectorized drums or barricades.
- C. Trench Width: Refer to the bedding instructions for the specific utility. See reference in Part 1, this Section.
- D. Cutting Roots: When excavating within a distance of 6 times the diameter at chest height of a tree to remain, cut roots by either of the following methods:

1. Expose large roots without tugging, hacking, or scraping on root. Cut with sharp axe or saw.
2. Prior to excavation, make a narrow vertical cut at limits of excavation using a utility trencher. Cut shall be at least 3 feet deep.

This requirement does not apply to small roots that are severed with the first advance of the excavator bucket.

- E. Dewatering: Water shall be prevented from entering or standing in the trench or tunnel. Dewatering methods may include pumping, sheeting and shoring, and control of runoff by ditching and berming as appropriate to the site conditions.
- F. Unsuitable Foundation: No pipe or fill shall be placed in water or on frozen, unstable, or otherwise unsuitable subgrade. If material encountered at the trench subgrade cannot support the pipe, Engineer shall be called for identification and directions. Engineer's directions to remedy unsuitable foundations shall be followed. Remediation directed by Engineer may be overexcavation and replacement with surge rock or concrete cradle for rigid pipe, or concrete encasement for flexible pipe.
- G. Overexcavation: All overexcavation in trenches shall be filled with stone fill material.
- H. Rock: If rock is encountered, Contractor shall inform Engineer and shall not commence excavation of rock until the upper limits of the rock strata have been defined. Contractor shall follow individual utility specification for overexcavation. A blasting permit is required for use of explosives on a construction site.
- I. Disposal: Excess material shall be disposed of on site only as permitted by the drawings or as directed by Engineer; such directions shall control the location, shape, method of placement, and types of material disposed. If on-site disposal is not permitted, Contractor shall make his own arrangements for off-site disposal.
- J. Bedding: Pipe shall be bedded and initial backfill placed according to the pipe bedding requirements of the specific utility.
- K. Backfill and Compaction: Thickness of lifts shall be compatible to the compaction equipment used. Backfill material and compaction requirements above the initial bedding zone shall be:
 1. In areas not under proposed pavement, backfill shall be acceptable fill material compacted to 90 percent of standard density as determined by ASTM D698.
 2. In areas to receive pavement or within 4 foot horizontal of proposed pavement, backfill shall be aggregate base course compacted to 95 percent of standard density as determined by ASTM D698.

3. Where the trench width allows the effective use of embankment compaction techniques, follow the requirements for embankment construction. Examples of this condition are:
 - i. A deep trench where a sufficiently wide bench is cut at least 2 feet above the proposed top of pipe.
 - ii. Where trenching is done prior to mass grading the trench shall be backfilled per 1 or 2 above; however the fill above the existing ground at the time of the pipe installation may be placed as embankment.
4. Excavations with maximum horizontal dimension of 4 feet or less may be filled with flowable fill at Contractor's option.
- L. Preparation of Final Surface: Surface elevation shall match adjacent surfaces and shall not form a depression. Unless subsequent surface improvements are called for in the work, restore surface to match or exceed previously existing condition. See reference in Part 1 for additional requirements for preparation of pavement subgrade in paved areas and topsoil placement in nonpaved areas.
- M. Maintenance of Traffic Flow: Except where work zone is completely closed to traffic, plates or temporary surfacing shall be used to maintain traffic flow.

3.02 TUNNELLING: Tunnelling shall be completed prior to open trench installation of upstream and downstream reaches. Tunnelling shall be used where required on the drawings. Contractor may, at his option, substitute tunnelling for open trench excavation. Payment for optional tunnelling shall be at the unit price for the trench, backfill, and surface restoration of the depth and type for which the substitution was made.

- A. Casing Pipe: Casing pipe shall be installed by augering or jacking. Auger shall be sized to leave no voids outside the installed casing pipe. Alignment and grade shall permit the carrier pipe to be installed to the line and grade proposed on the drawings. Field welds shall conform to American Water Works Association (AWWA) Standard C206.
- B. Carrier Pipe: A minimum of 2 sets of skids shall be used for each length of carrier pipe. Thickness of skids shall be adjusted to bring installed carrier pipe to proposed line and grade. Carrier pipe shall be pulled or pushed through so as to not disturb the integrity of the joints.
- C. Sand - Cement Fill: Required tightness tests shall be completed before filling the casing void. Sand - cement fill mixture shall be blown or pumped to fill the annular space between carrier pipe and casing pipe. Both ends of casing shall be closed with common brick and mortar.
- D. Tolerances: Unless otherwise stated in the drawings, the installation shall be true to design line and grade to within 0.1 diameter of the carrier pipe.
- E. Plans for boring, monitoring of uplift and settlement, lining, carrier pipe installation, and grouting of large diameter tunnels shall be submitted to Engineer for review.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 2100-A TRENCH DETAIL

UG 2100-B SANITARY AND STORM SEWER BEDDING

UG 2100-C PLATFORM FOR EXPOSED PIPE INSTALLATION

END OF SECTION 2100

SECTION 2200 – SUBGRADE PREPARATION AND PAVEMENT MILLING

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers the removal of pavement by excavation and preparation of pavement subgrade. Topics included are disposal, equipment requirements, cold milling, subgrade compaction and grading tolerances, and placement of granular base.
- 1.02 SALVAGE AND DISPOSAL:** The Unified Government retains the ownership of milled asphalt chips. Contractor shall transport millings to the Unified Government-owned yard(s) identified in the Special Conditions. Millings shall be tail dumped where directed. Unified Government will stockpile material. Other material shall be disposed of off site. Contractor shall make all arrangements necessary for disposal of materials.

PART 2 - PRODUCTS

- 2.01 EXCAVATING EQUIPMENT:** Excavating equipment operating on pavement surfaces to remain shall be mounted on rubber tires.
- 2.02 ROTOMILL MACHINES:** Pavement milling machines shall be track propelled type rotomill capable of maintaining precise grade and cross-slope control. Milling machines used for cold recycling shall be capable of distributing and mixing asphalt emulsion inside the drum cage, or a separate mixer shall be used. Approved models are CMI Roto-Mill, Roadtec Roto-Mill, or Caterpillar Roto-Mill.
- 2.03 SUBGRADE STABILIZATION MATERIALS:** Stabilization materials shall meet the following requirements, and application shall be as specified in Part 3:
 - A. Fly ash shall meet the requirements of ASTM C260, Class C or Class F.
 - B. AB-3 shall be Aggregate for Aggregate Base Construction, gradation AB-3, KDOT Standard Specifications Subsection 1105.
 - C. Surge rock shall be Stone for Aggregate Ditch Lining, $D_{50} = 5$ inches, KDOT Standard Specifications Subsection 1116.
- 2.04 PLATE FOR TEMPORARY TRAFFIC SUPPORT:** Plate shall be ASTM A36 structural steel, minimum 3/4-inch thick, and of sufficient length to provide adequate bearing surface on solid pavement.

PART 3 - EXECUTION

- 3.01 MILLING:** Normal depth of milling shall be 2 inches or less, but Engineer shall determine the exact limits and depth of milling. Pavement shall be removed to the edge of the concrete gutter or curb. When pavement is an asphalt overlay over brick or concrete, the asphalt shall be removed to the

underlying pavement, as directed by Engineer. Headers shall be cut at limits of milled area. Headers shall be straight across the pavement and shall have a vertical face. Headers across alleys and driveways shall be in line with the edge of pavement. A temporary wedge of milled chips shall be provided at headers, and shall be removed immediately prior to paving. Work shall be scheduled so that no longitudinal ridges are left overnight. Pavement shall be swept clean of loose chips immediately following the milling operation. From the time that an area is milled, to the time that it is overlaid, Contractor shall patch pot holes in the exposed base, on a daily basis if needed. Milled chips may be used for this patching.

When edge milling is called for on a street milling shall include the entire surface of the intersection to maintain surface water flow paths in the finished work.

If no traffic control plan is included in the drawings, the minimum traffic control requirements shall be augmented with the addition of uneven pavement signs posted on the streets under construction.

3.02 SUBGRADE PREPARATION: Pavement subgrade shall include street subgrades between lines 1 foot outside of the curbs and other areas shown on the drawings.

- A. Subgrade Stabilization: If material encountered at the subgrade cannot be compacted to the required limits, call Engineer for identification and directions. Engineer's directions to remedy unsuitable foundations shall be followed. Remediation directed by Engineer may be:
 - 1. Excavating, spreading to dry, replacing, and recompact the soft material;
 - 2. Overexcavation and disposal of the soft material and replacement by AB-3, surge rock, or asphalt pavement material; or
 - 3. Blending soft material with fly ash and recompact.
- B. Requirements for new construction: Pavement subgrade shall be scarified 6 inches and compacted to at least 95 percent standard density as determined by ASTM D698; moisture content shall be within 3 percent of optimum. Pavement subgrade shall be graded continuously during final compaction effort to produce uniform grade and density. Subgrade elevation shall be true to plan elevation to within 1/2-inch.
- C. Requirements for rehabilitation: Subgrade, whether undisturbed soil or top of stabilization material, shall be free from loose material and sudden changes in alignment. Subgrade elevation shall permit pavement section to equal adjacent pavement thickness, minimum patch thickness, or at the elevation directed by Engineer; whichever is the lowest elevation. Sudden changes in subgrade elevations are not permitted.

3.03 GRANULAR BASE COURSE: Granular base shall be AB-3 aggregate compacted to 95 percent of standard density as determined by ASTM D698. Moisture content shall be within 3 percent of optimum at time of compaction.

END OF SECTION 2200

SECTION 2250 – UTILITY PATCH REQUIREMENTS

PART 1 - GENERAL

- 1.01 SCOPE:** This section covers pavement removal and replacement for all incursions into the pavement caused by utility main and service repairs. Pavement maintenance activities that cause incursions, such as pothole repair, joint repair, or delamination repair, are not covered by this section.
- 1.02 SALVAGE AND DISPOSAL:** Excavated material shall be lawfully disposed of off site. Contractor shall make all arrangements necessary for disposal of materials.
- 1.03 PERMITS:** Contractor shall obtain a right of way use permit for the work. Contractor shall obtain a haul permit from the Unified Government if operations require on-street transportation of earth or excavated rock.
- 1.04 RELATED WORK:** Refer to the following sections for the indicated related work.

Asphalt mixes	Section 4000-Plant Mix Asphalt
Concrete mixes	Section 3000-Concrete Materials and Methods
Curb and walk repairs	Section 3100-Concrete Pavement and Flatwork
Tiebars and dowels	Section 3000-Concrete Materials and Methods

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

- 3.01 PATCH LAYOUT:** Size and orientation of patch is dependent on size of the excavation, the age and type of pavement, and the classification of the road. Refer to detail drawings for limitation on patch layout.
- 3.02 PATCH EXTENSION AND MERGING:** Patches near the edge of pavement or near a joint in the pavement will be extended. Patches in recently placed or overlaid asphalt shall include an extended surface course mill and overlay. Adjacent patches shall be merged when sufficiently close. Refer to detail drawings for additional extension and merging requirements.
- 3.03 PAVEMENT REMOVAL:** Pavement shall be cut wider than the excavation to provide a shoulder of undisturbed earth under the edges of the patch. Refer to detail drawings for overcut requirements. Pavement cut shall produce a full depth vertical face in sound pavement. If pavement is asphalt over concrete or brick, the asphalt cut shall be stepped back from the cut in the rigid base prior to patching. Where a portion of a pavement, curb, walk, or wall is to be left in place, the portion removed shall stop at an existing joint or a sawn joint. Joints shall be sawn or sliced full depth along a straight line and with a perpendicular face. No method of cutting, breaking or excavation that would vibrate or

dislocate remaining pavement shall be used. If patch edges are damaged, they shall be recut into sound pavement.

- 3.04 PATCHES IN ASPHALT PAVEMENT:** See reference in Part 1 for asphalt mix requirements. Concrete base course shall be placed. Base shall extend to bottom of existing pavement or 8 inches below top of pavement whichever is thicker. A 2-inch asphalt surface course shall be placed over the cured concrete.
- 3.05 PATCHES IN CONCRETE PAVEMENT:** See reference in Part 1 for concrete requirements. Patches shall be tied or dowelled into existing concrete on all sides. Tiebar end in existing concrete shall be grouted in place. Refer to detail drawings for location of ties and dowels. See reference in Part 1 for material specs for ties and dowels. Patch shall be covered with a plate until concrete reaches 3/4 of its design strength or seven days, whichever is shorter. Concrete base shall be placed flush with existing pavement surface and finished to match existing surface.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 2250-A ASPHALT PAVEMENT PATCH
UG 2250-B PAVEMENT PATCH IN FAILED PAVEMENTS
UG 2250-C CONCRETE PAVEMENT PATCH
UG 2250-D PATCH MERGING – CASE 1
UG 2250-E PATCH MERGING – CASE 2

END OF SECTION 2250

SECTION 2300 - BLASTING

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers use of explosives in construction and demolition. Topics include permit requirements, blaster qualifications, and reference standard for transport, storage, use, and disposal of explosives.
- 1.02 REFERENCE STANDARDS:** In this Section, the "Uniform Fire Code", Western Fire Chiefs Association shall be referred to as "UFC".
- 1.03 PERMIT:** Blasting permits are required for every project using explosives. A two step process is required to obtain a blasting permit. The process is summarized as follows:
- A. Permit for storage of explosives shall be applied for at the Fire Prevention office, 815 North 6th Street, Kansas City, Kansas. Documents required for processing the permit include a Blaster license and a User license issued by the State of Kansas and a site drawing showing the location of storage and points of use.
 - B. Permit for use of explosives for construction or demolition shall be applied for at the Unified Government Engineer's office, 701 North 7th Street, Kansas City, Kansas. Documents required for processing the permit include:
 - 1. Certificate of Insurance for Catastrophic Coverage - A certificate separate from the one covering the work as a whole will be required. The insurance limit will be a minimum of \$5,000,000.00. Based on the location of the proposed blasting, the limit may be increased, so consultation with the Unified Government Engineer's office prior to application is encouraged. The specific language requirements for insurance certificates contained in the General Conditions shall apply.
 - 2. Blasting Bond - The amount of bond is the maximum amount established in the UFC, \$100,000.00.
 - 3. Storage Permit Issued by the Unified Government Fire Marshal - This is item A described above.
 - 4. Blaster and User license issued by the State of Kansas.
 - 5. Blaster and User business license issued by the Unified Government.
 - 6. Pre-blast survey.
 - C. Permits shall be kept on site for the duration of blasting operations.
- 1.04 PREBLAST SURVEY:** Preblast survey shall be conducted by an independent, neutral blasting consultant who regularly performs preblast surveys. Two copies of the signed written summary shall be submitted to Engineer.

Preblast survey shall record photographic and verbal documentation of preblast damage to the exterior and interior of structures within 300 feet of the proposed blast points. Verbal documentation may be either written text or audio tape, with written transcripts as required by Engineer to evaluate claims. Minimum photographic record shall be developed negatives in 35-mm format and a contact print. Alternate minimum photographic record shall be digital, JPEG format, with 4.0 mega pixel sensor size. Submit 5"x 7" prints as required by Engineer to evaluate claims. Transcript and prints requested by Engineer to evaluate claims shall be supplied at no additional cost to the Unified Government. Survey records shall be kept on file by the blasting consultant for a minimum of 5 years.

If access to the interior of buildings is denied, the survey record shall contain a returned certified letter to the tenant or owner of the building as proof of attempts by the blasting consultant to gain entry. Letter shall explain the purpose of the survey and have attached the survey and signed denial of access statement, which clearly represents the purpose of the preblast survey and explains the contact procedure with the blasting consultant.

1.05 PROTECTION OF EXISTING STRUCTURES: Minimum protection from noise, flyrock, and ground vibration is described below. Contractor shall take whatever additional protective measures he deems necessary.

- A. Noise: No building shall be exposed to a peak sound level in excess of 130 dB, when measured by instrument with a low frequency limit of 6 hertz or lower.
- B. Flyrock: No flyrock shall leave the construction limits. Overburden or blasting mats shall be used where necessary to prevent unsafe conditions.
- C. Ground Vibration: Ground vibrations shall be monitored by a seismograph located at the nearest building (or if the nearest building is distant, the seismograph may be located at a reasonable distance from the blast in the direction of the nearest building). Seismographs used for monitoring ground vibrations shall record peak particle velocity and frequency in 3 mutually perpendicular directions.

The peak particle velocity shall not exceed 1.0 inches/second for frequencies greater than 11 hertz, and shall not exceed 0.50 inches/second for frequencies of 11 hertz and less.

1.06 SAFETY: Blasting operations shall be conducted by the blaster(s) named in the permit. Storage, transportation, handling, use, and disposal of explosives shall conform to the requirements of the UFC.

1.07 BLASTING RECORDS: The blaster shall retain a record of blasts for a minimum of 5 years. Upon request, these records shall be made available to Engineer or the public for review. Records shall contain the company name of the contractor doing the blasting; the location, time, and date of blast; the name, signature, and certification number of the blaster; type of material blasted; type of explosive; total weight of explosive detonated in an 8 millisecond period; sketch of blast area including number, diameter and depth of holes, burden, spacing, delay pattern; initiation system; mats or other protection; identity, distance, and direction of the nearest building; noise and seismic records.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION 2300

SECTION 2400 - RIPRAP AND GABIONS

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers riprap-and rock-filled gabions for erosion protection and retaining structures. Topics included are materials; filter fabric; filter course; placement by dumping; hand placement; grouting of riprap; and gabion installation.
- 1.02 RELATED WORK:** Refer to the following sections for related work:

Concrete Curing
Filter Fabric

Section 4000-Concrete Materials and Methods
Section 2000-Earthwork

PART 2 - PRODUCTS

- 2.01 STONE RIPRAP:** Stone meeting the requirements of KDOT Standard Specifications Subsection 1116, stone for riprap. Unless indicated otherwise, the light 24-inch size shall be used (grading for light 24-inch: 50 percent of the mass consists of rock over 200 pounds and not more than 10 percent earth or rock less than 5 pounds). Concrete rubble is not acceptable.
- 2.02 FILTER COURSE FOR RIPRAP:** Crushed stone or gravel meeting the requirements of KDOT Standard Specifications Subsection 1116, stone for filter course Type I, and meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Retained</u>
5-inch	0
4-inch	0 - 5
2-inch	10 - 40
1-inch	25 - 60
3/8-inch	55 - 85
No. 4	70 - 95

- 2.03 GABIONS:** PVC coated, wire gabions meeting the requirements of KDOT Standard Specifications Subsection 1711. Sizes shall be multiples of standard 3' x 3' x 3' cell. Minimum thickness of blanket gabions shall be 18 inches.
- 2.04 ROCK FOR GABIONS:** Rock for gabions shall be hard dense rock, and shall have a maximum dimension of 8 inches and a minimum dimension of 4 inches. Recycled concrete of the proper dimension is allowed for gabion rock.

PART 3 - EXECUTION

- 3.01 RIPRAP:** Unless otherwise specified, riprap shall receive a dumped treatment. Distribution of large and small stone shall be uniform throughout the mass.

- A. Toe Trench: A trench shall be excavated at the toe of slope to receive riprap. If dimensions not shown on drawings, trench depth and width shall equal specified riprap thickness.
- B. Filter Fabric: Filter fabric shall be placed only where called for in the Special Conditions or project drawings. Edges shall be lapped 12-inches minimum.
- C. Filter Course: Six-inch filter course layer shall be placed over the subgrade for all locations.
- D. Minimum Thickness: Thickness of riprap blanket shall be 150 percent of the dimension of the largest rock.
- E. Dumped Riprap: Stone shall be dumped by truck or bucket into its approximate final location. Handling and dumping shall not cause segregation of stone sizes. Individual stones shall be adjusted to eliminate high and low spots and provide uniform thickness.
- F. Hand Placed Riprap: Where hand placement is indicated, stones shall be laid on edge with ends and sides abutting. Large spaces between stones shall be filled with spalls and spalls rammed into place. The entire surface shall be rammed to obtain a tight even surface conforming to lines and grade.
- G. Grouting: When indicated on the drawings, the spaces between the stones shall be filled with grout. Grout shall be broomed into the voids until they are completely filled. Grout shall be cured as required for flatwork as referenced in Part 1, this Section.

3.02 GABIONS: The placing, wiring, filling, and closing of gabions shall conform to the requirements of KDOT Standard Specifications Subsection 836. Unless indicated otherwise in the Special Conditions or drawings, the standard foundation bedding shall be a 4-inch gravel cushion over filter fabric, and the standard back treatment shall be filter fabric between the gabions and the backfill material.

END OF SECTION 2400

SECTION 3000 - PLANT MIX ASPHALT

PART 1 - GENERAL

1.01 SCOPE: This Section covers materials for asphalt paving mixes and mixing plant requirements. Topics include plant calibration, aggregate and asphalt requirements, asphaltic cement design mix and job mix tolerances, prime and tack coat material, mixing plant requirements, batching requirements, and transportation requirements.

1.02 RELATED WORK: Refer to the following sections for the indicated related work:

Placement of Asphalt Pavement	Section 3100-Asphalt Paving
Placement of Asphalt Patches	Section 3300-Asphalt Repairs
Utility Patches	Section 2250-Utility Patch Requirements

1.03 SUBMITTALS: If requested by Engineer, the Contractor shall submit the following for review:

- A. Aggregate gradation, abrasion test, and plasticity test results.
- B. Asphalt certifications from asphalt supplier.
- C. Job mix formula and Marshall test results based on the aggregate stockpiles to be used for the work.
- D. A plant calibration report prepared by an independent testing laboratory.
- E. Results of plant quality control tests.

1.04 PLANT QUALITY CONTROL: If requested by Engineer, submit one sample from each lot of 500 tons, or portion thereof, to be tested by an independent laboratory with respect to gradation, plasticity index, percent natural sand, and other tests. Engineer shall have access to the plant (including employee rest rooms and break rooms) to perform full time on-site inspection; Engineer's right to plant access shall be continuous for the duration of the Contract and shall not be limited to actual production runs of asphalt for Unified Government projects.

1.05 TRUCK WEIGHT TICKETS: Truck weight tickets shall be numbered sequentially and shall include job name, mix identification, time truck was loaded, and weight of load to the nearest one hundredth ton.

PART 2 - PRODUCTS

2.01 AGGREGATE: Aggregates shall be free of shale, lumps of clay, coatings of clay or dust, organic material, and conglomerate particles. Aggregates from recycled pavements are not permitted. Aggregates shall be blended to give the gradations specified in the design mix for the required use.

- A. Coarse aggregate is defined as all material retained on a No. 8 sieve. Coarse aggregate shall be crushed limestone with at least 70 percent of the particles having at least 2 fracture faces. Sandstone shall not exceed 5 percent. Wear measured by the Los Angeles Abrasion Test (AASHTO Method T96) shall not exceed 40 percent.
- B. Fine aggregate is defined as all material passing a No. 8 sieve. Fine aggregate shall consist of sand, stone screenings, or a combination of the two together with that fraction of the coarse aggregate stock that passes a No. 8 sieve. Natural sand shall not exceed 25 percent of the total combined aggregate. The plasticity index of the fraction passing a No. 40 sieve shall not exceed 3 percent.
- C. If mineral filler in addition to that present in the aggregate is necessary, it shall consist of stone dust or portland cement.

2.02 ASPHALTIC CEMENT: Asphaltic cement shall meet the requirements for PG 58-22, 58-28, or 64-22, established in KDOT Standard Specifications Section 1200.

2.03 ASPHALT PAVING MIXTURES: Except as may be amended for high volume roads, proportioning of paving mixtures shall fall within the following limits for the type specified:

<u>Sieve Size</u>	<u>KCK Base Course Percent Retained</u>	<u>KCK Surface Course Percent Retained</u>
1-inch	0	0
3/4-inch	5 - 15	0
1/2-inch	25 - 47	0 - 10
3/8-inch	43 - 62	12 - 26
No. 4	60 - 75	42 - 56
No. 8	69 - 78	66 - 74
No. 16	74 - 92	--
No. 30	79 - 87	79 - 92
No. 50	87 - 96	--
No. 100	88 - 97	91 - 98
No. 200	92 - 97	92 - 98
AC	4.5 - 6.5	4.5 - 5.5

In addition to the above limits, the amount of material between any two successive sieves in the following series shall not be less than 3% or more than 23%: No. 4 and No. 8.

Within the limits of the of the design mix, the supplier shall prepare a job mix formula. When tested according to ASTM D1559, the job mix shall meet the following criteria:

Marshall Stability	1500 lbs. minimum
No. of blows	50
Flow	0.08 to 0.16 inches

Air Voids	Percent
Base	1 to 8
Surface	1 to 5
Voids in Aggregate	Percent Minimum
Base	13
Surface	14

- 2.04 AMENDED MIXTURE FOR HIGH VOLUME ROADS:** For high volume roadways a substitution of asphalt surface course mixture may be required. When required by special conditions, a APWA Type 6-01 Asphaltic Concrete Surface Course shall be substituted for a KCK Surface Course. The master grading limits, job mix formula, tolerances, and Marshall characteristic specifications shall be in accordance with the Kansas City Metropolitan American Public Works Association Specification, 2001, or latest revision there too.

- 2.05 MIX TOLERANCES:** Paving material delivered to the site shall not vary from the job mix formula by more than the following amounts:

<u>Sieve Size</u>	<u>Percent by Wt. of Total Mix</u>
No. 4	5
No. 8, 16, 30	4
No. 50, 100	3
No. 200	2
AC	0.5

- 2.06 TACK COAT:** Tack coat shall meet the requirements for ST-1P established in KDOT Standard Specifications Section 1200.

- 2.07 PLANT REQUIREMENTS:** Plants for producing asphaltic paving mixtures shall be designed and operated to produce a well-graded mixture within the job mix tolerances and shall meet the requirements of KDOT Standard Specifications Section 603. Plants shall have the output capacity to provide uniform delivery matched to the placing capacity of the paving equipment and site conditions. Plants shall have the following operation and control equipment:

- A. Truck scales shall be accurate to within 4 pounds per 1,000-pound live load. Scales shall have a rated capacity at least 5,000 pounds more than the heaviest total load to be weighed.
- B. Safe, adequate access for inspection shall be provided to areas of the plant from which samples or observation may be required. These areas include the dryer, screens, storage bins, asphalt control unit, aggregate stockpiles, and truck loading space.
- C. A temperature gauge reading from 200°F to 400°F shall be provided at the asphalt feed line. A recording temperature gauge, sensitive to $\pm 5^{\circ}\text{F}$ and to a rate of change of $\pm 10^{\circ}\text{F}$ per minute, shall be provided at the dryer discharge.

- D. Positive control shall be provided for proportioning aggregate and asphalt and for setting of mixing time.

2.08 HAUL TRUCKS: Haul trucks shall have tight metal bottoms, clean of foreign material. Truck bed shall be lubricated with a volatile oil to prevent the mix from sticking. Trucks shall be provided with covers which completely cover the load to protect it from cooling. Tare weight of haul trucks shall be established twice a day.

PART 3 - EXECUTION:

3.01 PLANT OPERATIONS: The requirements in KDOT Standard Specifications Sections 602 and 603 for preparation and heating of asphalt, preparation and preheating of aggregates, temperature limits, mixing time, batching requirements, wasting of unsuitable material, and weighing operations shall be met.

3.02 HAULING: Delivery of material to the paver shall be at a uniform rate matched to the capacity of the paving equipment and site conditions. Delivery shall be scheduled so that material may be placed during daylight. Trucks shall be covered during transportation of the load and shall remain covered until the truck is next in line to be unloaded. If there is a delay in using a complete load, the remaining portion shall be recovered until it can be used.

END OF SECTION 3000

SECTION 3100 - ASPHALT PAVING

PART 1 - GENERAL

1.01 SCOPE: This Section covers placing asphalt base and surface courses, including overlays. Topics include weather limits, equipment requirements, repair of subgrade, tack coat, leveling courses, delivery temperatures, spreading, finishing, compacting, and field testing.

1.02 RELATED WORK: Refer to the following sections for the indicated related work:

Asphalt Mixtures	Section 3000-Plant Mix Asphalt
Profilograph Requirements	Section 3200-Pavement Trueness
Subgrade Preparation	Section 2200-Subgrade Preparation and Pavement Milling

1.03 REFERENCE STANDARDS: In this Section, the "Standard Specifications for State Road and Bridge Construction", Kansas Department of Transportation, shall be referred to as "KDOT Standard Specifications".

1.04 DEFINITIONS: In this Section, the following words shall have the meanings specified:

- A. Base: The substrata upon which an asphalt lift is placed. It includes compacted and undisturbed earth subgrades; aggregate base course; brick, concrete, or asphalt pavements being overlaid; and previous asphalt lifts installed as part of the work.
- B. Asphalt: Bituminous paving material containing asphaltic cement and aggregate.

1.05 ENVIRONMENTAL LIMITS: Except when directed by Engineer, asphalt shall not be placed unless all the following environmental conditions are met:

- A. Air temperature shall be 40°F minimum and rising.
- B. Fog and rain are absent.
- C. Surface to be paved shall be free of moisture and frost.
- D. Work is completed during daylight or under artificial lights approved by Engineer.

PART 2 - PRODUCTS

2.01 PAVERS: Pavers shall conform to the requirements for bituminous pavers contained in KDOT Standard Specifications Division 150 and shall be capable of spreading and finishing asphalt in the lane widths specified. Paver shall be a self-contained, self-propelled unit with an approved automatic screed control system capable of controlling the elevation and transverse slope of the screed. Where a traveling string line is used, the length of beam shall be at least 20 feet.

- 2.02 ROLLERS:** Rollers used for compaction of asphalt shall conform to the requirements for self-propelled steel-wheeled rollers, light pneumatic-tired rollers, and vibratory rollers contained in KDOT Standard Specifications Division 150. Two-axle and three-wheel rollers shall weigh between 8 and 12 tons; three-axle rollers shall weigh at least 12 tons; pneumatic-tired rollers shall weigh at least 225 pounds per inch of width of tire tread. Vibratory rollers shall be used only with permission of Engineer. Rollers shall be equipped with means of wetting the contact surfaces to prevent sticking of the hot asphalt.
- 2.03 DISTRIBUTORS:** Distributors shall conform to the requirements for bitumen distributors contained in KDOT Standard Specifications Division 150. Distributors shall be constructed and operated to insure distribution of tack coat within 0.01 gallon per square yard for any quantity from 0.05 to 0.50 gallon per square yard.
- 2.04 STABILIZATION MATERIALS:** Stabilization materials shall meet the following requirements, and application shall be as specified in Part 3:
- A. AB-3 shall be Aggregates for Aggregate Base Construction, gradation AB-3, KDOT Standard Specifications Subsection 1105.
 - B. Surge rock shall be Stone for Aggregate Ditch Lining, $D_{50} = 5$ inches, KDOT Standard Specifications Subsection 1116.
 - C. Asphalt millings from Unified Government stockpile or produced as part of the current work.

PART 3 - EXECUTION:

- 3.01 VERIFICATION:** Verify environmental limits are met and are not forecast to change before the day's paving can be completed. Verify utility work is complete and that valve and manhole covers are at the proper elevation.
- 3.02 BASE REPAIR:** Remove soft and weak spots in base to the extent and depth determined by Engineer and refill with asphalt or stabilization material as directed by Engineer. Asphalt shall be roller-compacted with a steel-wheeled roller to the required density of the overlaying course. Except if depth of repair is less than 6 inches and asphalt course will be placed before repair has cooled, wheel compaction will be permitted. AB-3 aggregate and millings shall be compacted to 95 percent maximum density as determined by ASTM D698; surge rock shall be dumped and leveled.
- 3.03 BASE PREPARATION:** Base shall be cleaned of all foreign material and treated as follows:
- A. All bases shall have joints and cracks larger than 3/8-inch cleaned and filled with sand emulsion mixture. Holes, spalls, and low spots shall be filled with an asphalt leveling course. The surface shall be given a tack coat at the rate specified.
 - B. Leveling course shall be the same mix design as the overlaying course. The leveling course shall be placed with a paver or a long wheel base motor grader. Leveling course shall be compacted to the required density of the overlaying course.

C. Tack coat shall be distributed at the following rates:

<u>Base Material</u>	<u>Application rate</u>
Concrete or Brick	0.05 to 0.10 Gal/SY
Asphalt	0.05 to 0.12 Gal/SY
Aggregate or Earth	0.10 to 0.20 Gal/SY

Tack coat shall not be applied more than 2,000 feet ahead of paver. Contractor shall provide signs and flaggers necessary to keep traffic from driving on the tack coat. Tack coat shall be applied to vertical contact surfaces of curb, gutters, manholes, headers cut into existing pavement, and similar structures.

3.04 SPREADING AND FINISHING: Compacted thickness shall not be greater than 4 inches for base course, and not greater than 2 inches for surface course. Depth shall be adjusted so that compacted grade is 1/4-inch above approved curb, gutter, correctly adjusted manholes, and similar structures. Material shall be placed within the temperature limits established in the job mix formula. Asphalt paving materials shall be placed with approved paver wherever practical. Paver shall be controlled by string line, traveling string line, or a reference shoe riding on previously placed pass of the same lift or approved curb. String line shall be required on the first pass of either the first or second lifts of the base course. Surface shall be smooth, true to grade and section, and free from surface irregularities. Minor defects shall be immediately repaired by raking fine material into place. Outside edges shall be formed by an edge plate or smooth roller.

Areas inaccessible to pavers may be placed and finished by hand or with appropriately sized equipment. When hand spreading and finishing are permitted, material shall be placed so as to avoid incorporation of foreign material and produce uniform density. Raking shall produce a smooth surface free from excessive coarse aggregate and honeycomb.

3.05 JOINTS: Joints shall provide a thorough, continuous bond and acceptable texture. Longitudinal joints shall be made by overlapping the previous lift and raking the course aggregate out of the overlapped section before compaction. Edges rounded by traffic shall be cut back to a vertical face before placing the adjacent pass. If rounded edges are probable in the final lift, the lift shall overlap the intended joint location and shall be saw cut at the joint location to produce a vertical face.

Joints in sequential layers shall be offset by at least 6 inches. Joints in the final surface layer shall fall on the center line and, if more than two passes are necessary, on intermediate lane lines. Longitudinal edges longer than the distance produced by one truckload of material shall not be left overnight.

Header joints matching existing pavement shall be vertical saw cut; header joints for overlays shall be milled to produce a vertical face. Base course ramps shall be removed to the depth of surface course before placement of the surface course.

3.06 COMPACTION: Rolling effort shall produce the required densities and, for the final lift, a smooth, uniform driving surface. Rolling shall follow the paver as closely as practical, and compaction shall be completed before pavement reaches 175°F. Standard compaction procedure is a breakdown rolling with a steel wheeled roller, verification and correction of grade and cross section, an

intermediate rolling with a pneumatic-tired roller, and a final rolling with a steel wheel roller. Each rolling operation shall consist of successive passes overlapping approximately one-half of the roller width. Passes shall be arranged to prevent water from roller wheels from collecting on the pavement. Inaccessible areas shall be compacted with power driven hand operated tampers. If the standard compaction procedure does not give satisfactory results or results in tearing or pumping of the pavement, Contractor shall vary the timing or make up of the compaction train subject to Engineer's approval.

- 3.07 PROTECTION FROM CONSTRUCTION TRAFFIC:** Freshly laid pavement shall be protected from concentrated wheel loads.
- 3.08 DENSITY TESTING AND DENSITY REQUIREMENTS:** Engineer will take road density tests at frequencies to be determined in the field, but not more often than one test of three cores for every 200 tons placed. Unified Government will core specimens, and Contractor shall fill core holes with asphalt mix. Field density shall be equal to or greater than 96 percent of the reference density, as determined by Kansas Test Method KT 14.
- 3.09 SURFACE TOLERANCE:** Final grade relative to survey datum shall be true within 0.1 foot. Asphalt grade shall be within 0 to 1/2-inch above elevation of approved adjacent structures. Tolerances apply equally to joints, machine placed, and hand placed surfaces. In areas not subject to profilograph testing, finished surface shall be true to plane in every direction to within 0.2 inch measured with a 10-foot straight edge and to within 0.4 inch measured from a 25-foot string line.
- 3.10 SURFACE STANDARD:** Final surface quality shall be smooth, free of segregation, true to cross section, uniform in density, texture, and appearance, and free from surface irregularities; and shall provide a final pavement ride quality acceptable to Engineer. Corrective actions deemed necessary by Engineer to improve final ride quality shall be made promptly by Contractor, at no additional cost to Unified Government.

END OF SECTION 3100

SECTION 3200 - PAVEMENT TRUENESS

PART 1 - GENERAL

1.01 SCOPE: This Section covers methods and requirements for testing and reporting pavement trueness. Topics covered are locations for profilograph test, equipment, surface test, smoothness evaluations, and corrective action.

1.02 RELATED WORK: Refer to the following sections for related work:

Asphalt Pavements	Section 3100-Asphalt Paving
Concrete Pavements	Section 4100-Concrete Pavement and Flatwork

1.03 SUBMITTALS: Contractor shall submit the following for review:

- A. Profilograph and operator certifications.
- B. Profilograph trace and certified interpretation and checking template.

1.04 TEST LOCATIONS: Contractor shall provide trueness testing, interpretation, and corrective action at the following locations:

- A. Asphalt and concrete pavements identified for profilograph, smoothness, or trueness testing in the Special Conditions or on the drawings shall be tested and corrected.
- B. Asphalt and concrete pavements, which are not otherwise identified for testing, shall be tested when they exhibit poor subjective ride quality, as determined by Engineer. Such determination may include all or part(s) of the pavement on a given project.
- C. The following areas are excluded from the trueness testing requirements: bridge decks, shoulders, acceleration and deceleration lanes, patches, or hand finished pavements less than 100 feet in length.
- D. Within the pavements subject to testing, the following areas shall be excluded for determination of initial index, but shall be subject to "must grind" requirements: horizontal curves with centerline radius of less than 1000 feet, pavement within superelevation transitions, pavement within warp section of an at grade intersection, and vertical curves with a K of 90 feet or less.

where: $K = \text{abs}(L/(g_1 - g_2))$
 L = length of vertical curve in feet
 g_n = algebraic approach grade in percent
 $\text{abs}()$ = absolute value function.

PART 2 - PRODUCTS

- 2.01 PROFILOGRAPH EQUIPMENT:** Equipment for trueness testing shall be a California type profilograph or other style of machine that yields compatible results and which is approved by the KDOT Bureau of Materials and Research. The equipment shall be furnished and operated by Contractor as specified in Kansas Test Method, KT-46I.

PART 3 - EXECUTION

3.01 SMOOTHNESS EVALUATION:

- A. Contractor shall furnish the profilograph trace and his evaluation to Engineer. The testing and evaluation shall be performed by a trained and certified operator, and the evaluation shall be so certified. The testing procedure and evaluation of the trace shall be performed in accordance with Kansas Test Method, KT-46I, using zero bandwidth, except as modified by this Section.
- B. Index shall be reported per lane and shall be the average index of the two wheel paths for the lane.
- C. Contractor shall mark the profilograph trace at frequent intervals to correspond to uniquely identifiable permanent features. Markings shall be sufficient to accurately locate out of tolerance areas on the pavement.
- D. For determining pavement sections where corrective work is required, the pavement will be evaluated in 0.1-mile sections using the profilograph trace.
- E. Profilograph traces and certified interpretations shall be submitted and required repairs completed prior to acceptance of pavement.

3.02 CORRECTIVE ACTION:

- A. Areas representing high points having deviations in excess of 0.4 inches in 25 feet shall be corrected by Contractor. This "must grind" criteria applies regardless of the average index of the 0.1 mile section or posted speed.
- B. Tolerances: Corrective action shall be taken to produce a pavement with the required index and thickness. For pavements with posted speeds up to and including 45 mph, the maximum allowable profile index for a 0.1-mile section is 40.0 inches per mile. For pavements with posted speeds in excess of 45 mph, the maximum allowable profile index for a 0.1-mile section is 30.00 inches per mile.
- C. Corrective actions may be diamond grinding, or milling and replacement of asphalt surface course, or removal and replacement of pavement. Diamond grinding is permitted for "must grind" bumps. Grinding significant portions of the surface (such as would be required to correct chatter) will not be permitted. Where surface corrections are made, Contractor shall

establish a uniform texture. Corrected areas shall be neat rectangular areas. Corrective work shall be completed prior to determining pavement thickness.

- D. On sections where corrections are made, the pavement shall be retested by Contractor to verify that corrections have produced the required profile index.
- E. Engineer may waive corrective actions where he determines high index is the result of matching pre-existing conditions.

END OF SECTION 3200

SECTION 3300 - ASPHALT REPAIRS

PART 1 - GENERAL

1.01 SCOPE: This Section covers miscellaneous repair methods for asphalt pavement. Topics include asphalt patch, sealcoat, haydite sealcoat, in-place cold recycling, and asphalt overlay fabrics.

1.02 RELATED WORK: Refer to the following sections for the indicated related work:

Approved Roto-Mills	Section 2200-Subgrade Preparation and Pavement Milling
Utility Patches	Section 2250-Utility Patch Requirements
Asphalt Mixtures	Section 3000-Plant Mix Asphalt
Machine Laid Asphalt Paving	Section 3100-Asphalt Paving
Concrete for Utility Patch	Section 4000-Concrete Materials and Methods

1.03 SUBMITTALS: Contractor shall submit the following for review:

- A. Fabric brand name and model, manufacturer's material certifications, installation instructions, and specifications for installation equipment.

PART 2 - PRODUCTS

2.01 EXCAVATING EQUIPMENT: Excavating equipment operating on pavement surfaces to remain shall be mounted on rubber tires.

2.02 ROLLERS: Rollers shall conform to the requirements for self-propelled steel-wheeled rollers, pneumatic-tired rollers, and vibratory rollers contained in KDOT Standard Specifications Section 150. Two-axle and three-wheel rollers shall weigh from 8 to 12 tons; three-axle rollers shall weigh at least 12 tons; pneumatic-tired rollers shall weigh at least 225 pounds per inch of width of tire tread. Small, 1.5-ton vibratory rollers shall be used when required or permitted by Engineer.

2.03 DISTRIBUTORS: Distributors shall conform to the requirements for bitumen distributors contained in KDOT Standard Specifications Section 150. Distributors shall be constructed and operated to insure distribution of emulsion within 0.01 gallon per square yard for any quantity from 0.05 to 0.50 gallon per square yard.

2.04 CHIP SPREADER: Chip spreader shall conform to the requirements of self-propelled aggregate spreader contained in KDOT Standard Specifications Section 150.

2.05 HAYDITE CHIPS: Dust free, 3/8-inch, thermo-expanded shale produced as a manufacturing by-product.

2.06 LIMESTONE CHIPS: KDOT Standard Specifications Subsection 1109, CM-C aggregates for cover material.

- A. Material shall be crushed limestone, washed to prevent dusting. CM-C grading requirements are as follows:

<u>Sieve Size</u>	<u>Percent Retained</u>
3/4-inch	0
1/2-inch	0-12
3/8-inch	40-100
No. 4	95-100

- B. When specified, chips shall be precoated with 1-1/4% of MC-250 grade of liquid asphalt by heating the aggregate in a standard hot-mix plant to a temperature within the range of 160° F to 185° F. The percent of asphalt as specified shall be determined based on the dry weight of aggregate.
- C. Contractor shall furnish to Unified Government test results for soundness, wear, deleterious substances, sieve analysis, and asphalt content, from a certified testing laboratory. Tests shall be performed from representative samples of the first 500 tons produced, second 1,000 tons produced, third 1,000 tons produced; all to be at the supplier's expense.

2.07 POLYMER MODIFIED ASPHALT: Shall conform to the following

Tests (Note 1)	Min.	Max.
Viscosity, SSF @ 122 F	50	400
Storage Stability Test (Note 2), 24 hour percent	--	1
Tensile Stress 800% Elongation 39 F 15mm/min. kg/cm ²	0.2	--
Elastic Recovery 50 F	58%	--
Sieve Test, 20 mesh, percent	--	0.1
<u>Distillation:</u>		
Oil distillate by volume of emulsion, percent	--	3
Residue from distillation, percent	65	--
<u>Tests on Residue from Distillation:</u>		
Penetration, 77F, 100g., 5 sec.	75	200
Ductility, 77F 5 cm/minute, cm	125	--
Solubility in Trichlorethylene, percent	97.2	--
Softening Pint, Ring & Ball, F		
AASHTO T53-81	100	--
Float Test 140F sec. ASTM-D-139	1200	--

Notes:

1. All tests are performed in accordance with AASHTO T 59-82 except as noted.
2. In addition to AASHTO T 59, upon examination of the test cylinder, after standing undisturbed for 24 hours, the surface shall show no white, milky colored substance and shall be a homogeneous brown color throughout.

2.08 EMULSIFIED ASPHALT: Emulsified asphalt for cold recycling shall conform to KDOT Standard Specifications Section 1200. Emulsified asphalt for Haydite and sealcoat shall be CRS-1H and shall

conform to KDOT Standard Specifications Section 1200. During hot weather, CRS-2 emulsified asphalt may be substituted.

- 2.09 ASPHALT OVERLAY FABRIC:** Fabric shall be paving grade non-woven fabric (Petromat or approved equal) and shall meet or exceed the following specifications:

<u>Material Specification</u>	<u>Typical</u>	<u>Minimum</u>
Weight, oz./sq. yd.	4.3	3.8
Tensile Strength, lbs. ¹	115	90
Elongation at Break, % ¹	65	55
Mullen Burst Strength, psi	235	200
Asphalt Retention, gal./sq. yd.	---	200

¹ ASTM D5034

Asphalt sealant for fabric shall be AC-10.

- 2.10 SOIL STABILIZATION MATERIALS:** Stabilization materials shall meet the following requirements, and application shall be as specified in Part 3, this Section:

- A. AB-3 shall be Aggregate for Aggregate Base Construction, gradation AB-3, KDOT Standard Specifications Subsection 1105.
- B. Surge rock shall be Stone for Aggregate Ditch Lining, D₅₀ = 5 inches, KDOT Standard Specifications Subsection 1116.

PART 3 - EXECUTION:

- 3.01 PATCHING ASPHALT PAVEMENT:** Repairs to base course on rehabilitation and overlay projects shall be made as follows:

- A. Street Rehabilitation Projects: Remove pavement and subsoil to the depth directed by Engineer. Place AB-3 or surge rock as directed by Engineer to stabilize unsuitable subgrade and to fill overexcavated areas. AB-3 shall be compacted to 95 percent standard density. Place two 3-inch lifts of asphalt base and one 2-inch lift of asphalt surface material, unless thicker section is specified in Special Conditions or drawings. If patch area is too restricted to permit roller compaction, compact with hand-operated power equipment only if approved by Engineer. Patch shall be completed to top of base course on the same day the pavement is removed.
- B. Overlay Projects: In advance of overlay operations, Engineer will inspect existing pavement and determine locations of distress requiring additional repair and rehabilitation. Where thickness of distressed pavement is less than 8 inches, pavement shall be removed to the

limits directed by Engineer filled with full depth asphalt overlay material to the elevation of the adjacent pavement, and wheel compacted prior to final overlay.

Where thickness of distressed pavement is greater than 8 inches, pavement and subgrade shall be removed to the limits directed by Engineer, and filled with compacted AB-3 to within 1 to 2 inches below the adjacent surface to be overlaid. Patched area shall be leveled with asphalt overlay material and compacted to match the adjacent pavement surface elevation prior to final overlay.

C. Other methods as directed by Engineer.

- 3.02 SEALCOAT:** Pavement shall be swept clean with a power broom immediately prior to placing sealcoat. Emulsified asphalt shall be placed at a rate determined by Engineer at the time of application, but within the range of 0.25 to 0.35 gallons per square yard. Plain or precoated limestone chips shall be placed uniformly at a rate of 25 to 30 pounds per square yard and rolled with 3 passes of a pneumatic-tired roller. Limestone chips shall be placed with an approved spreader. Surplus material shall be swept up by a power broom immediately after rolling. Surface shall be swept again the following morning. Contractor shall remove surplus material for a two-week period as directed by Engineer.
- 3.03 HAYDITE SEALCOAT:** Pavement shall be swept clean with a power broom immediately prior to placing Haydite sealcoat. Emulsified asphalt shall be placed at a rate determined by Engineer at the time of application, but within the range of 0.25 to 0.35 gallon per square yard. Haydite chips shall be placed uniformly at a rate of 12 to 13 pounds per square yard and rolled with 3 passes of a pneumatic-tired roller. Haydite chips shall be placed with an approved spreader. Surplus material shall be swept up by a power broom immediately after rolling. Surface shall be swept again the following morning. Contractor shall remove surplus material for a two-week period as directed by Engineer.
- 3.04 ENVIRONMENTAL LIMITS:** Haydite and chip sealcoat operations shall take place only when the pavement surface is dry, the air and pavement temperatures are above 60°F, the humidity is below 60 percent, and rain and fog are absent.
- 3.05 IN-PLACE COLD RECYCLING:** Existing pavement and aggregate base shall be milled to an average depth of 6 inches and a minimum depth of 4 inches. Milling depth shall be adjusted to avoid incorporating subgrade soil. Milling shall produce a uniform edge line. Unbroken pieces with maximum dimension greater than 5 inches shall be removed. Emulsified asphalt shall be distributed at a rate of 0.75 gallon per square yard, and uniformly mixed into the recycled material. Engineer may vary the rate to obtain optimum asphalt for recycled aggregate conditions. Distribution and mixing may take place within the drum cage of the milling machine or as separate operations. Mixture shall be graded to establish a uniform crown section, or superelevated section where appropriate. Surface of the compacted mixture shall be planar to within 1/2-inch in ten feet each way.

Contractor shall prepare compaction test strips with differing sequences of steel-wheel and pneumatic-tired rollers. Test strips shall be compacted until four consecutive passes fail to increase

the density one pound per cubic foot. Target density shall be the maximum test strip density. Compaction shall be to 97 percent of the target density.

Unless otherwise specified in the Special Conditions or drawings, the subsequent surface treatment shall be a two-inch asphalt overlay.

- 3.06 FABRIC PLACEMENT:** Manufacturer's installation instructions shall be followed. A manufacturer's representative shall be present during installation. Weather limitations for application of fabric shall be the same as for asphalt paving. Depressions in the subgrade of such extent and alignment to affect final paving shall be filled prior to placing fabric. Pavement shall be swept clean with a power broom immediately prior to placing fabric. Asphalt sealant shall be applied uniformly from a pressure distributor at a rate of 0.25 gallon per square yard. Engineer may vary the application rate to obtain optimum asphalt for pavement conditions and fabric weight. Fabric shall be overlaid the same day it is placed.

END OF SECTION 3300

SECTION 4000 - CONCRETE MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE: This Section covers concrete materials and mixtures; flowable fill; materials for reinforcing, formwork, joints, and curing; ready-mix plant and transportation requirements; and special methods for cold and hot weather placement.

1.02 RELATED WORK: Refer to the following sections for related work:

Placing and Finishing Pavements	Section 4100-Concrete Pavement and Flatwork
Placing and Finishing Concrete Structures	Section 4200-Concrete Structures

1.03 REFERENCE STANDARDS: The following documents are referenced in this Section:

- A. Documents by the American Concrete Institute are referenced as “ACI”.
- B. Documents by the Concrete Reinforcing Steel Institute are referenced as “CRSI”.
- C. Mixes specified by the Kansas City Metro Materials Board are referenced as “KCMMB”
- D. Mixes specified by Kansas Department of Transportation are referenced as “KDOT”

1.04 SUBMITTALS: Contractor shall submit the following for review:

- A. Suppliers mix design, strength test results, and aggregate sieve analysis.

PART 2 - PRODUCTS

2.01 FORMWORK: Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions shown on the drawings. Construct and maintain forms to the tolerances given in ACI 301, Section 4. Forms shall be sufficiently tight to prevent leakage of mortar and shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement. Provide combined tie-spreaders with snap-off ties leaving a truncated cone hole on formed surfaces exposed to view.

Forms may be of wood or metal and shall be designed to permit easy removal without injury to the concrete. Surface of forms shall provide a smooth, dense, plane surface to the finished concrete where exposed to view. Forms shall be coated with an approved light oil to prevent concrete from adhering and shall be thoroughly cleaned and re-oiled before each use.

2.02 CONCRETE MATERIALS: Material used in the manufacture of concrete shall conform to one of the following:

- A. KCMMB mixes shall use the aggregates, cement and cementitious materials, water, aggregates and admixtures required in the KCMMB specifications.
- B. KDOT mixes shall use the aggregates, cement and cementitious materials, water, aggregates and admixtures required in the KDOT standard specifications as narrowed below:
 - 1. Course aggregate shall be class 1, limestone meeting gradation CA-4,
- C. Air entraining admixture shall conform to the requirements of ASTM C260.
- D. Fly ash shall for flowable fill meet the requirements of ASTM C618, Class C or Class F.

2.03 CONCRETE MIXES: Mix proportions for all concrete shall conform to ACI 211.1 and unless otherwise specified, shall be selected preferably on the basis of field experience. In the case where sufficient or suitable strength test data is not available, concrete shall be proportioned on the basis of laboratory trial mix design. Concrete shall be supplied by ready-mix plants meeting the requirements of this Section. Unless modified by the special conditions, concrete mixes for specific applications shall meet the following limits:

- A. Concrete for cast-in-place structures:
 - 1. Uses:
 - a. Bridge decks, beams, stringers, caps, columns,
 - b. bridge abutments and piers,
 - c. cast-in-place reinforced concrete box culverts, head walls, wing walls, and
 - d. retaining walls where the wall is within public right of way or supports public right of way,
 - e. cast in place tops for drainage inlets.
 - 2. Mix: KCMMB, 5K, mix provided by a KCMMB approved supplier.
- B. Concrete for slabs and pavement:
 - 1. Uses:
 - a. curb, and gutter, inlet throats and curb transitions for inlets,
 - b. concrete street pavements,
 - c. driveways and sidewalks for commercial, industrial and institutional land uses,
 - d. driveways and sidewalks installed as part of a Unified Government capital project regardless of land use,
 - e. corner curb ramps,
 - f. concrete base for pavement patch,
 - g. medians and header curbs,
 - h. work not specifically listed under one of the other mixes.
 - 2. Mix: KCMMB, 4K mix, provided by a KCMMB approved supplier.

C. Concrete for residential flatwork:

1. Uses:
 - a. sidewalks and driveways on residential frontage (except concrete for corner curb ramps shall be the same as concrete for curb and gutter) when installed by or under contract to the resident, lot builder or developer.
2. Mix: One of the following:
 - a. KDOT Concrete for Pavement, Air Entrained, or
 - b. KDOT Grade 4.0 (AE), coarse and fine aggregate, or
 - c. KCMMB, 4K, provided by a KCMMB approved supplier. Fiber not required for KCMMB mix.

D. Concrete for precast:

1. Uses:
 - a. precast manholes, junction boxes, and drainage inlets, including precast inlet tops,
 - b. precast reinforced concrete box culverts.
2. Mix: Either of the following:
 - a. KDOT Grade 4.0 (AE), coarse and fine aggregate, or
 - b. KCMMB, 4K, provided by a KCMMB approved supplier.

E. Concrete for underground uses:

1. Uses:
 - a. cast in place junction boxes, drainage inlets and manholes, excluding inlet tops
 - b. manhole, junction box and drainage inlet invert/base,
 - c. bases for street light and signal pole, and
 - d. pipe encasement and concrete cradles.
2. Mix: Either of the following:
 - a. KDOT Grade 3.5 (AE), coarse and fine aggregate, or
 - b. KCMMB, 4K, provided by a KCMMB approved supplier.

F. Field identifiable parameters: The following field identifiable parameters are for the convenience of the project manager and field personnel. It provides a guide to the preliminary evaluation of concrete quality from typical field tests or job mix information. The table shows typical values for each mix, but it does not constitute a minimum standard nor does it supersede the KCMMB or KDOT mix and material specifications. The KCMMB and to a smaller degree the KDOT specifications are job mix based and absolute minimum values of mix parameters cannot be established. Slump particularly may vary beyond the typical range for machine placed or pumped concrete.

<u>Mix</u>	<u>Cement</u>	<u>Slag/ash</u>	<u>Coarse Aggregate</u>	<u>Slump</u>	<u>W/C Ratio</u>	<u>Break</u>	<u>Air</u>
KCMMB 5K	660	25%	Granite/ Quartz	2 - 4	0.40	6,200	5-8
KCMMB 4K	600	25%	Granite/ Quartz	2 - 4	0.44	5,200	5-8
KDOT Concrete for Pavement, Air Entrained	602	0-20%	Limestone	<2.5	0.49	600 Flexual	>5
KDOT Grade 4.0	602	0-25%	Limestone	2 - 4	0.44	5,200	5-8
KDOT Grade 3.5	564	0-25%	Limestone	2 - 4	0.46	4,600	5-8

2.04 FLOWABLE FILL: Flowable fill shall be self-leveling and shall consist of Portland cement, fly ash, water, and fine aggregate. Fly ash shall for flowable fill meet the requirements of ASTM C618, Class C or Class F. Accelerators may be used. Mix proportions shall be selected by manufacturer. If used as trench fill, the 28-day compressive strength shall be greater than 45 psi but less than 150 psi to permit future excavation. If used for abandonments, there are no minimum strength requirements.

2.05 REINFORCEMENT: Reinforcement shall meet the following specifications:

A. Reinforcing bar: ASTM A615, Grade 60 deformed billet steel bar, uncoated finish.

Epoxy coated bars shall meet the requirements of KDOT Standard Specifications Subsection 1602.

B. Dowels: ASTM A615, Grade 40, plain steel, uncoated finish, greased dowel. Provide matched cap when required by the drawings or Special Conditions. If no size is given, dowels shall be 1-1/8-inch diameter by 18 inches length. Provide dowel basket to hold dowels in parallel alignment.

C. Bolsters, Chairs, and Accessories: Conform to ACI SP-66 and the CRSI Manual of Standard Practice. Provide all spacers, bolsters, chairs, ties, and other devices necessary to properly space, place, support, and fasten reinforcement in place during the concrete placement. Metal accessories shall be galvanized or plastic-coated where legs will be exposed in finished concrete surfaces. Submit representative samples for approval prior to installation.

2.06 FIBER REINFORCEMENT: Where required, fiber reinforcement and application rate shall comply with the material specifications and performance requirements set forth one of the following:

A. Polypropylene fiber: ASTM C1116, for Type III Synthetic-Fiber Reinforced Concrete, and as follows. Synthetic reinforcing fibers shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and be specifically manufactured to an optimum gradation for use as concrete reinforcement. Provide a minimum of 1.5 pounds fiber reinforcement per cubic yard of concrete. Fibers shall be added at the batch plant.

- B. Cellulose fiber: 100% Alkali-resistant, virgin cellulose fiber with average length of 2.1 mm and fiber count of 1,590,000 fibers/gram. Buckeye UltraFiber 500 or equivalent. Provide a minimum of 1.0 pounds fiber reinforcement per cubic yard of concrete. Fibers shall be added at the batch plant.

2.07 CURING MATERIALS: Curing materials shall meet one of the following requirements:

- A. Waterproof sheeting shall be 4-mil, opaque white polyethylene sheeting conforming to ASTM C171. Sufficient quantity shall be provided to allow laps. Hold down weights to continuously weight all edges and laps shall be provided.
- B. Curing membrane shall be Type 2, white pigmented compound, meeting KDOT Standard Specifications Subsection 1406. Curing membrane shall not be used where concrete shall be subsequently painted.
- C. Where asphalt pavement will overlay a concrete base coarse, use Type SS-1H emulsified asphalt conforming to KDOT Standard Specifications Subsection 1202. The heating and temperature of the bituminous material shall be in accordance with the provisions of KDOT Standard Specifications Section 602.

2.08 PLANT, TRANSPORT, AND MISCELLANEOUS EQUIPMENT: Ready-mix plants shall conform to KDOT Standard Specifications Division 150 and ASTM C94. Ready-mix plants shall have means of controlling the mix temperatures within the limits given in Part 3 of this Section. Transport equipment and methods shall conform to KDOT Standard Specifications Division 150. Vibrators, slip form pavers, saws, and other miscellaneous equipment shall conform to KDOT Standard Specifications Division 150.

PART 3 - EXECUTION

3.01 GENERAL: Transportation, placement, and consolidation of concrete shall conform to KDOT Standard Specifications Division 400 and ACI 304. Curing of concrete shall conform to KDOT Standard Specifications Divisions 500 and 700 and to ACI 301 except only in-form curing, waterproof sheeting, or curing membrane are allowed. Minimum curing times are given in the sections describing installation of specific items.

3.02 COLD WEATHER CONCRETING: This requirement applies when air temperature drops below 40°F or when forecast to drop below 40°F within 24 hours of placing. A specific cold weather protection plan shall be submitted to Engineer for review. Depending on severity of weather, the plan may include heating of concrete mix to between 60°F and 80°F, use of insulating blankets, and use of artificial heat source or other methods recommended by ACI 306. Minimum length of protection shall be 72 hours unless forecast shows daily lows above 40°F. Use of an accelerator or high-early cement will be considered only in the most severe conditions, and then only if delay of placement poses a threat to public welfare. No concrete shall be placed on frozen subgrade.

3.03 HOT WEATHER CONCRETING: This requirement applies when the temperature rises above 90°F. A specific hot weather protection plan shall be submitted to Engineer for review. Depending

on the severity of the weather, the plan may include cooling of concrete mix to below 90°F, scheduling work to place and finish concrete during cool periods of the day, prewetting of forms and subgrade, rapid placement of curing material, use of fiber to extend sawing window, and use of fog spray or other methods recommended by ACI 305. Use of a retarder will be considered only in the most severe conditions, and then only if delay of placement poses a threat to public welfare.

END OF SECTION 4000

SECTION 4100 - CONCRETE PAVEMENT AND FLATWORK

PART 1 - GENERAL

1.01 SCOPE: This Section covers installation of portland cement concrete street pavement, curbs and gutters, sidewalks, steps, ADA ramps, median paving, driveways, drainage ditch lining, and spillway lining. Topics covered are permit and inspection requirements formwork, reinforcement placing, concrete placing, joints, connection of patches to existing pavement, finishing, curing, opening to traffic, and tolerances.

1.02 RELATED WORK: Refer to the following sections for related work:

Permits	Section 1000- General Requirements
Subgrade Preparation	Section 2000- Earthwork
Pavement Removal	Section 2200- Subgrade Preparation and Pavement Milling
Profilograph Requirements	Section 3200- Pavement Trueness
Concrete Mixes and Weather Limits	Section 4000- Concrete Materials and Methods
Reinforcing Supports	Section 4000- Concrete Materials and Methods

1.03 INSPECTIONS: A minimum of two inspections by a Unified Government representative are required: formwork and reinforcing inspection including string line inspection for curb and gutter, prior to ordering concrete; and final inspection after curing period is complete.

1.04 PERMITS: Permits that may be required for pavement and flatwork construction are: driveway permit for construction, alteration, or repair of a driveway; and right-of-way use permit for any other construction, repair, or patching of curbs, sidewalks, pavements, or medians in the right-of-way. A minimum of two inspections by a Unified Government representative are required for driveways: formwork and reinforcing inspection, including string line inspection for curb and gutter, prior to ordering concrete; and final inspection after curing period is complete.

PART 2 - PRODUCTS

2.01 GENERAL: Concrete mix designs are specified elsewhere; see Related Work in Part 1 of this Section.

2.02 EXPANSION JOINTS: Joint materials shall comply to the following specifications:

A. Driveways, Sidewalks, and Joints Between Sidewalk and Curb: Joint filler shall be one of the following:

- a. Zip strip: All wood fiber with weather and termite resisting additives and shall meet ASTM D1751 nonextruding type (Homex 300 by Homasote Co., or equal). Joint filler

shall be manufactured with 1/2-inch deep pull strip to guarantee uniform depth of joint recess.

- b. Resilient bituminous type filler ASTM D1751, nonextruding bituminous type.
 - B. Street Pavements and Curbs: Joint filler shall conform to ASTM D1751, nonextruding bituminous type.
 - C. Joint sealant shall be hot type joint sealing compound meeting the requirements of ASTM D1190, hot-poured mastic type.
- 2.03 DETECTABLE WARNING:** Material for detectable warnings for curb ramps shall be wet set, solid panels. Panel size shall be nominal 24"x24" with a minimum thickness of 7/8". Panels shall be manufactured from either air entrained concrete or Portland cement. Panels shall have minimum 6,000 psi compressive strength. Alternate material, cast grey iron ASTM A48 Class 35B. Manufacturer's installation template shall be used to place panels. Pre-approved models include:
- A. CASTinTACT panels, by MASCO
 - B. Detectable warning panels, by M R Casting, Inc.
 - C. DetectaShield panels, by Maher Products, Inc.
 - D. Detectable Warning Plates, by Neenah Foundry Company
 - E. Or other approved equal panel

PART 3 - EXECUTION

- 3.01 GENERAL:** General placing and curing requirements and weather limitations are specified elsewhere; see Related Work in Part 1 of this Section. The following requirements are in addition to the referenced section.
- 3.02 FORMS:** Metal forms shall be used for street pavement and curb and gutter, except wood or masonite forms may be used to form radiuses or where approved by Engineer. Alternatively, slip forming may be used in lieu of metal forms. The machine shall be equipped with vibrators and be capable of placing concrete to the specified cross section, thickness, line, and grade within the allowable tolerances.
- 3.03 REINFORCEMENT:** Reinforcement shall be placed as indicated or specified. Reinforcing shall be supported on chairs, see reference Part 1. Lap splices shall be Class B as defined by ACI 318 unless otherwise indicated or specified. Reinforcing of pavement on grade shall be at least 3 inches clear of subgrade and 2 inches clear of other surfaces.
- 3.04 EXPANSION JOINTS:** Joints shall be placed where directed by Engineer, where indicated on the drawings or Special Conditions, and as required below:

- A. Expansion joint filler shall extend the entire width of the pavement from the subgrade to 1/2-inch below the surface of the pavement. Joint filler shall be secured so that it will not move during placement, consolidation, and finishing of the concrete.
- B. If dowels are required, they shall be supported in dowel baskets. The dowels shall be epoxy coated on the working end and within 2 inches of the joint. The dowels shall be fitted with a cap to allow working clearance. The dowels shall lie parallel to the slab surface and perpendicular to the joint face. One-half of each dowel shall be greased as a bond break.
- C. Expansion joints shall be sealed. Joint preparation shall follow the sealant manufacturer's recommendations.
- D. Place expansion joints in the following locations:
 - 1. Where new work abuts existing building foundations, zip-strip filler and sealant shall be used.
 - 2. Where new work abuts inlets or other drainage structures, or utility and signal pole foundations. Filler shall be 1/2-inch thick. Joint need not be sealed.
 - 3. Where shown on the drawings.
- E. Expansion joints are not required between curb and gutter, sidewalk, and concrete street pavement. New elements shall be cast against to the existing elements.

3.05 CONTRACTION AND CONTROL JOINTS: Place contraction joints where directed by Engineer, where indicated on the drawings or Special Conditions, and where required as follows:

- A. Control joints shall be cut to one-third of the slab depth. Control joints in street pavements shall be sawn. Control joints in sidewalks and curbs may be tooled with a radiused jointer or sawn. Control joints in driveways may be sawn or tooled. Sawn joints shall be soft sawn to a depth of 1.5-inches as soon as the concrete can bear the weight of the saw and shall be resawn to one-third of the slab depth within 24 hours. Tooled joints shall have a 1/4 to 1/2-inch radius.
- B. Maximum control joint spacing shall be 24 times the slab thickness. Locations of control joints on street paving shall fall on lane lines to the maximum extent possible. The resulting panels shall be approximately square with no sharp points or inside corners. Maximum length to width ratio shall be 1.5:1. Curb and gutter shall be jointed at not more than 10-foot spacing.
- C. Requirements for sealing control joints depend upon width of saw kerf, see Standard Detail *UG 4100-A Concrete Pavement Joint Details*.

3.06 CONSTRUCTION JOINTS: Locate construction joints on street pavement where indicated on the drawings. Obtain Engineer's approval of joints located by Contractor. Longitudinal construction

joints shall fall on lane lines to the maximum extent possible. Longitudinal construction joints shall be keyed and connected with tiebars. Transverse headers shall be connected with tie bars. Transverse headers may be formed or sawn. Construction joints shall be used wherever placement is suspended for 30 minutes or more. Unless a monolithic pavement and curb is used, construction joints shall be used between concrete street paving and curb and gutter.

3.07 CONCRETE JOINT REPAIR: Limits of patching shall be marked in the field by Engineer. Minimum patch size will be 4 feet long and one lane panel wide. Traverse joints shall have three dowels at 12-inch spacing centered in each wheel path. Unless otherwise required by the drawings or Special Conditions, the longitudinal joints shall not be tied. Dowels and tiebars shall be epoxy grouted into the existing pavement. Longitudinal joints shall have bond breaker sheeting applied to the existing face.

3.08 PLACEMENT: Concrete shall be deposited on properly prepared and unfrozen subgrade conforming to the requirements of Section 2200. The concrete shall be placed as uniformly as possible to minimize the amount of additional spreading necessary. Concrete shall not be placed around manholes or other structures until they have been brought to the required grade.

3.09 STRIKE OFF AND FLOATING: The concrete shall be struck off at such a height that after consolidation and final finishing it shall be at the elevations shown on the drawings. A depth of at least 2 inches of concrete shall be carried in front of the strike-off screed for the full width of the slab. The concrete shall be brought to a true and even surface, free from rock pockets, with the fewest possible number of passes of the screed.

After the concrete has been struck off, it shall be further smoothed by means of a float. Wood floats shall not be used on air-entrained concrete. Surface tolerances shall be checked and material added or taken away and the surface refloated to produce a uniform surface within tolerances, and free of tool marks.

3.10 FINISHING: After floating, concrete shall be given the finish listed for the appropriate application.

- A. Street pavement for collector and arterial streets shall receive a transverse tined texture. Transverse grooves shall be approximately 3/16-inch wide at 3/4-inch centers with a depth of approximately 1/8-inch. The groove pattern shall be uniform over the entire pavement.
- B. Street pavement for local streets, driveways, curb and gutter, sidewalks, and stair treads, median pavements, and concrete base under asphalt shall receive a transverse, coarse broom finish. Sidewalks shall be "picture-framed" with a 3 to 4 inch tooled edge or, where directed by Engineer, shall match the adjacent existing sidewalks.
- C. Drainage ditch lining and spillway lining shall receive no additional finishing after final floating.

3.11 CURING AND FORM REMOVAL: Curing method shall conform to Section 4000. Curing period shall be seven days. Curing material shall be applied immediately after finishing operations. All edges and laps of waterproof sheeting shall be continuously weighted so that wind cannot enter. Curing membrane, or asphalt emulsion when specified, shall be applied to produce a uniform, opaque

surface. Formed element shall be cured in form a minimum of 16 hours, after which curing material shall be applied for the remainder of the curing period. Maintain curing material free of defects during curing period.

- 3.12 PROTECTION AND OPENING TO TRAFFIC:** Protect concrete from unauthorized imprinting of any sort. Protect concrete from traffic, both through traffic and construction vehicles, until concrete has reached 3,000 psi.
- 3.13 TOLERANCES:** Finished concrete shall meet the following tolerances for planeness and alignment.
- A. On concrete surfaces not subject to profilograph testing, finished surface shall be true to plane within 1/4-inch in 10 feet, as determined by a 10-foot straight edge placed anywhere on the surface in any direction.
 - B. Thickness shall not be less than 0.2-inch less than the specified thickness.
 - C. Lines, joints, and edges whether formed, cut, or tooled shall not vary from true by more than 1/2-inch in 20 feet or more than 1 inch overall.
 - D. Stairs shall meet the tolerances contained in the Unified Government's building code. Those tolerances are summarized as follows: The tolerance between the largest and smallest riser and between the largest or smallest tread shall not exceed 3/8-inch in any flight of stairs, nor by more than 1/4-inch between consecutive steps. Where the bottom or top riser adjoins a sloping public way, walkway, or driveway having an established grade and serving as a landing, the bottom or top riser is permitted to be reduced along the slope to less than 4 inches in height with the variation in height of the bottom or top riser not to exceed one unit Vertical in 12 units Horizontal (8 percent slope) of stairway width.
- 3.14 DEFECTIVE WORK:** Defective work shall be repaired or replaced in the manner required by KDOT Standard Specifications Division 500.
- 3.15 DETECTABLE WARNING:** Follow manufacturer's installation recommendations. Use fresh-set installation method. Use manufacturer's installation template to guide the extent and depth of fresh concrete to be removed. Protect panels from overspray of curing compound.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 4100-A CONCRETE PAVEMENT JOINT DETAILS
 UG 4100-B CONCRETE PAVEMENT JOINT LAYOUT AND PATCHING
 UG 4100-C CURB AND GUTTER SECTIONS
 UG 4100-D CURB AND GUTTER INSTALLATION (ASPHALT STREETS)
 UG 4100-E CURB AND GUTTER INSTALLATION (CONCRETE STREETS)
 UG 4100-F ADA RAMP FOR NEW CONSTRUCTION
 UG 4100-G DRIVEWAY LAYOUT – SHEET 1 OF 2 – GENERAL
 UG 4100-H DRIVEWAY LAYOUT – SHEET 2 OF 2 – FOR ADA ACCESSIBILITY

- UG 4100-I DRIVEWAY DIMENSIONS & MATERIALS – SHEET 1 OF 6 – CONSTRUCTION
ENTRANCE
- UG 4100-J DRIVEWAY DIMENSIONS & MATERIALS – SHEET 2 OF 6 – FIELD ENTRANCE
- UG 4100-K DRIVEWAY DIMENSIONS & MATERIALS – SHEET 3 OF 6 – RESIDENTIAL
- UG 4100-L DRIVEWAY DIMENSIONS & MATERIALS – SHEET 4 OF 6 – LONG DRIVEWAY ON
RESIDENTIAL LOTS
- UG 4100-M DRIVEWAY DIMENSIONS & MATERIALS – SHEET 5 OF 6 – COMMERCIAL /
INDUSTRIAL DRIVEWAY
- UG 4100-N DRIVEWAY DIMENSIONS & MATERIALS – SHEET 6 OF 6 – SIDE PROPERTY LINE
SETBACK ALL DRIVEWAYS

END OF SECTION 4100

SECTION 4200 - CONCRETE STRUCTURES

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers installation of header curb, retaining walls, energy dissipation structures for drainage channels, reinforced concrete box (RCB) culverts, headwalls, and wing walls. Topics covered are formwork, weep holes, reinforcement placing, concrete placing, joints, finishing, curing, timing of form removal, dampproofing, and tolerances.
- 1.02 RELATED WORK:** Refer to the following sections for related work:
- | | |
|-----------------------------------|---|
| Concrete Mixes and Weather Limits | Section 4000-Concrete Materials and Methods |
| Porous Fill Material | Section 2000-Earthwork |
- 1.03 SHOP DRAWING:** Unless drawings give a complete tabulation of reinforcing, submit reinforcing shop drawings for review by Engineer prior to fabrication. This requirement applies to retaining walls, headwalls, wingwalls, and RCB's only.
- 1.04 PRECAST STRUCTURES:** Minimum material and construction requirements and dimensional tolerances for precast structures shall be the same as for cast-in-place concrete structures. Precast structures shall be designed for HS-20 vertical load an equivalent fluid pressure of 60 psf/ft horizontal.

PART 2 - PRODUCTS

- 2.01 CASTINGS:** Castings for inlet grates and catch basin access covers shall conform to ASTM A48, Class 35B. Castings for manhole covers and rings shall conform to ASTM 48, class 35B and shall be of the weight, dimension, and design shown on the detail drawings.
- 2.02 WEEP HOLES:** Weep holes shall be formed with 3-inch diameter, schedule 40 PVC pipe. Material for granular pocket shall be porous fill material as referenced in Part 1. Alternate to granular pocket material shall be drainage mat equal to Miradrain 6000 by Mirafi Inc. or Enkadrain by BASF Corporation.
- 2.03 DAMPPROOFING:** Dampproofing shall be asphalt based, fibrillated semi-mastic, of a consistency for cold brush application and conforming to ASTM D2823. Surface preparation and primer shall be as recommended by dampproofing manufacturer. Apply at a rate to achieve a 1/16-inch wet film thickness.
- 2.04 CONCRETE MIXES:** Mix designs are specified elsewhere; see Related Work in Part 1 of this Section.
- 2.05 GRANULAR BEDDING MATERIAL:** KDOT Standard Specifications Subsection 1102, CA-5 or Subsection 1108, BD-1, crushed stone or gravel, meeting the following gradation.

CA-5		BD-1	
<u>Sieve Size</u>	<u>Percent Retained</u>	<u>Sieve Size</u>	<u>Percent Retained</u>
1-inch	0	1-1/2-inch	0
3/4-inch	0 - 5	1-inch	0 - 10
3/8-inch	40 - 60	3/4-inch	10 - 40
No. 8	95 - 100	No. 4	80 - 100
		No. 16	90 - 100
		No. 50	93 - 100
		No. 100	98 - 100

PART 3 - EXECUTION

- 3.01 GENERAL:** General placing and curing requirements and weather limitations are specified elsewhere; see Related Work in Part 1 of this Section. The following requirements are in addition to the referenced section.
- 3.02 FORMS:** Forms shall be designed and constructed in accordance to ACI 301 and ACI 347. Forms shall be placed and braced so the finished surfaces are within tolerances. Clean out and inspection holes shall be left in the bottom of otherwise inaccessible areas until after form inspection. A 3/4-inch chamfer shall be placed on all edges exposed to view, except slabs of catch basins adjacent to sidewalks shall be radiused to match the adjacent walk. Forms for surfaces visible after backfill shall be free from defects that would affect the texture of the concrete surface; the number of seams in exposed work shall be minimized and arranged in an orderly manner. Use forms for all concrete except where otherwise indicated or specified. Concrete for encasements and manhole and inlet bases may be earth formed.
- 3.03 REINFORCING AND EMBEDMENTS:** Reinforcing bars shall be protected by the thickness of concrete indicated on the drawings. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

<u>Location of Reinforcement</u>	<u>Cover in Inches</u>
Concrete cast against and permanently exposed to the earth	3
Formed surfaces exposed to the earth, or water, or weathering	2

Provide all spacers, bolsters, chairs, ties, and other devices necessary to properly space, place, support, and fasten reinforcing in place during the concrete placement. Bolsters, chairs, and accessories shall conform to ACI SP-66 and the CRSI Manual of Standard Practice. Metal accessories shall be galvanized or plastic-coated where legs will be exposed in finished concrete surfaces.

Placement of reinforcement and embedded items shall be in accordance with ACI 17, ACI 301, and the CRSI Manual of Standard Practice. Embedments shall be secured with templates.

When it becomes necessary to splice reinforcing steel at points other than those shown on the drawings, the location and length of splice shall be approved by Engineer. Welding or tack welding of reinforcement will not be permitted.

Weepholes shall be installed where shown on the drawings or, if not shown, at 10-foot centers on all retaining walls, headwalls and wingwalls, and culvert sidewalls.

3.04 EXPANSION JOINTS: Expansion joints shall be placed where indicated or specified and between the cast-in-place structure and existing structures.

- A. Expansion joint filler shall cover the entire face of the joint except as required to place backer rod and joint sealant. Joint filler shall be secured so that it will not move during placement and consolidation of the concrete.
- B. If dowels are required, they shall be supported in a dowel basket. Dowels shall lie perpendicular to face of joint.
- C. After removal of forms but before backfilling, expansion joints shall be sealed. Both faces shall be sealed. Joint preparation and placement shall follow the sealant manufacturer's recommendations.

3.05 CONTRACTION JOINTS: Unless shown otherwise on the drawings, vertical contraction joints shall be placed on retaining walls and header curb not more than 30 feet apart nor more than 15 feet from a corner, but not within 5 feet of a corner. Other structures shall receive contraction joints where shown on the drawings. Joints in header curb shall align with score pattern in sidewalk. Joints in retaining wall shall align with vertical rustication or other vertical architectural elements.

Control joints shall be formed with recesses on both sides and top of section; reduction in width of 20 percent shall be achieved. Form strip may stay in place on faces to receive backfill. One half of horizontal temperature steel shall be interrupted at joint.

3.06 CONSTRUCTION JOINTS: Locate construction joints where indicated or specified. Where Contractor's procedures call for additional construction joints, they shall be reviewed by Engineer prior to placement. Construction joints shall have a 1-1/2" x 3-1/2" key beveled 15° for removal. Reinforcing steel shall continue across construction joints.

3.07 OBSERVATION: Reinforcing, embeddings, joints, and formwork shall be observed by Engineer prior to ordering concrete. One day response time to request observation, not counting weekends or holidays, shall be allowed. Contractor's job foreman shall accompany Engineer on this observation.

3.08 PLACING AND CONSOLIDATING: Rate of placing shall be adjusted to avoid both the creation of cold joints in the wall and blowout or deformation of the forms. Maximum free fall of concrete shall be 5 feet. Concrete shall be placed as close to final position as practicable. Concrete shall be vibrated or, in areas inaccessible to vibrators, shall be rodded to produce a solid mass.

- 3.09 CURING AND FORM REMOVAL:** Concrete shall be cured for four days, including the time the forms remain in place. The tops of slabs or wall sections and surfaces where forms are removed before four days shall be cured by application of waterproof sheeting or curing membrane, according to the curing requirements for concrete pavement and flatwork.

Removal of forms shall not damage the concrete. Forms and falsework shall not be removed prior to the times set in the table below. Times are valid for Type I or II cement without set adjusting admixtures and for air temperatures above 50°F. Required times may be adjusted by Engineer to reflect actual conditions.

Walls and Sides of Slabs	16 hours
Top Slabs less than 10 Feet Clear Span	4 days
Top Slabs 10 to 20 Feet Clear Span	7 days

No backfill shall be placed until 80 percent of 28-day design strength is reached.

- 3.10 FINISHING:** Unless otherwise indicated or specified, concrete surfaces shall be finished as follows:

- A. Unformed surfaces: Tops of walls and shaped inverts shall receive a troweled finish to produce a uniformly smooth surface. Tops of inlet boxes shall receive a finish similar to adjacent sidewalk or, if no sidewalk exists, as specified for new sidewalk.
- B. Surfaces not visible after backfill shall have defects and tie holes patched and fins larger than 1/4-inch removed.
- C. Surfaces exposed to view in the finished work shall have defects and tie holes patched and all fins removed. The color of the patching grout shall be adjusted to match the formed surface by use of white portland cement. If patching is extensive or if the patches do not match the color of the formed surface, the surface shall receive a hand rubbed finish after patching is completed.

- 3.11 MOISTURE PROTECTION:** Dampproofing shall be installed on the backfill side of retaining walls and header curb. Follow manufacturer's recommendations. Dampproofing shall be held back 6 inches from top of wall. A minimum 2-cubic-foot pocket of granular material shall be installed behind weepholes. As an alternate, a continuous 4-foot tall section of drainage mat may be installed over the weepholes.

- 3.12 BEDDING FOR PRECAST STRUCTURES:** Unless a cast-in-place base or invert is required, a 6-inch layer of consolidated granular bedding material shall be placed under precast structures.

- 3.13 TOLERANCES:** Formed surfaces shall be within the tolerances specified below or ACI 301, whichever is the most restrictive:

- A. Vertical lines, edges, and surfaces shall be plumb to 1/4-inch in 10 feet, and 1/2-inch in the entire length.

- B. Horizontal lines and edges shall be level to within 1/4-inch in 20 feet, and 1/2-inch in the entire length.
- C. Linear elements shall be at position shown on drawings to within 1/2-inch. Embedments shall be at position shown on drawings to within 1/4-inch.
- D. All members except inverts and footings shall be no more than 1/4-inch thinner nor 1/2-inch wider than shown on the drawings. Thickness of footings shall be no more than 5 percent thinner than shown on drawings.

END OF SECTION 4200

SECTION 5000 - MANHOLE CONSTRUCTION**PART 1 - GENERAL**

1.01 SCOPE: This Section covers manhole construction for sanitary and storm sewers; and pipeline and bedding materials for sanitary and storm sewers.

1.02 RELATED WORK: Refer to the following sections for related work:

Concrete for Cast-in-Place Manholes
Hydrostatic Testing

Section 4200-Concrete Structures
Section 5100-Sanitary Sewer Main

1.03 REFERENCE STANDARDS: The following documents are referenced in this Section:

A. Documents by the American Society for Testing and Materials are referenced as "ASTM".

1.04 SUBMITTALS: Contractor shall submit the following for review:

A. Suppliers certifications for pipe materials, precast manholes, castings, joints gaskets, non-shrink grout, and dampproofing.

PART 2 - PRODUCTS

2.01 MANHOLES: Precast manhole risers, cones, and grade rings shall conform to ASTM C478. Cast-in-place manholes shall conform to the requirements for cast-in-place concrete referenced in Part 1; precast grade rings shall be used for cast-in-place manholes. Minimum manhole diameter shall be 4 feet. In addition, all manholes shall conform to the following:

A. Wall thickness shall conform to the following table:

<u>Manhole diameter</u>	<u>Wall Thickness, inches</u>			
	<u>Precast Manhole</u>		<u>Cast-In-Place Manhole</u>	
	depth 16' or less	depth greater than 16'	depth 12' or less	depth greater than 12'
4 ft	4	5	6	8
5 ft	5	6	6	8
6 ft	6	7	6	8

B. Concentric cones shall be used unless otherwise shown on drawings or Special Conditions.

C. Flat slab tops may be used only on manholes six feet or less in depth. Flat slab top shall be precast and designed to resist HS-20 loading with one foot cover.

- D. Wall openings for pipe shall be cast with 1" x 1" keyway for grouted pipes or shall have a precast clamping shoe.
- E. External dampproofing shall be asphalt ASTM D449, Type A and shall be applied to all sanitary sewer manholes.

Internal waterproofing, where required, shall be 60-mil polyvinylchloride or polyethelene sheet with webs or ribs to mechanically lock the sheet to the manhole wall. Joint strips shall be ribless and shall be a minimum of 4 inches wide.
- F. Joint sealant for precast sections and castings shall be preformed, flexible, butyl rubber joint sealant, conforming to Federal Specification SS-S-210. Waterstops for pipe joints shall be 3/8-inch synthetic rubber O-rings or clamping type shoe.

External joint waterproofing shall be a composite sheet material consisting of a butyl compound and an elasto-polymer-backing sheet with a composite thickness of 80 mils and a minimum width of 6 inches.
- G. Covers and rings shall conform to ASTM 48, class 35B and shall be of the weight, dimension, and design shown on the detail drawings. Bolt-Down Covers and Rings shall be used where called out and conform to Detail UG 5000-E.
- H. Steps shall be polypropylene encased steel core steps. Steps shall conform to ASTM C478, Paragraph 11. Steel core shall conform to ASTM A615, grade 60 and shall have section properties equal or greater than 1/2-inch round section. Coating shall conform to ASTM D2146, Type II. Steps shall be set at 90° to the exiting main such that descent will be onto the largest shoulder of the shaped manhole base. Steps are only required where called out in the special conditions or project drawings.
- I. Non-shrink grout shall be shrink compensating in the plastic state, shall show no expansion after set (ASTM C827 test method), shall have a compressive strength of at least 3,000 psi (ASTM C109 test method), and shall have a placement time of at least 45 minutes.
- J. Brick for the repair of existing manholes shall conform to ASTM C32, grade SS or SM, nominal size 2-1/4" x 4" x 8". Mortar and plaster coating for brick shall be 2 parts portland cement, 1 part masonry cement, and 6 parts plaster sand. Mortar and plaster shall be used within 30 minutes or discarded.

PART 3 - EXECUTION

3.01 MANHOLE INSTALLATION: New manholes shall be precast or cast-in-place.

- A. Connecting pipes shall be encircled with a waterstop, and the wall opening filled with non-shrink grout. Pipe stubs shall be made with a bell end of pipe abutting the outside wall. Stub shall be stopped with watertight removable stopper.

- B. Bases shall be integral with cast-in-place section or shall be cast in place; unattached precast base shall not be used. See Standard Detail for dimensions of base.

Invert channels shall be formed to a "U" shape, matching the lower half of the pipe cross section and extending to 3/4 height of the pipe. Channels connecting pipes of different sizes shall transition smoothly over the length of the manhole. When the pipes come in at differing angles, the channel shall be formed with as large of radius as possible. Channels shall be provided for all pipes including stub lines. Benches shall slope to the channel at 1:12 slope.

- C. Joint sealant shall be installed between all precast sections, including grade rings and between grade rings and cover ring. Lifting holes shall be filled with non-shrink grout.

External joint waterproofing shall be installed to all joints including adjustment rings. Overlap shall be minimum of 1 foot.

External dampproofing shall be applied to all sanitary sewer manholes. Two 6-mil coats shall be applied following manufacturer's recommendations.

- D. Two grade rings shall be installed at each manhole. Thickness of rings shall be as required to adjust to grade as described below, but normally one 4-inch and one 6-inch ring are desired. If more than 12 inches of grade rings would be required, the manhole shall be reconstructed. Grade shall be matched within 1/2-inch.

3.02 CONNECTION TO EXISTING MANHOLE: Wall break out of existing manhole shall be the minimum width required for inserting the new pipe. The bench on the existing base shall be removed on the side the new pipe enters and a new channel and bench installed. Contractor shall retrieve all debris that enters the downstream sewer main. Pipe installation and wall repair shall be the same as for new manholes.

3.03 ACCEPTANCE TESTING: Manholes may be subjected to visual inspection, and sanitary sewer manholes shall be subjected to hydrostatic testing or vacuum testing. Vacuum testing will be conducted only on newly constructed manholes.

- A. Hydrostatic test shall be conducted after a manhole has been in place for 28 days. Manholes shall be filled to the top or to 25 feet, whichever is less. Manhole shall be prefilled 12 hours in advance of testing. Test shall consist of filling the manhole, and measuring replacement water at the end of one hour. Exfiltration rate shall be less than 0.05 gallon per hour per vertical foot of manhole.
- B. Vacuum testing shall use an Air-Loc Vacuum Manhole tester by Cherne Industries, Inc. or approved equal. The time for the vacuum to drop from 10 inches Hg to 9 inches Hg shall be not less than the following:

<u>Manhole Diameter</u>	<u>Time</u>
4 feet	60 Seconds
5 feet	75 Seconds
6 feet	90 Seconds

- C. Visual inspection shall evaluate the completeness of the manhole and the alignment of the invert channel.
- D. Manholes failing acceptance tests shall be repaired or rebuilt and retested.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 5000-A STANDARD MANHOLE DETAIL – SHEET 1 OF 3
UG 5000-B STANDARD MANHOLE DETAIL – SHEET 2 OF 3
UG 5000-C STANDARD MANHOLE DETAIL – SHEET 3 OF 3
UG 5000-D DROP MANHOLE DETAIL
UG 5000-E BOLT-DOWN MANHOLE DETAIL

END OF SECTION 5000

SECTION 5100 - SANITARY SEWER MAIN

PART 1 - GENERAL

1.01 SCOPE: This Section covers installation of sanitary sewer mains and services. Topics include permits and fees, record drawings, pipe materials, trench widths, pipe laying, service taps, bedding, initial backfill, encasement, and water and drainage course crossings.

1.02 RELATED WORK: Refer to the following sections for related work:

Site Restoration	Section 1000-General Requirements
Trenching	Section 2100-Trenching and Tunneling
Concrete Cradle Material	Section 4000-Concrete Materials and Methods
Manholes	Section 5000-Manhole Construction

1.03 FEES AND PERMITS: The following permits and fees are required for sewer connection. Amounts of the various fees are set by code and may be obtained from the Public Works Department.

- A. Sewer work permit will be required for connection to or repair of an existing sanitary or storm sewer.
- B. Initial tap fee will be assessed to offset the cost of installing the tap.
- C. Connection fee will be assessed to recover the prorated cost of construction of sewer mains and laterals. Separate fees for laterals and mains will be collected. Connection fees do not apply to properties previously assessed for lateral and main districts.
- D. Right of way permit is required if work occurs in right of way.

1.04 UNIFIED GOVERNMENT CODE REQUIREMENTS FOR SERVICE LINES ON PRIVATE PROPERTY: Chapter 30, Code of Unified Government Ordinances contains detailed provisions on fees, permits, service lines, and taps. Copies of this Chapter are available at the Public Works Department office.

1.05 KDHE REQUIREMENTS: Contractor is notified that the Kansas Department of Health and Environment (KDHE) has requirements for the protection of potable water systems that may affect the work covered by this Section. These requirements are reproduced as *Attachment 5100-A* at the end of this Section. This reproduction was downloaded from the KDHE website in January 2008.

1.06 SUBMITTALS: Contractor shall submit the following for review:

- A. Sieve analysis of bedding material.
- B. Pipe and joint details.
- C. Special, fitting, and coupling details.

- D. Affidavit of compliance with applicable standard.
 - E. Test certificates.
- 1.07 CROSS CONNECTIONS PROHIBITED:** Do not make cross connections between storm sewers and sanitary sewers unless the system is a combined sewer system and the cross connection is authorized.
- 1.08 NOTIFICATION OF DISRUPTION:** Contractor shall make the following contacts with occupants of properties that will experience service disruption:
- A. Written notice, between 3 and 7 days in advance of the disruption, describing the work to be done, the approximate schedule, restrictions on water use, and a local telephone number for Contractor if problems arise.
 - B. Attempted personal contact and a written notice, one day before the disruption, giving the time limit of the disruption and repeating Contractor's telephone number.
 - C. In the event service cannot be restored within the scheduled time, attempted personal contact and written notice informing the occupants of the delay and offering compensation as outlined elsewhere in this Section.
- 1.09 SERVICE DISRUPTION LIMIT:** The maximum disruption of service to any property shall be 12 hours. In the event a residence cannot be reconnected within the disruption limit, Contractor shall pay for lodging and meals for the affected residents. In the event a business cannot be reconnected within the disruption limit, Contractor shall compensate businesses for the loss of water usage.
- 1.10 TIMING OF CONNECTION TO EXISTING SEWER SYSTEM:** To prevent storm water or trench water from entering the existing sewer system, the new main shall remain isolated from the existing system until backfill and acceptance tests are complete.

PART 2 - PRODUCTS

2.01 SANITARY SEWER PIPE FOR GRAVITY MAINS:

- A. Vitrified Clay Pipe (VCP): VCP pipe and fittings shall conform to ASTM C700, Extra Strength Pipe. Joints shall conform to ASTM C425 bell and spigot, or plain-end pipe, factory applied with synthetic rubber seals. All clay pipe furnished shall be extra strength. Permit for spot repair only and only with Engineer's authority.
- B. Polyvinyl Chloride Pipe (PVC): PVC pipe and fittings for gravity systems shall conform to ASTM D3034. Wall thickness for pipes 8-inch to 10-inch diameter shall conform to SDR 26 wall thickness and for 4-inch and 6-inch service lines shall conform to ASTM D2665, Schedule 40. Wall thickness for pipes 12-inch to 15-inch diameter shall conform to SDR 35 wall thickness. Pipes with diameter of 18 inches and greater shall be either solid wall conforming to ASTM D3034, or ASTM F679, SDR 35, or profile wall pipe conforming to ASTM F794, PS=46 psi (when measured at 5 percent deflection). Joint shall conform to

ASTM D3212, and bell end shall be grooved to receive gasket. Synthetic rubber gasket shall conform to ASTM F477. Furnish permanent plugs for future service line connections and testing.

- C. Ductile-Iron Pipe (DIP): DIP pipe and fittings for gravity systems shall conform to ASTM A746. The minimum thickness for all sizes of DIP gravity sewer pipe shall be pressure class 350. Push-on joints shall be provided, conforming to AWWA C111 for all buried pipe unless otherwise specified or indicated. Fittings shall conform to AWWA C110 and be ductile iron. Pipe shall be furnished with factory applied 40-mil thickness polyethylene lining. Lining material shall be virgin polyethylene complying with ASTM D1248, compounded with sufficient carbon black to resist ultraviolet rays during above ground storage of the pipe. Where indicated on the drawings or Special Conditions, DIP pipe shall be encased in 8-mil polyethylene tube or sheet.
- D. Lined Reinforced Concrete Pipe (RCP): Round RCP pipe shall conform to ASTM C76 and ASTM C361. Portland cement shall be ASTM C150, Type II, and shall not contain tricalcium aluminate in excess of 5 percent. Rubber gaskets for joints in circular pipe shall be O-ring type, circular cross section conforming to ASTM C361, for fittings, closures, and specials. Wall thickness shall be Wall B or greater. Concrete shall have a minimum compressive strength of 6000 psi at 28 days. Use rubber to concrete compression type joints conforming to ASTM C361 for bell and spigot with gasket wholly confined in spigot groove or steel end ring joints with rubber O-ring gaskets. Pipe shall have factory applied 60-mil interior polyvinyl chloride lining over the upper 300 degrees segment of the pipe, fitting, or special. Lining shall have projecting ribs to provide mechanical bond to pipe. Lining shall extend across joints for field sealing.
- E. Composite Pipe (Hobas Pipe): Round composite pipe shall conform to ASTM D3262. Pipe shall be furnished in nominal lengths of 10 or 20 feet. Joints shall be fiberglass sleeve couplings with EPDM rubber compound sealing gaskets as the sole means to maintain joint watertightness and shall conform to ASTM D4161.

2.02 SANITARY SEWER SERVICE LINES: Service connections shall be made with manufactured tees or wyes for new installations and with saddle taps for existing mains.

- A. Wye/Saddle: Tee or wye fitting connections suitable for assembly to 4-inch or 6-inch house or building sewers shall be one of the following types:
 - 1. Reducing branch tee or wye fittings with elastomeric-gasket joints same as pipe. Service line connection shall be bell end with an elastomeric ring gasket and a minimum wall thickness of SDR 26.
 - 2. Saddle-type fittings with an elastomeric ring-gasketed, bell-end service connection and minimum wall thickness of SDR 26. Saddle-type fitting shall be supplied with a rubber sealing gasket and stainless steel straps for connection to pipe.
- B. Service Line: Service line shall be PVC schedule 40.

- C. Adaptor: Manufactured couplings are required to mate the main fittings with the schedule 40 service line.

2.03 SANITARY SEWER PIPE FOR FORCE MAINS:

- A. Polyvinyl Chloride Pressure Pipe (PVC): PVC pipe and fittings for force mains shall conform to AWWA C900 or AWWA C905 and shall be designed to have internal pressure plus allowance for surge pressure equal to 250 percent of the operating pressure listed in the Special Conditions, but not less than 200 psi. Gaskets shall conform to ASTM F477 and be synthetic rubber. PVC pressure pipe shall have cast-iron pipe equivalent outside diameters. Pipe joints shall be integral bell type pipe ends designed for joint assembly using elastomeric gaskets. Fittings shall be ductile iron and conform to AWWA C110 or AWWA C153 and be either mechanical joint or push-on type joint.
- B. Ductile-Iron Pressure Pipe (DIP): DIP pipe and fittings for force main shall conform to ANSI A21.50 and ANSI A21.10. Joints may be mechanical or push-on type. Pipe shall have cement lining conforming to ANSI A21.4 or polyethylene lining as specified in 2.01C. Where indicated on the drawings or Special Conditions, DIP pipe shall be encased in 8-mil polyethylene tube or sheet. DIP pipe and fittings within one (1) laying length of force main air release or air and vacuum relief valves shall be polyethylene lined.

- 2.04 CARRIER PIPE FOR TUNNEL INSTALLATIONS:** Carrier pipe shall be ductile iron to allow for both pressure and gravity as specified above. Minimum pressure rating shall be 125 psi, or the rating of the line to which it is connected, whichever is greater.

- 2.05 BEDDING:** KDOT Standard Specifications Section 1100, CA-5 coarse aggregate for concrete, washed stone or gravel, meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Retained</u>
1-inch	0
3/4-inch	0 - 5
3/8-inch	40 - 60
No. 8	95 - 100

Alternate gradations of washed stone or gravel may be substituted with Engineer's approval.

- 2.06 ENCASEMENT MATERIAL:** As referenced in Section 4000 - Concrete Materials and Methods.

2.07 MISCELLANEOUS MATERIALS:

- A. Locator stakes for service and mainline stubs shall be nominal 2" x 4" wooden stakes of sufficient length to extend from the pipe to the surface of the ground.
- B. Temporary plugs shall be model recommended by pipe manufacturer, and watertight to a static head of 25 feet.

- C. Sleeve connectors for pipes of differing materials shall be commercially manufactured connections providing permanent, watertight, semi-flexible connection capable of withstanding the hydrostatic testing pressures.

2.08 PIPE MATERIAL FOR SPOT REPAIR: Sewer pipe that is deteriorated or damaged shall be replaced with the same material as existing unless otherwise approved by the Engineer. Clay pipe shall be replaced with PVC using an approved flexible connector with steel band manufactured specifically for connecting these materials. Unless approved by the Engineer, connection shall be made at existing joints.

PART 3 - EXECUTION

3.01 BYPASS PUMPING: Except for reaches specifically listed in the Special Conditions as not requiring bypass pumping, Contractor shall provide bypass pumping for sewage flows as follows:

- A. The line segments scheduled for cured-in-place sectional or spot repairs, replacement by pipe bursting or pipe reaming, or containing manholes to be lined shall have all flows bypassed around them. The pumping system shall be sized for normal to peak flow conditions. Contractor shall maintain an operational backup pump on site where required in the Special Conditions. Direct discharge of flow to surrounding area drainage or separate storm sewer system is unacceptable. Do not attempt flow diversion on combined sewers or storm sewers if rainfall is anticipated before completion of the installation can be completed.
- B. The upstream manhole shall be monitored at all times, and an emergency deflate system shall be incorporated so that plugs may be removed at any time without requiring confined space entry. A plug shall be used to stop the sewage from reaching the line segment or manhole being lined or replaced. Remove plug at end of each working day and place relined, replaced, and existing sections and temporary or permanent service tie-ins back in service.
- C. When preparing to make connections to the existing system or other work which will interrupt service to the utility users, Contractor shall follow the Notification of Disruption procedures listed in Article 1.08 of this Section.

3.02 TRENCHING: See Section 2100-Trenching and Tunneling for trench excavation, protection, dewatering, and general backfill. Trench width, measured at 1 foot above the exterior top of pipe, shall be at least 15 inches greater but not more than 24 inches greater than the exterior width of the pipe. Excessive width trenches shall be corrected by use of bedding material throughout the initial backfill zone.

3.03 PIPE LAYING (GRAVITY MAINS): Installation of pipe shall proceed from the downstream end of the project with bell ends facing upstream. Alignment and grade shall be uniform between manholes, and a positive system of grade control shall be used for maintaining alignment. In the case of spot repairs, maintain constant grade and alignment between limits of repair. Rigid blocks shall not be used to hold pipe in place prior to depositing the bedding, unless pipe is to receive total concrete encasement. The ends of the installed pipe shall be plugged whenever the work is not in progress. Joint installation shall follow the manufacturer's recommendation.

Rigid pipe, RCP, or VCP shall be encased in concrete from the manhole wall to the first joint beyond the manhole, unless a flexible, watertight gasket, approved by Engineer, is used to connect the sewer to the manhole.

- 3.04 PIPE LAYING (FORCE MAINS):** Pressure sewers (force mains) shall be installed to the slopes and depths shown on the drawings. If a detailed profile is not shown, main shall be installed to a continuous slope to prevent possible air entrapment at high spots of the line. Minimum depth of cover shall be 42 inches. Approved air relief valves shall be installed at all locations shown on the drawings. For materials other than ductile-iron pipe, the main shall be "snaked" in the trench to accommodate minor expansion and contraction, but in no case shall the minimum side clearance be less than specified. Thrust blocks shall be installed at pipe deflections, bends, tees, and plugs and shall be adequate to resist both operating and testing forces or as shown on the drawings. Thrust blocks shall be complete and cured before pressure testing. Damage caused by failure to provide adequate thrust supports shall be corrected at no additional cost to Unified Government. Force mains shall be marked with warning tape placed from one to two feet above pipeline.

- 3.05 SERVICE LINES:** Taps not larger than 6 inches on existing mains shall be made by Unified Government Water Pollution Control Department, except where the existing main is ductile-iron pipe.

Taps shall rise from the main at a 45° angle. The requirements for service lines included here are for the portions of service lines within the street right-of-way or sewer easement; see the reference in Part 1 concerning code requirements for construction of service lines on private property. Service lines shall slope at a minimum of 1/4:12, except when approved by Engineer, a minimum of 1/8:12 may be used. Where not immediately connected to a building drain, service lines shall be marked with a locator stake. Minimum cover for service lines is 4 feet unless the line is encased in concrete.

- 3.06 BEDDING:** Unless otherwise specified, granular bedding material shall be placed uniformly on both sides of the pipe to the limits given below and compacted to 95 percent standard density, as determined by ATSM D698. Depth of granular bedding material below the exterior bottom of pipe shall meet the following minimums:

<u>Pipe Diameter</u>	<u>In soil</u>	<u>In rock</u>
24 inches and less	4 inches	6 inches
27 inches to 60 inches	4 inches	9 inches
66 inches and greater	6 inches	12 inches

The top limit of granular bedding material shall be 12 inches above top of the pipe.

- 3.07 WATER MAIN AND DRAINAGE COURSE CROSSINGS:** See paragraph 1.07C for requirements for sewers crossing a potable water main.

Sewers crossing a drainage course and having less than 4 feet of cover shall be encased in concrete and shall have a down stream impervious trench check. Applicable drainage courses are identified on the drawings.

- 3.08 CUT-OFF WALLS AND SLOPE ANCHORS:** Slope anchors shall be minimum of twelve inches thick and shall extend a minimum of 2 feet from the exterior of the pipe on all sides. They shall be cast against undisturbed earth in the trench walls and bottom. In rock, anchors shall be keyed a minimum of 6 inches into undisturbed rock.

Anchors shall be cast against pipe bells or a capped cross on bell-less pipe. Whenever there is more than 8 feet of vertical fall between manholes, and the pipe slope is greater than 10%, anchors shall be placed at intervals not to exceed 8 feet of vertical fall.

- 3.09 CONCRETE ENCASEMENT:** For concrete encasement, refer to Detail Drawings.

- 3.10 ALIGNMENT TESTING:** To verify alignment, deflection, and workmanship, installed pipe will be televised by the Unified Government Water Pollution Control Division. Televised pipe will be inspected for a smooth, structurally sound, straight, round main. Pipe may also be televised before the end of the warranty period. Unacceptable defects include infiltration, displacement at joints, intrusion of foreign material, service taps entering at the wrong angle, or cracked, distressed, or out of round pipe. Possible out of round PVC pipe and other flexible pipe may be further checked by mandrel testing at Contractor's expense. Pipe shall pass a mandrel with an outside diameter of 95 percent of the undeflected interior diameter and a length of not less than twice the inside diameter of the pipe.

Pipe not passing alignment tests shall be repaired or replaced and retested.

- 3.11 TIGHTNESS TESTS:** To verify watertightness, pipe shall be subjected to hydrostatic testing or low pressure air testing and observation of infiltration. Contractor option of A or B as follows for gravity mains.

- A. Hydrostatic testing of gravity mains shall be conducted one reach at a time. System shall be prefilled 12 hours in advance of testing. Test shall consist of filling upstream manhole to 4 feet above the invert or 2 feet above the top of pipe, whichever is greater, and measuring replacement water at the end of one hour. For lines 24 inches or less in diameter, exfiltration rate shall be less than 0.20 gallon per hour per inch of pipe diameter per 100 feet of pipeline. For larger pipes, the exfiltration rate shall be less than 4.80 gallons per hour per 100 feet of pipeline. Pipe shall be dewatered after testing.
- B. Low pressure air testing shall be conducted and evaluated in accordance with ASTM F1417 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air. Following is a condensed description of Time-Pressure Drop Method; by giving this condensed version, the Unified Government does not waive any requirements of the full test method. Air testing shall be conducted one reach at a time. Reach shall be sealed and pressurized to 4.0 psig. Pressure shall be maintained between 3.5 and 4.0 psig for minimum 2 minutes to permit temperature equalization. Once temperature is equalized, decrease pressure to 3.5 psi for start of test. Disconnect air supply and measure the time required for the pressure to drop to 2.5 psig. Reaches will pass the air test if the time for the pressure drop is greater than shown in the following table:

Note: Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 36 in. in diameter.

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

- C. Hydrostatic testing of force mains shall conform to AWWA C600 procedures as modified herein. Test shall be performed after backfill is complete. Contractor shall provide and install test plugs. Pressure test shall be conducted at 2.0 times the maximum operating pressure. Leakage test shall be conducted at the maximum operating pressure.
- D. Pipe not passing tightness tests shall be repaired or replaced and retested.
- E. Tightness tests are not required for spot repairs.

ATTACHMENTS:

Attachment 5100-A KDHE POLICIES FOR SEPARATION OF WATER MAINS & SEWERS

END OF SECTION 5100

KDHE POLICIES FOR SEPARATION OF WATER MAINS & SEWERS

1. SEPARATION OF WATER MAINS AND SEWERS

- a. **GRAVITY SANITARY SEWERS** – When potable water pipes and gravity sanitary sewers are laid parallel to each other, the horizontal distance between them shall be not less than 10 ft (3.0 m). The distance shall be measured from edge to edge. The laying of water pipes and sanitary sewers shall be in separate trenches with undisturbed earth between them. In cases where it is not practical to maintain a 10 ft (3.0 m) separation, KDHE will consider proposals providing equivalent protection by other methods on a case-by-case basis, if supported by data from the design engineer. Equivalent protection may require sanitary sewer construction with one of the following additional protective features: concrete encasement, vacuum sewers, or jointless pipe such as polyethylene or cured-in-place.

When a water pipe and a sanitary sewer cross and the sewer is 2 ft (0.6 m) or more (clear space) below the water pipe, no special requirements or limitations are provided herein. At all other crossing, the sanitary sewer is to be constructed of one of the following materials (or approved equal) and pressure tested to assure water tightness pursuant to Chapter VI of the KDHE Minimum Standards of Design of Water Pollution Control Facilities:

Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.51 with minimum thickness class 50, and gasketed, push-on, or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.

PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR41, ASTM F679, ASTM F789, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212.

Reinforced concrete pipe conforming to ASTM C76 with gasketed joints in conformance with ASTM C361 or ASTM C443.

Joints in the sewer pipe shall be located as far as practical from the intersected water main.

Where a water main is laid across or through an area where there is an existing sanitary sewer, which is not constructed of one of the above specified materials and is 2 ft (0.6 m) or less below the water pipe, the existing sewer shall be encased in concrete with a maximum of 6 in (15 cm) thickness for a 10 ft (3.0 m) distance on each side of the crossing or the crossed section of sewer replaced to meet the above specified construction requirements. KDHE will consider proposals providing equivalent protection by other means on a case-by-case basis, if supported by data from the design engineer.

- b. **SEWER CONNECTIONS** – There are to be no physical connections between any parts of the potable water system with building sewers, sanitary sewers, or wastewater treatment facilities by means of which it would be possible for sewage, even under exceptional circumstances, to reach the wells, storage reservoirs, or distribution systems.

- c. PRESSURE SEWER LINES – When force mains run parallel to water lines, the separation distance shall be as far as practical, but at least a 10 ft (3.0 m) horizontal separation shall be maintained. There shall be at least a 2 ft (0.6 m) vertical separation at crossings with the water main crossing above the sewer force main. In cases where it is not practical to maintain the required vertical or horizontal separation distance between a water line and a sanitary sewer force main, KDHE will consider proposals providing equivalent protection by other methods on a case-by-case basis, if supported by data from the design engineer.
- d. SEWER MANHOLES – No water pipe shall pass through or come in contact with any part of a sewer manhole.
- e. STORM SEWERS – The separation distance between a storm sewer (which is not a combined storm/sanitary sewer) and a water main should be based on geotechnical considerations. Required separation distances between water mains and combined storm/sanitary sewers are equivalent to those for water mains and gravity sanitary sewers.
- f. DRAINS – Underground drains from fire hydrants or valve pits should not be directly connected to sanitary or storm drains.

Source:

KDHE POLICIES, GENERAL CONSIDERATIONS AND DESIGN REQUIREMENTS FOR PUBLIC WATER SUPPLY SYSTEMS IN KANSAS, 1995 Edition

Chapter VIII Distribution Systems

B. Protection Considerations

1. Separation of Water Mains and Sewers

Pages VIII-2 – VIII-4

SECTION 5200 - STORM SEWER

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers installation of storm sewer mains and culverts. Topics include permits and fees, trench widths, pipe laying, bedding, initial backfill, encasement, water crossings, underdrain installation, slope anchors, encasement, and alignment tests.
- 1.02 RELATED WORK:** Refer to the following sections for related work:
- | | |
|--------------------------------|--|
| Site Restoration | Section 1000-General Requirements |
| Trenching | Section 2100-Trenching and Tunneling |
| Concrete Cradle Material | Section 4000-Concrete Material and Methods |
| Manholes and Pipe Material | Section 5000-Manhole Construction |
| Filter Fabric for General Uses | Section 2000-Earthwork |
- 1.03 SUBMITTALS:** Contractor shall submit the following for review:
- A. Sieve analysis of bedding material.
- 1.04 KDHE REQUIREMENTS:** Contractor is notified that the Kansas Department of Health and Environment has requirements for the protection of potable water systems that may affect the work covered by this Section.
- 1.05 TIMING OF CONNECTION TO EXISTING SEWER SYSTEM:** To prevent trench water from entering the existing sewer system, the new main shall remain isolated from the existing system until backfill and acceptance tests are complete.

PART 2 - PRODUCTS

2.01 STORM SEWER AND CULVERT PIPE:

- A. Reinforced Concrete Pipe (RCP): RCP pipe shall conform to ASTM C76 for round pipe, ASTM C506 for arch pipe, and ASTM C507 for elliptical pipe. Unless otherwise specified, Class III, wall B shall be provided. Joints shall be tongue-in-groove with preformed, flexible sealants and shall conform to ASTM C990. End sections shall be flared and shall meet the concrete material, steel area, and workmanship requirements for Class III or A-III pipe. Fittings shall be manufactured from green precast stock, carefully mitered, and shall have reinforcing cages welded together at the joint.

Reinforced concrete box sections shall conform to ASTM C789 for normal installations and ASTM C850 for installations under roadways with less than 2 feet of cover. Design tables shall be appropriate for the loading conditions. Designs not taken from the design tables shall be sealed by a registered professional engineer.

- B. High Density Polyethylene Pipe (PE or HDPE): HDPE pipe and fittings shall conform to ASTM F2306. Pipe shall be made from virgin PE compounds confirming to cell class 435400C in ASTM D3350. Joints shall be integral bell and spigot with rubber gaskets. Joint shall be water tight as defined in ASTM F2306. Pipe manufacturer shall be certified through the Plastic Pipe Institute third party certification program.

2.02 POLYETHYLENE (PE) UNDERDRAIN: Corrugated PE tubing for underdrains shall conform to KDOT Standard Specifications Subsection 1908.

2.03 FILTER FABRIC: Filter fabric for underdrains shall be a geotextile meeting the requirements of KDOT Standard Specifications Subsection 1710.

<u>Property</u>	<u>Limit</u>	<u>Method</u>
Tensile Strength	150 lbs.	ASTM D4632
Puncture Strength	80 lbs.	ASTM D4833
Trapezoid Tear	100 to 40	ASTM D4571

2.04 BEDDING: KDOT Standard Specifications Section 1100, CA-5, Coarse Aggregate for Concrete, washed stone or gravel, meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Retained</u>
1-inch	0
3/4-inch	0 - 5
3/8-inch	40 - 60
No. 8	95 - 100

2.05 SELECT BACKFILL: Site excavated or imported noncohesive material free of clay lumps, rocks larger than 3 inches, organics, trash, or frozen material.

2.06 ENCASEMENT MATERIAL: As referenced in Part 1.

2.07 TEMPORARY PLUGS: Temporary plugs shall be a model recommended by pipe manufacturer; watertight to a static head of 25 feet.

2.08 PIPE MATERIAL FOR SPOT REPAIR: Sewer pipe that is deteriorated or damaged shall be replaced with the same material as existing, except clay pipe, which may be replaced with PVC (SDR 26) using an approved flexible connector made specifically for connecting these materials. Grouted inserts of any kind will not be allowed. Connection shall be made at existing bells or joints.

PART 3 - EXECUTION

3.01 TRENCHING: See reference in Part 1 for trench excavation, protection, dewatering, and general backfill. Trench width, measured at 1 foot above the exterior top of pipe, shall be at least 15 inches greater but not more than 24 inches greater than the exterior width of the pipe. Excessive width trenches shall be corrected by use of bedding material throughout the initial backfill zone.

- 3.02 PIPE LAYING:** Installation of pipe shall proceed from the downstream end of the project with bell ends facing upstream. Alignment and grade shall be uniform between manholes, and a positive system of grade control shall be used for maintaining alignment. Due to difficulty of compacting beneath wide pipes, loose bedding material shall be shaped to receive the full length of the pipe except where required to mate joints. The ends of the installed pipe shall be plugged whenever the work is not in progress. Joint installation shall follow the manufacturer's recommendation.
- 3.03 INITIAL BACKFILL:** Select backfill shall be placed from the upper limit of the bedding to a level 12 inches above the exterior top of pipe. Limestone bedding material shall not be used with ductile-iron pipe. Material shall be placed uniformly on both sides of the pipe and compacted with hand operated equipment to 95 percent of standard density as determined by ASTM D698.
- 3.04 BEDDING:** Unless otherwise specified, granular bedding material shall be placed uniformly on both sides of the pipe to the limits given below and compacted to 95 percent of standard density as determined by ATSM D698. Depth of granular bedding material below the exterior bottom of pipe shall meet the following minimums:

<u>Pipe Diameter</u>	<u>In soil</u>	<u>In rock</u>
24 inches and less	4 inches	6 inches
27 inches to 60 inches	4 inches	9 inches
66 inches and greater	6 inches	12 inches

The top limit of granular bedding material shall be springline (the widest part) of the pipe.

- 3.05 UNDERDRAIN INSTALLATION:** Underdrain shall have minimum grade of 1 percent unless shown otherwise on the drawings. Upstream ends of underdrain shall be capped. Junctions shall be made with manufactured wyes and tees. Granular bedding material shall extend from a minimum of 4 inches below the pipe to a minimum of 8 inches above the pipe. Granular bedding shall be enclosed by filter fabric lapped a minimum of 1 foot.
- 3.06 SLOPE ANCHORS:** Slope anchors shall be minimum of 12 inches thick and shall extend a minimum of 2 feet from the exterior of the pipe on all sides. They shall be cast against undisturbed earth in the trench walls and bottom. In rock, the walls and anchors shall be keyed a minimum of 6 inches into undisturbed rock. Anchors shall be cast against pipe bells or a capped cross on bell-less pipe. Whenever there is more than 8 feet of vertical fall between manholes, anchors shall be placed at intervals not to exceed 8 feet of vertical fall.

- 3.07 CONCRETE ENCASEMENT:** Concrete encasement shall extend a minimum of 6 inches beyond the outside wall of pipe; except the top level of encasement at drainage course crossings shall be as shown on the detail drawing. Encasement shall be reinforced with four No. 6 reinforcing bar for sizes up to and including 24 inches. Reinforcing for larger sizes shall equal 0.4 percent of the cross sectional area of the concrete. Reinforcing bar shall be placed with 3 inches of cover from the bottom and sides of the encasement. Laps shall be 16 bar diameters.
- 3.08 ALIGNMENT TESTING:** To verify alignment and workmanship, installed pipe may be lamped or televised. Lamped sections shall have no elongation of the silhouette or evidence of debris or dirt in the pipe. Televised pipe shall be inspected for a smooth, structurally sound, straight main. Pipe may also be televised at the end of the warranty period. Unacceptable defects include displacement at joints, intrusion of foreign material, and cracked or distressed pipe.

Pipe not passing alignment tests shall be repaired or replaced and retested.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 5200-A PLUNGE POOL FOR OUTLET IN LINE WITH STREAM

UG 5200-B TOE WALL FOR FLARED END SECTION

UG 5200-C STORM SEWER OUTLET LATERAL TO STREAM – SHEET 1 OF 2 – PLAN VIEW

UG 5200-D STORM SEWER OUTLET LATERAL TO STREAM – SHEET 2 OF 2 – TOE BANK
PROTECTION

UG 5200-E LEVEL SPREADER – SHEET 1 OF 2 – PLAN VIEW

UG 5200-F LEVEL SPREADER – SHEET 2 OF 2 – RIGID LIP CROSS SECTION

END OF SECTION 5200

SECTION 5300 – CURED-IN-PLACE PIPE

PART 1 - GENERAL

1.01 SCOPE: This Section covers cured-in-place pipe for rehabilitation of existing sanitary and storm sewer mains and services. Topics include product and installer qualifications, prebid inspection, pipe preparation, lining design, cured-in-place pipe, building service restoration, point repair, and building service lining.

1.02 RELATED WORK: Refer to the following sections for related work:

Site Restoration	Section 1000-General Requirements
Traffic Control	Section 1300-Traffic Control
Open Cut Repair	Section 5100-Sanitary Sewer Main
Bypass Pumping	Section 5100-Sanitary Sewer Main
Tightness Tests	Section 5100-Sanitary Sewer Main
Water and Electric Power	Section 1000-General Requirements

1.03 SUBMITTALS: Contractor shall submit for review including, but not limited to, product data for the following:

- A. Liner tube, resin, sealant, and fittings, adapters, and specials.
- B. Certificates and Affidavits (furnish prior to shipment or installation as applicable):
 - 1. Affidavit of compliance with applicable standards for resins and tube materials.
 - 2. Certification that Contractor is a licensed installer of any patented process.
- C. Post installation video.

1.04 DELIVERY AND STORAGE: Delivery and storage of lining and other materials shall conform to requirements of the manufacturer. Furnish required storage facilities. Handle lining materials in compliance with manufacturer's recommendations. Damaged material will be unacceptable for installation.

1.05 PREQUALIFICATIONS: In order to be considered in the bid evaluation process, Contractor shall have: A minimum nation wide installation history of 250,000 feet of cured-in-place lining installations; a minimum nation wide installation history of 1,000 point repair lining installations; and a minimum nation wide installation history of 5,000 building service lining installations. All products shall have minimum 1 year installation history in MARC area counties. Applicant shall list references with contact names and phone numbers. Contractor shall provide Unified Government with prequalification information regarding cured-in-place projects at time of bid. This information shall include total linear feet of pipe installed, diameter of pipe, materials used, and contact name, address, and phone number of the owner to whom the service was provided. Unified Government may, at its discretion, adjust or waive the aforementioned prequalifications.

- 1.06 BIDDER'S INSPECTION:** Bidder shall examine video tapes of lines prior to prebid meeting. Bidder shall use tape to identify service connections, obstacles, and residual load carrying capacity of the host pipe. Bidder shall make a reach by reach (manhole to manhole) determination of load carrying capacity of the host pipe before the prebid meeting. Engineer will review differing opinions regarding host pipe capacity at the prebid meeting and make a determination of the required design assumptions by addendum. Obstacles located by Bidder shall be identified at the prebid meeting. Lines so deteriorated as to risk collapse with a complete and thorough cleaning shall be identified and discussed at the prebid meeting. Bidder shall evaluate obstacles and determine appropriate repair strategy. Successful Bidder shall submit copy of the prebid video tape along with a tape log and a proposal listing obstacle locations and repair strategy. Tape log shall include obstructions and all service or other connections to the pipe.
- 1.07 LINING DESIGN:** Minimum liner thickness for each liner depth/diameter combination shall be as scheduled on the drawings. Engineer may consider Contractor proposed changes in thickness based upon use of higher flexural modulus resins. Contractor proposed changes must be supported by detailed calculations satisfactory to Engineer.
- 1.08 POST INSTALLATION VIDEO:** Contractor shall provide one copy of a videotape showing pipe after lining. Video shall be annotated to indicate all restored services.

PART 2 - PRODUCTS

- 2.01 CURED-IN-PLACE LINING PRODUCTS:** Products shall conform to ASTM D5813, "Cured-In-Place Thermosetting Resin Sewer Pipe".
- 2.02 LINER TUBE:** The tube shall consist of one or more layers of flexible needled felt or an equivalent nonwoven material capable of carrying resin and withstanding installation pressures and curing temperatures. The liner tube shall be manufactured of a resin-impregnated flexible tube cured in place using circulating hot water. The tube shall be compatible with the resin system used. The tube shall be capable of conforming to offset joints, bells, and disfigured pipe sections. The tube shall be custom fabricated to a size that, when installed, will tightly fit the internal circumference of the original conduit. Allowance shall be made for circumferential stretching during installation. Contractor shall determine the tube lengths for individual installation runs in accordance with manufacturer's recommendations.

The cured liner tube shall conform to the following minimum structural standards:

- A. Tensile strength- 3,000 psi.
- B. Flexural stress- 4,500 psi.
- C. Flexural modulus of elasticity- 250,000 psi.

- 2.03 RESIN:** The resin used shall have the following characteristics:

- A. The resin used shall be high-grade corrosion resistant isophthalic polyester, vinyl ester, or epoxy that is compatible with the liner tube and installation process to be used.
 - B. The resin must be able to cure in the presence of water, and the initiation temperature for cure shall be less than 180° F.
- 2.04 SEALANT:** A sealant composed of a resin mixture compatible with the liner tube and as recommended by the liner tube manufacturer shall be used at pipe terminations and at points where the cured lining tube fails to make a tight seal.
- 2.05 INTALLATION EQUIPMENT:** Provide equipment for the installation and curing of the liner tube as recommended by the manufacturer.

PART 3 - EXECUTION

- 3.01 GENERAL:** Installation shall be in accordance with ASTM F1216, “Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube” or ASTM F1743, “Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).”
- 3.02 PRECLEANING:** Contractor shall remove all internal debris, solids, and roots from the sewer line that will interfere with the installation or adhesion of the lining. Only fully deteriorated lines identified at the prebid meeting as subject to collapse by cleaning operations shall be exempt from a complete cleaning. Contractor shall make a post cleaning/pre-installation video to verify line is clean and obstructions are clear.
- 3.03 SPOT REPAIRS:** Line obstructions shall be repaired as follows:
- A. The original pipeline shall be clear of obstructions such as solids, dropped joints, protruding service connections, crushed or collapsed pipe, and reductions in the cross-sectional area of more than 20 percent that will prevent the insertion of the resin-impregnated tube. Protruding service connections shall be removed to prevent dimpling of the finished liner. Maximum allowable protrusion shall be 1/2-inch. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, a spot repair excavation shall be made to uncover and remove or repair the obstruction.
 - B. Contractor shall perform all cured-in-place sectional and spot repairs for the sewer line segments scheduled.
 - C. Building service lining shall be provided where called out on plans or special conditions.
- 3.04 BYPASS PUMPING:** See related work in Part 1.
- 3.05 PLACEMENT AND CURING:**
- A. Installation by inversion is required to be in compliance with ASTM F1216 as follows:

1. Prepare inversion tube by vacuum impregnating the liner tube with the uncured resin. Install inversion standpipe over existing manhole or other Unified Government-approved access. Attach and insert inversion tube through the standpipe with watertight seal and lubricated as recommended by the manufacturer. Invert liner to predetermined length through the existing pipe using hydrostatic pressure in the standpipe and in accordance with manufacturer's approved procedure.
2. Maintain water at constant temperature during hydraulic leak test that shall be performed during the curing period. Provide certification of test results for each installed section.
3. Cure installed liner using a hot water recirculation system designed to develop uniform curing temperature throughout the entire length of the lined section. The manufacturer shall approve the procedure and temperature for the resin/catalyst system employed. The resin manufacturer shall recommend duration of the cure period, and liner shall obtain proper hardness before curing is considered complete.
4. Cool the hardened liner by introducing cool water into the recirculation system and draining the heated water. Maintain static head on cured liner until temperature throughout the liner is reduced below 100° F. Limit drainage rate to avoid creating a vacuum and damaging the freshly cured liner.
5. Seal any annular space between the cured liner tube and the existing pipe where the cured tube fails to make a tight seal. Seals shall be a resin mixture compatible with the resins in the inversion tube.

3.06 BUILDING SERVICE REINSTATEMENT: Prior to installation, Contractor shall record the location of service connections and lateral lines. Service reinstatements shall be made by trenchless technologies that provide continuous lining from the main through the connection and a minimum 3 feet into the service. If, after review by Engineer, it is determined a service cannot be reinstated with trenchless technology, it shall be reinstated with conventional open cut methods. Services shall be reinstated within the time limits listed in Section 5100, regardless of method.

3.07 STRENGTH TESTS: Short-term flexural properties and tensile properties tests specified in ASTM F1216 shall be performed and the results submitted to Engineer.

3.08 TIGHTNESS TESTS: Tightness tests can be conducted by any means allowed for sanitary sewer mains. As a substitute to the tightness test, hydrostatic test conducted during curing will be allowed when equipment is set up to provide accurate measurement of makeup water. Results shall be submitted to Engineer.

END OF SECTION 5300

SECTION 5400 - LINING EXISTING MANHOLE

PART 1 – GENERAL

1.01 SCOPE: This Section covers repair of existing manhole by placement of a cementitious lining. Topics include product and installer qualifications, manhole cleaning, manhole and invert patching, lining, and exfiltration tests.

1.02 RELATED WORK: Refer to the following sections for related work:

Site Restoration	Section 1000-General Requirements
Traffic Control	Section 1300-Traffic Control
Bypass Pumping	Section 5100-Sanitary Sewer Main

1.03 ACCEPTABLE VENDORS:

- A. Coating materials for use in lining standard environment existing manholes shall be AP/M Permaform PERMACAST MS-10,000; Strong Systems, Inc. MS-2A; Master Builders, Inc. Emaco S88C; Standard Cement Materials, Reliner MSP; or Quadex QM-1s Restore.
- B. Coating materials for use in lining corrosive environment existing manholes shall be AP/M Permaform COR+GARD; Aquafin, Inc. Hydro-Pox 212 GL; De Neef Construction Chemicals, Inc. Denepox Sewergel; Raven Lining Systems AquataPoyx Systems or Raven 400 Series; or Sauereisen, Inc. Sewergard No. 210RS.

1.04 ENVIRONMENTAL LIMITS: Product shall not be placed on surfaces with below freezing temperature, or if surface may experience below freezing temperature within 24 hours after application. When air temperatures exceed 90° F, chill mix to maintain mix temperature below 85° F.

1.05 COMPONENT COMPATIBILITY: All equipment, materials, application methods, and installer training shall be approved for the application by the manufacturer of the lining material.

1.06 SUBMITTALS: Contractor shall submit for review including, but not limited to, the following:

- A. Lining material product data sheet and information.
- B. Manufacturer's application procedure and recommended application equipment.
- C. Certification that the coating system materials furnished comply with all requirements specified herein.

1.07 INSTALLER QUALIFICATION: The firm shall be certified or licensed by the manufacturer of the lining material to have equipment and training recommended to prepare the manhole and to apply the specified coatings.

PART 2 – PRODUCTS

2.01 PATCHING AND LEAK CONTROL MATERIALS: Material for patching of manholes shall be a quick setting, non-shrink, material at least as strong as the liner material and produced or recommended by the lining manufacturer. Selection of actual patch product, if any, shall be based on field conditions.

2.02 LINER MATERIAL:

- A. Material for standard environment spray-on lining shall be a pre-blended mixture of cements, chemically active aggregates, fiber reinforcements, and other additives specifically selected for their special properties and formulated for spray application. No material (other than potable water) shall be used with or added to the approved design mix without prior approval or recommendation from the lining manufacturer and Engineer. All water used in the mixture shall be clean and potable. The density of the material at placement of the coating shall not be less than 95 pounds per cubic feet. Approximate working time of the material after initial application shall be 30 minutes. Material shall meet the following requirements for the strength class required:

<u>Test</u>	<u>Normal</u>	<u>Method</u>
Compressive Strength	3000 psi, 24 hours	ASTM C109
Flexural Strength	1200 psi, 28-day	ASTM C348
Shrinkage at 90 percent relative humidity	0 percent	ASTM C596
Bond Strength	130 psi, 28-day	ASTM C952
Freeze-Thaw	No visible damage after 100 cycles	ASTM C666
Permeability	Shall not exceed 450 Coulombs	ASTM T277

- B. Material for corrosive environment lining shall be a 100% solids, solventless two-component epoxy resin system suitable for spray or trowel application. Products shall be mixed and applied as recommended by manufacturer and approved by Engineer.

2.03 INSTALLATION EQUIPMENT: Application equipment shall be manufactured or licensed by the material supplier and designed specifically for the application of manhole liners. Minimum pumping pressure shall be 250 psi.

High-pressure water spray for surface cleaning shall reach minimum 3500 psi.

PART 3 – EXECUTION

3.01 BYPASS PUMPING: See Related Work Part 1.

3.02 MANHOLE PREPARATION: Invert and service lines shall be covered to prevent waste material from entering lines. Foreign material shall be removed from wall and bench by high-pressure water spray. Loose or protruding brick, mortar, or concrete shall be chipped out. Large voids and active leaks shall be patched and plugged.

3.03 INVERT REPAIR: Inverts with visible damage or infiltration shall be repaired. Contractor shall block flow and clean invert. Patch material shall be applied a minimum of 1/2-inch thick over the entire invert and shall extend onto the bench sufficiently to tie to subsequent liner placement.

3.04 LINER APPLICATION: Material shall be mixed and applied using the procedure and equipment approved and licensed by the lining manufacturer. Surface to receive lining shall be saturated but free of water drops. Liner shall be sprayed on following manufacturer's recommendations. Spray material to a minimum 1-inch uniform thickness to ensure that all voids and crevices are filled and a smooth surface remains after troweling. Trowel to compact material into voids and crevices and to "set" the bond on the manhole surface. Below 12 feet, minimum liner thickness shall be 1-1/2-inches.

Top limit of the liner shall be a minimum of 1 inch up onto the casting. Bench shall receive a single coat of a minimum 1/2-inch thickness at the invert and shall increase in thickness in the direction of the wall so as to provide the required minimum slope. The entire bench shall be coated to the edge of the invert channel. The bench/wall intersection shall receive a radiused fillet.

3.05 CURING: The liner shall be cured a minimum of 4 hours before being exposed to flow.

3.06 ACCEPTANCE TESTING: Liner shall be visually inspected for complete coverage and finish. When directed by Engineer, water tightness of the liner shall be tested as follows:

- A. When ground water is high or when cave-in adjacent to manhole allows dye to be introduced at the outer surface of the manhole, the liner shall be inspected visually for leaks. No leak shall be discernible.
- B. When water is not present or cannot be introduced at the outer surface of the manhole, an exfiltration test shall be conducted. Manhole shall be inundated to top and allowed to stand for 5 minutes. For depths of 6 feet or less, water drop shall be less than 1 inch. For every additional foot of depth, an additional loss of 1/8-inch shall be acceptable.

END OF SECTION 5400

SECTION 5500 - STORM SEWER INLETS

PART 1 – GENERAL

1.01 SCOPE: This Section covers construction of catch basins, area inlets, and field inlets for storm sewers, and includes precast suppliers qualification, removal of existing inlets, construction of boxes, lids and bases, construction of curb transitions and throat, and waterproofing.

1.02 RELATED WORK: Refer to the following sections for related work:

Mulch selection by slope	Section 1400-Construction Period Erosion Prevention
Concrete for cast in place inlets	Section 4200-Concrete Structures
Backfill under pavements	Section 2100-Trenching and Tunneling
Concrete work for transition and throat	Section 4100-Concrete Pavement and Flatwork

1.03 QUALITY ASSURANCE: If precast boxes are used, supplying plant shall be on KDOT preapproved list of precasters.

1.04 SUBMITTALS: Contractor shall submit the following for review:

- A. Current certification of KDOT approval for the precast suppliers.
- B. Shop drawings showing reinforcement and dimensions of inlets and tops.

1.05 FIELD VERIFICATION: Contractor shall field verify depth measurement. Contractor shall be responsible for the correct location of pipe penetrations.

1.06 NOMENCLATURE: Within this Section the following nomenclature is used to describe specific styles of storm sewer inlets:

- A. In-Line Catch Basin: A curb opening inlet with the front of the lid in line with the face of the curb on the adjoining street.
- B. Setback Catch Basin: A curb opening inlet with the front edge of the lid set back 2 feet behind the normal face of curb on the adjoining street.
- C. Field Inlet: An inlet open on one or more sides that is not adjacent to a street.
- D. Area Inlet, or Grated Area Inlet: An inlet whose only opening to surface water is a cast iron grate set in the top of the box.

PART 2 – PRODUCTS

- 2.01 PRECAST BOXES AND LIDS:** Precast boxes and lids shall conform to the dimensions in the Detailed Drawings. Precast supplier shall meet quality assurance requirements listed in Part 1. As installed, walls may vary from plumb by not more than 4 percent. For street slopes greater than 4 percent, the top face of the box shall be sloped to match the street grade. Radiused precast tops shall be cast for a 20-foot radius. Steps are not required.

Precast boxes may have openings for pipes pre-measured and cast in the box, or the openings may be cut in the field. Precast bases are allowed in new construction only. Precast bases are not allowed in reconstruction projects.

- 2.02 CAST-IN-PLACE BOXES AND LIDS:** Cast-in-place boxes and lids shall conform to the dimensions in the Detailed Drawings. Products and work shall conform to the requirements of concrete structures (see related work, Part 1). Walls shall not vary from plumb by more than 1/2-inch overall. Top face of box shall be sloped to match the adjacent street, to within a slope of 1/2-inch in 12 inches. Steps are not required.
- 2.03 MANUFACTURED PIPE CONNECTORS:** For locations where pipes are allowed to be butt connected at a field cut joint, connector shall be a manufactured, watertight, flexible connector made specifically for connecting the pipe materials encountered.
- 2.04 SIZE:** If not otherwise shown on the installation drawings, use a standard size box. Standard box shall be 3' x 5' inside dimension. Minimum box size shall be 2-1/2' x 4', inside dimension, for a catch basin or field inlet. Minimum size shall only be used to avoid a utility conflict. Standard and minimum box size for a grated area inlet shall be 3' x 3', inside dimension. Use larger boxes only where indicated on the installation drawings. Wall thickness shall be 6 inches. Dimension tolerance shall be $\pm 1/4$ -inch in wall thickness, $\pm 1/2$ -inch in interior dimension. Top shall be planar to within 1/4-inch.
- 2.05 CASTINGS:** Access covers and rings shall conform to ASTM A48, Class 35B, and shall be of the weight, dimension, and design shown on the Detail Drawings.

PART 3 – EXECUTION

- 3.01 DEMOLITION OF EXISTING INLET:** When inlet is a replacement of an existing inlet, the entire inlet, base, and lid shall be removed. Removal of adjacent surface improvements shall be to the limits marked in the field by Engineer. All excavated material shall be promptly removed from the site.
- 3.02 BOX AND LID CONSTRUCTION:** New inlets shall be precast or cast-in-place. Cast-in-place box or lid may be combined with a precast lid or box. Lids shall be sloped to match the adjacent street slope. Precast boxes may be tipped out of plumb by no more than 1/2-inch in 12 inches to accomplish this result. Walls of cast-in-place boxes shall be formed on both sides. Casting against the wall of the excavation is not acceptable. Grout beds for the inlet tops shall extend the full length and width of the wall. Grout beds shall be minimum of 1/2" to a maximum of 2". Grout that weeps

from the joint shall not be struck off, but shall be left for inspector's observation. Fill lift holes.

- 3.03 BASE, INVERT AND PIPE CONNECTION TO BOX:** The minimum base thickness shall be 8 inches measured at flowline. Minimum base thickness under precast wall shall be 12 inches. Temporary supports for precast box shall be concrete block or other non-biodegradable, non-rusting, dimensionally stable, manufactured support. Support by stone or concrete rubble is not acceptable. Cast-in-place base shall extend not less than 4 inches or more than 10 inches beyond outside face of wall. Sides of base shall be formed by separate forms or by vertical wall of excavation that is within dimension tolerances. Concrete for base shall extend a minimum of 4 inches up both the inside and outside of the precast wall to form a soil-tight seal. A 6-inch thick, reinforced precast base with cast-in-place invert shaping is acceptable.

Where inlet has no inflow pipe, no channel is required, and invert shall be sloped to the flowline of the outflow pipe at no less than 2 percent nor more than 25 percent slope. Where inlet has one or more inlet pipes, construct invert channel. Invert channels shall be formed to a "U" shape, matching the lower half of the pipe cross section and extending to one-half the height of the pipe. Channels connecting pipes of different sizes shall transition smoothly over the length of the box. When the pipes come in at differing angles, the channel shall be formed with as large of radius as possible. Benches shall slope to the channel at 1:12 slope.

Where pipe openings in a precast box are cut in the field, saw kerf the outside to a minimum depth of 2 inches. To the extent clearance allows, saw kerf the inside to a minimum depth of 1 inch. Break out opening and cut reinforcing to clear pipe. Keep opening size small. If Engineer determines opening size is excessive or that excessive spalling occurred during break out, forms will be required on inside or both faces.

Connection of pipe to box shall form a soil-tight seal. Pipe shall be cut to skew and shall be recessed from 0 to 1 inch from the face of a cast-in-place wall, and 3 inches $\pm$ 1/2-inch projecting from the face of a precast wall. For cast-in-place construction, a soil-tight seal shall be the cast wall fully bonded to the pipe with no honeycomb or gaps. For precast construction, a soil-tight seal may be built as follows: the pipe opening shall be packed full of low slump concrete or non-shrink grout. Such packing shall extend at least 1/2-inch onto the inside face of the wall and 3 inches onto the outside face of the wall. If the extension sags away from the face of wall, the joint between the precast box and the packing for the opening shall be sealed with mastic and covered with 2 layers of 10-mil plastic sheet. Plastic sheet corrective measure is required on the outside face only.

- 3.04 RECONNECTION TO EXISTING LATERAL:** Where a pipe is damaged by removal of an existing inlet, it shall be replaced with pipe of like material; except clay pipe, which shall be replaced with PVC (solid wall SDR 35 or closed cell profile wall). Connection shall be made at an existing joint or made with a manufactured pipe connector at a sawed butt joint. Where the lateral must be deflected from previous alignment, the desired method is to deflect pipe at joints within manufacturer's recommended limits only when approved by Engineer. Alignment break shall be sealed using a manufactured pipe connector surrounded by a concrete collar. When allowed, concrete collar shall extend a minimum 12 inches beyond the joint, shall be a minimum of 6 inches thick all around.

3.05 TRANSITIONS AND THROAT CONSTRUCTION: Dimension, cross section, and reinforcing of transitions and throat shall conform to the Detail Drawings. Concrete mix shall conform to concrete for curb and gutter. Transition sections shall have full gutter for the full length regardless of style of adjacent curb. Flowline of transition shall be straight grade. Curb shape in the transition shall match adjacent at the match end and shall be standard curb section at the catch basin. Curb shape shall transition smoothly between these two shapes. Transitions and throat shall be cast monolithic. Transition curb shall end in a hand-packed, radiused placement supporting the corner of the lid. Tolerance in height of throat opening shall be $\pm 1/2$ -inch.

3.06 BACKFILL AND RESTORATION: All fill shall be imported. Fill within 4 feet of pavements shall conform to the granular fill requirements for trenches (see related work in Part 1). Fill beyond these limits may be granular fill or may be a clean clay loam or sandy loam. Fat clay, lumpy, rocky, gravelly, or non-uniform material will not be accepted. The same source shall be used for fill for the entire project.

For spot repair contracts, all work at a given inlet, including restoration and turf restoration, shall be completed within two weeks of start of work at the inlet. Turf restoration shall be conducted promptly regardless of the planting season.

3.07 ACCEPTANCE TESTING: Inlets shall be subjected to visual inspection prior to acceptance:

- A. Visual inspection of inlet will evaluate the completeness of the inlet and the alignment of the invert channel, seal of pipe penetration, seal of lift holes, uniformity of grout bed for the lid, height and width of throat, and conformity of transition to requirements.
- B. Visual inspection of adjacent surfaces will evaluate the surface finish treatment, the grade match to the inlet, and elimination of areas where water may pond.
- C. Inlets failing acceptance tests shall be repaired or rebuilt and retested.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 5500-A CURB INLET DETAIL – SHEET 1 OF 4
 UG 5500-B CURB INLET DETAIL – SHEET 2 OF 4
 UG 5500-C CURB INLET DETAIL – SHEET 3 OF 4
 UG 5500-D CURB INLET DETAIL – SHEET 4 OF 4
 UG 5500-E STEPPED BOX DETAIL FOR CURB INLET
 UG 5500-F FIELD INLET
 UG 5500-G GRATED AREA INLET

END OF SECTION 5500

SECTION 6000 - GUARDRAILS

PART 1 - GENERAL

1.01 SCOPE: This Section covers guardrails and guardrail end treatment. Topics include storage requirements for rails, material requirements, general installation requirements, and acceptance criteria.

1.02 RELATED WORK: Refer to the following Section for indicated related work:

Asphalt Shoulder Repair Section 3300-Asphalt Repairs

1.03 SUBMITTALS: The following material shall be submitted for review:

A. Manufacturer's certifications for material requirements listed in Part 2.

1.04 STORAGE OF GALVANIZED MATERIAL: Store all galvanized rail elements, end sections and accessories to prevent galvanic action. Do not store in direct contact with the soil. The material may be stored in the open, provided it is properly separated, stacked and drained.

Protect galvanized surfaces which have been abraded exposing the base metal, threaded portions of all fittings and fasteners and cut ends of bolts from moisture, soil or other damaging elements.

The Contractor is responsible for the condition of the material in storage.

PART 2 - PRODUCTS

2.01 GUARDRAIL PLATES: Guardrail plates and accessories shall be all new materials meeting the requirements of KDOT Standard Specifications Subsection 1618. Plates shall be Class A, Type I. Only materials prequalified by KDOT Bureau of Materials and Research shall be used. Galvanized material with damaged coating will be rejected or, if Engineer determines the damage is minor, shall be repaired. Plates for radiuses less than 150 feet shall be shop bent.

2.02 POSTS: Posts and blocks for repair or extension of existing guardrail shall match existing posts in type and finish; and shall be painted if necessary to meet this requirement. Unless otherwise noted in the plans and specifications, new installations shall be steel posts and blocks that meet the requirements of KDOT Standard Specifications Subsection 1618. Wood posts and blocks for guardrail shall meet the requirements of KDOT Standard Specifications Subsection 2301. Wood posts and blocks shall be preservative treated to the requirements of KDOT Standard Specifications Subsection 2303.

2.03 CORROSION PROTECTION: Rail plates, steel posts and blocks, fasteners, and accessories shall be hot-dipped galvanized after fabrication. Field cuts or other injuries to the zinc coating shall be repaired with two coats of zinc dust paint. Zinc dust paint shall meet the requirements of KDOT Standard Specifications Subsection 1803.

- 2.04 FIELD PRESERVATIVE:** Preservative for field treatment of cut wood posts and blocks shall meet the requirements of KDOT Standard Specifications Subsection 2303.
- 2.05 POST BACKFILL:** Place backfill around the posts in thin layers and thoroughly compact. For the top of the backfill, use the same material of at least the same thickness as that used in construction of the shoulders at that point.

PART 3 - EXECUTION

- 3.01 GENERAL:** Installation of new and resetting of existing guardrail shall conform to KDOT Standard Specifications Section 827 and the following. Posts shall be set plumb and true to line and may be driven or set in excavation. Driven posts shall be protected by a driving cap. Excavation backfill shall be placed in maximum 12-inch lifts and well compacted. Excavation, including rock excavation, and post driving required for the erection of guardrail and guide posts is subsidiary to the installation of the posts and rails.

Galvanized sections shall not be field cut, reamed, or drilled without Engineer's approval. When base metal is exposed, the exposed area shall be painted with galvanized paint. When untreated wood is exposed, the exposed area shall be treated with field preservative.

Rail plates splices shall lap in the direction of traffic (end facing oncoming traffic underneath). Rail plates for terminal sections shall retain the required shape in a relaxed condition.

Damage to asphalt shoulders shall be repaired as specified for rehabilitation work in the referenced section in Part 1, except cold mix asphalt may be substituted if, in Engineer's opinion, the damage is minimal.

END OF SECTION 6000

SECTION 6100 - PAVEMENT MARKING (THERMOPLASTIC)

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers hot-applied, extruded thermoplastic and cold-applied tape for white and yellow pavement marking. Topics include worker's qualifications; weather limits; material requirements; schedule of sizes, patterns, and uses; surface preparation; application requirements; and acceptance criteria.
- 1.02 REFERENCE STANDARDS:** In this Section, the "Manual on Uniform Traffic Control Devices," U.S. Department of Transportation, Federal Highway Administration, is referred to as "MUTCD".
- 1.03 INSTALLER'S QUALIFICATIONS:** Installation shall be by an installer with at least ten successful installations of pavement marking of similar scope. The ten installations shall include work for at least 3 separate owners in the Kansas City metropolitan area.
- 1.04 ENVIRONMENTAL LIMITATIONS:** Except when directed by Engineer, pavement markings shall not be placed unless the following environmental conditions are met:
- A. Air temperature shall be 55°F and rising.
 - B. Pavement shall be completely free of moisture.
 - C. For cold-applied tape, the pavement temperature shall be at least 70°F.
- 1.05 SUBMITTALS:** The following shall be submitted for review:
- A. Manufacturer's and supplier's test results from an independent testing laboratory demonstrating compliance of hot-applied compound, drop-on beads, and cold-applied tape to the requirements given in Part 2 of this Section. This submittal is not required for those materials listed as approved materials in Part 2.
 - B. Manufacturer's application recommendations.
 - C. References demonstrating installer's qualifications.

PART 2 - PRODUCTS

- 2.01 THERMOPLASTIC MARKING:** Only extrusion type thermoplastic systems with both integral and top dressing glass beads shall be accepted. Prior to the application of drop-on beads, thermoplastic marking compound shall have the following properties:

A. Chemical composition shall be:

<u>Component</u>	<u>Percent by Weight</u>	
	<u>White</u>	<u>Yellow</u>
Binder	18 min	18 min
Titanium Oxide	10 - 15	---
Lead Chromate	---	4 - 10
Glass Beads	48 min	48 min
Filler	remainder	remainder

Thermoplastic fumes shall be nontoxic at recommended application temperature.

B. Binder shall be of alkyd type, composed of maleic modified rosin ester and other plasticizers.

C. Colors: White shall be pure white with reflectance of 75 percent minimum as tested by ASTM E97. Yellow shall match FHWA PR color No. 1 with reflectance of 45 percent minimum as tested by ASTM E97.

D. Other properties shall be as follows:

<u>Property</u>	<u>Limit</u>	<u>Test Method</u>
Color Retention	No Variance	72-hour exposure per ASTM D795
Water Absorption	0.5% max	ASTM D570
Softening Point	90°C min	ASTM E28
Low Temperature Resistance	No cracks or flaking from substrate	Min 32 sq. in. thermoplastic on concrete substrate; 1 hr cold water immersion; 24 hr deep freeze at -10°C; return to room temperature.
Specific Gravity	1.9 to 2.3	Water Displacement Method
Drying Time	15 minutes at ambient temp of 75°F	Material applied at 400°F, line solid and no effect of tracking.
Indentation Resistance	40 to 75 units after 15 seconds	Shore Durometer, Type A2 per ASTM D2240; at 45°C $\pm 2^\circ$ and a 2 Kg weight
Abrasion Resistance	8 gram loss max	Total loss from four repeats of blasting with 400 g of glass beads at 22 psi
Reheating	thermoplastic held at 425°F for 6 hr shall pass all tests described in this table	

- E. Sealer: Sealer for aged asphalt pavements shall meet thermoplastic manufacturer's recommendations.

2.02 GLASS BEADS:

- A. The following requirements apply to all glass beads used in thermoplastic:

1. Refractive index shall be between 1.50 and 1.60 when tested by the liquid emersion method at 25°C.
2. Roundness: At least 75 percent of glass beads shall be true spheres when tested by ASTM D1155.
3. Gradation of glass beads shall be:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 20	100
No. 30	75 - 95
No. 50	15 - 35
No. 100	0 - 5

- B. Coatings:

1. Glass beads used in compound shall be coated to promote adhesion to the thermoplastic binder.
2. Glass beads used as top dressing shall be resistant to clumping caused by moisture. Beads used as top dressing shall pass the moisture resistance/free flow, anti-wicking, and adhesion tests.

2.03 COLD-APPLIED MARKINGS: Cold-applied pavement markings shall meet the requirements of KDOT Standard Specifications Subsection 2204, cold plastic pavement marking material. Only materials prequalified by KDOT Bureau of Materials and Research shall be used.

- A. Surface Adhesives: Adhesive for cold-applied markings shall be spray on type for asphalt pavements and contact cement for concrete pavements. Adhesive shall meet cold-applied marking manufacturer's recommendations for the type required.

2.04 TEMPORARY PAVEMENT MARKINGS: Temporary pavement marking tape used for construction traffic control shall meet the requirements of KDOT Standard Specifications Subsection 2205 and shall be completely removed at the completion of the job or phase.

2.05 APPLICATION EQUIPMENT: Application equipment shall be as recommended by the marking manufacturer.

PART 3 - EXECUTION:

3.01 STANDARD SIZES AND PATTERNS: Unless required otherwise in the Special Conditions or drawings, the following sizes, patterns, and materials shall be used:

<u>Use</u>	<u>Color</u>	<u>Type</u>	<u>Size</u>	<u>Pattern</u>
Center Line	Yellow	Hot	Double 4" line with 4" space	Continuous line; break at intersections and intersection type commercial entrances
Lane Line	White	Hot	6" wide	12.5' line, 37.5' skip
Channelizing Line	White	Hot	6" wide	Continuous line
Edge line	Varies	Hot	6" wide	Continuous line; at median islands, painted medians, and rural arterials and collectors
Diagonals	Varies	Hot	18" wide	At 45° clockwise rotation from direction of travel; line spacing in feet = posted speed limit in mph
Stop bars	White	Hot	24"	4' separation from cross walk; otherwise in line with stop sign
Cross walk	White	Hot	12" lines	Line separation normally 6', increase to 8' or 10' in areas of high pedestrian traffic
Cross bars	White	Hot	24" bars with 4' spaces	Cross bars for midblock use; bar length normally 6', increase to 8' or 10' in areas of high pedestrian traffic
Words	White	Cold	8' high	Alphabet style shall conform to MUTCD
Arrows	White	Cold	----	Arrow style shall conform to MUTCD; turn arrow 8' high, through arrow 9.5', turn and through 12.75'

Lines 12" wide or less shall be extruded in one pass. Bars 12" through and including 24" shall be extruded in two passes.

3.02 SURFACE PREPARATION: Pavement shall be dry and free of oil, dirt, and debris at time of application. Asphalt surfaces older than 3 months and all concrete surfaces shall be sand or shot blasted, swept, and air blasted before application of pavement markings. Newly laid asphalt shall be swept and air blasted before application of pavement markings.

- 3.03 APPLICATION:** Application procedures shall follow the marking manufacturer's recommendations. Surface adhesive shall be applied for all cold-applied applications. Sealer shall be applied for thermoplastic applications to concrete surfaces and asphalt surfaces older than 3 months.

Rate of glass bead top dressing of thermoplastic shall be 10 pounds of glass beads for 100 square feet of marking. Beads shall be dispensed uniformly across the section of the molten thermoplastic. Beads shall imbed themselves to approximately 60 percent of their diameter.

- 3.04 TOLERANCES:** Pavement marking be within the following tolerances:

- A. Thickness shall be minimum 90 mils. (Thermoplastic only)
- B. Edges and ends shall not run or bleed more than 1/4-inch in 10 feet. (Thermoplastic only)
- C. Width shall be true to plan $\pm$ 1/4-inch for 4-inch and 6-inch lines, and $\pm$ 1/2-inch for other lines.
- D. Length of stripes skips and bars shall be true to plan $\pm$ 2 inches.
- E. Longitudinal lines shall be at proper location to $\pm$ 2 inches and shall not vary more than 1 inch in 200 feet.

- 3.05 APPEARANCE STANDARD:** At end of guarantee period, markings shall have uniform surface, crisp edges, and clean cut offs; shall exhibit satisfactory retroreflectivity; and shall meet the location tolerances of this Section.

END OF SECTION 6100

SECTION 6150 - PAVEMENT MARKING (PAINT)

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers application of water borne paints for white and yellow pavement marking. Topics include worker's qualifications, weather limits, material requirements, patterns and uses, surface preparation, application requirements, and acceptance criteria.
- 1.02 REFERENCE STANDARDS:** In this Section, the "Manual on Uniform Traffic Control Devices," U.S. Department of Transportation, Federal Highway Administration, is referred to as "MUTCD."
- 1.03 INSTALLER'S QUALIFICATIONS:** Installation shall be by an installer with at least ten successful installations of pavement marking of similar scope. The ten installations shall include work for at least 3 separate owners in the Kansas City metropolitan area.
- 1.04 ENVIRONMENTAL LIMITATIONS:** Except when directed by Engineer, pavement markings shall not be placed unless the following environmental conditions are met:
- A. Air temperature shall be 60°F and rising.
 - B. Pavement shall be completely free of moisture.
- 1.05 SUBMITTALS:** The following shall be submitted for review:
- A. Manufacturer's and supplier's test results from an independent testing laboratory demonstrating compliance of paint compound and drop-on beads to the requirements given in Part 2 of this Section.
 - B. Manufacturer's application recommendations.
 - C. References demonstrating installer's qualifications.

PART 2 - PRODUCTS

2.01 PAINT:

- A. Formulation:
 - 1. The pigment of the yellow paint shall consist of the following for each 100 gallons of paint.
 - a. 30 lbs. of 11-2401 Hansa Yellow XT, from Hoechst Celanese Corp. or approved equivalent.
 - b. 17 lbs. of Rutile Titanium Dioxide.

- c. Other such extender pigments as necessary to produce a close match to the yellow color requirement.
- B. Drying Time: When tested according to ASTM D711 at a wet film thickness of 0.012-inch and with the paint and glass plate at 120°F, the paint shall dry to "no pick-up" in not more than 5 minutes; and at 130° to 140°F, the paint shall dry to "no pick-up" in not more than 90 seconds; and at 140° to 150°F, the paint shall dry to "no pick-up" in not more than 60 seconds.
- C. Dry Opacity: Contrast ratio shall be not less than 0.96 when the paint is applied with a 0.012-inch film applicator. Dry opacity will be determined according to Method 4121, Federal Test Method Standard No. 141a. Apply the paint with the above applicator to the chart specified in Section 1.1 of Method 4121.
- D. Daylight Reflectance: When tested according to Method 6121, Federal Test Standard No. 141a, the Daylight Reflectance of the white paint shall be not less than 80 percent relative to magnesium oxide.
- E. Color: The color of the yellow paint shall match the Standard Shade within the red and green tolerance limits when compared with the Highway Yellow Color Tolerance chart obtained from the U.S. Department of Transportation, Washington, DC.
- F. Consistency (viscosity): The consistency shall be not less than 75 nor more than 90 K.U. as determined by ASTM D562.
- G. Flexibility: Apply the paint to aluminum panels with a 0.005-inch Bird Film Applicator. Air dry 18 hours and bake for 5 hours at a temperature of 105°C to 110°C. Cool for 15 minutes at 77°F and bend over the conical mandrel. Examine without magnification. There shall be no cracking of the film at a mandrel diameter of one inch or larger. The panel shall be aluminum alloy 2024-0, 0.032-inch thick plus or minus 0.003 inch. The conical mandrel shall be as specified in ASTM D522.
- H. Abrasion Resistance: When subjected to the Falling Sand Abrasion Resistance Test, the amount of sand required to completely abrade the paint film from an area 5/32-inch in diameter on the panel shall be not less than 70 liters.
 - 1. The test shall be conducted according to Method 6191 of Federal Test Method Standard No. 141a with the following additions and exceptions:
 - a. Panel preparation shall be as indicated below.
 - b. Fresh, new unused sand shall be used for each test of three panels.
 - c. Sand shall be measured by weight, with 17.5 lbs. of sand being counted as equivalent to 5 liters.

- d. A test shall be the average liters of sand required to abrade the 5/32-inch spot on three separate panels.
- 2. Panels for the test will be prepared as follows: Apply the paint without reduction to a smooth glass panel with a 0.006-inch Bird Film Applicator. Air dry for 24 hours and bake for 3 hours at a temperature of 105° to 100°C. Condition the panel for 24 hours at a temperature of 70° to 80°F and a relative humidity of 50 to 70 percent before making the test. The glass panels shall not be less than 8 inches long, and the abrasion test shall be made on the middle third of the film on the panel.
- I. Water Resistance: Apply a film of the paint with a 0.005-inch Bird Film Applicator to a smooth glass panel approximately 10 inches long. Allow to dry for 48 to 72 hours and then immerse one end of the panel in a beaker of distilled water to a depth of approximately 5 inches. After 24 hours of immersion, remove the panel and examine. After 24 hours of air drying, the immersed portion of the film shall be equal in hardness, toughness, gloss, color, and adhesion to the portion of the film that was not immersed in water. Adhesion shall be checked using a knife blade or spatula on both ends of the film, comparing the ease with which the film can be removed from the glass.
- J. Stability Test: Fill a one-pint friction top paint can with the thoroughly mixed sample to within one inch of the top. Determine consistency in grams according to Method 4281, Federal Test Method Standard No. 141a. Close the can with the lid and shake for 5 minutes. Place the can in an air oven at 60°C plus or minus 2°C for 18 hours. Remove and cool to room temperature. Open the can, remove any skins, and examine the contents. There shall be no livering or other deteriorations. Thoroughly mix the paint and again determine the consistency in grams. The increase in consistency shall be not more than 17 grams. This 17 grams is equivalent to slightly more than 3.0 K.U. increase in consistency.
- K. Fineness of Grind: When tested according to ASTM D1210, the fineness of grind shall be not less than 3 Hegman units.
- L. Freeze-Thaw Resistance Test: When tested according to ASTM D2243, the consistency shall not change by more than 5 K.U. and shall show no breaking of the emulsion or coagulation.
- M. Bead Embedment: Paint shall be applied to a glass panel at a wet film thickness of 0.012 inch followed immediately by an application of glass beads dripped onto the surface of the paint. After drying or at least 24 hours, observe the amount of bead embedment with a 30 power microscope. At least 90 percent of the beads shall be embedded between 40 percent and 60 percent. The glass beads used for this test shall conform to Article 2.02, Glass Beads, of this Section.

2.02 GLASS BEADS:

A. The following requirements apply to all glass beads used with painted lines:

1. Refractive index shall be between 1.50 and 1.60 when tested by the liquid emersion method at 25°C.
2. Roundness: At least 75 percent of glass beads shall be true spheres when tested by ASTM D1155.
3. Gradation of glass beads shall be:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 20	100
No. 30	75 - 95
No. 50	15 - 35
No. 100	0 - 5

B. Coatings:

1. Glass beads used in compound shall have an adhesion promoting coating specific to a paint system.
2. Glass beads used as top dressing shall be resistant to clumping caused by moisture. Beads used as top dressing shall pass the moisture resistance/free flow, anti-wicking, and adhesion tests.

2.03 APPLICATION EQUIPMENT: Application equipment shall be as recommended by the marking manufacturer.

PART 3 - EXECUTION:

3.01 STANDARD SIZES AND PATTERNS: Unless required otherwise in the Special Conditions or drawings the following sizes patterns and materials shall be used:

<u>Use</u>	<u>Color</u>	<u>Size</u>	<u>Pattern</u>
Center Line	Yellow	Double 4" line with 4" space	Continuous line; break at intersections and intersection type commercial entrances
Lane Line	White	6" wide	12.5' line, 37.5' skip
Channelizing line	White	6" wide	Continuous line
Edge line	Varies	6" wide	Continuous line; at median islands, painted medians, and rural arterials and collectors

<u>Use</u>	<u>Color</u>	<u>Size</u>	<u>Pattern</u>
Diagonals	Varies	18" wide	At 45° clockwise rotation from direction of travel; line spacing in feet = posted speed limit in mph
Stop bars	White	24"	4' space from cross walk; otherwise in line with stop sign
Cross walk	White	12" lines	Line separation normally 6', increase to 8' or 10' in areas of high pedestrian traffic
Cross bars	White	24" bars with 4' spaces	Cross bars for midblock use; bar length normally 6', increase to 8' or 10' in areas of high pedestrian traffic
Words	White	8' high	Alphabet style shall conform to MUTCD
Arrows	White	-----	Arrow style shall conform to MUTCD; turn arrow 8' high, through arrow 9.5', turn and through 12.75'

3.02 SURFACE PREPARATION: Pavement shall be dry and free of oil, dirt, and debris at time of application. Asphalt surfaces older than 3 months and all concrete surfaces shall be sand or shot blasted, swept, and air blasted before application of pavement markings. Newly laid asphalt, shall be swept and air blasted before application of pavement markings.

3.03 APPLICATION: Application procedures shall follow the marking manufacturer's recommendations.

Rate of glass bead top dressing of painted lines shall be 4 to 6 pounds of glass beads per gallon of paint. Beads shall be dispensed uniformly across the section of the painted line. Beads shall imbed themselves to approximately 60 percent of their diameter.

3.04 TOLERANCES: Pavement marking be within the following tolerances:

- A. Thickness shall be minimum dry film thickness of 10 mils.
- B. Width shall be true to plan $\pm 1/4$ -inch for 4-inch and 6-inch lines, and $\pm 1/2$ -inch for other lines.
- C. Length of stripes, skips, and bars shall be true to plan ± 2 inches.
- D. Longitudinal lines shall be at proper location to ± 2 inches and shall not vary more than 1 inch in 200 feet.

3.05 APPEARANCE STANDARD: At end of guarantee period, markings shall have uniform surface, crisp edges, and clean cut offs; shall exhibit satisfactory retro-reflectivity; and shall meet the location tolerances of this Section.

END OF SECTION 6150

SECTION 6200 - UNIT PAVERS

PART 1- GENERAL

1.01 SCOPE: This Section covers unit pavers. Topics include worker's experience, material certification, weather limits, bedding, installation, and tolerances.

1.02 RELATED WORK: Refer to the following sections for the named related subjects:

Curbs and Headers	Section 4100-Concrete Pavement and Flatwork
Base Course	Section 2200-Subgrade Preparation and Pavement Milling
Concrete Base	Section 4100-Concrete Pavement and Flatwork
Asphalt Base	Section 3100-Asphalt Paving
Mortar	Section 6400-Stone Wall

1.03 INSTALLER'S QUALIFICATIONS: Installation shall be by an installer with at least three successful installations of concrete pavers of similar scope.

1.04 SUBMITTALS: The following material shall be submitted for review:

- A. A sufficient number of pavers to show the full range of size, color, and surface texture.
- B. Manufacturer's and supplier's test results from an independent testing laboratory demonstrating compliance of pavers to the requirements given in Part 2 of this Section.
- C. Sieve analysis of bedding and joint sand.
- D. References demonstrating installers' experience.

1.05 SAMPLE PANEL: A minimum 40-square foot sample of each paving style shall be prepared using the personnel, materials, edges, and methods to be employed in the final work. This area will be used to determine surcharge of the sand layer, joint sizes, laying patterns, colors, and texture of the job. Rejected samples shall be removed and additional samples prepared until Engineer approves sample. Sample shall be the standard from which the work shall be judged. Sample may form part of the final work.

1.06 ENVIRONMENTAL LIMITS: Pavers shall not be installed on frozen surfaces or during snow or rain.

PART 2 - PRODUCTS

2.01 CONCRETE UNIT PAVERS: Concrete pavers shall be manufactured and supplied by a member of the Concrete Paver Institute, a division of the National Concrete Masonry Association. Minimum paver thickness shall be 2-3/8 inches for medians, alleys, and pedestrian areas, and 3-1/8 inches for streets. Face size and shape shall be as specified in the Special Conditions. Color shall be selected by Engineer from manufacturer's available colors. Pavers shall have spacer bars on the sides of each

unit; spacer bars shall be a minimum of 1/16-inch thick. Pavers shall meet the requirements of ASTM C936 and as follows:

- A. Minimum average compressive strength of 8,000 psi at 28 days.
- B. Maximum absorption no greater than 5 percent measured in accordance with ASTM C140.
- C. No breakage and less than 0.5 percent weight loss after 50 freeze-thaw cycles tested by ASTM C67, or suitable field history.

2.02 JOINT SAND: Bedding and joint sand shall be concrete sand conforming to ASTM C33 grading requirements as shown below. Sand shall be sharp, washed, and free of foreign material. Masonry sand shall not be used.

<u>Sieve Size</u>	<u>Percent Retained</u>
3/8-inch	0
No. 4	0 to 5
No. 8	0 to 20
No. 16	15 to 50
No. 30	40 to 75
No. 50	70 to 90
No. 100	90 to 98

2.03 BEDDING MATERIALS:

- A. For crosswalks, medians and roadway pavements bedding shall be same as mortar for stone walls. See related work part 1.
- B. For sidewalks unamended joint sand shall be used for Bedding.

2.04 INSTALLATION EQUIPMENT: Cutting and compaction equipment shall meet the following requirements:

- A. Cutting equipment shall be either a double-bladed splitter or masonry saw. In areas of high pedestrian traffic, wet sawing may be required by Engineer.
- B. Compactor shall be low amplitude, high frequency plate vibrator capable of 3,000 to 5,000 lbs. centrifugal force.

2.05 EDGE RESTRAINTS: Concrete curbs and headers used as edge restraints are specified as referenced in Part 1. Other edge restraints, if any, are specified in the Special Provisions.

PART 3 - EXECUTION

- 3.01 EXAMINATION:** Prior to installation, Contractor shall verify that subbase is installed, dry, and at the correct grade and elevation, and that curbs or headers or other edge restraints are installed and approved by Engineer.
- 3.02 BASE COURSE:** Base course shall be installed as detailed on the drawings or in the Special Provisions. If not specified elsewhere, the base for medians and pedestrian areas shall be 4 inches of compacted granular base course.
- 3.03 SAND BEDDING:** Bedding sand shall be spread and screeded to form a uniform 1- to 1-1/2-inch layer. Sand bed shall be protected from compaction, including compaction from foot traffic, or settlement from exposure to rain, snow, or condensation. Sand that has become compacted prior to setting pavers shall be raked and screeded.
- 3.04 PAVER INSTALLATION** Pavers shall be installed as follows:
- A. Paving pattern shall be as specified in the Special Conditions or the drawings, or as directed by Engineer.
 - B. Pavers shall be free of foreign materials before installation.
 - C. Pavers shall be set hand tight with 1/16-to 1/8-inch wide joints. Gaps at edges shall be filled with cut pavers or edge units. Cuts shall be made with approved equipment. Gaps at edges of 3/8-inch and smaller shall be filled with sand.
 - D. Pavers shall be vibrated into the sand bed using approved equipment. All pavers shall be vibrated the same day they are set, except pavers within 3 feet of the laying face shall not be vibrated. Pavers shall be protected from direct contact with the compactor by a layer of sand. A minimum of two passes shall be completed. Vibration shall continue until sand completely fills the joints.
 - E. After vibration, the top surface elevation of pavers on aggregate base shall be 1/8-to 1/4-inch above adjacent curbs, inlets, concrete collars, and channels. Pavers on concrete base shall be flush with curbs, inlets, concrete collars, and channels.
 - F. When possible, work shall be arranged to avoid leaving an unrestrained edge overnight. When left overnight, the laying face and sand bed shall be covered with waterproof sheeting.
 - G. Excess sand shall be removed. Completed paving shall be swept.
- 3.05 TOLERANCES:** Finished surface shall be true to plane and line within the following limits:

<u>Item</u>	<u>Tolerance</u>
Surface Planeness	3/8-inch in 10'
Horizontal Line	1/2-inch in 20' and 1-inch overall
Vertical Offset at Joint between two Pavers	1/16-inch

END OF SECTION 6200

SECTION 6300 - CHAIN LINK FENCE

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers 3'-6" tall and 6'-0" tall chain link fence. Topics include installer's qualifications, post and fabric materials, foundations, and gates.
- 1.02 INSTALLER'S QUALIFICATION:** Installation shall be by an installer with at least five successful installations of chain link fence of similar scope.
- 1.03 RELATED WORK:** Refer to the following sections for related work:
- | | |
|---------------------|---|
| Temporary Fence | Section 1200-Incidental Construction |
| Foundation Concrete | Section 4000-Concrete Materials and Methods |
- 1.04 SUBMITTALS:** Submit the following for review:
- A. Gate shop drawings.

PART 2 - PRODUCTS

- 2.01 GENERAL:** Fence materials shall meet the requirements of KDOT Standard Specifications Subsection 1619.
- 2.02 POSTS:** Minimum post sizes shall be as listed below:
- | <u>Member</u> | <u>6-foot fence</u> | <u>42-inch fence</u> |
|---------------------------|----------------------------|---------------------------|
| Line post | 2-3/8-inch OD, 3.65 lb/ft | 1-7/8-inch OD, 2.72 lb/ft |
| Corner post and pull post | 2-7/8-inch OD, 5.79 lb/ft | 2-3/8-inch OD, 3.65 lb/ft |
| Top rail and pipe bracing | 1-5/8-inch OD, 1.40 lb/ft | 1-5/8-inch OD, 1.40 lb/ft |
| Gate post | 4-inch OD, 9.10 lb/ft | 2-7/8-inch OD, 5.79 lb/ft |
| Gate frame | 1-7/8-inch OD, 2.09 lb/ft | 1-7/8-inch OD, 2.09 lb/ft |
| Auto gate post | 6-5/8-inch OD, 18.97 lb/ft | 4-inch OD, 9.10 lb/ft |
- Post caps may be aluminum or galvanized steel.
- 2.03 FABRIC AND TENSION WIRE:** Chain link fabric shall be 9-gage, 2-inch mesh, knuckled top selvedge, and bottom selvedge may be knuckled or barbed. Bottom tension wire shall be 7-gage.

PART 3 - EXECUTION

- 3.01 STANDARD CONFIGURATION:** Unless otherwise required in the Special Conditions or drawings, fence shall be installed as follows. Fabric support shall be top rail and bottom tension wire. For fence adjacent to a vertical drop of greater than 3 feet, fence shall include a 1-5/8-inch diameter bottom rail. Selvedge shall be knuckled top and barbed on bottom. Fence shall not be surmounted with barbed wire. Line post spacing shall be 10 feet maximum. Pull posts shall be placed at sharp breaks in grade and at maximum 330-foot intervals in straight runs. Bottom clearance shall be 2 inches maximum.
- 3.02 FOUNDATION:** Line posts shall extend 2'-6" into a 3'-0" concrete encasement. End, corner, pull, and gate posts shall extend 3'-0" into a 4'-0" concrete encasement. Encasement for a 42-inch tall fence shall be 10-inch diameter; encasement for a 6-foot tall fence shall be 12-inch diameter.
- 3.03 GATES:** Gates shall be swing type hinged for 90° swing. Frames shall be welded and water tight. Hinges shall be heavy pattern with large bearing surface and shall not twist under the action of the gate. Double gates shall include stops and keepers. Stops shall be set in concrete. Double gate latches shall be plunger bar type, full gate height to engage the gate stop. Single gate latches may be forked type. Latches shall be arranged for padlocking with the padlock accessible from both sides. Contractor is not required to supply padlocks.

END OF SECTION 6300

SECTION 6400 - STONE WALLS

PART 1- GENERAL

- 1.01 SCOPE:** This Section covers outdoor stone masonry for retaining walls and headwalls. Topics include worker's qualifications, mockups and examples, weather limits, material requirements, base construction, lay-up and joints, and tolerances.
- 1.02 RELATED WORK:** Refer to the following sections for the named related subjects:
- | | |
|----------------------------|---|
| Concrete and Reinforcement | Section 4000-Concrete Materials and Methods |
|----------------------------|---|
- 1.03 INSTALLER'S QUALIFICATIONS:** Installation shall be by an installer with at least three successful installations of stone masonry of similar scope.
- 1.04 SUBMITTALS:** The following material shall be submitted for review:
- A. Sieve analysis of bedding and joint sand.
 - B. References demonstrating installer's experience.
- 1.05 SAMPLE PANEL:** A minimum 24-square foot sample of each stone masonry style shall be prepared using the personnel, materials, and methods to be employed in the final work. This area will be used to determine the joint sizes, laying patterns, colors, and texture of the job. Rejected samples shall be removed and additional samples prepared until Engineer approves sample. Sample shall be the standard from which the work shall be judged. Sample may form part of the final work.
- 1.06 EXAMPLE:** If an example wall is identified in the Special Conditions or drawings, the identified style elements (color, size, lay up, joint size, tooling, and related items) shall supersede the requirements of this Section. If stone masonry is a repair to existing stonework, the existing stonework shall serve as an example for all style elements.
- 1.07 ENVIRONMENTAL LIMITS:** Cold weather protection shall be applied when the air temperature is 40°F and falling during or within 48 hours after placement of stone masonry work.

PART 2 - PRODUCTS

- 2.01 STONE:** Stone shall be hard, durable, ledge limestone with natural parallel flat beds, free from soft or spongy pieces. Triangular and lens shaped stones are not allowed. Maximum length to width ratio shall be 2:1. Stone for the entire project shall be supplied from a single quarry. Tooling shall be limited to squaring up of corner stones, and minor shape or size adjustment necessary to maintain joint sizes. Stone shall be free of dirt, dust, and surface moisture when laid.
- 2.02 MORTAR:** Mortar shall consist of portland cement and sand with the addition of 2 percent integral waterproofing of aluminum stearate, ammonium stearate, or calcium stearate. Sand measured in a

damp loose condition shall be not less than 2-1/4 and not more than 3 times the volume of cement. Add sufficient water to make workable plastic mix. Mortar shall not be retempered.

- A. Portland Cement: ASTM C150, Type I / II.
- B. Sand: ASTM C144.
- C. Integral waterproofing: Grace "Hydratite", Master Builders "Omicron Mortarproofing", Sika "Suconem Red Label", or Sonneborn "Hydrocide".

2.03 REINFORCEMENT: See reference in Part 1.

2.04 WEEPHOLES: Weephole forms shall be 1-1/2-inch schedule 40 rigid PVC pipe.

2.05 TIES: Ties for multiwythe walls shall be adjustable rectangular wire ties, minimum 3/16-inch diameter, cold-drawn steel wire, galvanized finish to ASTM A153, Class B-2.

2.06 PERMEABLE FILL: KDOT Standard Specifications Subsection 1102, CA-5 or Subsection 1108, BD-1, crushed stone or gravel, meeting the following gradation:

CA-5		BD-1	
<u>Sieve Size</u>	<u>Percent Retained</u>	<u>Sieve Size</u>	<u>Percent Retained</u>
1-inch	0	1-1/2-inch	0
3/4-inch	0 - 5	1-inch	0 - 10
3/8-inch	40 - 60	3/4-inch	10 - 40
No. 8	95 - 100	No. 4	80 - 100
		No. 16	90 - 100
		No. 100	98 - 100

PART 3 - EXECUTION

3.01 BASE: If concrete footing is not specified, provide 12-inch layer of compacted permeable fill for base. Aggregate base to extend 6 inches beyond wall.

3.02 LAYING STONE: Lay up shall be guided by stringline and plumbline. Pattern shall be uncoursed roughly square pattern. Stone showing pronounced striation shall be laid on its natural bed. Horizontal joints shall be level. Use small stone and spalls to limit the thickness of mortar in voids. Fill voids full of mortar. If more than one wythe of stone is required to meet the plan dimensions, wythes shall be connected with wire ties or stone penetrating both wythe at a rate of one for every 3-1/2 square feet.

Stones shall be set into full mortar bed. Mortar joints shall be no larger than 1/12 of the narrow dimension of the stone joined. Head and bed joints shall be the same width. Joints shall be slightly raked.

- 3.03 JOINT REPAIR:** Engineer will mark the limits of joint repair in the field. Joints to be repaired shall have deteriorated mortar joints removed to sound mortar or 1/2 the width of the stone or 3 inches, whichever is less. Fresh mortar shall be packed into the joints, and joints finished to match adjacent existing work.
- 3.04 COLD WEATHER REQUIREMENTS:** This requirement applies when air temperature drops below 40°F or when forecast to drop below 40°F within 24 hours of placing. A specific cold weather protection plan shall be submitted to Engineer for review. Depending on severity of weather, the plan may include use of insulating blankets, use of artificial heat source, or other methods. Minimum length of protection shall be 72 hours unless forecast shows daily lows above 40°F. Use of an accelerator is not allowed.
- 3.05 TOLERANCES:** Not including the roughness of the stone faces, the overall finished surface shall be true to plane and line within the following limits:

<u>Item</u>	<u>Tolerance</u>
Surface Planeness	3/4-inch in 10'
Horizontal Line	1-inch in 20' and 1-1/2-inch overall
Vertical Trueness	1-inch in 10'

END OF SECTION 6400

SECTION 6500 – MODULAR BLOCK RETAINING WALL SYSTEM

PART 1 - GENERAL

1.01 SCOPE: This Section includes furnishing and installing concrete modular block retaining wall units up to a maximum height of three and one half feet.

1.02 RELATED WORK: Refer to the following sections for related work:

Earthwork for Structures	Section 2000-Earthwork
Filter Fabric	Section 2000-Earthwork

1.03 SUBMITTALS: The following shall be submitted for review:

- A. Manufacturer's literature: Materials description.
- B. Color Samples: Color chips will be required if a substitution is requested. One unit of the retaining wall in the color specified by Unified Government shall be furnished. If approved, the unit may be used in the finished work.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete wall units shall meet requirements of ASTM C90, Sections 4, 5, 6, and 7, except compressive strength shall be a minimum of 3,000 psi, maximum water absorption shall be limited to 7.0 percent, and unit height dimensions shall not vary more than $\pm 1/16$ -inch from that specified.
- B. Concrete wall units shall have a face area of approximately 0.67 square foot.
- C. Color shall be in the range of Buff to Tan unless otherwise specified. Color shall be selected by Engineer from manufacturer's available standard colors.
- D. Face pattern geometry shall be bevel face, and texture shall be a split rock face. Concrete units shall include an integral concrete locating surface and shear connection flange along the lower rear edge.
- E. Base: Material shall consist of drainage aggregate, and/or concrete as shown on the drawings.
- F. Drainage aggregate: Fill between units shall consist of free-draining aggregate conforming to KDOT CA-5 (3/4 inch clean gravel).
- G. Backfill: Suitable native soils at a moisture content which enables compaction to specified densities. Unsuitable soils are those soils with the USCS classification of CH, OH, MH, OL, or PT. CL soils with a Plasticity Index (PI) greater than 25 are also considered unsuitable soils.

PART 3 - EXECUTION

3.01 FOUNDATION PREPARATION: Excavation and foundation preparation shall follow the requirements for earthwork for structures. See related work Part 1.

3.02 BASE COURSE PREPARATION:

- A. Base materials shall be prepared to ensure complete contact of retaining wall unit. Gaps will not be allowed. Base materials shall be to the depths and shown on the drawings. If not shown, a minimum 6-inch depth shall be used.
- B. Material shall be compacted so as to provide a level, hard surface on which to place the first course of wall units.

3.03 ERECTION:

- A. Place first course of concrete wall units on prepared base material. Check units for level and alignment. The top of all units in base course shall be at the same elevation.
- B. Ensure that concrete wall units are in full contact with base.
- C. Place concrete wall units side by side for the full length of wall. Use running bond layup. Cut units at sharp angles in the wall, as necessary to maintain running bond. Horizontal joints shall be straight and level. Backfill each course with drainage aggregate before commencing the next course. Pull the units forward until the locating surface of the unit contacts the locating surface of the units in the preceding course. Pull the units forward as far as possible.
- D. Fill all voids between and within concrete wall units with drainage aggregate. Place a minimum of 6 inches of drainage aggregate behind the concrete wall units. Stop drainage aggregate 6 inches below finished grade. Install a layer of geotextile filter fabric in between the drainable aggregate and the unexcavated soil.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 6500-A MANUFACTURED BLOCK RETAINING WALL FOR USE WITH INLET OR
SIDEWALK

END OF SECTION 6500

SECTION 7000 - SEEDING, SODDING, AND MULCHING

PART 1 - GENERAL

1.01 SCOPE: This Section covers seeding and sodding operations, seasonal limits, guarantee period, seed mixtures, soil preparation, top soil placement, fertilizing, mulching, and turf establishment.

1.02 INSTALLER'S QUALIFICATION: The senior member of each independently working sodding/seeding crew shall have a minimum one year's experience in the installation and establishment of sod/seed.

1.03 RELATED WORK: Refer to the following sections for related work:

Mulch	Section 1400-Construction Period Pollution Prevention
Seed bed preparation for erosion control	Section 1400-Construction Period Pollution Prevention

1.04 GERMINATION AND VIABILITY GUARANTEE PERIOD: Germination and viability of seed and sod shall be guaranteed for a period of two months from planting, or until the planted area is established and fully accessible for maintenance by the adjacent owner, whichever is longer. Performance standard shall be a uniform, vigorous, and densely planted growth.

The guarantee period of seeded and sodded areas against settlement, erosion, compaction due to traffic and construction activity, or failure to meet any other requirement of these specifications shall be the same as for the work as a whole.

1.05 APPLICABILITY: Unless shown otherwise in the Special Conditions or drawings, sod is required for restoration of turf and for residential and retail commercial lawns regardless of maintenance history. Grassed locations in ungroomed areas may be restored by seeding and mulching.

PART 2 - PRODUCTS

2.01 SOD: When sod placement is for repair of an existing lawn, the sod shall match the species of the existing lawn. Contractor shall be responsible for accurately determining the species. Sod for new installations shall be turf type tall Fescue or as indicated on the drawings or in the Special Conditions. Fescue sod may contain up to 35 percent Kentucky Bluegrass by seed count in lieu of netting. Sod shall be densely-rooted, dark green in color containing not more than 10 percent by coverage of other grasses and clovers. Sod shall be free of noxious and restricted species defined in KDOT Standard Specifications Subsection 2103. Sod shall be cut in strips containing approximately one square yard and not less than 18 inches wide. Sod thickness shall be 1 inch $\pm$ 1/4-inch. Sod shall be harvested immediately prior to shipping. Stakes for sloped areas shall be 1/2-inch square by 8-inch long wooden stakes. Allowable dates of sod placement are ground thaw to June 15, and September 1 to ground freeze.

2.02 SEED GENERAL: Seed purity shall conform to the requirements of KDOT Standard Specifications Subsection 2103. Seed mixes are listed below. Actual weight of seed shall be adjusted for purity and germination rate to provide the minimum weight of pure, live seed listed.

2.03 SEED FOR TURF: Seed mix for establishing lawn turf is as follows; all weights are lbs.-PLS/acre

- A. Cool season perennial turf grasses, total rate 150 lbs. No single variety shall be less than 10% of the entire mix:
1. Kentucky bluegrass, not to exceed 20% of the mix.
 2. Perennial ryegrass, not to exceed 30% of the mix.
 3. 3 separate cultivars of improved turf-type tall fescue, K-31 not allowed.

2.04 RESTORATION SEED MIX: Seed mix for establishing cover on disturbed areas that are to remain ungroomed (this includes temporary seed for erosion control) shall be selected from the following table.

Seed Mix for Restoration			
Item	Standard mix	Summer mix	Winter mix
Dates	3/01 thru 4/30, & 8/15 thru 10/14	5/01 thru 8/14	10/15 thru 2/29
Nurse crop	Ryegrass	Buckwheat	Same selection as standard mix except double all application rates. Orchard grass is a required cool season selection.
Legumes	Select 2 from species list	Birdsfoot Trefoil + one other from list	
Cool season grasses	Select 3 from species list	Select 2 from species list	
Warm season grasses	Select 3 from species list	Select 4 from species list	

Species list by type and application rates are as follows. Weights are lbs.-PLS/acre. Weights are for the indicated species contribution to the total mix; weights anticipate additional species in the mix and shall not be pro-rated.

- A. Nurse crop: select the species appropriate for the season
1. Cool season: Annual or Italian Ryegrass, *Lolium multiflorum*, 30 lbs.
 2. Warm season: Buckwheat, *Fagopyrum ssp*, at 60 lbs.
- B. Legumes:
1. Birdsfoot Trefoil, *Lotus, corniculatus*, 2.5 lbs.
 2. Alfalfa, *Medicago sativa*, 2.5 lbs.
 3. Crimson Clover, *Trifolium incarnatum*, 5 lbs.
 4. Hairy Vetch, *Vicia villosa*, 10 lbs.

C. Cool Season Grass:

1. Perennial Ryegrass, *Lolium perenne*, 10 lbs.
2. Canada Wildrye, *Elymus canadensis*, 5 lbs.
3. Red Top, *Agrostis gigantea*, 2.5 lbs.
4. Thickspike or Streambank Wheatgrass, *Elymus lanceolatus*, 5 lbs.
5. Meadow Brome, *Bromus erectus*, 5 lbs.
6. Orchardgrass, *Dactylis glomerata*, 2.5 lbs.

D. Warm Season Grass:

1. Big Bluestem, *Andropogon gerardii*, 5 lbs.
2. Indian Grass, *Sorghastrum nutans*, 5 lbs.
3. Switchgrass, *Panicum virgatum*, 2.5 lbs.
4. Prairie Dropseed, *Sporobolus heterolepis*, 2.5 lbs.
5. Little Bluestem, *Schizachyrium scoparium*, 5 lbs.
6. Sideoats Grama, *Bouteloua curtipendula*, 5 lbs.
7. Blue Grama, *Bouteloua gracilis*, 2.5 lbs.

2.05 FERTILIZER: Fertilizers shall conform to the requirements of KDOT Standard Specifications Subsection 2106. Suppliers shall be registered by the Kansas State Board of Agriculture. Ratio of Nitrogen, Phosphorus, Potassium shall be 10-1-1 to 24-3-3.

2.06 TOPSOIL: Top soil shall be a friable, loamy soil with a good supply of humus and high degree of fertility, black or dark brown in color, subject to approval of Engineer based on visual and tactile inspection. Topsoil may be either naturally occurring field topsoil or blended from a mineral subsoil and organic compost.

2.07 TILLING AND PLANTING EQUIPMENT: Tilling and planting equipment shall be appropriate to the size of the work. Seed drills shall be set for rows no more than 4 inches apart and a planting depth of 1/4- to 1/2-inch. Rollers shall have a weight of 60 to 90 pounds per linear foot. Hydroseeders shall be capable of producing a uniform distribution of seed, mulch, and fertilizer. Irrigation equipment shall be capable of uniform distribution and shall not cause wash out of topsoil or seed.

PART 3 - EXECUTION

3.01 VERIFICATION: Verify that rough grading is complete and accepted.

3.02 SOIL PREPARATION FOR SOD AND TURFGRASS AREAS: Soil preparation for sodded and seeded lawns is covered here. See related work, Part one for soil preparation for cover in disturbed areas that are to remain ungroomed. The top 9 inches of soil in planted areas shall closely resemble a native prairie soil in permeability and fertility. See related work Part 1 for ground preparation for restoration.

- A. Subsoil containing excessive construction aggregate shall be removed and replaced with clean soil. Add water to excessively dry soil. Remove rock, clods and foreign matter larger than 3 inches.
- B. If topsoil exists on site and has been segregated or where imported topsoil is specified, bring grade to four inches below final grade. Till subsoil to 5-inch depth, pulverizing clods. Place topsoil to a 4-inch depth.
- C. If topsoil is not segregated or if existing topsoil contains no humus and imported topsoil is not specified, bring grades to one inch below final grade. Till subsoil to 8-inch depth, pulverizing clods. Add 1-inch loose depth of peat moss or well-composted organic material; blend with top 4 inches of soil.
- D. Level by rake or chain drag and lightly compact with roller. Alternately level and compact by back dragging with skid loader. Soil shall be level but not slick and shall compress slightly under heel pressure.

3.03 FERTILIZATION RATES: Fertilizer shall be applied at a rate of 1 pound nitrogen per thousand square feet on areas to be seeded or sodded. Fertilization is not required in restoration areas that are to remain rough or ungroomed.

3.04 SOD PLACING: Sod shall be placed within 24 hours of harvesting. Sod shall be protected from drying prior to and after placing. Contractor shall place with tight joints, lay longitudinal joints along the contour, and stagger traverse joints. Sod shall be watered and rolled immediately after placing. Sod on slopes of 3:1 or greater shall be staked with minimum 3 stakes per square yard. Sod edges shall be tucked in at pavement edges and banked with moist earth at transition from sod to seed areas.

3.05 SEED PLANTING: Unless limited by the special conditions seed may be drilled, hydroseeded, premixed with compost mulch, impregnated onto the erosion control blanket, or broadcast. Drills shall be set as specified in Part 2 of this Section.

- A. Additional provisions for broadcast seed: Seed shall be broadcast only in hard to access areas and only during calm conditions. Application rate shall be doubled if seed is broadcast. If seed is broadcast, it shall be raked in to a depth of 1/4- to 1/2-inch.

3.06 MULCH: Mulch is required for all seeded areas. Mulch for lawns is same as mulch for restoration areas. See related work Part 1.

3.07 ESTABLISHMENT OF TURF: Seed and sod shall be irrigated during the germination and viability guarantee period specified in Part 1, this Section. Contractor shall maintain optimum soil moisture for growth. Turf shall be hardened by deep, infrequent watering during the last two weeks of the germination and viability guarantee period. Turf shall be protected from traffic, construction activities, settlement, and erosion.

END OF SECTION 7000

SECTION 7100 - TREES AND SHRUBS

PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers tree and shrub planting. Topics include seasonal limits, guarantee period, soil preparation, planting, fertilizing, mulching, and establishment.
- 1.02 INSTALLER'S QUALIFICATION:** The senior member of each independently working planting crew shall have a minimum one year's experience in the installation and establishment of landscape plantings.
- 1.03 REFERENCE STANDARDS:** In this Section, the following abbreviations stand for the indicated documents:
- A. "ASNS" shall mean the American Standards for Nursery Stock adopted by the American Association of Nurserymen.
- 1.04 SUBMITTALS:** Submit the following for review:
- A. Supplier's certification that nursery stock meet the requirements of Part 2.
- 1.05 SEASONAL LIMITS:** Planting shall coincide with annual growth cycles, specifically:
- A. Planting shall occur between October 1 and November 15 and between the time the ground thaws in spring and May 1. Engineer may vary placement dates due to weather or soil conditions.
- B. Planting shall be suspended during exceptionally wet weather and when frost is in the ground.
- 1.06 HANDLING AND ON-SITE STORAGE:** Balled and burlapped plants shall be handled by the ball only and shall not be rolled or dropped. Plants should normally be planted the same day they are delivered. Plants stored on site longer than 8 hours shall be thoroughly wetted twice a day. Plants stored on site longer than 48 hours shall be embedded in damp sand or wood mulch to the top of the root ball.
- 1.07 VIABILITY GUARANTEE PERIOD:** Deciduous planted material planted in a dormant state shall be guaranteed to come out of winter dormancy and into full vigorous leaf growth. Evergreen plants and deciduous plants planted during growing season shall be guaranteed live and vigorous for 90 days after landscape is accepted.

The guarantee period of planted areas against settlement, erosion, or compaction due to traffic and construction activity or the toppling of trees shall be the same as for the work as a whole.

PART 2 - PRODUCTS

- 2.01 NURSERY GROWN PLANTS:** Nursery grown stock shall meet the grading requirements of ASNS. Nursery stock shall be grown under climatic conditions similar to Kansas City for at least two years. Trees shall be balled and burlapped; shrubs and bedding shall be container grown. Unless otherwise specified, trees shall be 2-inch to 2-1/2-inch caliber. Container grown trees may be substituted for balled and burlapped when approved by Engineer.
- 2.02 ESTABLISHED MATERIAL:** Material to be transplanted shall be balled and burlapped if dug by hand or shall remain in tree spade until planting if dug by tree spade.
- 2.03 FERTILIZER:** Fertilizers shall conform to the requirements of KDOT Standard Specifications Subsection 2106. Suppliers shall be registered by the Kansas State Board of Agriculture. Fertilizer analysis shall be 12-12-12 (Nitrogen, Phosphorus, Potassium).
- 2.04 PLANTING SOIL:**
- A. For Planting Beds: Planting soil for mass plantings shall be a friable, loamy soil with a good supply of humus and high degree of fertility, subject to approval of Engineer based on visual and tactile inspection. Normally, the top 6 inches of field or pasture loam will meet this requirement. On-site subsoils mixed with 20 percent organic compost or other organic amendment by volume and spaded to eliminate clumps over 3 inches may be substituted as planting soil.
 - B. For Tree and Shrubs Planted in Individual Holes: Planting soil shall be excavated soil, tilled or pulverized to a texture resembling coarse sand. Organic compost may be added up to 5 percent. No other textural amendment shall be made.
- 2.05 MULCH:** Mulch for tree pits and shrub beds shall be chipped wood mulch, 1-inch maximum chip size, or pole peelings. Mulch shall be free from noxious weeds as declared by the Kansas State Board of Agriculture.
- 2.06 GUYS AND STAKES:** Guy and tie wires shall be galvanized, 9-gage, soft iron wire. Where wires contact trees, they shall be encased in new fabric lined rubber hose. Stakes shall be green painted, metal "T" fence posts. Commercial guying systems giving improved performance may be substituted with Engineer's approval.
- 2.07 ANTIDESICANT:** A polyvinylchloride complex liquid manufactured for application by spraying or dripping.
- 2.08 WEED CONTROL FABRIC:** Fabric shall be minimum 99 percent opaque to prevent photosynthesis and seed germination from occurring, yet allow air, water, and nutrients to pass through to the roots. Provide weed control fabric conforming to one of the following:
- A. Roll Type Polypropylene or Polyester Mats: Fabric shall be woven, needle-punched, and treated for protection against deterioration due to ultraviolet radiation. Minimum weight shall be 3.5 ounces per square yard with a minimum thickness of 20 mils.

- B. Non-Woven Landscape Blanket: 100 percent polyester, non-woven, needle-punched fabric manufactured specifically for weed control purposes, treated for protections against deterioration due to ultraviolet radiation. Minimum 0.04-inch thickness.

PART 3 - EXECUTION

- 3.01 VERIFICATION:** Verify that fine grading is complete and accepted.
- 3.02 PLANTING HOLE:** Holes shall be three times the width and the same depth as the root ball. If excavation method glazes the soil on the sides of the pit, the sides shall be thoroughly scratched to remove glaze. Engineer shall approve locations of pits; minimum 24-hour notification is required.
- 3.03 SHRUB BED PREPARATION:** Shrub beds shall consist of planting soil a minimum of 12 inches deep. Shrub bed preparation shall extend a minimum of 2-1/2 feet beyond the last row of shrubs. Fertilizer shall be mixed into the bed at a rate of 10 pounds for 1,000 square feet.
- 3.04 PREPLANTING INSPECTION:** Engineer will conduct preplanting inspection. Inspection will cover hole location and preparation, prepared shrub bed, plant material vitality and quality, and planting soil.
- 3.05 PLANTING:** Plants shall be spaced according to growth requirements and instructions on the drawings.
 - A. Balled plants and established trees transplanted by tree spade: Remove the soil at the top of the rootball to expose the root flare (the enlarged or swollen area where the large lateral roots emerge.) Plant with the root flare level with the surrounding soil. If planting hole is too deep fill and tamp excavated soil in the bottom of the planting hole; do not set root ball on uncompacted soil or a mound. Remove all wire and burlap. Set tree plumb. Backfill with pulverized excavated soil. Fill half way and thoroughly soak; complete backfill, tamp lightly, and soak again. Build watering well at edge of planting hole. Place three inch layer of mulch over planting hole; taper mulch to zero depth at the tree trunk. Top dress with 1/2 pound fertilizer.
 - B. Container grown shrubs: Remove plant from the container. If root bound, the root mass shall be split approximately half of the way up; the root mass shall be fanned and set over a cone of tamped soil in the planting hole. Backfill shall be lightly tamped to support plant from toppling. After the day's planting is complete, the shrub bed shall be thoroughly wetted. Two inches of mulch shall be placed over the shrub bed.
 - C. Evergreen plants and deciduous plants in leaf shall be treated with antidesicant. Application shall follow manufacturer's recommendations.
- 3.06 GUYING AND STAKING:** Plants shall be secured from toppling as follows:
 - A. Trees up to 4-inch caliber shall be secured with a minimum of 2 stakes and guy wires. Guys shall be attached to the trunk at approximately two-thirds the height of the tree.

B. Shrubs and bedding plants need no additional staking or guying.

3.07 ESTABLISHMENT PERIOD: Plants shall be irrigated during the viability guarantee period specified in Part 1. Contractor shall maintain optimum soil moisture for growth. Plants shall be hardened by deep, infrequent watering during the last two weeks of the viability guarantee period. Plants shall be protected from traffic, construction activities, settlement, and erosion. Planted areas shall be kept free of weeds. Plants found to be dead during the viability guarantee period shall be replaced immediately; the replacement shall be guaranteed as if it were original planting.

3.08 WEED CONTROL FABRIC: Install per manufacturer's written instructions.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 7100-A TREE PLANTING

END OF SECTION 7100

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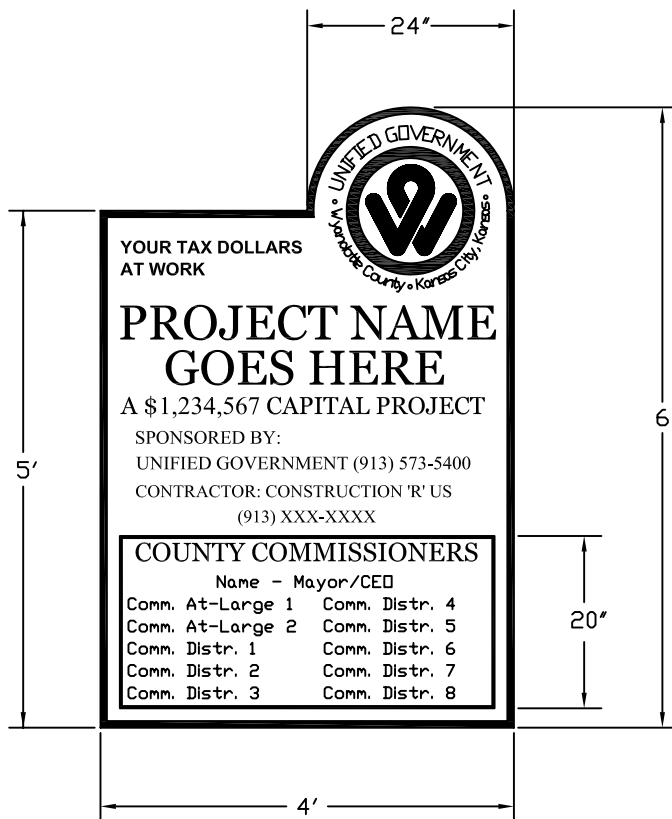
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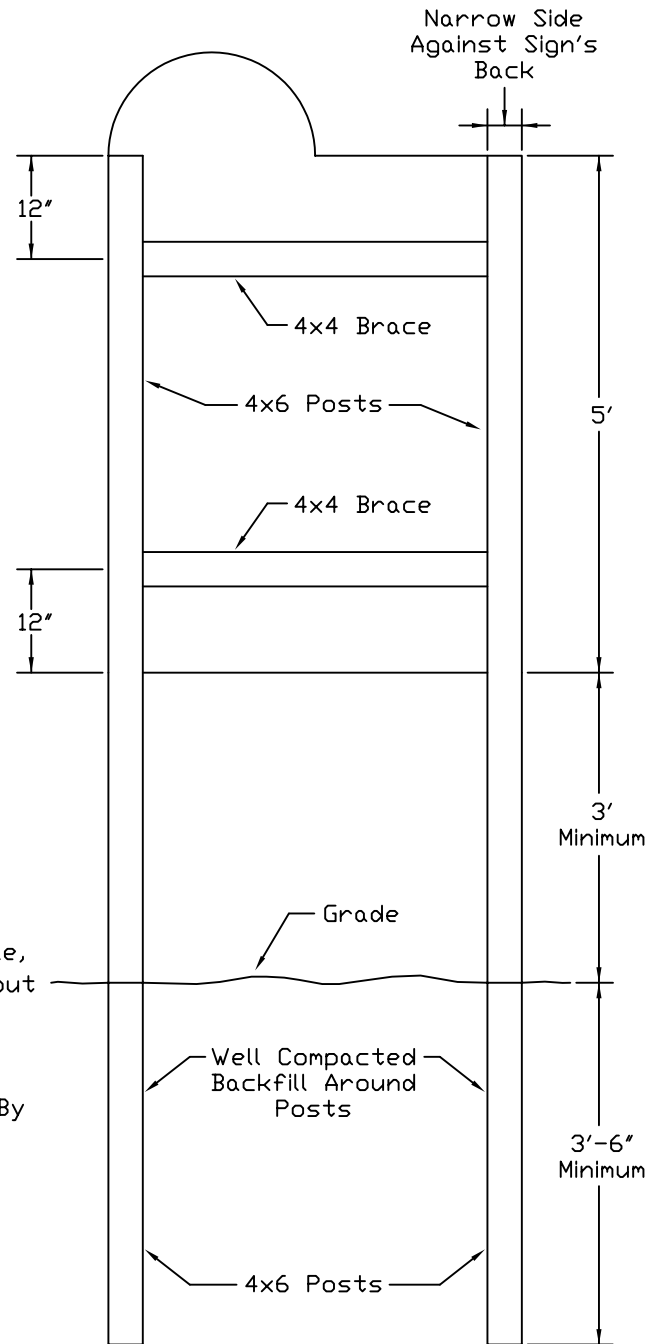
7100-A	Tree Planting
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For Projects Scheduled to Last 45 Calendar Days Or Longer At A Fixed Location

NOTES:

1. Sign Shall Be Black On White Background, Of Durable, Weatherproof Construction, With Professional Layout & Lettering, Sample Layout Shown, Submit Actual Layout To Engineer For Approval.
2. Project Sign Required Only For Work Administered By Unified Government Public Works Department.
3. Emergency Repairs Do Not Require A Sign.
4. Posts Shall Be Built To Breakaway As Per KDOT Standards.
 - a. A Skid Mount Is An Acceptable Alternate To Buried Post Foundation.
5. Frame & Post & Skids If Used Shall Be 4x6 Weatherproofed Timbers.
6. Names Of Current Mayor & Commissioners May Be Obtained From The UG Commissioners Office: (913) 573-5040

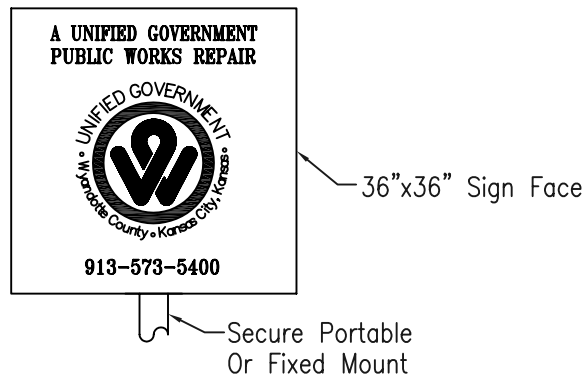


PROJECT SIGN

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 1000-A
2008 Edition



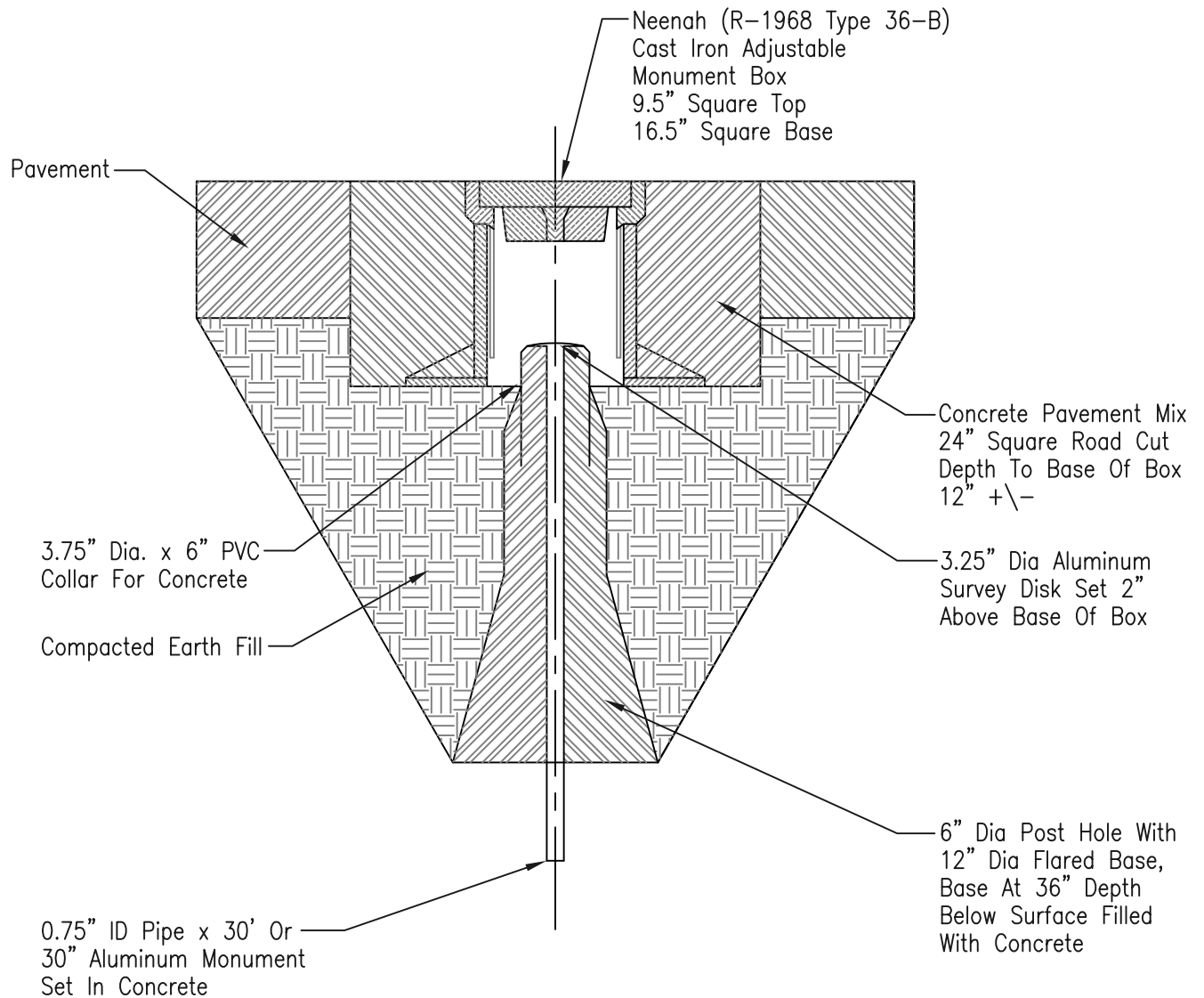
For Spot Repairs Or Projects Scheduled To Last Less Than 45 Calendar Days At A Single Site

NOTES:

1. Sign Shall Be Black On White Background, Of Durable, Weatherproof Construction, With Professional Layout & Lettering, Sample Layout Shown, Submit Actual Layout To Engineer For Approval.
2. Project Sign Required Only For Work Administered By Unified Government Public Works Department.
3. Emergency Repairs Do Not Require A Sign.

**PROJECT SIGN FOR PROJECTS OF SHORT DURATION
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT**

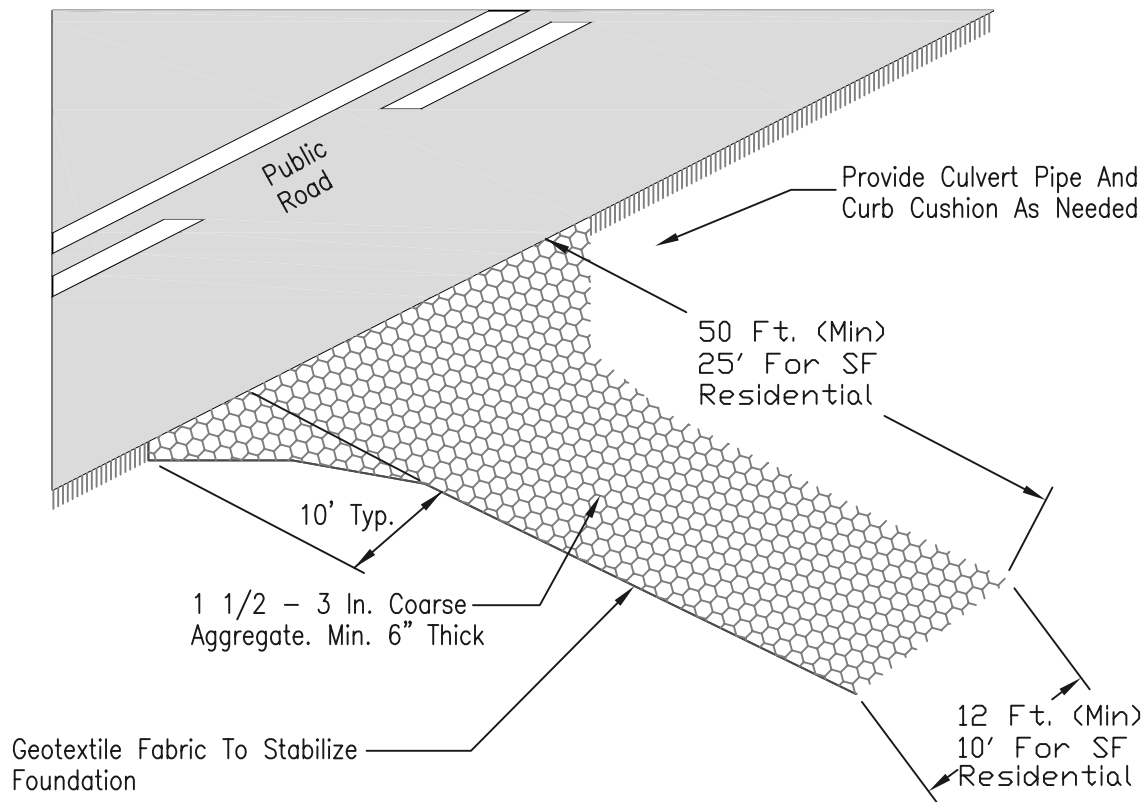
UG 1000-B
2008 Edition



NOTE:
All Work Shall Be Carried Out Under
The Direction Of A Kansas Registered
Professional Land Surveyor, & Subject
To Inspection By U.G. Surveyor.

REPLACEMENT OF GOVERNMENT CORNER MONUMENT IN PAVED AREA
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 1200-A
2008 Edition

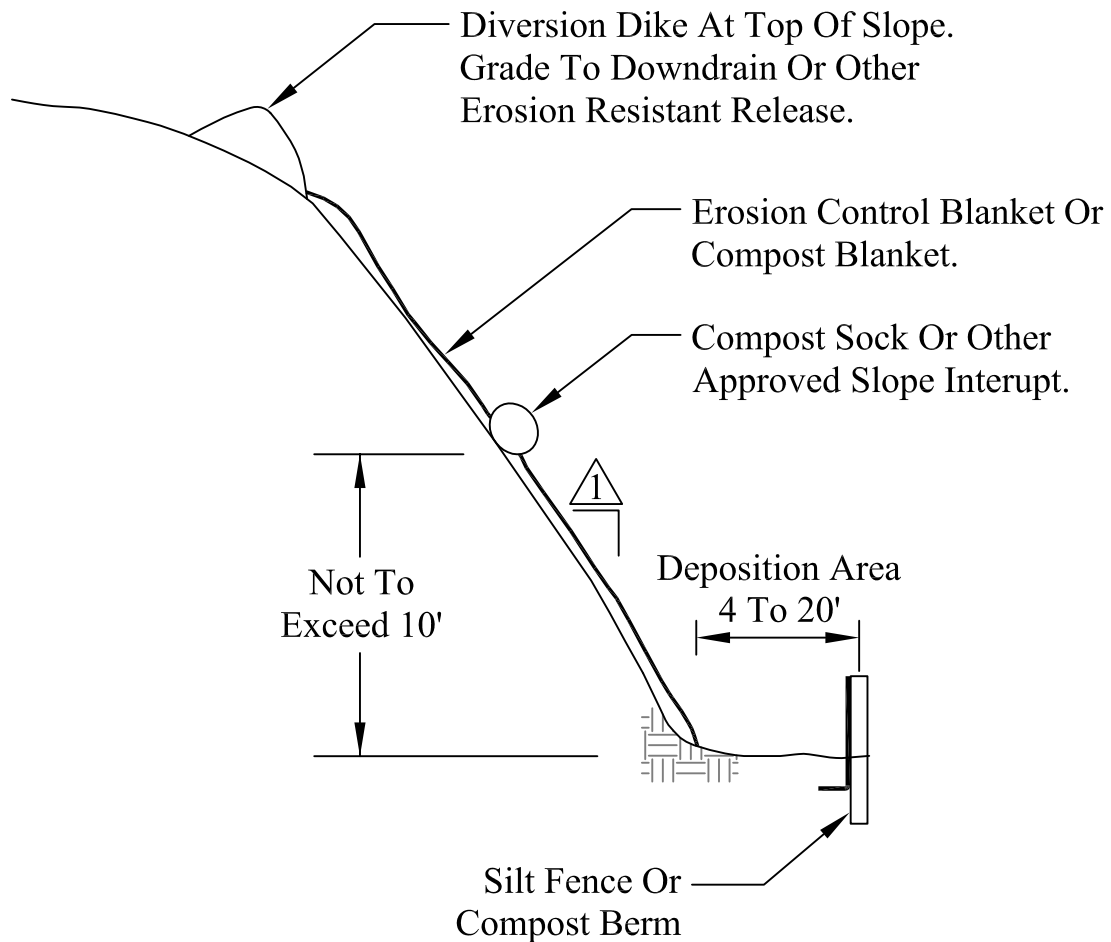


NOTES:

1. Renew Aggregate When Mud From Tires, Encroachment Of Sub Soil Or Loss Of Loose Aggregate Cause Fines To Fill More Than 25% Of Surface Voids.
2. Avoid Locating On Steep Slopes Or At Curves On Public Roads. If Possible, Locate Where Permanent Roads Will Eventually Be Constructed.

CONSTRUCTION VEHICLE ENTRY
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

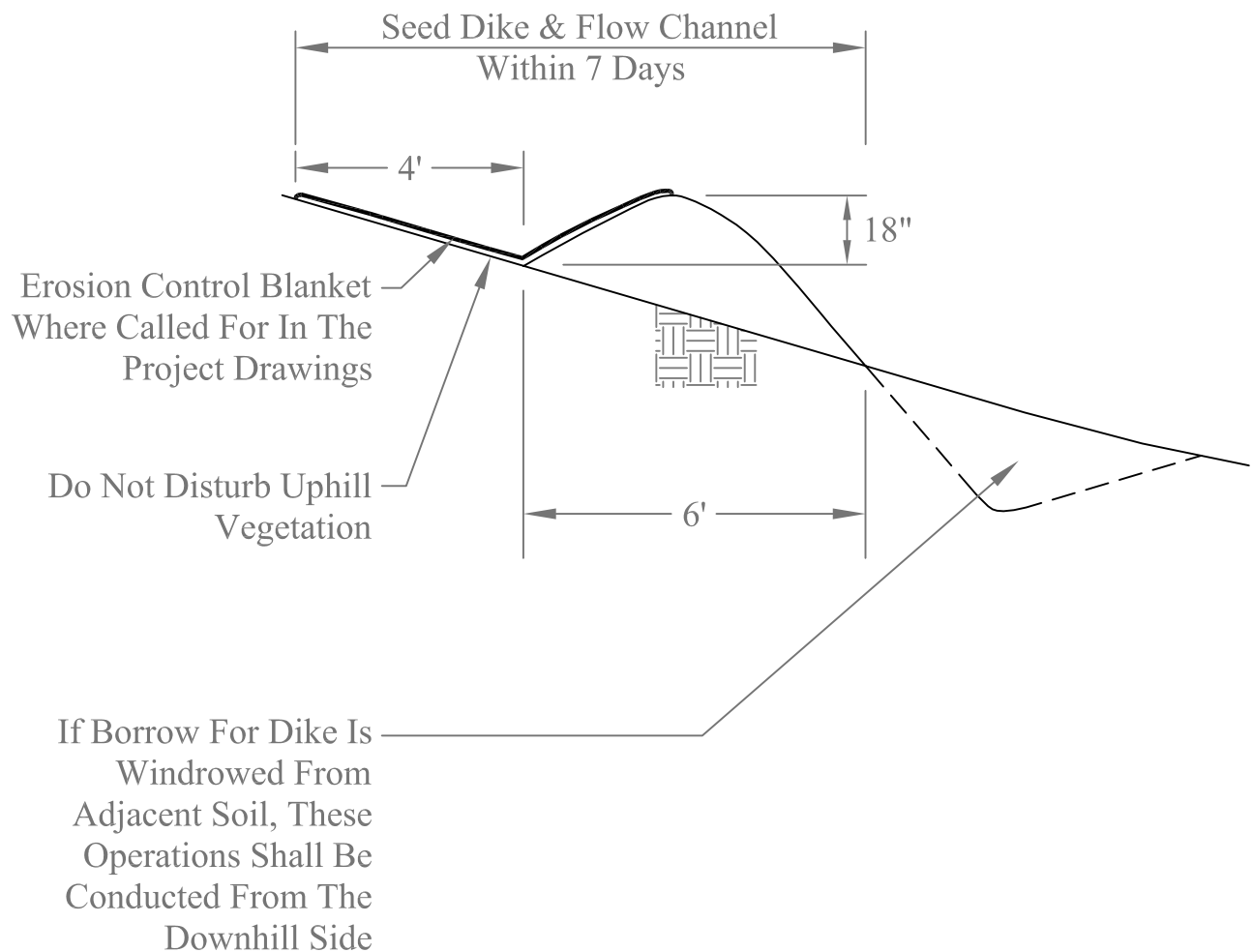
UG 1400-A
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Vertical Scale Exaggerated

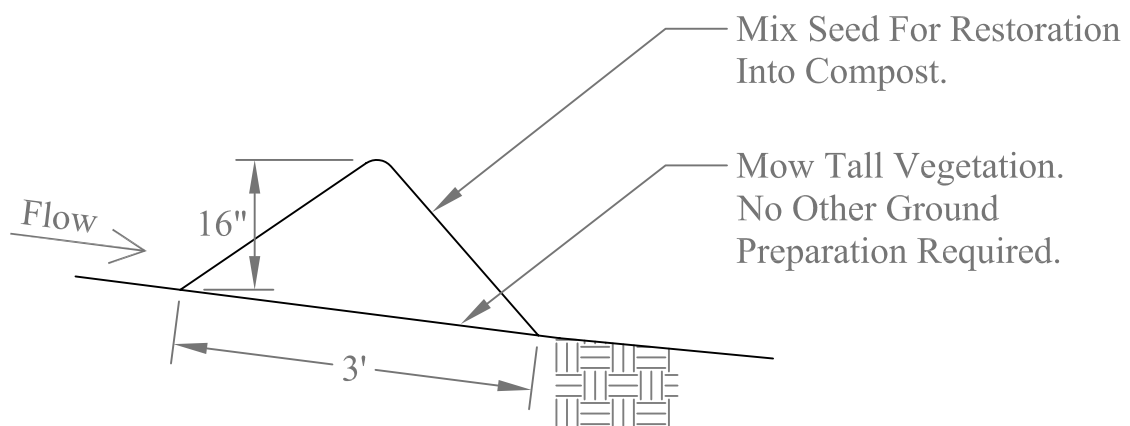
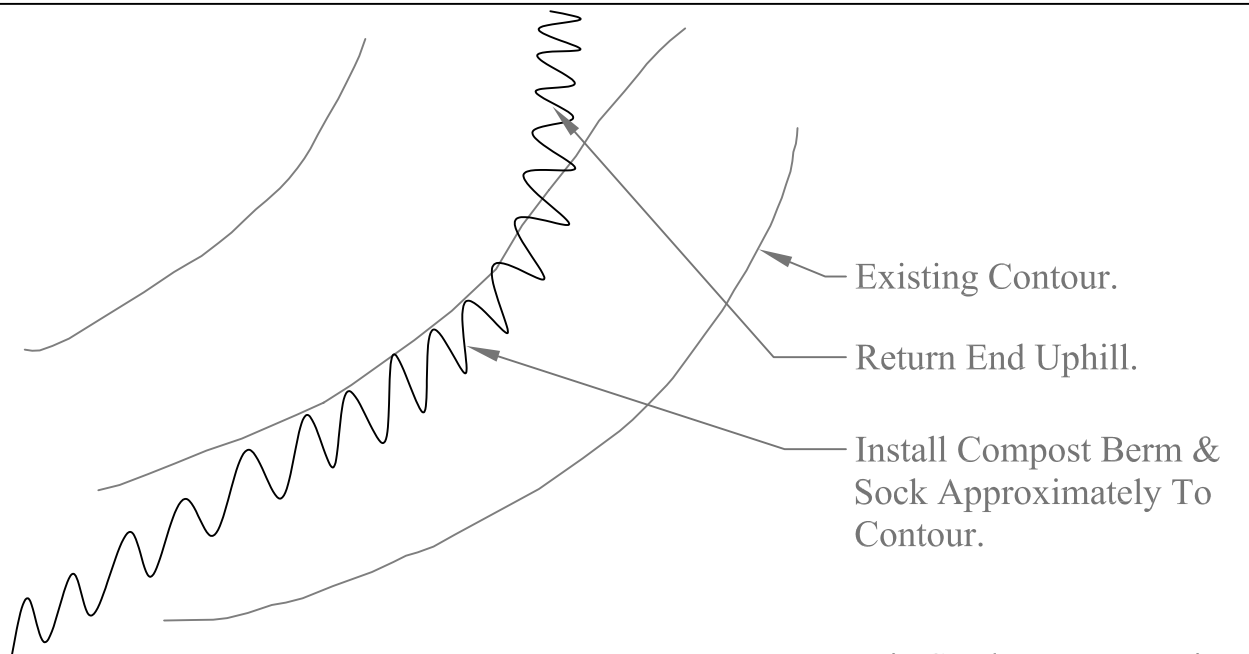
① Steep Slope Protection Applies To All Slopes Steeper Than 15%.

STEEP SLOPE PROTECTION
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

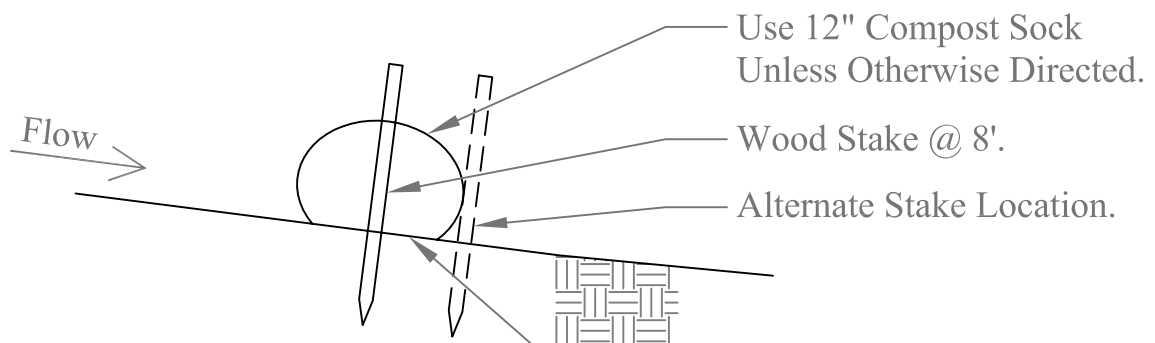


DIVERSION DIKE
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 1400-C
2008 Edition

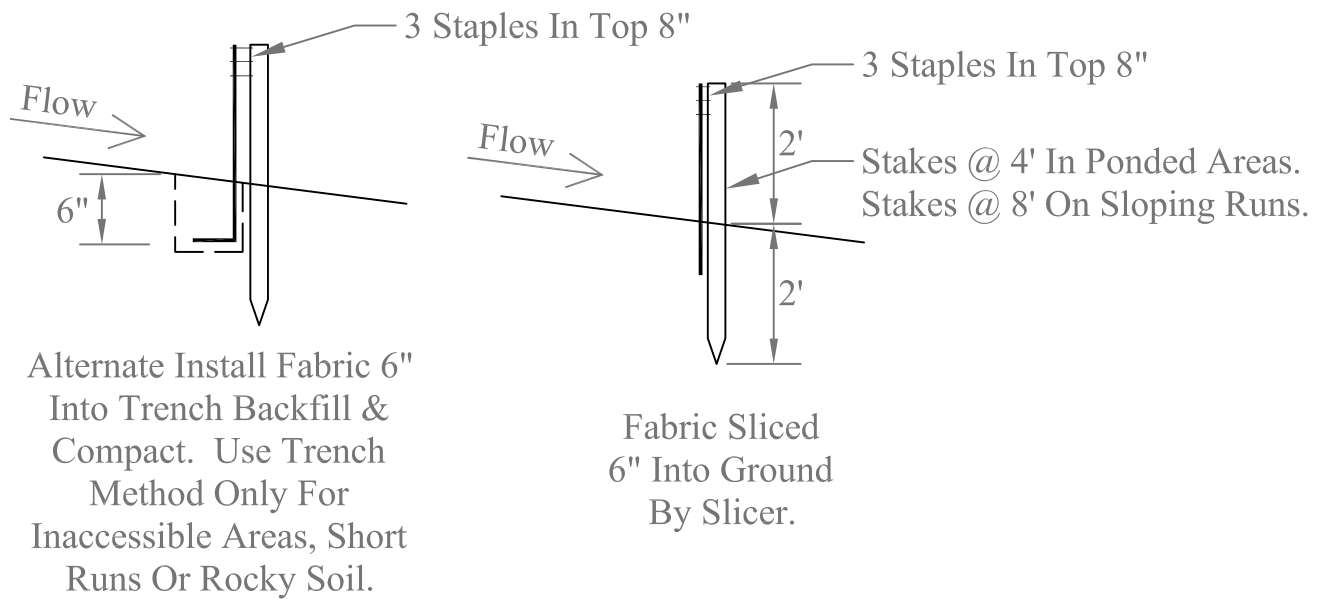
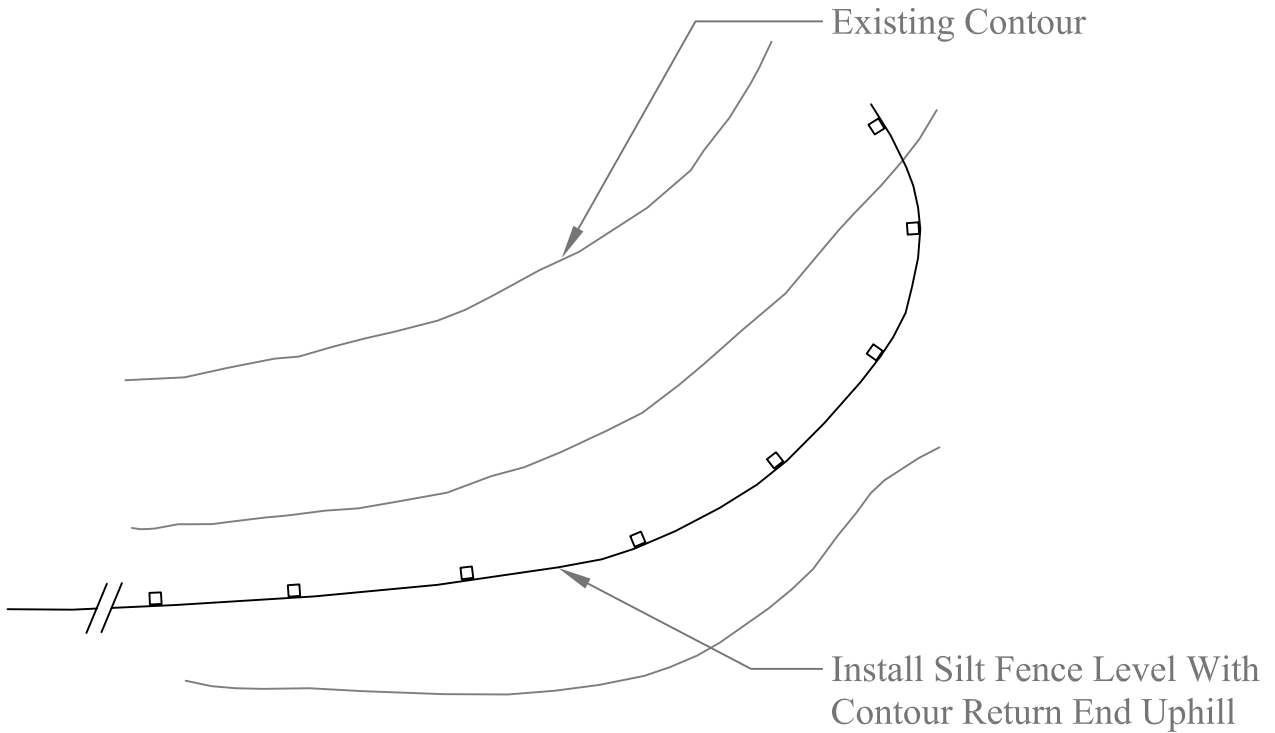


Compost Berm



Compost Sock

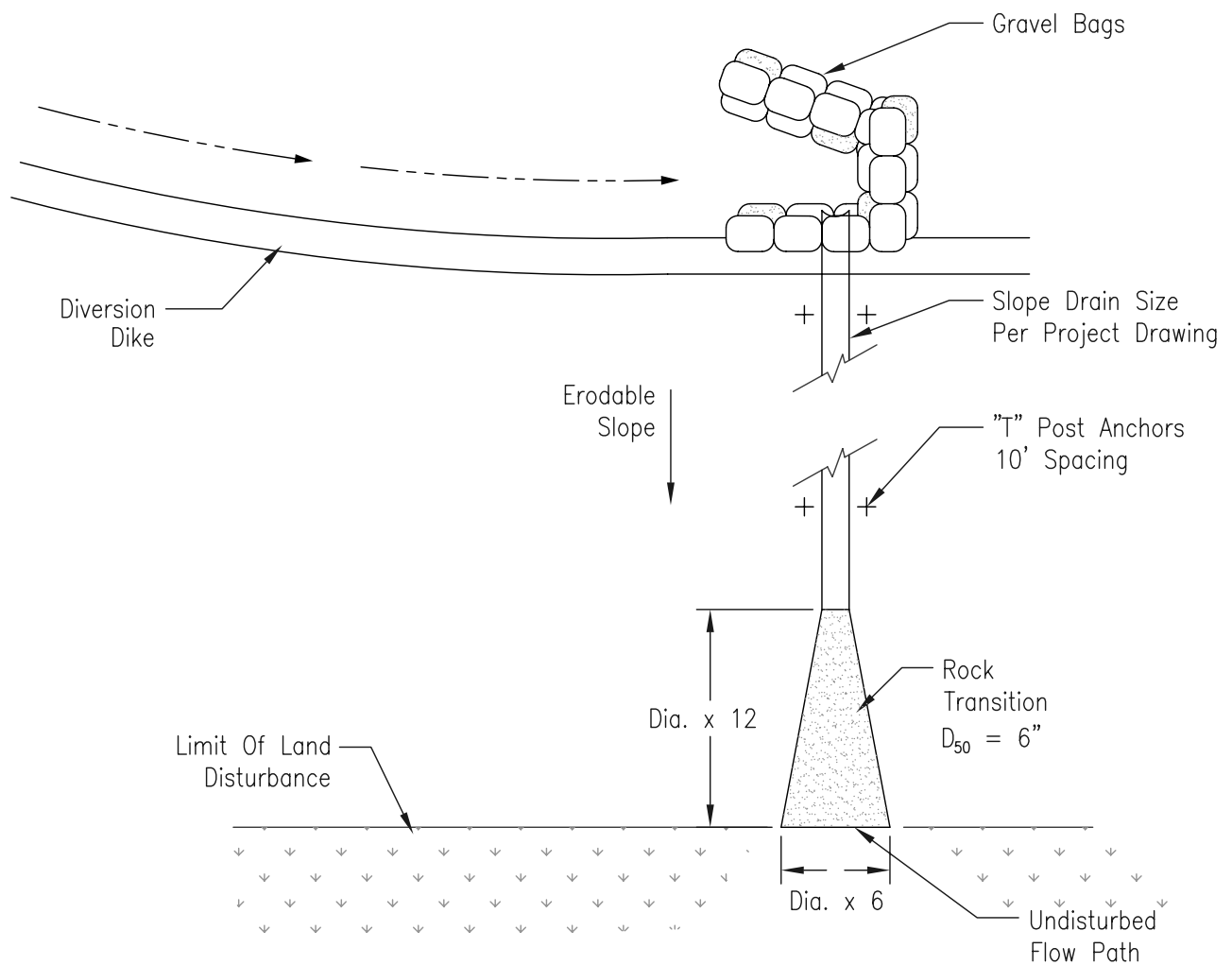
COMPOST BERM AND COMPOST SOCK
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT



SILT FENCE INSTALLATION

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

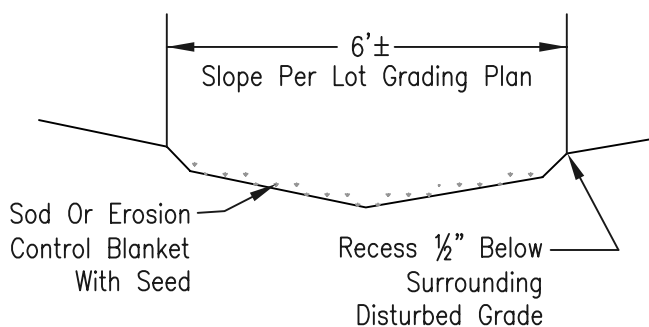
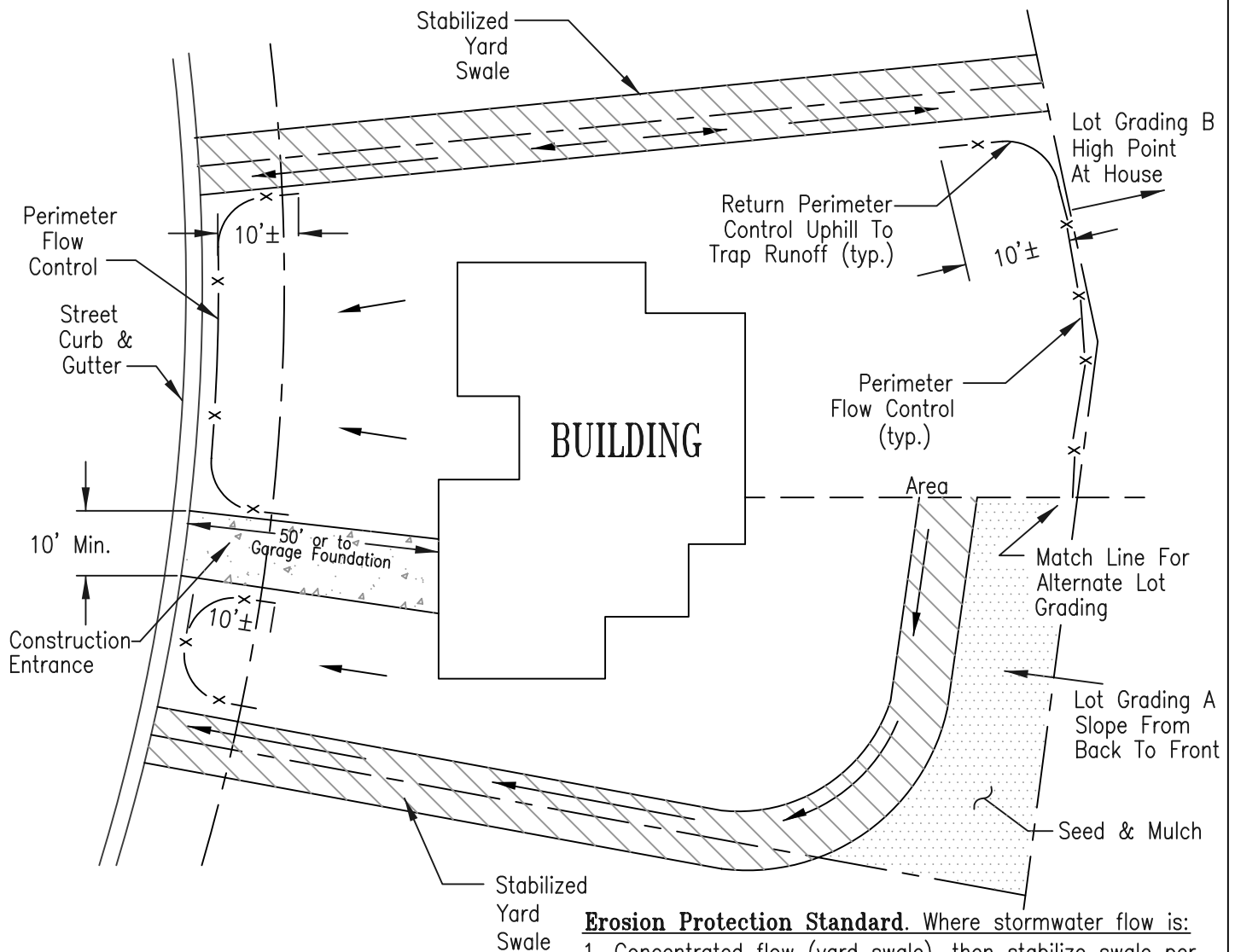
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Note: For Temporary Erosion Control Only

SLOPE DRAIN
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 1400-F
 2008 Edition

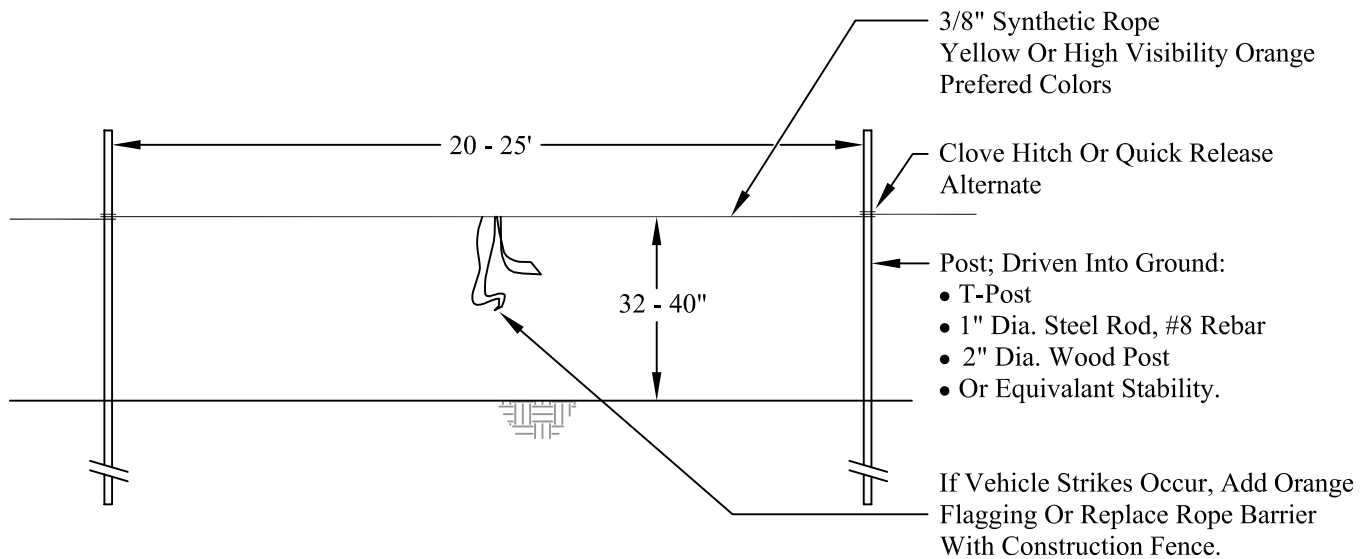


Erosion Protection Standard. Where stormwater flow is:

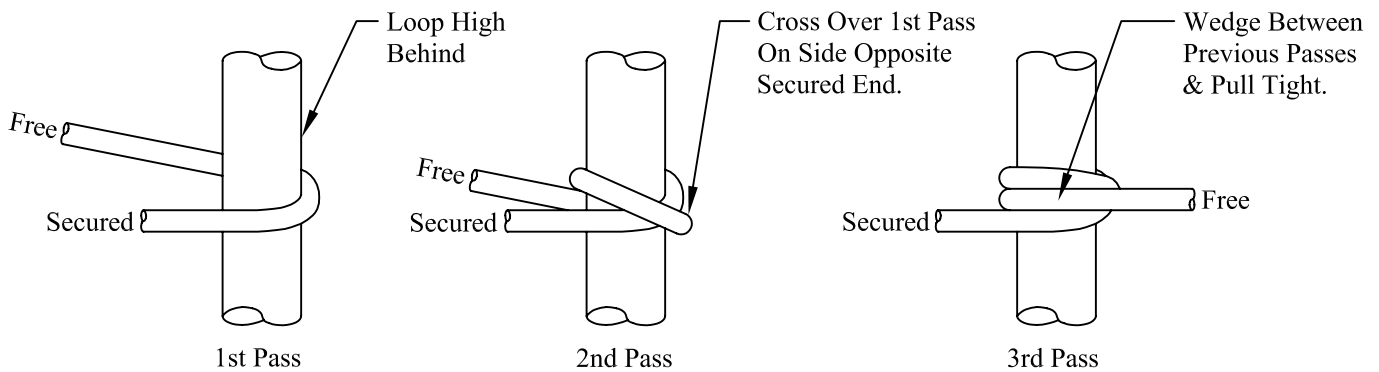
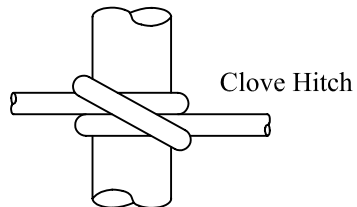
1. Concentrated flow (yard swale), then stabilize swale per detail on this page.
2. Sheet flow entering the site from an undisturbed area, then no additional protection is required.
3. Sheet flow entering the site from a disturbed area, then install perimeter flow control. Perimeter flow control may be compost sock, silt fence, 6 foot width of sod, 10 foot width of undisturbed native cover, or rocked construction entrance.
4. Sheet flow exiting the site, then install perimeter flow control to slow the velocity. See notes for definition of perimeter flow control.

**MINIMUM EROSION CONTROL FOR SINGLE
FAMILY RESIDENTIAL LOT
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT**

UG 1400-G
2008 Edition



Typical Dimensions & Materials



Quick Release Alternate to Clove Hitch



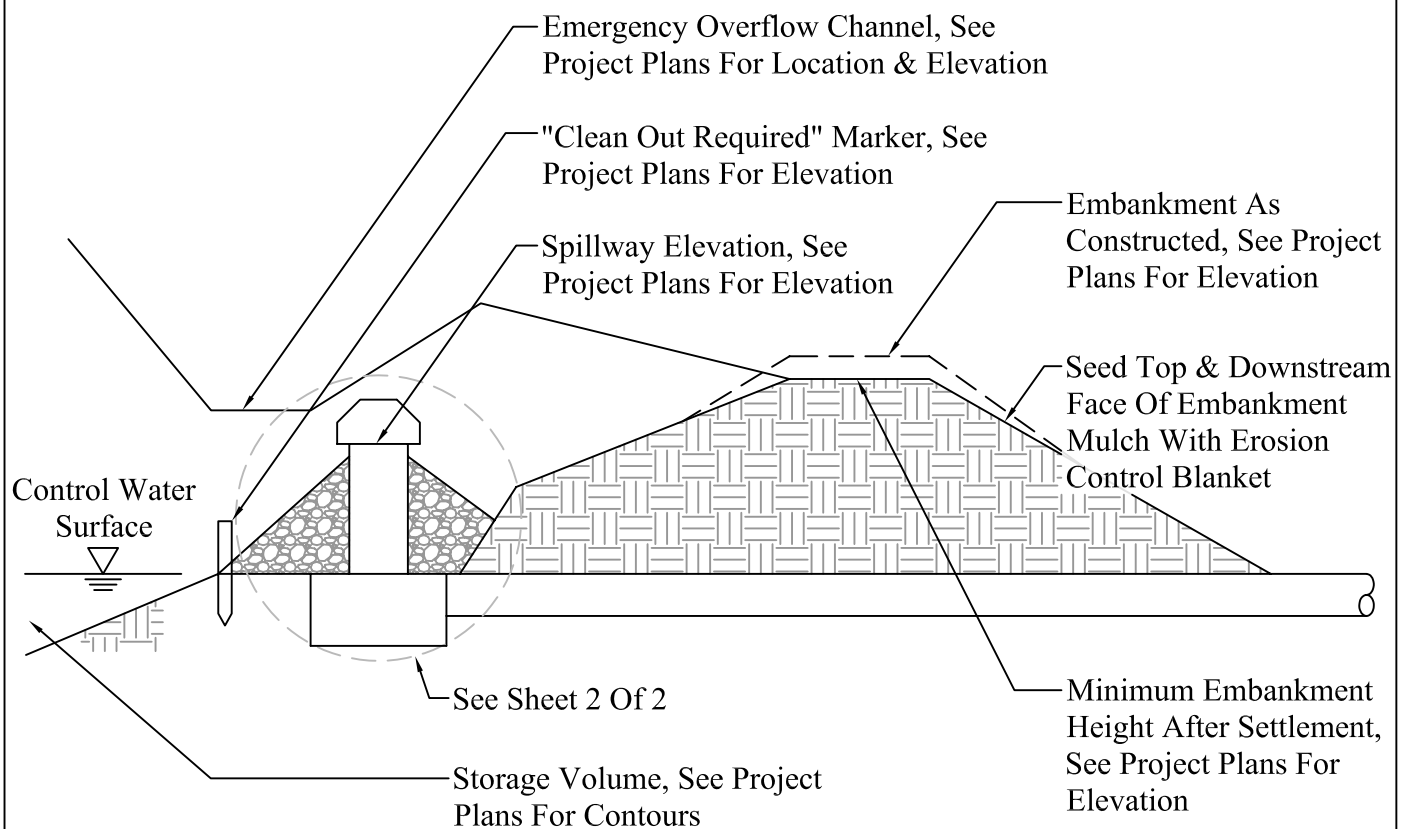
Note: Quick Release Alternate Must Be Kept
Taut Throughout Placement. Not For
Use On End Posts.

ROPE BARRIER

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 1400-H
2008 Edition

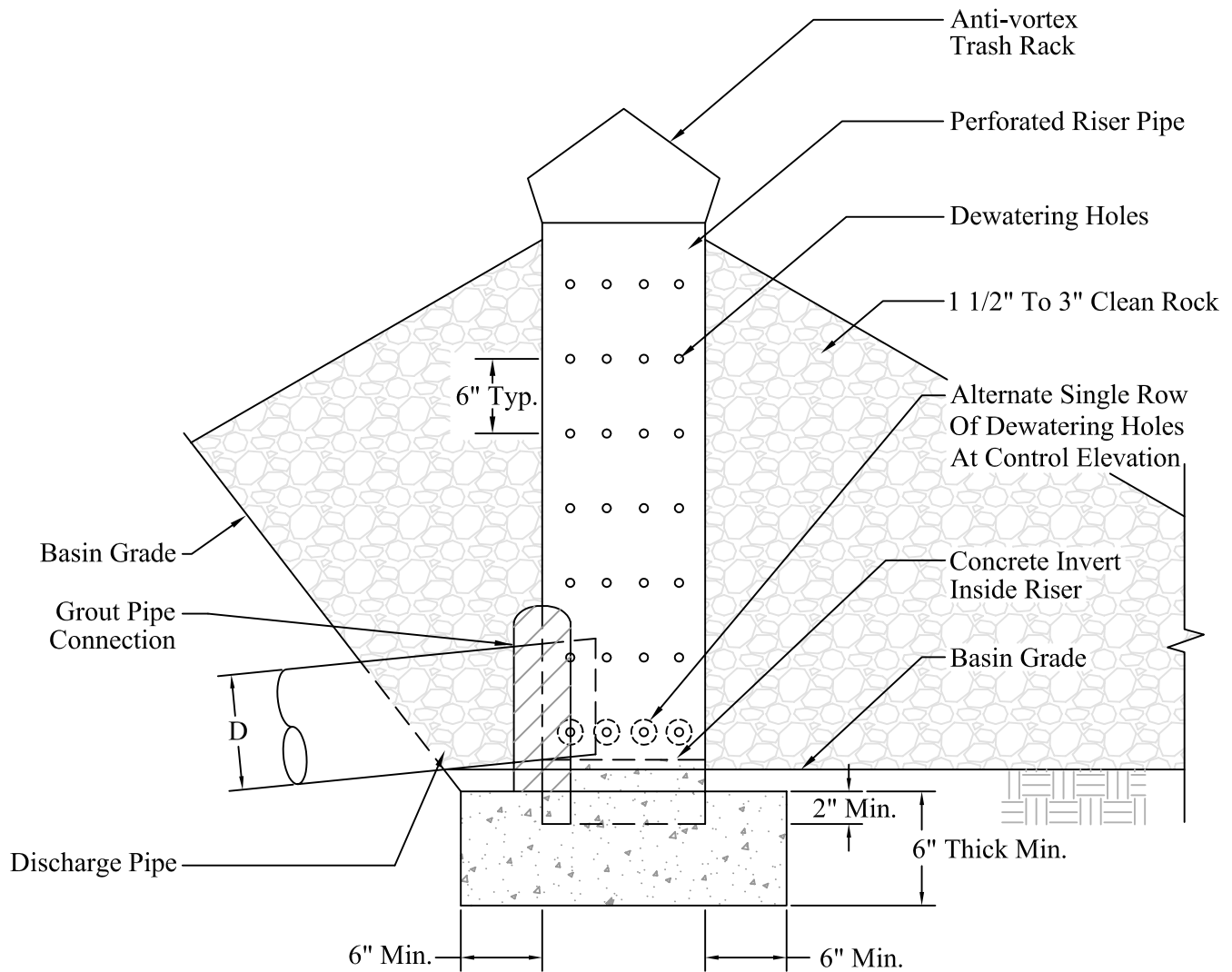


SECTION THROUGH EMBANKMENT AND BASIN CONTROLS

NO SCALE

SEDIMENT BASIN OUTLET, SHEET 1 OF 2
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

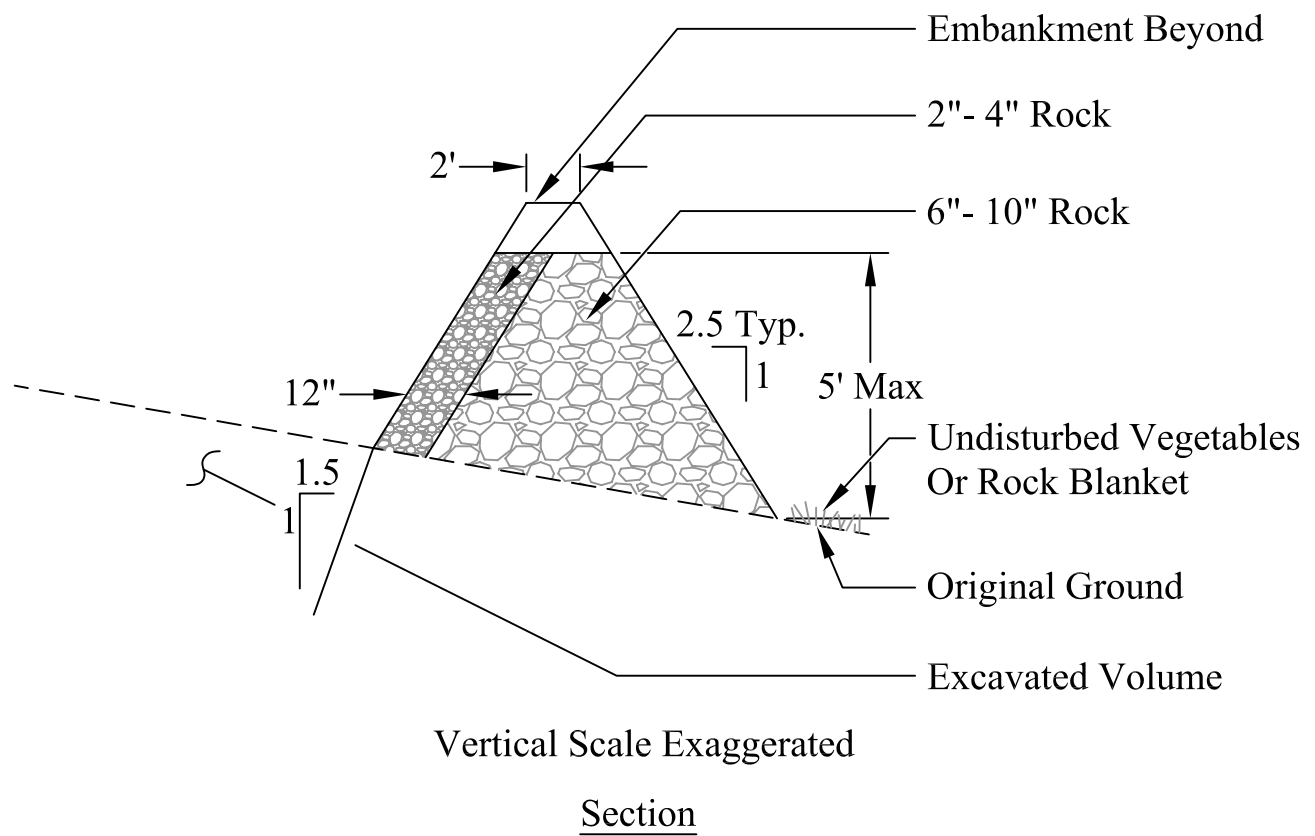
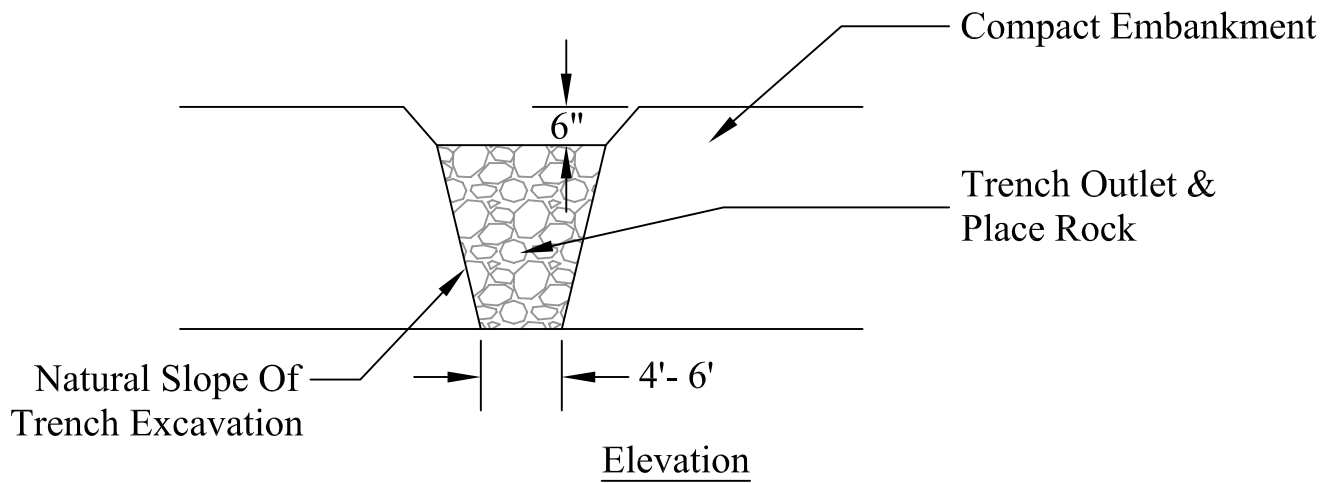
UG 1400-I
2008 Edition



NO SCALE

NOTES:

1. See Project Plans Or Design Guidelines For Diameter Of Pipes And Size And Number Of Dewatering Holes.
2. An Anti-Vortex And Trash Rack Shall Be Securely Installed On Top Of The Riser.
3. The Riser Shall Have A Base Attached With Sufficient Weight And Size To Prevent Flotation Or Over-Turning Of The Riser.



SEDIMENT TRAP OUTLET

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 1400-K
2008 Edition

See Pavement Patch Details
Section 2250 For Required Pavement
Sections, Overcuts, & Load
Transfer Devices

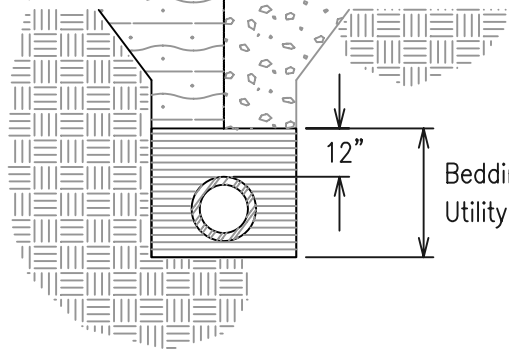
Match Adjacent
Elevation and Surfaces

3.0' Impact Area For
Calculation of ROW Permit
Fees

1.0' Overcut

In Open Areas Fill with
Acceptable Excavated
Material @ 90%. If Trench
is in Embankment,
Match Embankment
Compaction Requirement.

Under Pavement and within 4'
Horizontal of Pavement, Fill with
Aggregate Base Course, AB-3 @ 95%
Small Patches May Use Flowable Fill,
(60 to 90 psi).

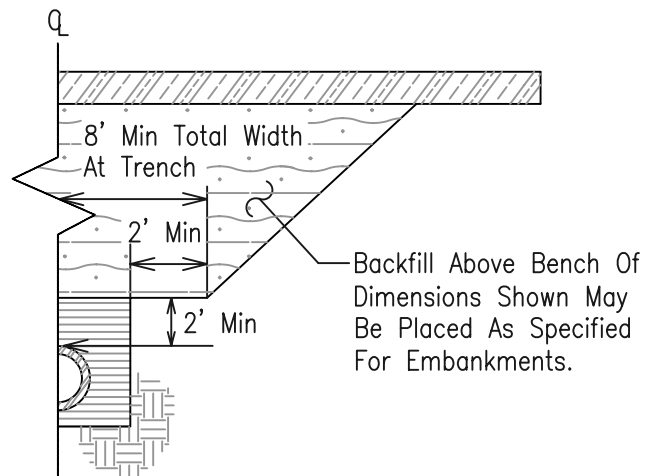


Bedding Zone: See Individual
Utility Requirements

TRENCH SECTION

NOTES:

1. If Rock Is Encountered Contact Engineer To Verify & Define Upper Limit Of Rock. See Individual Utility Requirements For Over excavation.
2. Shore Or Slope Sides Of Excavation. OSHA Has Additional Requirements For Excavations.
3. Thickness Of Lifts Must Match Compaction Methods.



ALTERNATE BACKFILL

TRENCH DETAIL

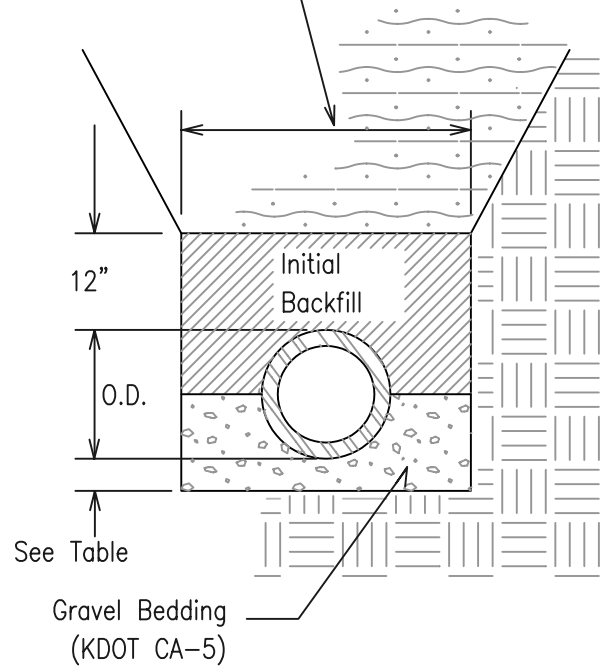
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 2100-A
2008 Edition

Width Shall Not Exceed 2 1/2
Times The Outside Pipe Diameter.

Initial Backfill Allowable Materials		
Application	Select Fill	Stone Fill
Paved Areas, All Materials & Depths	No	Yes
Open Areas, Rigid Pipes, Depths to 30'	Yes	Yes
Open Area, Flexible Pipe, Depths to 30'	Yes	Yes

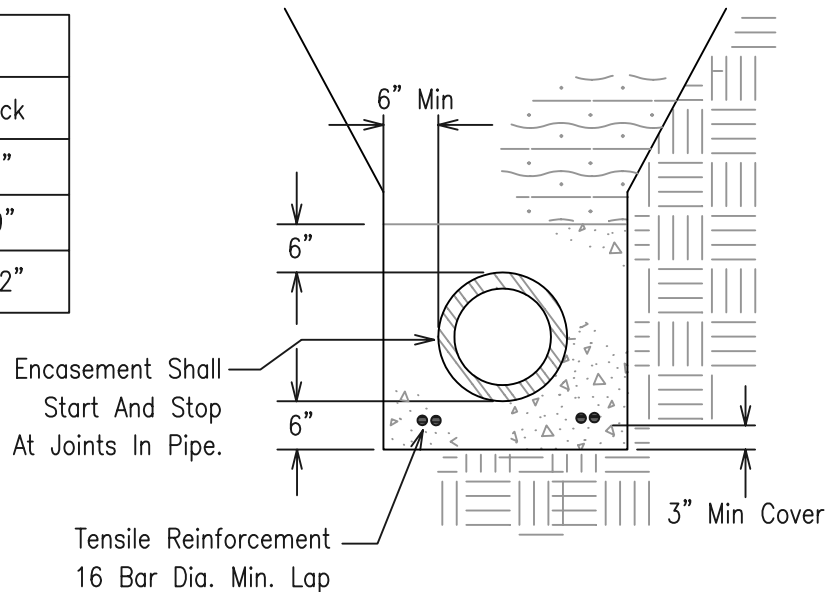
See Section 2100 For Definition Of Stone Fill
& Select Fill



STANDARD SEWER BEDDING

Bedding Depth Below Pipe		
Pipe Diameter	In Soil	In Rock
24" & Less	4"	6"
27" through 60"	4"	9"
66" & Greater	6"	12"

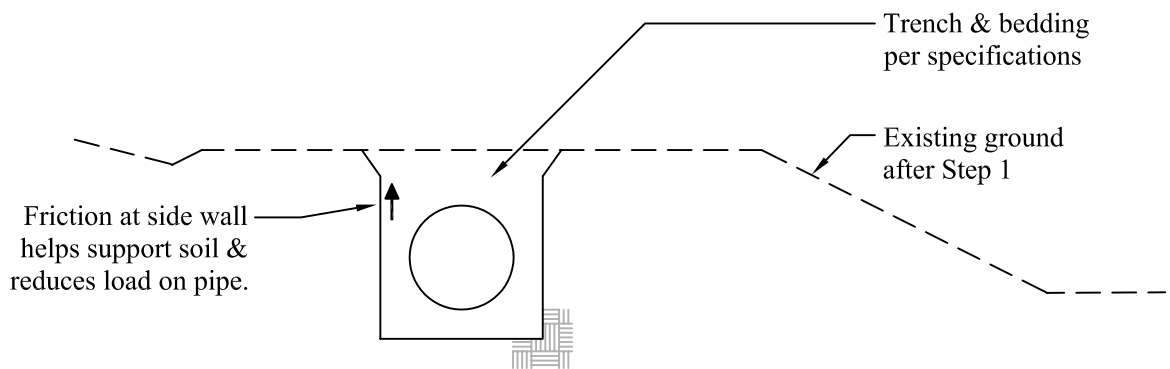
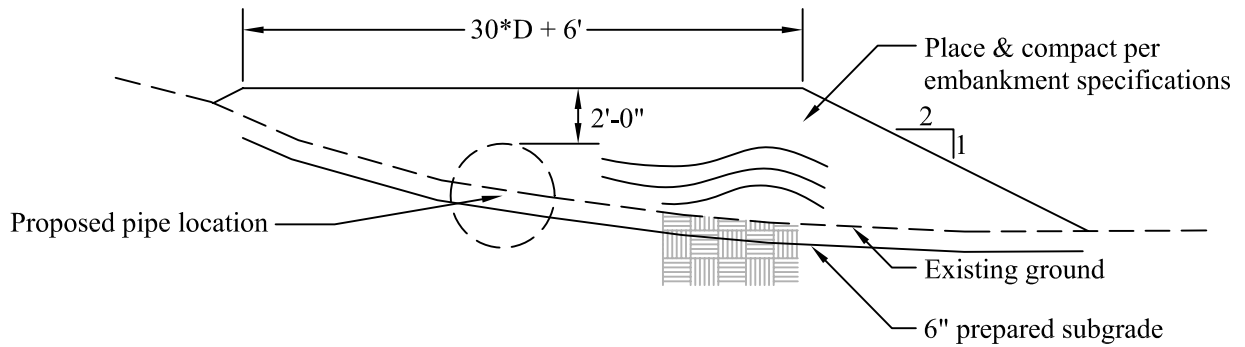
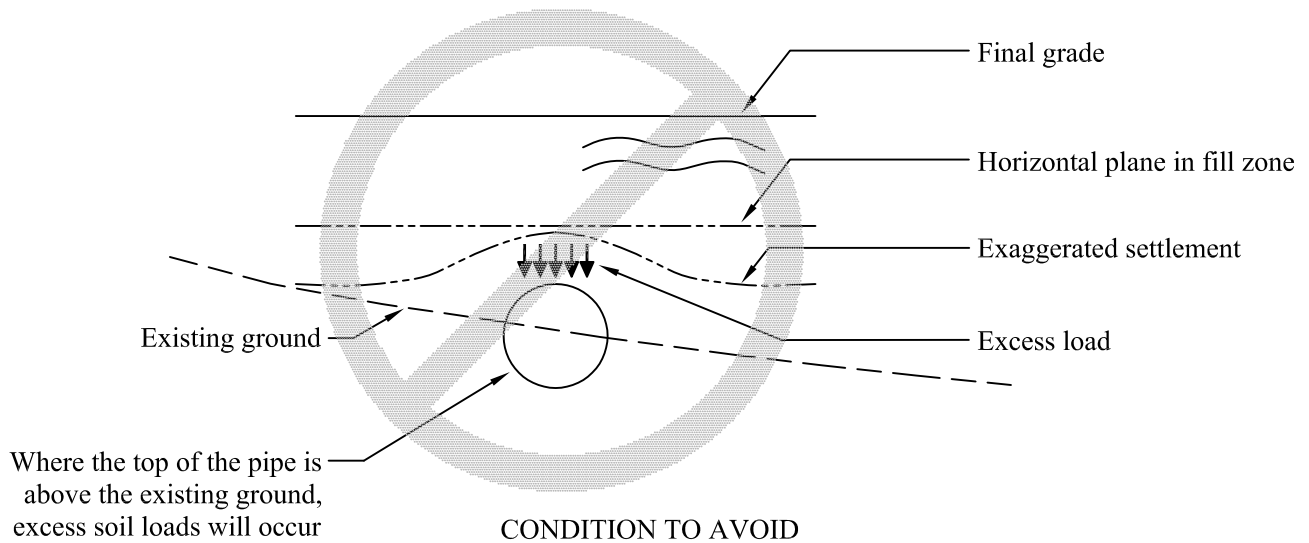
Concrete Encasement Minimum 6"
Beyond Outer Wall Of Pipe. Form or
Cast Against Trench Wall. Reinforcing
Steel Shall Be two #6 Bar for Pipe Up
To 8" Dia; Four #6 Bar for 10" Through
24" Dia; & as Approved By the Engineer
for Larger Than 24".



SEWER ENCASEMENT

SANITARY AND STORM SEWER BEDDING **PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION** **UNIFIED GOVERNMENT**

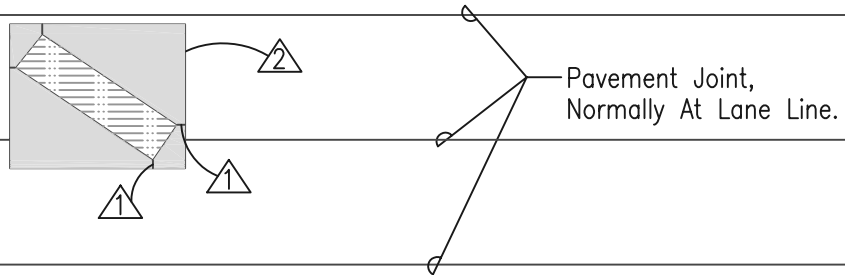
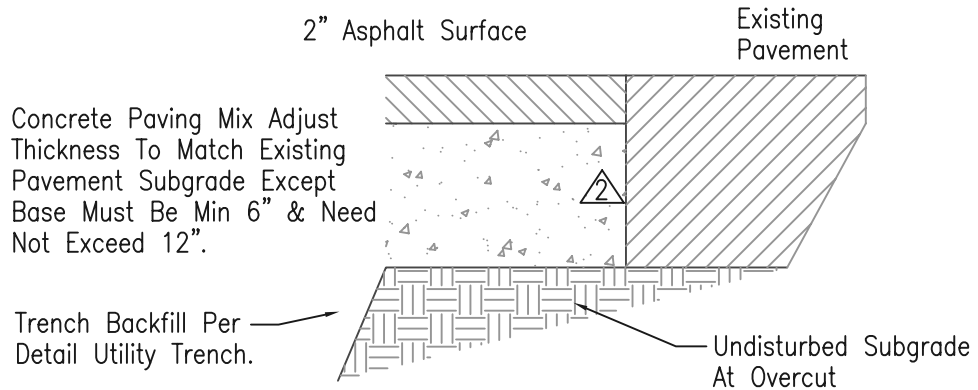
UG 2100-B
2008 Edition



NO SCALE

PLATFORM FOR EXPOSED PIPE INSTALLATION
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 2100-C
 2008 Edition



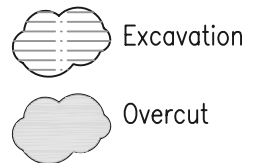
FLAG NOTES:

- ① Minimum Overcut Shall Be 1.0 Foot, Overcut Shall Be A Single Rectangle Oriented Parallel & Perpendicular to the Travel Lanes.
- ② No Load Transfer Devices Are Required At Overcut Joint.

SHEET NOTES:

- 1. Streets With Brick Base & Asphalt Overlay Shall Be Patched Per Asphalt Pavement Patch Details.
- 2. Refer To Specification For Asphalt & Concrete Mix, Tack, Placement, And Compaction Requirements.
- 3. Overcut Edges Shall Be Saw Cut Full Depth. Damaged Edges Shall Be Recut.

LEGEND

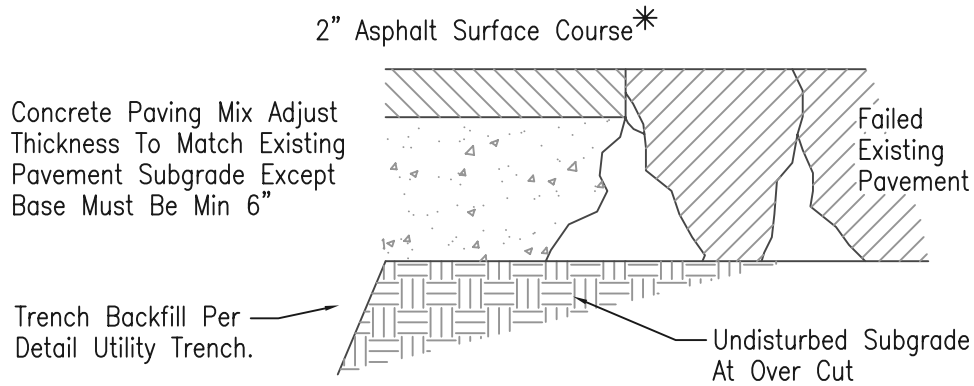


ASPHALT PAVEMENT PATCH

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

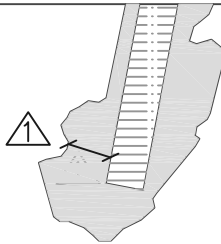
UNIFIED GOVERNMENT

UG 2250-A
2008 Edition



PAVEMENT X-SECTION

* At UG Engineer's Instruction
Use 6" Minimum Flush Filled
Concrete Paving Mix.



FLAG NOTES:

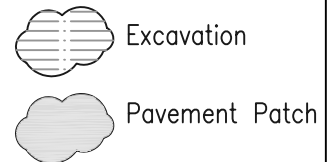
- ① To Maximum Extent Permitted By Pavement Condition, Locate A Saw Cut Between 6" & 2'-0" Of The Excavation. For Remainder Of Pavement Edge, Remove Dislodged Pavement Fragments With Minimum Disruption To Remaining Fragments. Any Shape Of Pavement Patch Acceptable In Failed Pavements.

SHEET NOTES:

1. Applicability: Failed Pavement Is Any Pavement So Fragmented That 30% Or More Of The Perimeter Of The Excavation Has A No Practical Saw Line Within 2 Feet Of The Excavation. "No Practical Saw Line" Shall Mean Sawing Would Dislodge Rather Than Cut The Pavement. UG Engineering Shall Determine.

2. Refer To UG Standard Specifications For Asphalt & Concrete Mix & Tack, Placement & Compaction Requirements.

LEGEND

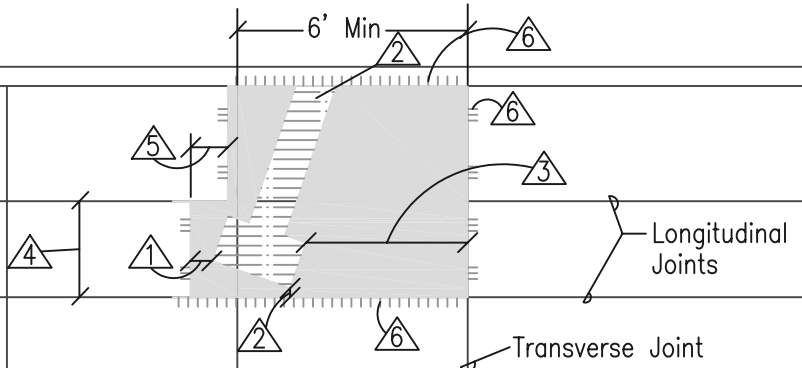
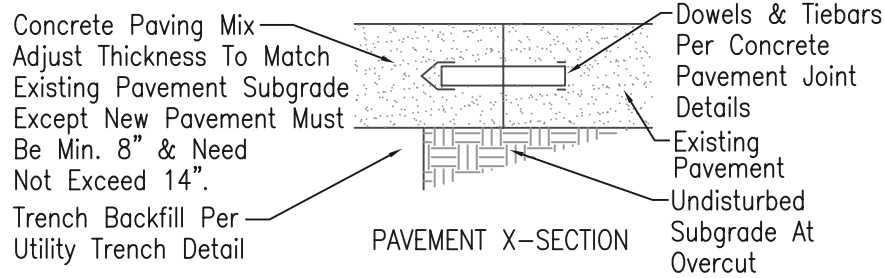


PAVEMENT PATCH IN FAILED PAVEMENTS

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 2250-B
2008 Edition



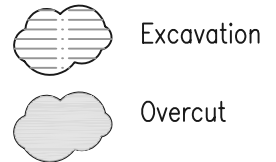
FLAG NOTES:

- ① Minimum Longitudinal Overcut In Mid-Panel Shall Be 1.0 Foot.
- ② Minimum Transverse Overcut 0.0 Foot.
- ③ Where Minimum Longitudinal Overcut Would Result In Remaining Panel Less Than 10' Long Between Cut & Transverse Joint Or Shrinkage Crack, Then Replace Panel To Transverse Joint Or Shrinkage Crack.
- ④ Patches Shall Extend From One Longitudinal Joint To Another. No Additional Overcut Is Required.
- ⑤ Where Patch Crosses Longitudinal Joint, Patch May Stagger Only If Stagger Is Greater Than 6 Feet.
- ⑥ Transverse Joint Dowels & Longitudinal Joint Tie Bars (Including Curb Tie Bars) Shall Be Installed Per Details For Concrete Pavement Joint Layout & Patching.

SHEET NOTES:

- 1. Streets With Brick Driving Surface Shall Be Patched Per Asphalt Pavement Patch Details.
- 2. If Asphalt Overlay Covers More Than 80% Of The Panels Surrounding The Cut, Then Restore Per Asphalt Pavement Patch Details.
- 3. Refer To UG Standard Specifications For Concrete Mix, Curing Requirements, And For Minimum Strength For Opening To Traffic.
- 4. Pavement Thickness And Finish Shall Match Thickness Of Adjacent Panels Except New Pavement Shall Not Be Less Than 8" Thick, Nor Greater Than 14" Thick.
- 5. Overcut Edges Shall Be Saw Cut Full Depth. Damaged Edges Shall Be Recut.

LEGEND



CONCRETE PAVEMENT PATCH

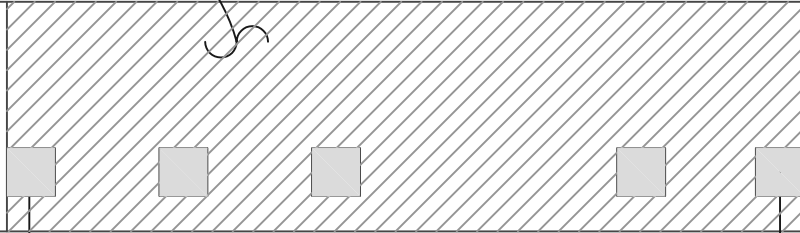
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 2250-C
2008 Edition

②

Pavement Joint
Normally @ Lane Line



①

LEGEND



Overcut



Additional Mill &
Overlay Beyond
Over Cut

FLAG NOTES:

①

When 3 Or More Patches Over The Same Utility, Whether As Part Of The Current Repair Or A Previous Repair, Are Separated By An Average Center-To-Center Distance Of 25 Feet Or Less The Mill And Overlay Requirement Shall Be Applicable. Intermediate Gaps Of Greater Than 25 Feet Shall Be Incorporated In The Merge Patch As Long As The Average c-c Distance Requirement Is Met.

②

Minimum 2" Depth Mill & Overlay Full Width Of All Lanes Multiple Patches Encroach. Overlay Shall Be Placed By Paving Machine. Terminal Header Shall Align Across All Lanes To Be Over Laid.

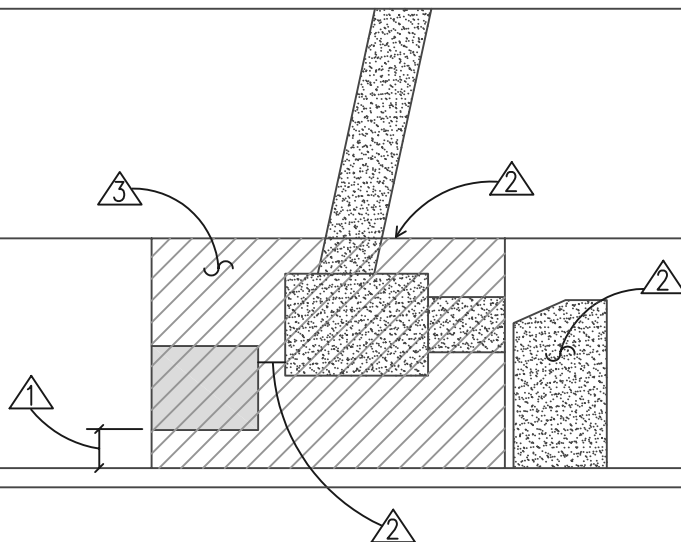
EXCEPTIONS TO THIS RULE WILL BE AT THE ENGINEER'S DISCRETIONS. FACTORS TO BE CONSIDERED ARE:

- A. The Condition Of The Unpatched Pavement. The Worse The Unpatched Pavement, The Less Need To Merge The Patch. Failed Pavements May Not Require Any Merging Of Patches.
- B. Alignment Of The Multiple Patches. The Closer The Patches Are To The Wheel Path, The Greater The Need To Merge Patches.
- C. The Total Number Of Multiple Patches. The Greater The Number Of Patches, The Greater Need To Merge The Patches.
- D. The Average & Maximum Distance Between Multiple Patches. The Greater The Average Or Maximum distance, The Less Need To Merge Patches.
- E. The Location Of Lane Lines And Pavement Joints. Preference Given To Merging Patches In The Same Lane.

PATCH MERGING – CASE 1

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 2250-D
2008 Edition



FLAG NOTES:



If Standard Overcut Would Be Less Than 2' From The Curb And Gutter, Then Extend The Patch To The Gutter Line.



Merge Every Existing Patch Whose Edge Is Less Than 9' From A Rectangle Drawn Around The Standard Overcut And All Closer Patches That Meet The Same Requirement. This Is A Recursive Determination With No Set Limit Of Intermediate Patches.

Exceptions To This Rule Will Be At The Engineer's Discretion. Factors To Be Considered Are:

- A. The Surface Texture And Structural Soundness Of The Existing Patch. The Better The Existing Patch, The Less Need To Merge The Patch.
- B. The Condition Of The Unpatched Pavement. The Worse The Unpatched Pavement, The Less Need To Merge The Patch. Failed Pavements May Not Require Any Merging Of Patches.
- C. The Continuity Of The Existing Patch To The Standard Overcut. The Greater The Number Of Intervening Patches, The Less The Need To Join The Patch.

D. The Size Of The Merged Patch. The Larger The Merged Patch, The Less Need To Merge Additional Existing Patches.

E. The Location Of Lane Lines And Pavement Joints. Preference Given To Merging Patches In The Same Lane.



Merged Patch Shall Be Full Depth Pavement Replacement Or 2" Mill And Overlay At Engineer's Discretion. Overlay Shall Be Placed By Paving Machine. Factors To Be Considered Are:

- A. The Structural Soundness Of The Existing Patch. The Better The Existing Patch, The Less Need For Full Depth Pavement Replacement.
- B. The Condition Of The Unpatched Pavement. The Better The Unpatched Pavement, The Less Need For Full Depth Replacement.

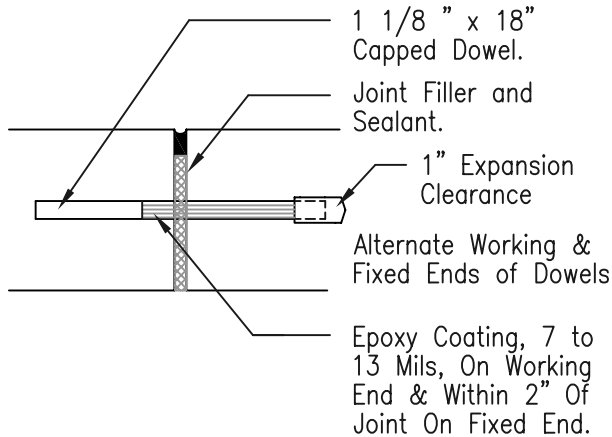
LEGEND

- Standard Overcut
- Existing Patch
- Area Of Merged Patch

PATCH MERGING – CASE 2

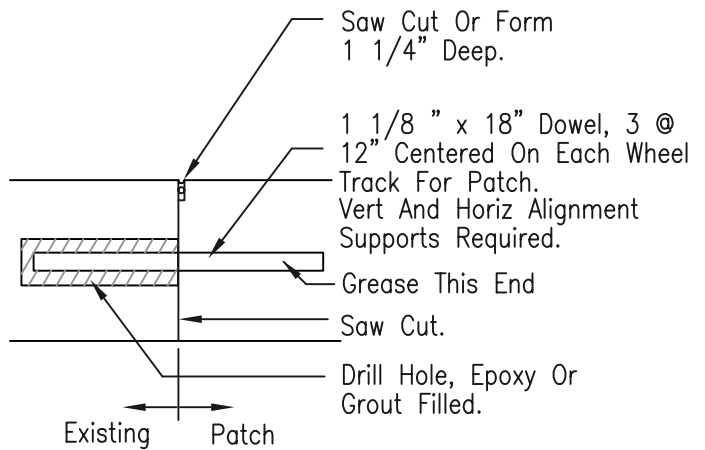
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

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2008 Edition

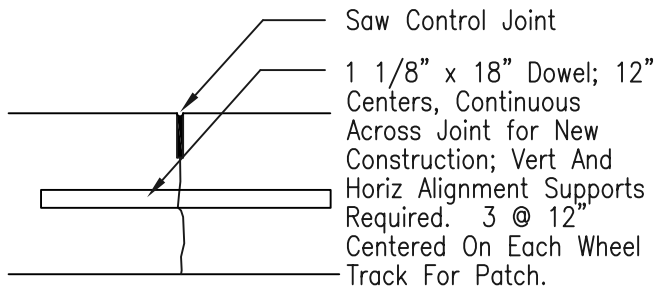


EXPANSION JOINT

Space Expansion Joints As Shown On Project Drawings

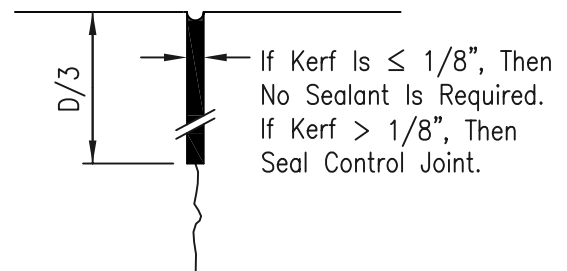


TRANSVERSE JOINT AT PATCH



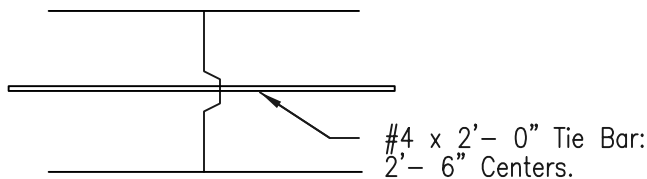
TRANSVERSE JOINT NEW PAVEMENT

Spacing of Transverse Joint As Shown On Project Drawings; 15' If Not Shown.



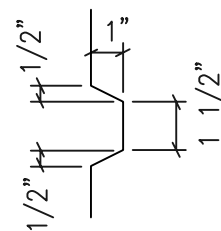
CONTROL JOINT DIMENSIONS

Note: Joints In Sidewalks Or Driveways Me Be Tooled As An Alternate To Saw Cutting. Tooled Joints Do Not Require Sealant.



TIED LONGITUDINAL CONSTRUCTION JOINT

Place Longitudinal Joint Where Shown On The Project Drawing; At Lane Lines If Not Shown.



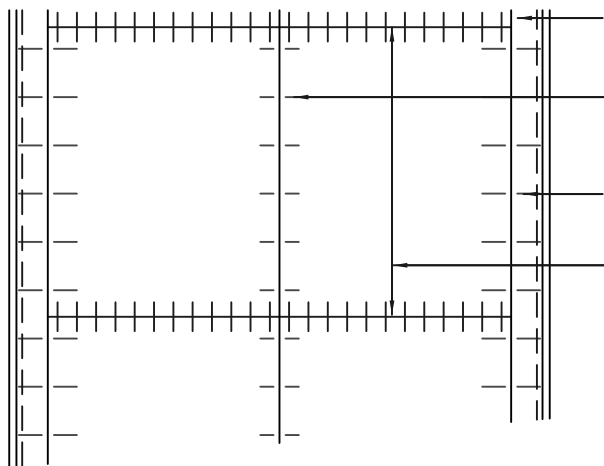
KEY SHAPE

CONCRETE PAVEMENT JOINT DETAILS

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

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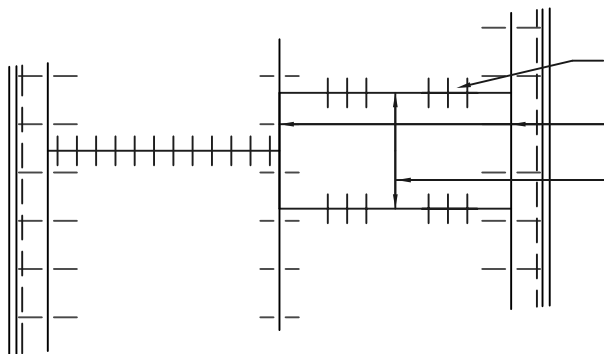
Dowels In Dowel Basket At Transverse Joints

Deformed Tiebars At Longitudinal Joint (Lane Line)

Deformed Tiebars At Curb Joint.

Space Joints To Eliminate Wire Mesh, 15' Typical, Or As Shown On The Project Drawings.

NEW CONSTRUCTION

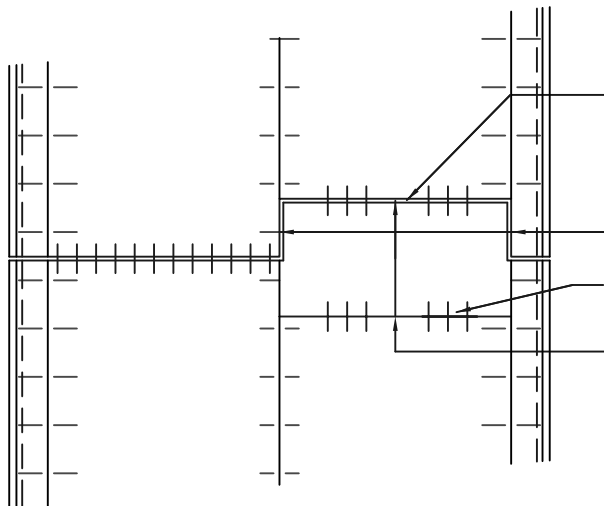


3 @ 1-1/8 " x 18" Dowels In Each Wheel Track

Deformed Tiebars At Curb And Lane Line.

Length As Marked By Engineer, 6' Minimum.

TRANSVERSE CONTROL JOINT REPAIR



Install Joint Filler On Transverse and Longitudinal Joints On One Side Of Patch To Make Continuous Working Joint.
Dowel Caps Required On Expansion Joint.

Cut Tiebars. Do Not Reinstall.

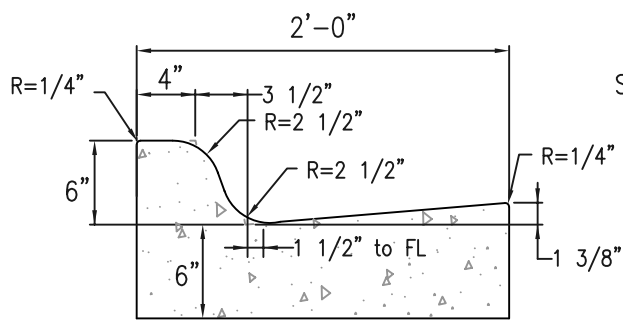
3 @ 1-1/8 " x 18" Dowels In Each Wheel Track

Length As Marked By Engineer, 6' Minimum.

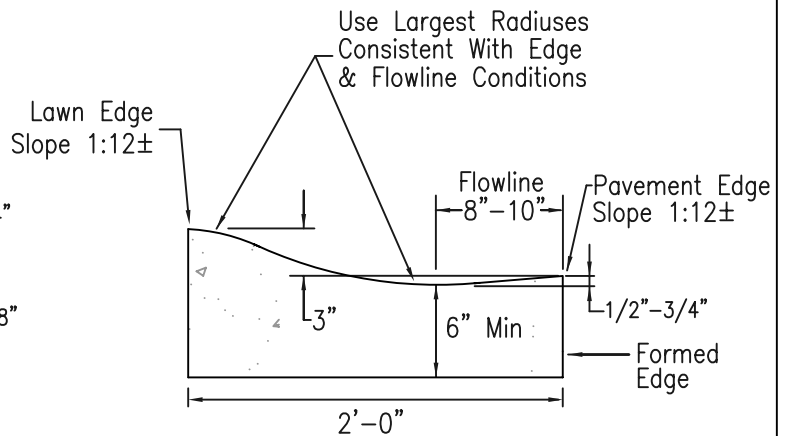
TRANSVERSE EXPANSION JOINT REPAIR

CONCRETE PAVEMENT JOINT LAYOUT AND PATCHING
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

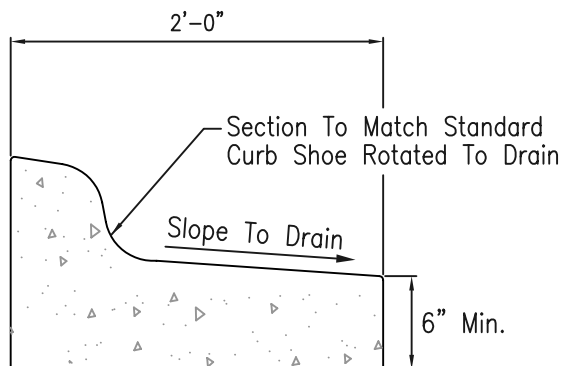
UG 4100-B
2008 Edition



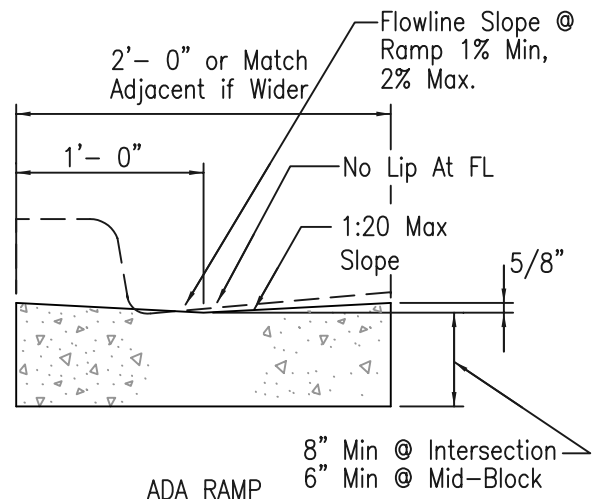
STANDARD, STAND UP, OR
VERTICAL CURB



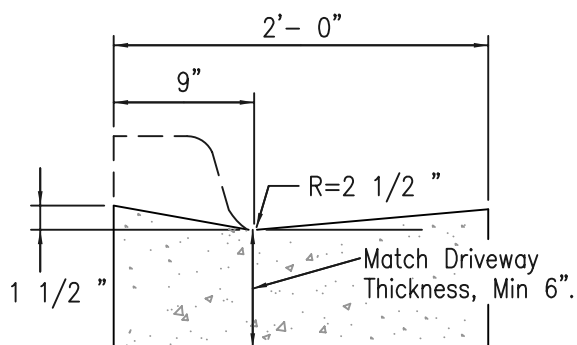
ROLL OVER, OR LAZYBACK CURB
For Residential Use Only



MEDIAN, SPILL OR DRY CURB



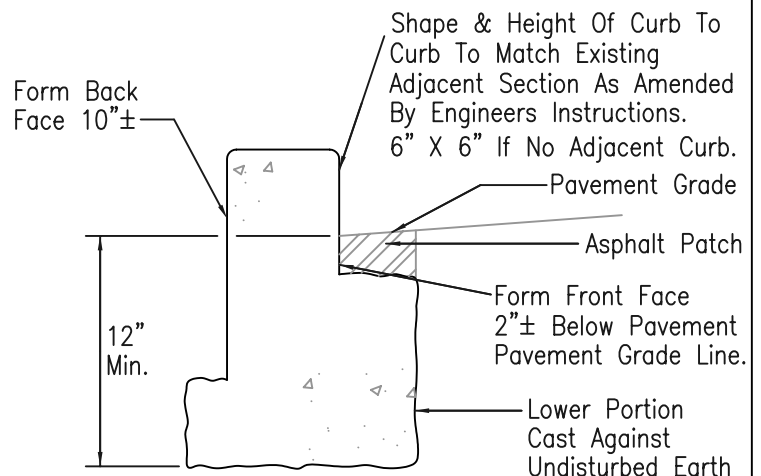
8" Min @ Intersection
6" Min @ Mid-Block
ADA RAMP



DRIVEWAY

NOTES:

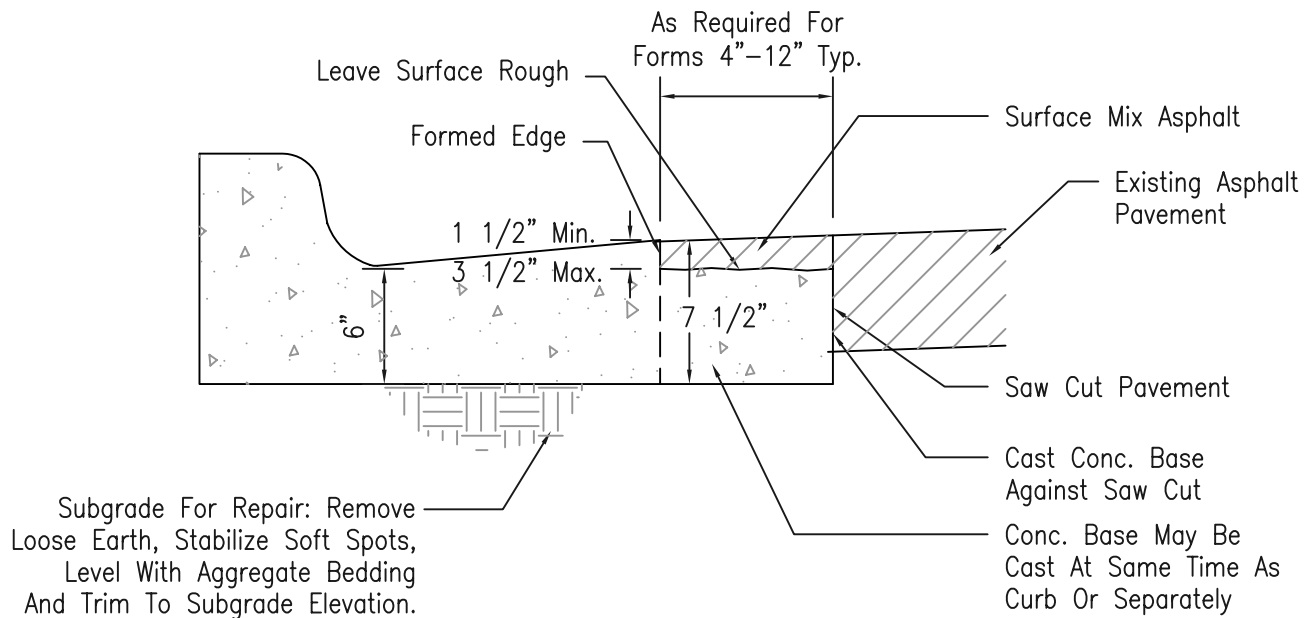
Broom Finish Shall Be Used For All
Curb & Gutter.



CURB ONLY

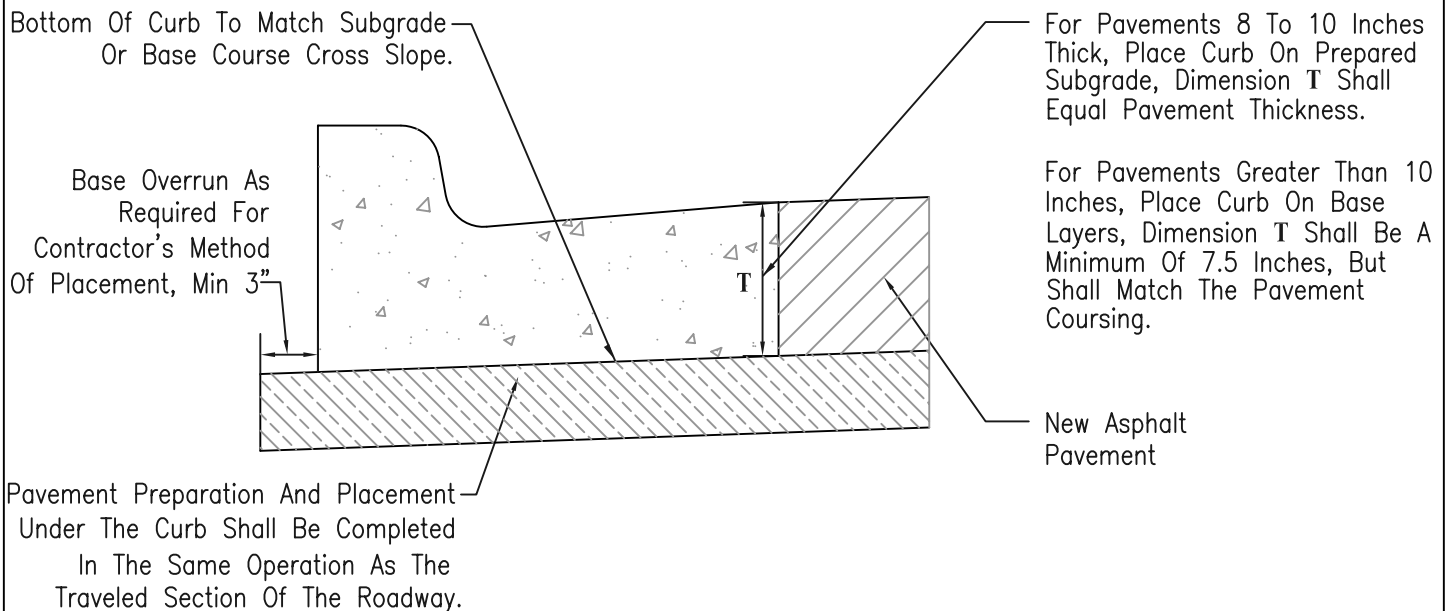
CURB AND GUTTER SECTIONS
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

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2008 Edition



CURB REPAIR

(Where Adjacent Pavement Is To Remain In Place)



CURB FOR NEW PAVEMENT

(For New Mainline Pavement & Repairs Where Adjacent Pavement Is Replaced)

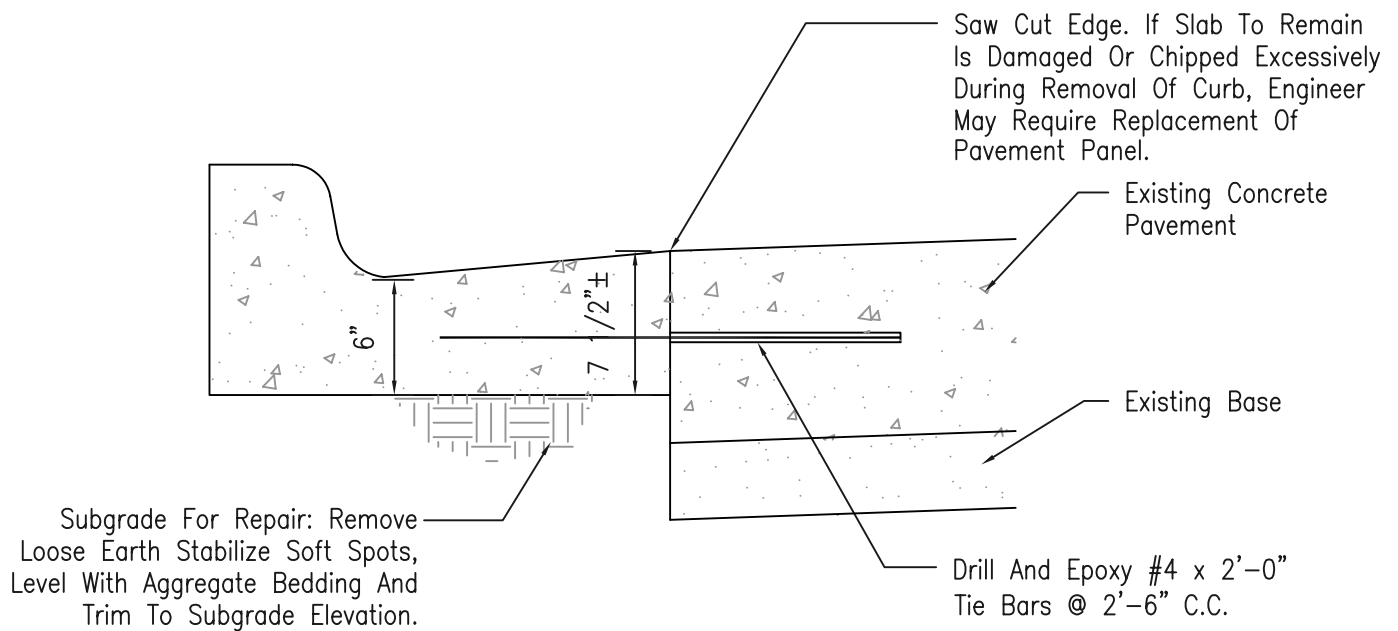
NOTES: Installation Details Shown on This Sheet for Standard Curb Apply to All Typical Curb Sections.

CURB AND GUTTER INSTALLATION (ASPHALT STREETS)

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

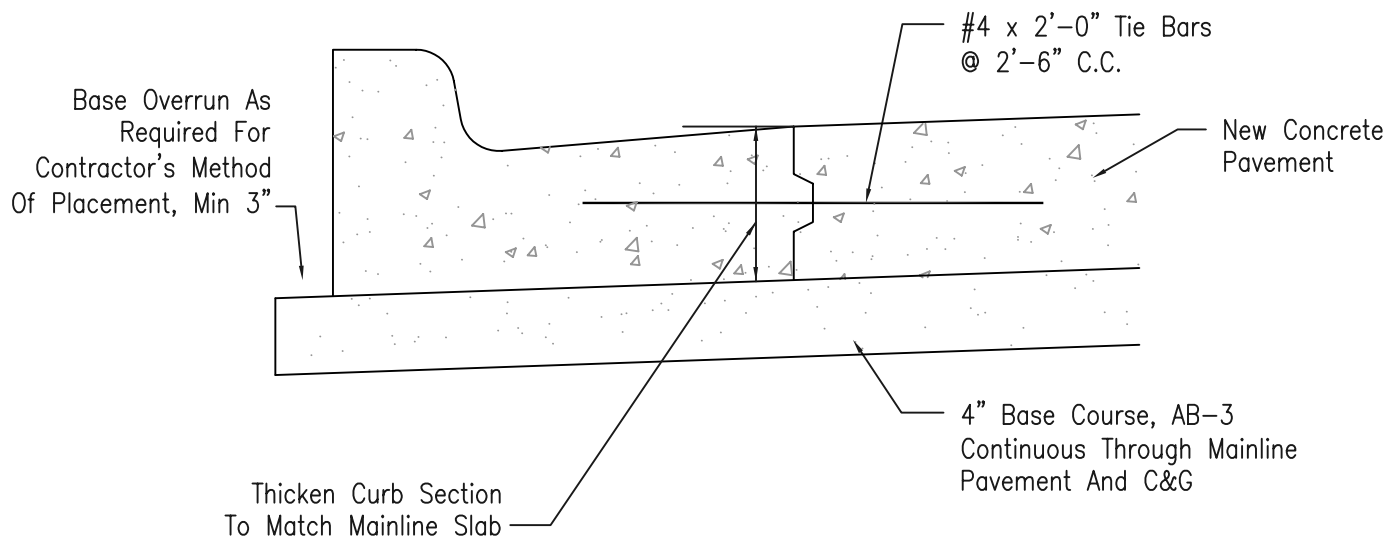
UNIFIED GOVERNMENT

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2008 Edition



CURB REPAIR

(Where Adjacent Pavement Is To Remain In Place)



CURB FOR NEW CONCRETE PAVEMENT

(For New Mainline Pavement & Repairs Adjacent To Pavement Slabs Should Be Replaced)

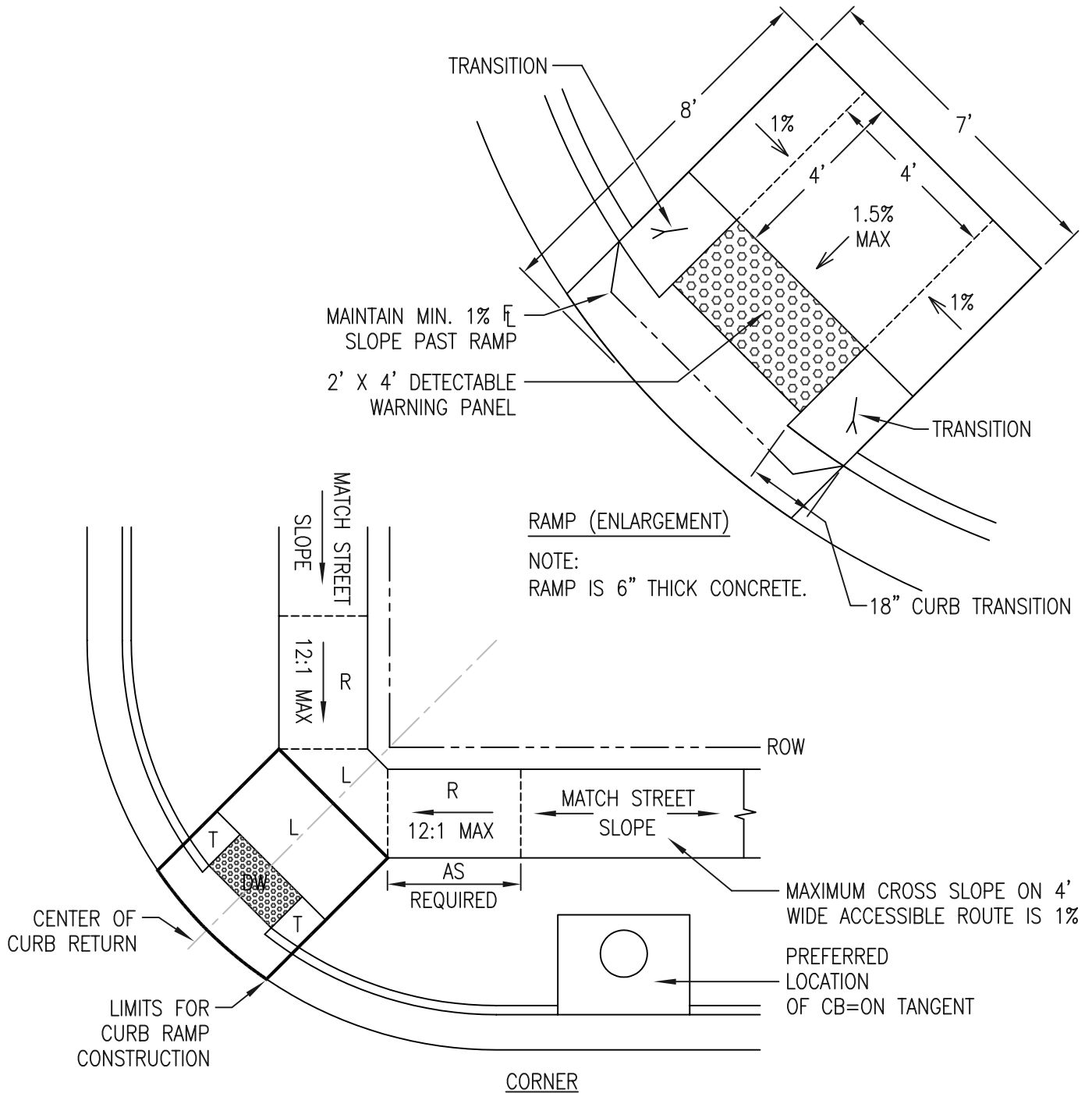
NOTES: Installation Details Shown on This Sheet for Standard Curb Apply to All Typical Curb Sections.

CURB AND GUTTER INSTALLATION (CONCRETE STREETS)

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

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LEGEND:

- L: LANDING: SLOPE 1% TOWARD FLOWLINE & 0 TO 2% ACROSS WIDTH OF LANDING.
- R: RAMP: MAXIMUM 8.3% SLOPE IN DIRECTION OF TRAVEL, CROSS SLOPE 0 TO 2%.
- T: TRANSITION: MAXIMUM 10% SLOPE IN ANY DIRECTION, WHEN ADJACENT TO APPROACH WALK.
- DW: DETECTABLE WARNING PANELS.

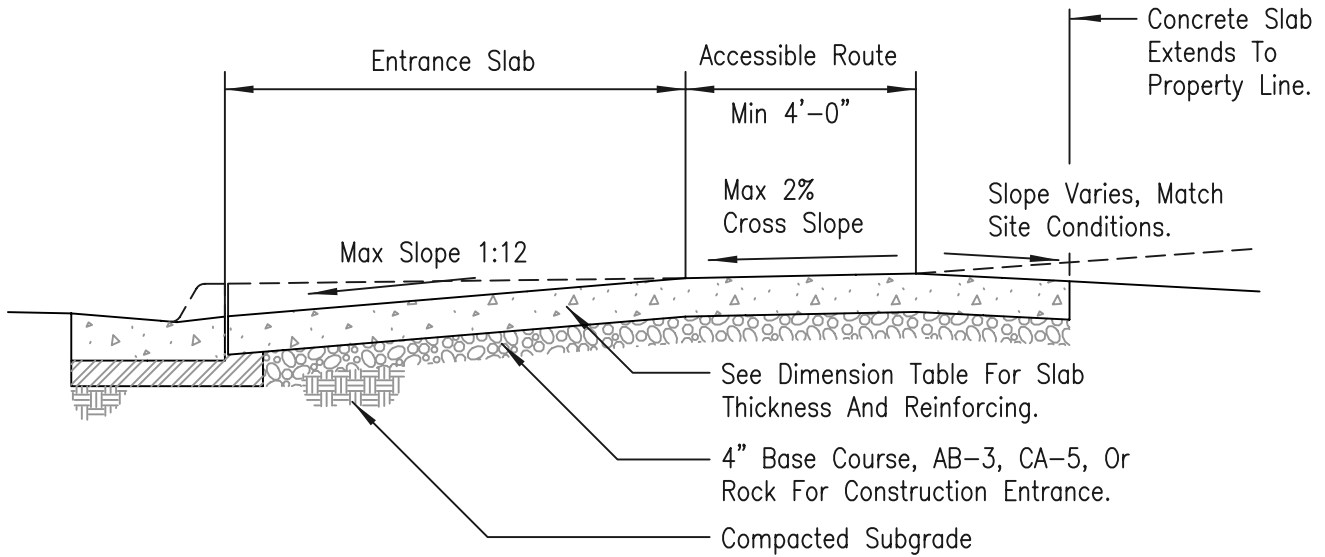
ADA RAMP FOR NEW CONSTRUCTION

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

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2008 Edition

Location Of Accessible Route
Varies. See Driveway Layout Detail



DRIVEWAY SECTION

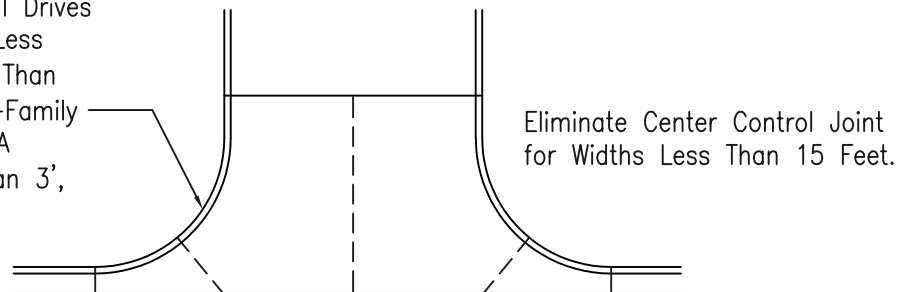
Type	Max. Width	Min. Slab Thickness	Min. Reinforcing
Residential *	25'	6"	None
Commercial	30'	8"	None
Industrial Δ	35'	8"	#4 @ 12" CC At Midspan On Chairs

*For Rural Section Roads (No C&G) Residential Driveways May Be 6" Asphalt On Compacted Subgrade.

Δ May Be Larger Than 35' If Approved By The County Engineer.

DIMENSION TABLE

Commercial & Industrial Drives May Have Radius Not Less Than 15', Nor Greater Than 25'. Single and Multi-Family Residential Shall Have A Transition Not Less Than 3', Nor Greater Than 5'.



CONTROL JOINT LOCATIONS

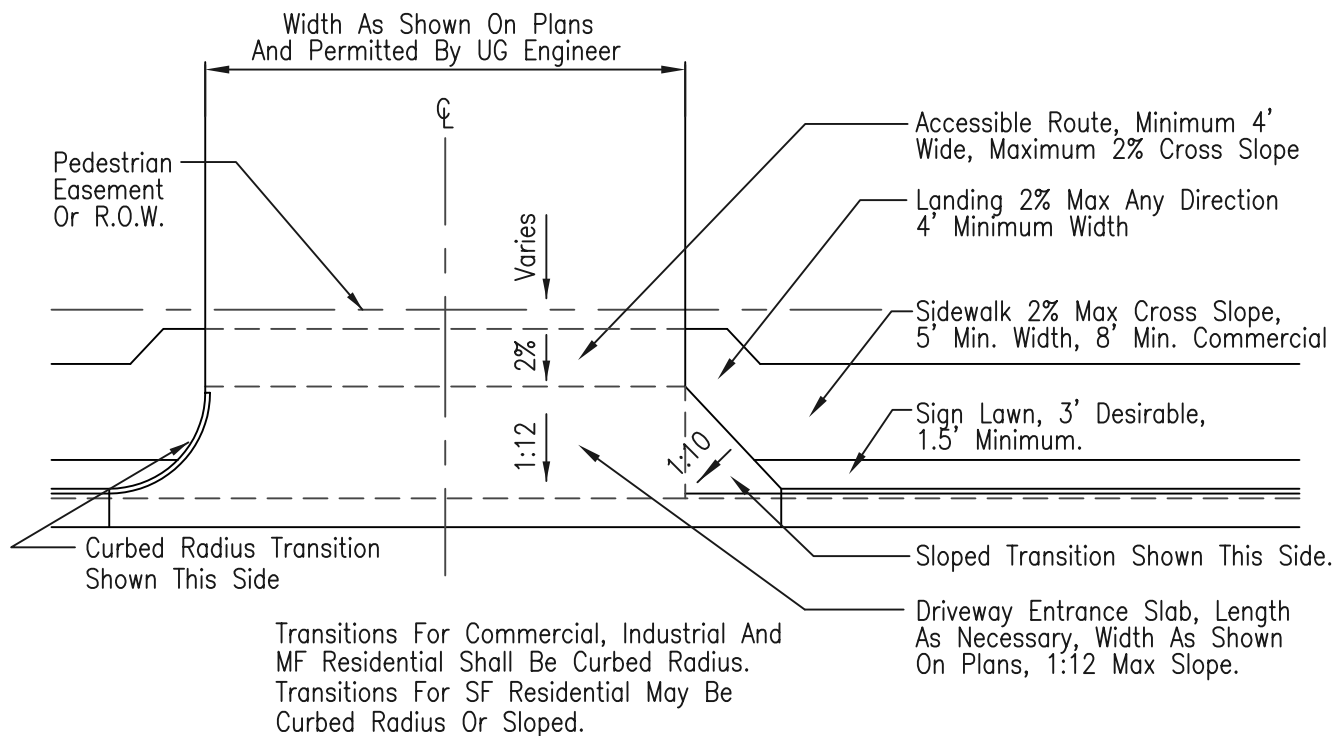
DRIVEWAY LAYOUT, SHEET 1 OF 2

GENERAL

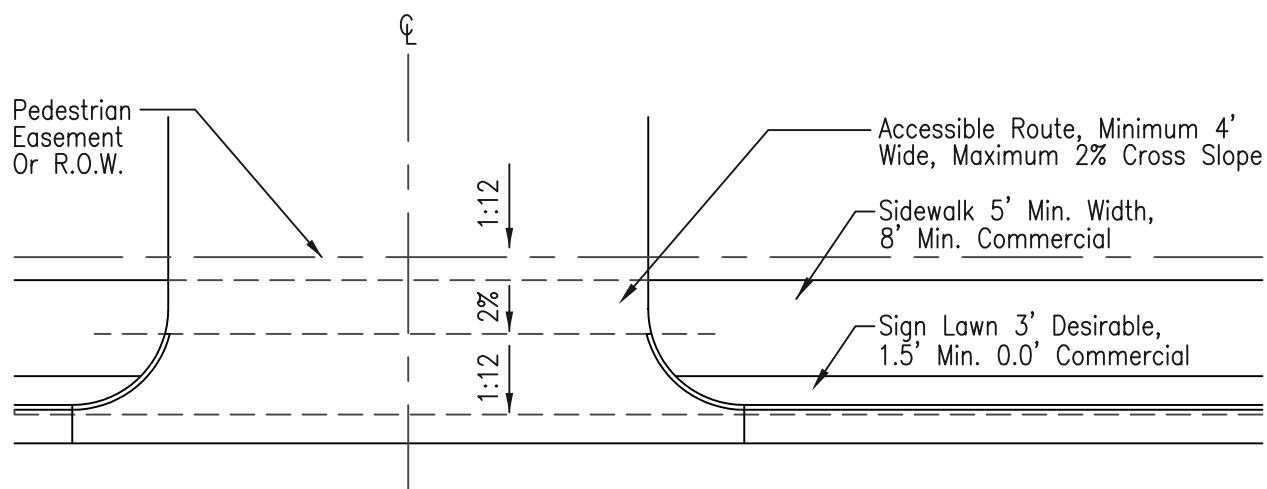
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

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UG 4100-G
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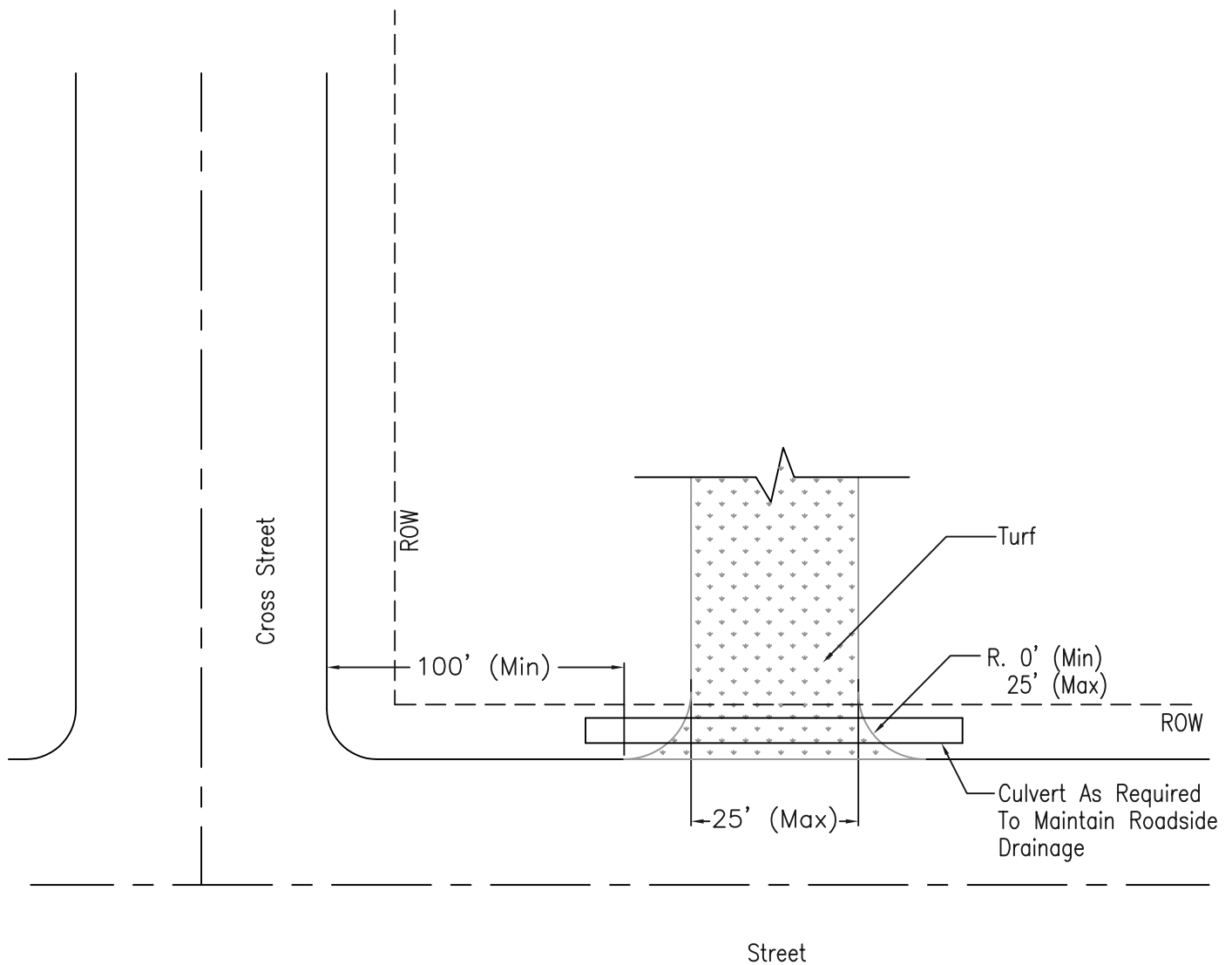
ACCESSIBLE ROUTE AT TOP OF DRIVEWAY



Where Pedestrian Easement Does Not Allow Accessible Route
At Top Of Entrance Slab, Accessible Route Shall Lay Between
Sloped Portions Of The Entrance Slab.

ACCESSIBLE ROUTE ALIGNED WITH SIDEWALK

DRIVEWAY LAYOUT, SHEET 2 OF 2 **FOR ADA ACCESSIBILITY** **PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION** **UNIFIED GOVERNMENT**



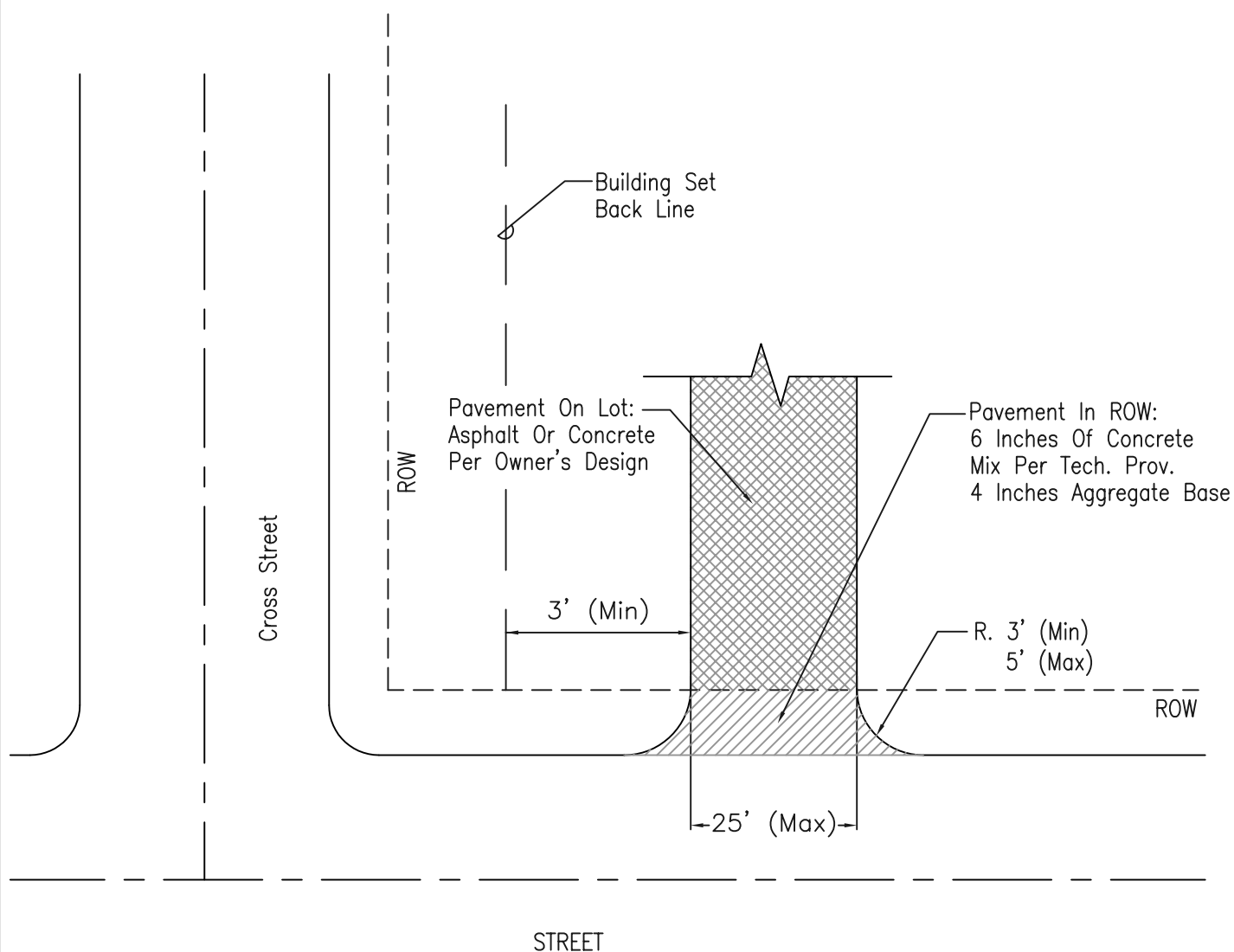
DRIVEWAY DIMENSIONS & MATERIALS, SHEET 2 OF 6

FIELD ENTRANCE

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 4100-J
2008 Edition

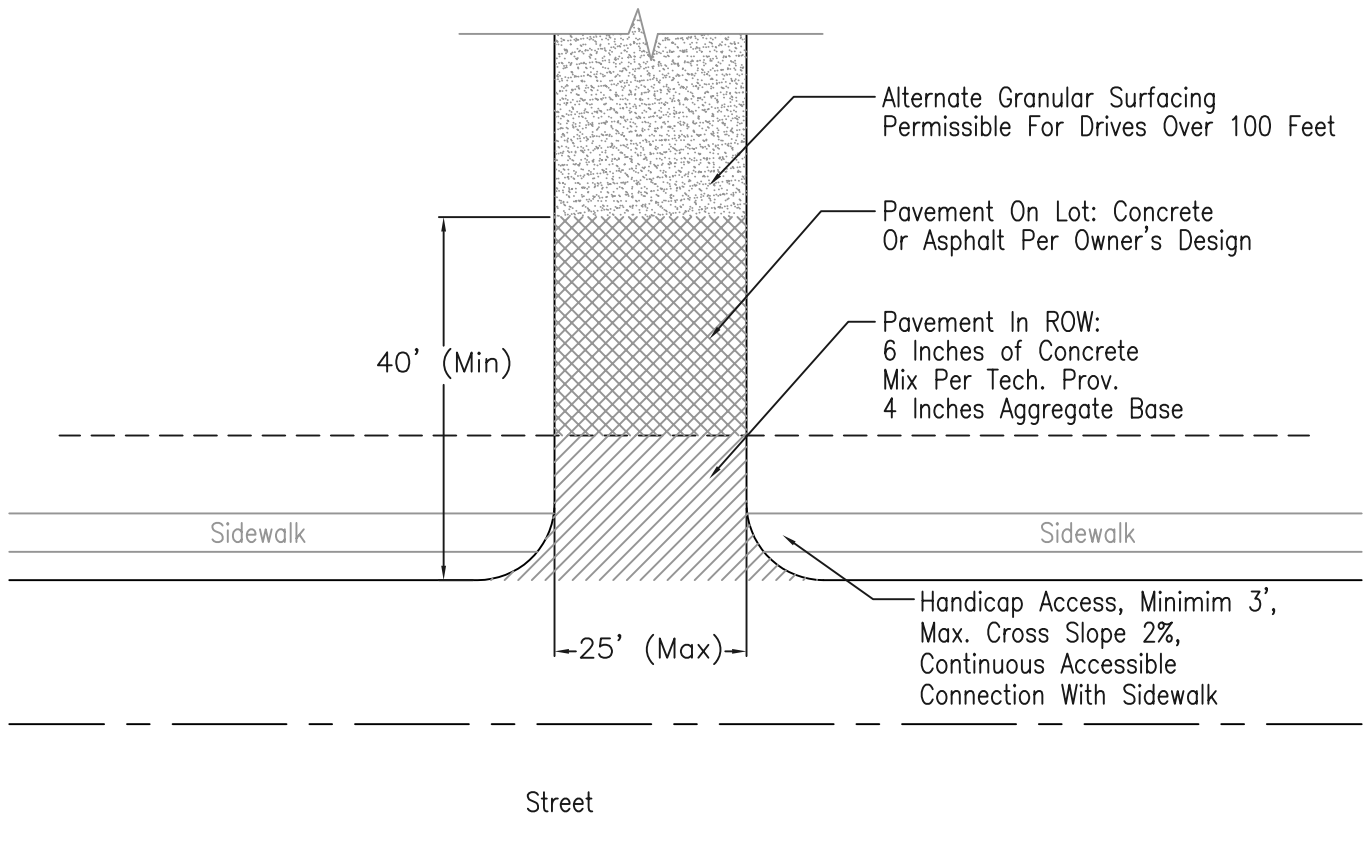


NOTE:

Applies To Single Family & Duplex Lots. Multifamily Entries Shall Conform To Commercial Driveway Standards.

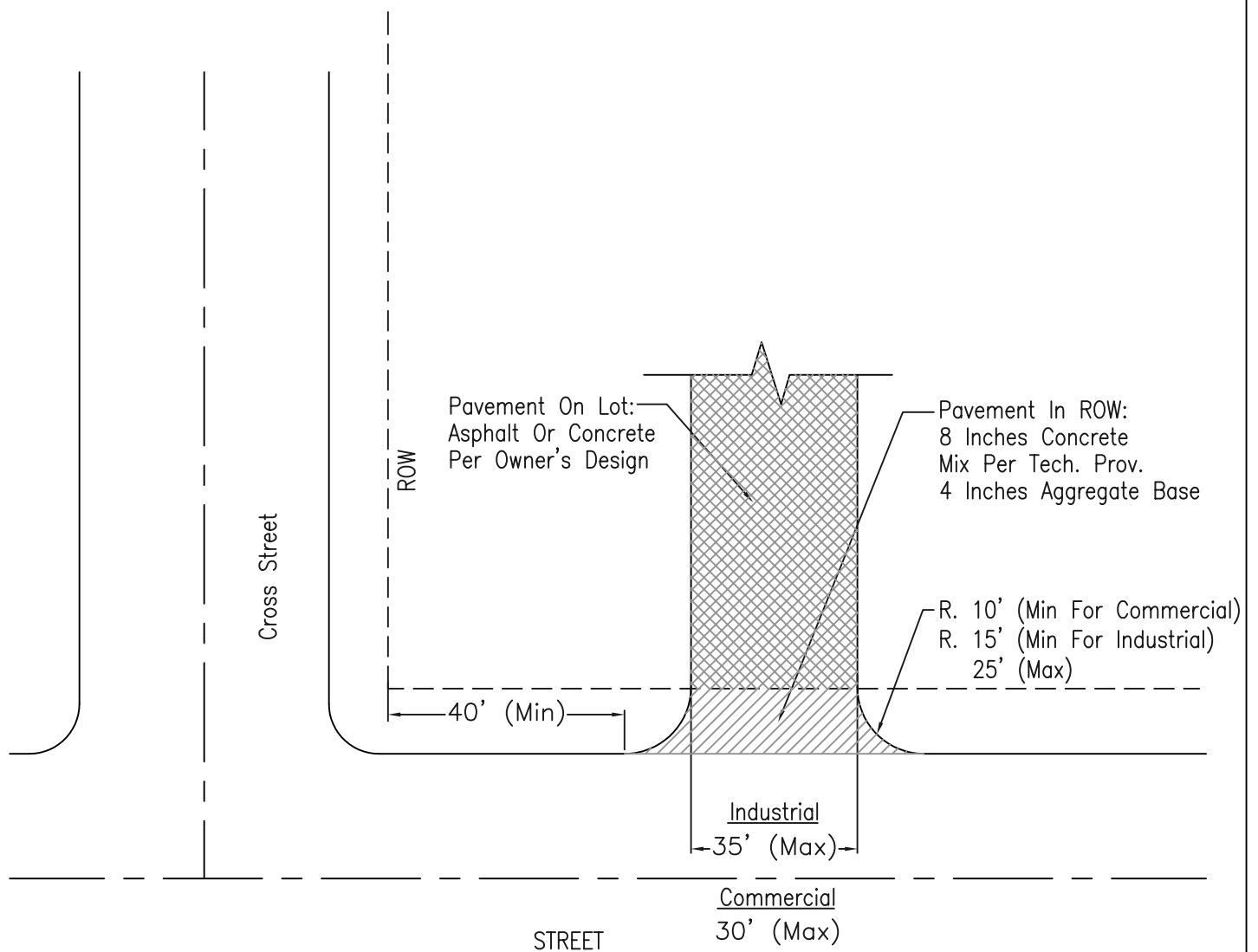
DRIVEWAY DIMENSIONS & MATERIALS, SHEET 3 OF 6
RESIDENTIAL
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 4100-K
 2008 Edition



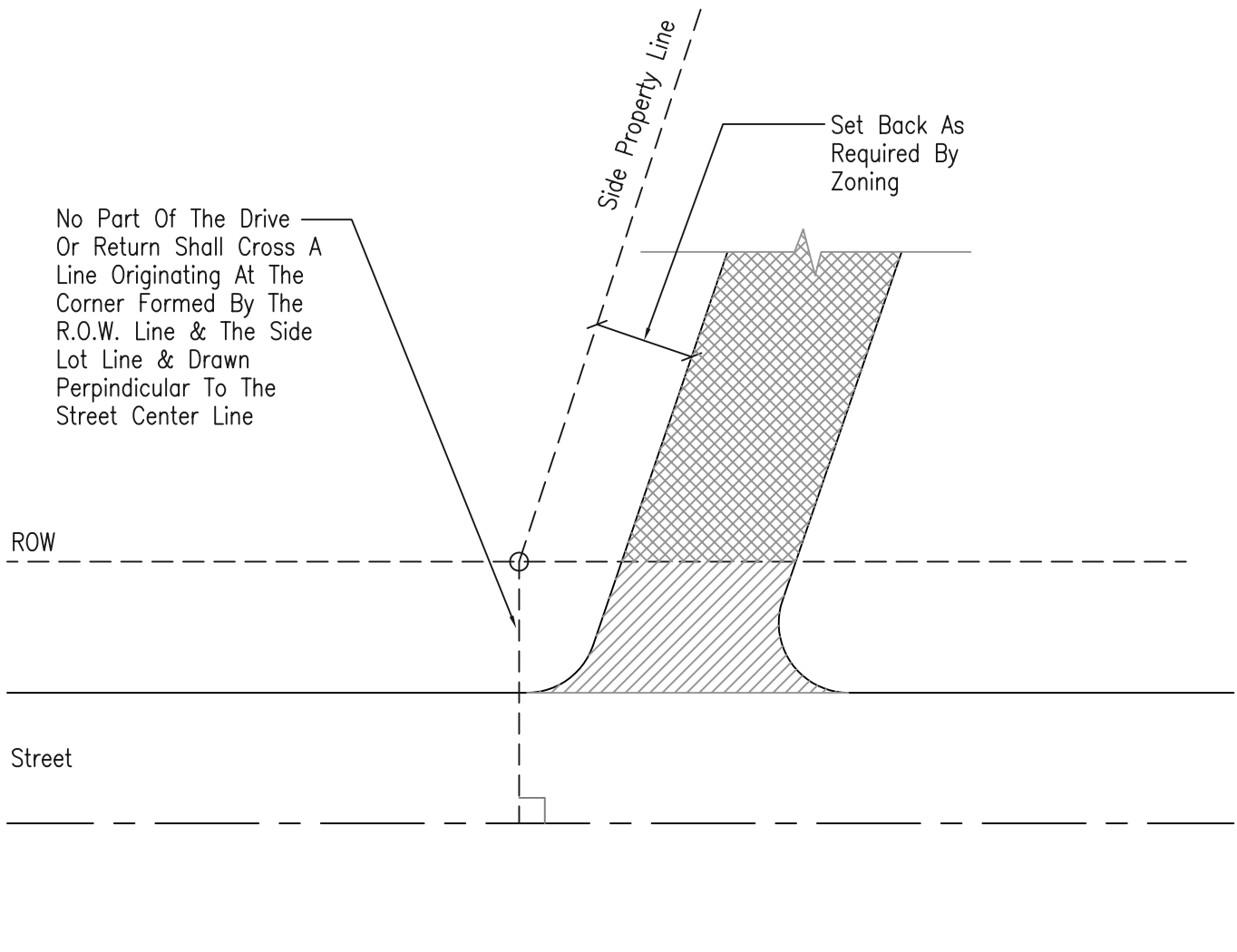
DRIVEWAY DIMENSIONS & MATERIALS, SHEET 4 OF 6
LONG DRIVEWAY ON RESIDENTIAL LOTS
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 4100-L
2008 Edition



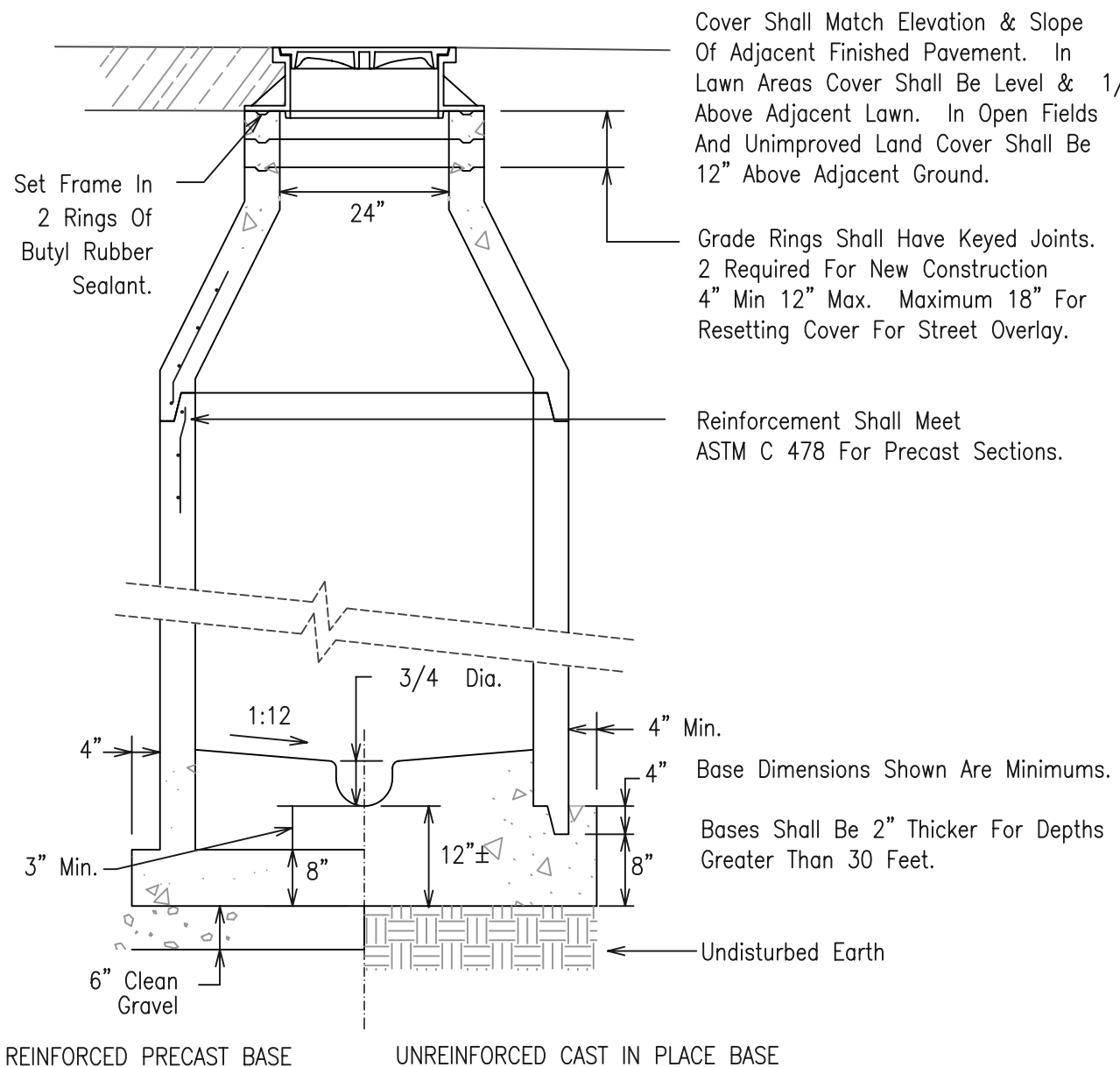
DRIVEWAY DIMENSIONS & MATERIALS, SHEET 5 OF 6
COMMERCIAL / INDUSTRIAL DRIVEWAY
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DRIVEWAY DIMENSIONS & MATERIALS, SHEET 6 OF 6
SIDE PROPERTY LINE SETBACK ALL DRIVEWAYS
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
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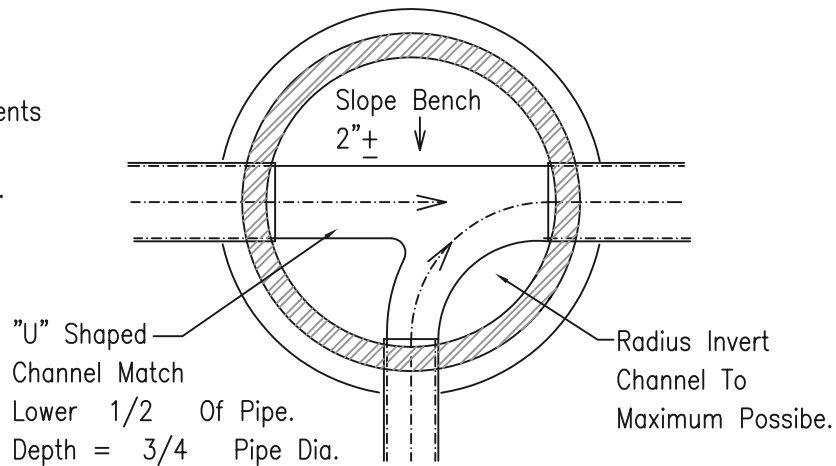
NOTES:

1. Risers, Cones & Grade Rings Shall Conform To ASTM C 478. Use Concentric Cones Unless Otherwise Directed.
2. All New Sanitary Manholes Shall Be Vacuum Tested.
3. Water Proofing Requirements: Apply Mastic Gasket Or Preformed Joint Material At Every Joint, Including Adjustment Rings. Two 6 Mil Coats Of External Damp Proofing Required. Apply Composite External Joint Waterproofing At Barrel and Adjustment Ring Joints. See Spec for Internal Damp Proofing Requirements. Grout Fill Lifting Holes.

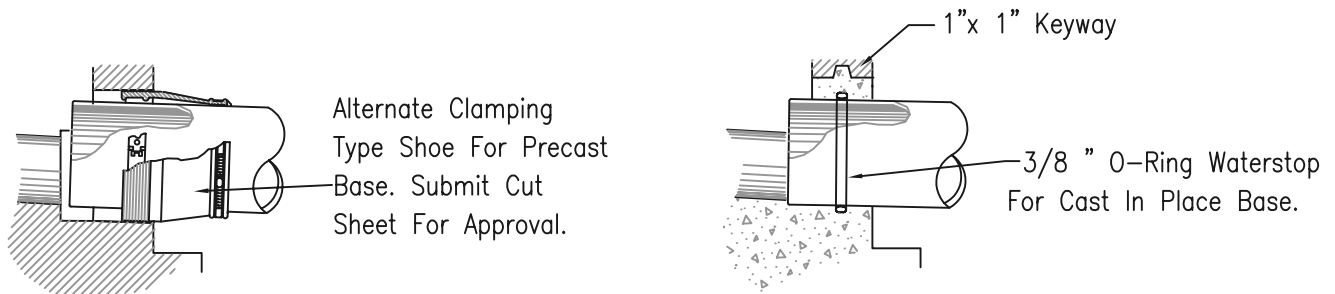
STANDARD MANHOLE DETAIL, SHEET 1 OF 3
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5000-A
 2008 Edition

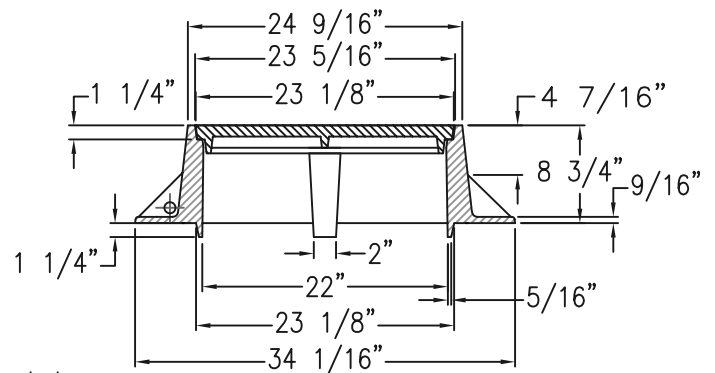
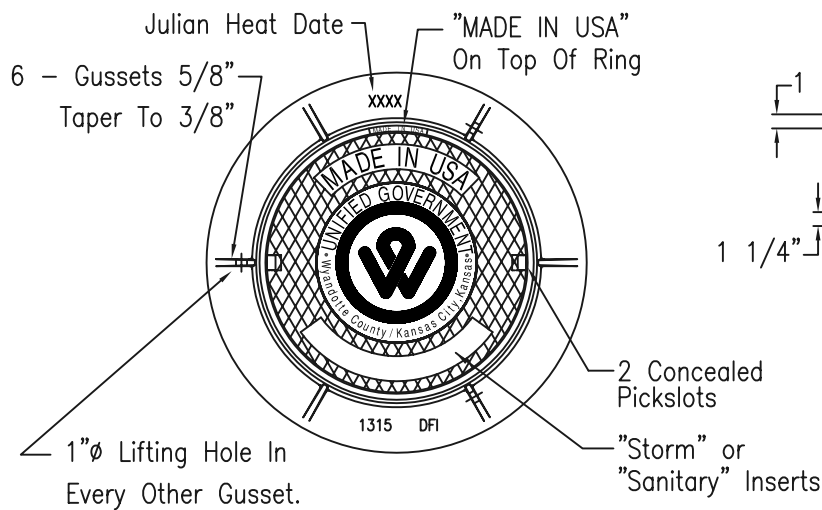
Invert Shaping Requirements
Apply To All Manholes,
Junction Boxes, & Inlets.



INVERT SHAPING



SANITARY SEWER PIPE JOINT WATERSTOP



NOTE:

- Furnished With Machined Horizontal Bearing Surface.
- Material: Gray Cast Iron ASTM A-48, Class 35B.
- Weight: Frame 225 Lbs.
Cover 135 Lbs.
- Finish: No Paint

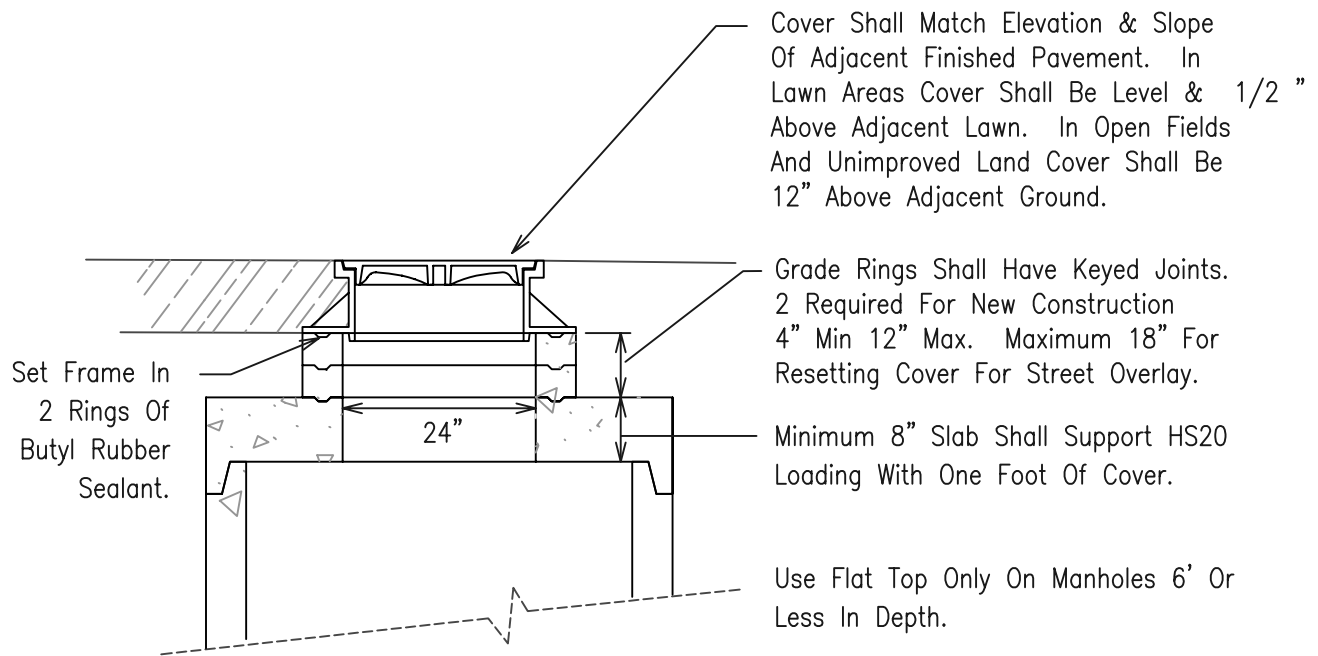
STANDARD MANHOLE COVER (SANITARY)

STANDARD MANHOLE DETAIL, SHEET 2 OF 3

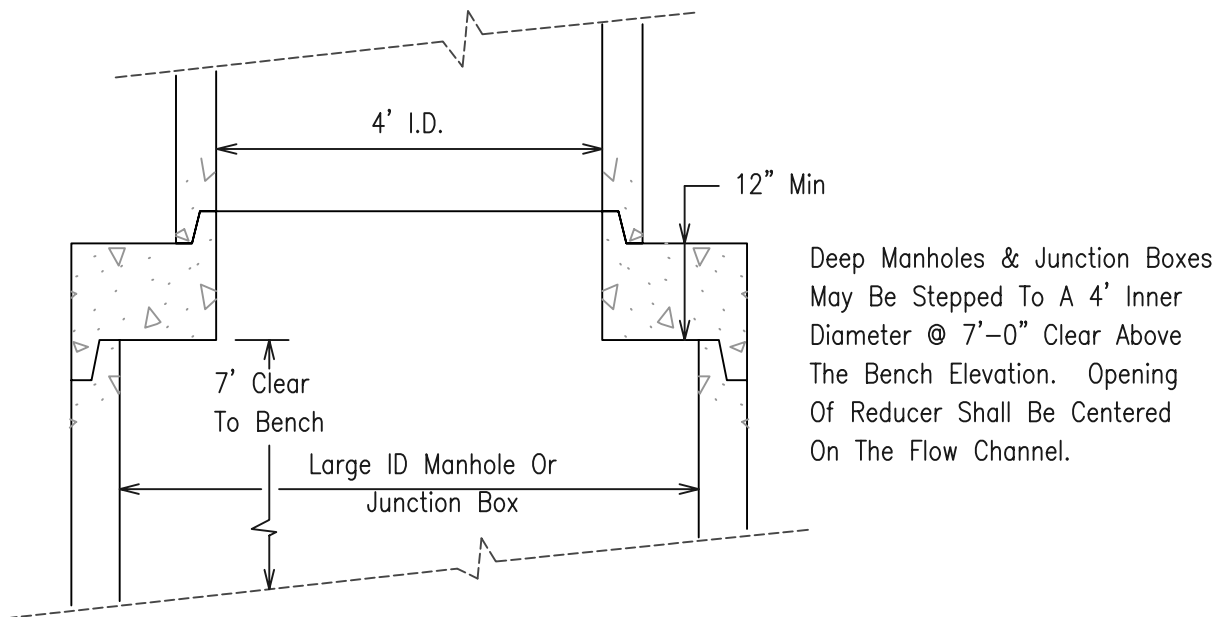
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 5000-B
2008 Edition



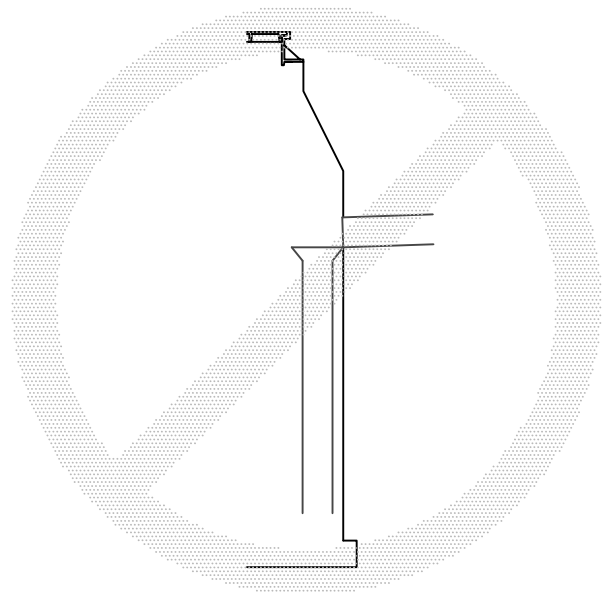
FLAT TOP MANHOLE, SHALLOW INSTALLATION



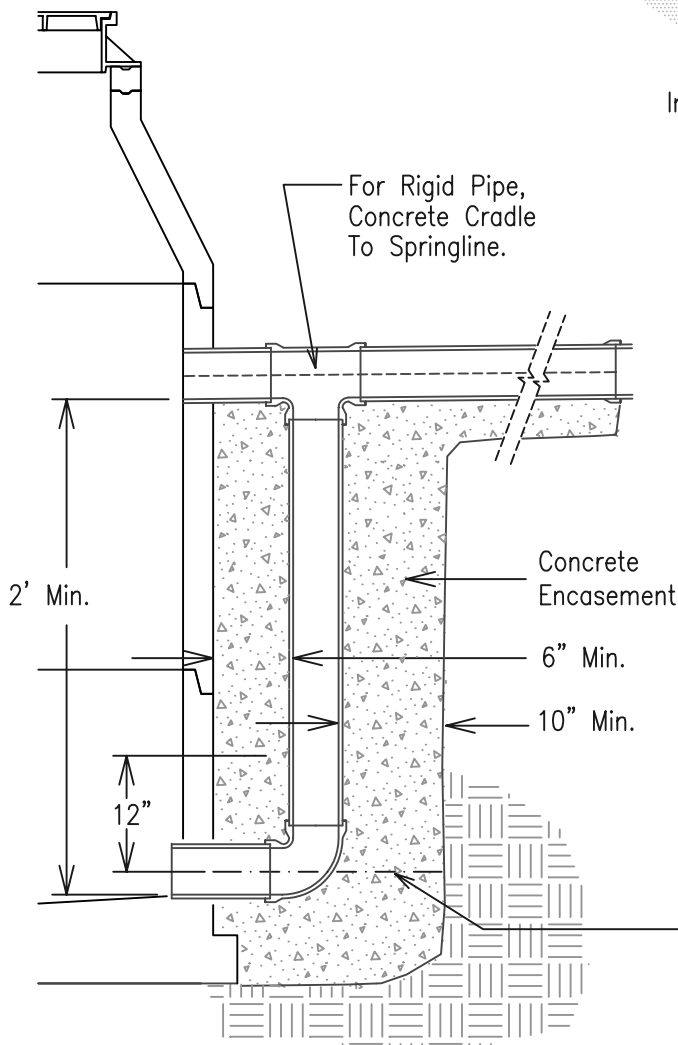
BARREL REDUCTION FOR DEEP MANHOLES

STANDARD MANHOLE DETAIL, SHEET 3 OF 3
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Inside Drops Are Not Allowed



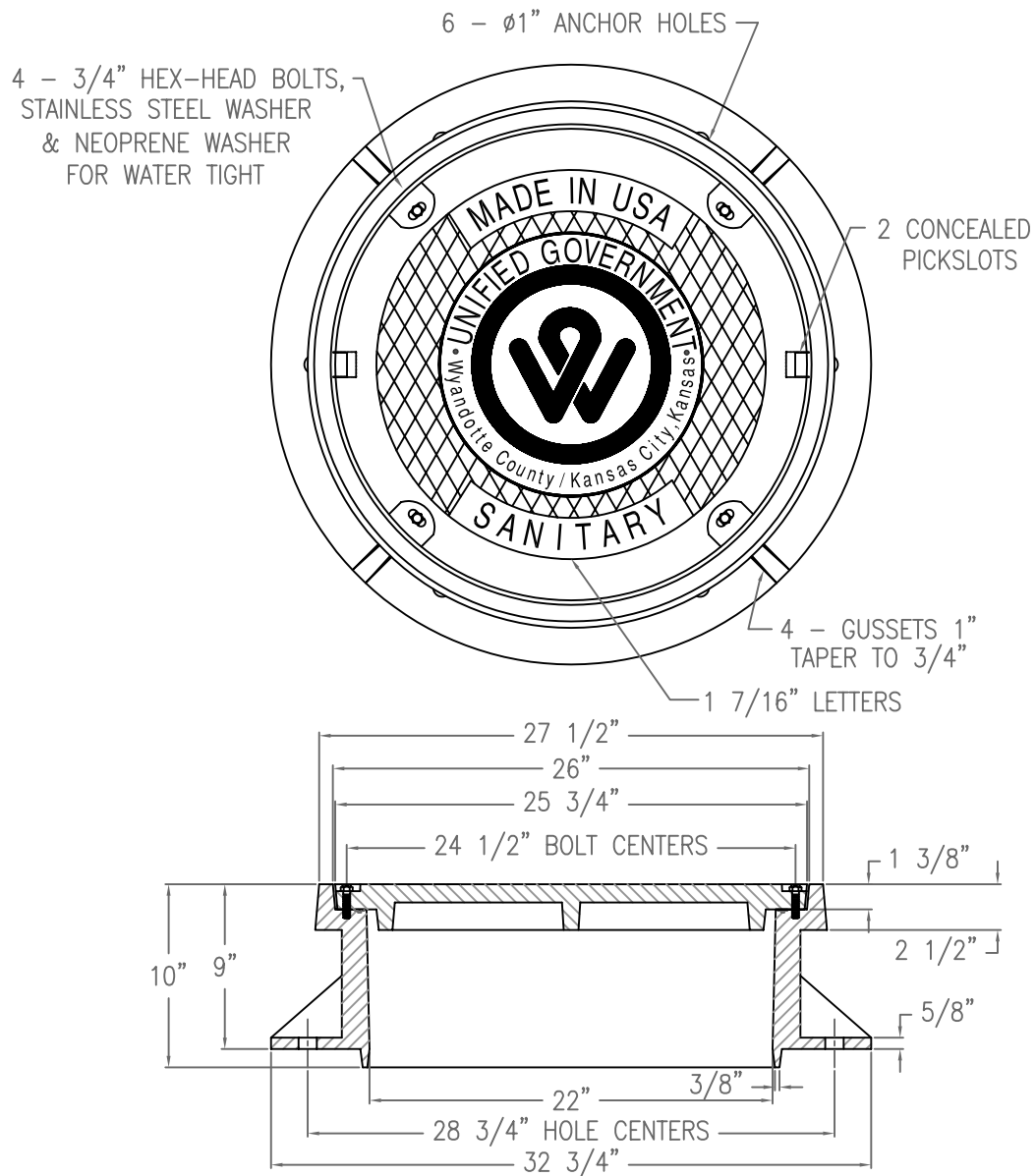
For Rigid Pipe,
Extend Cradle To 1st Joint
Past Point Where Trench
Reaches Allowable Width.

Drop Pipe Shall Be Same
Diameter & Material As Main.

Upper Limit for Encasement
for PVC Drop Pipe and Main
Remainder of Backfill Shall
Be Granular Material.

DROP MANHOLE DETAIL
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

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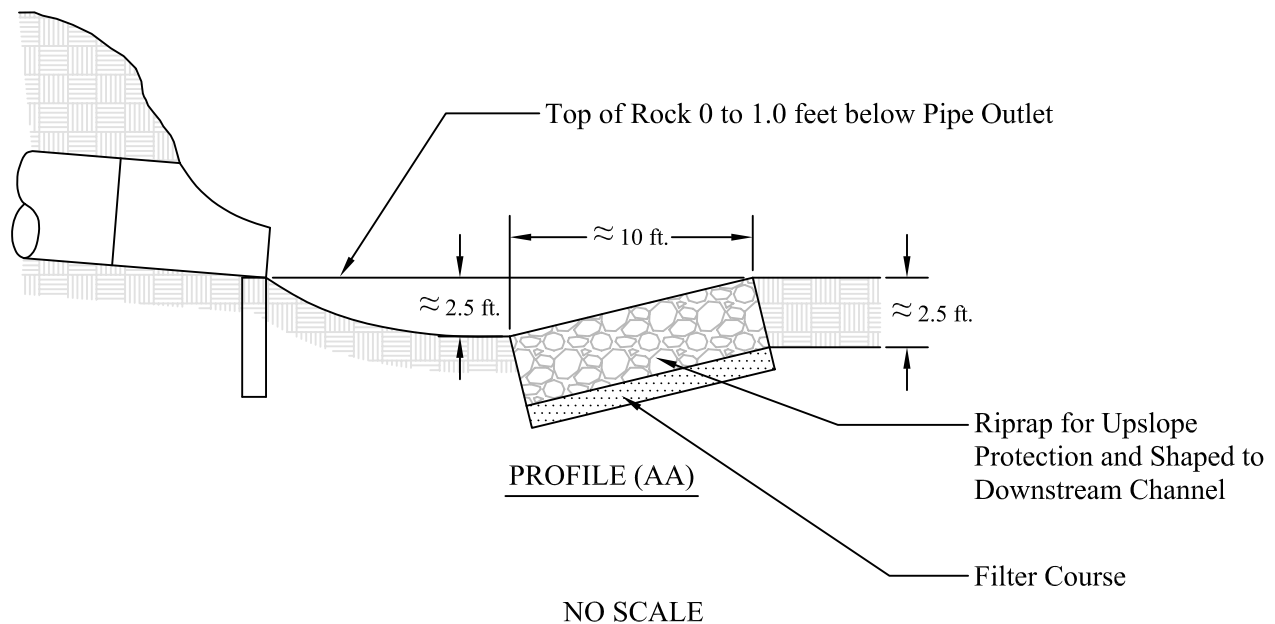
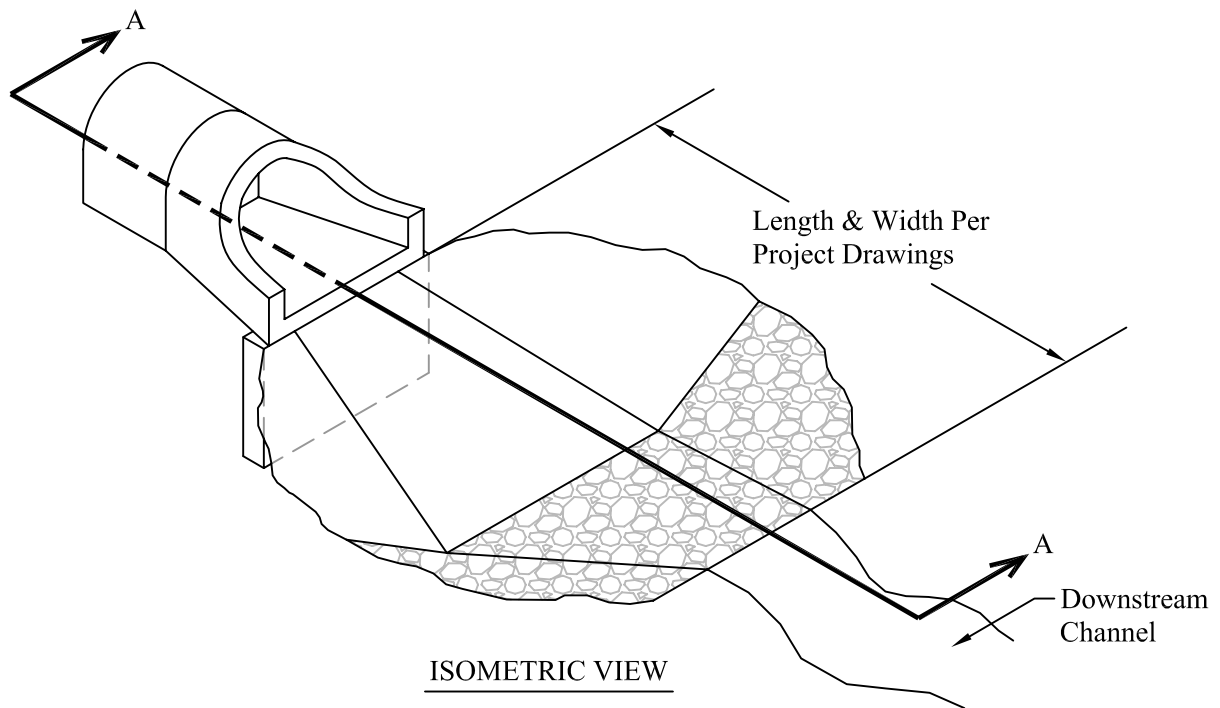
NOTES:

1. FURNISHED WITH MACHINED
HORIZONTAL BEARING SURFACE.
2. FURNISHED WITH T-GASKET.

MATERIAL:	CAST GRAY IRON ASTM A-48, CLASS 35B
FINISH:	NO PAINT
WEIGHT:	FRAME 310 LBS. COVER 195 LBS.

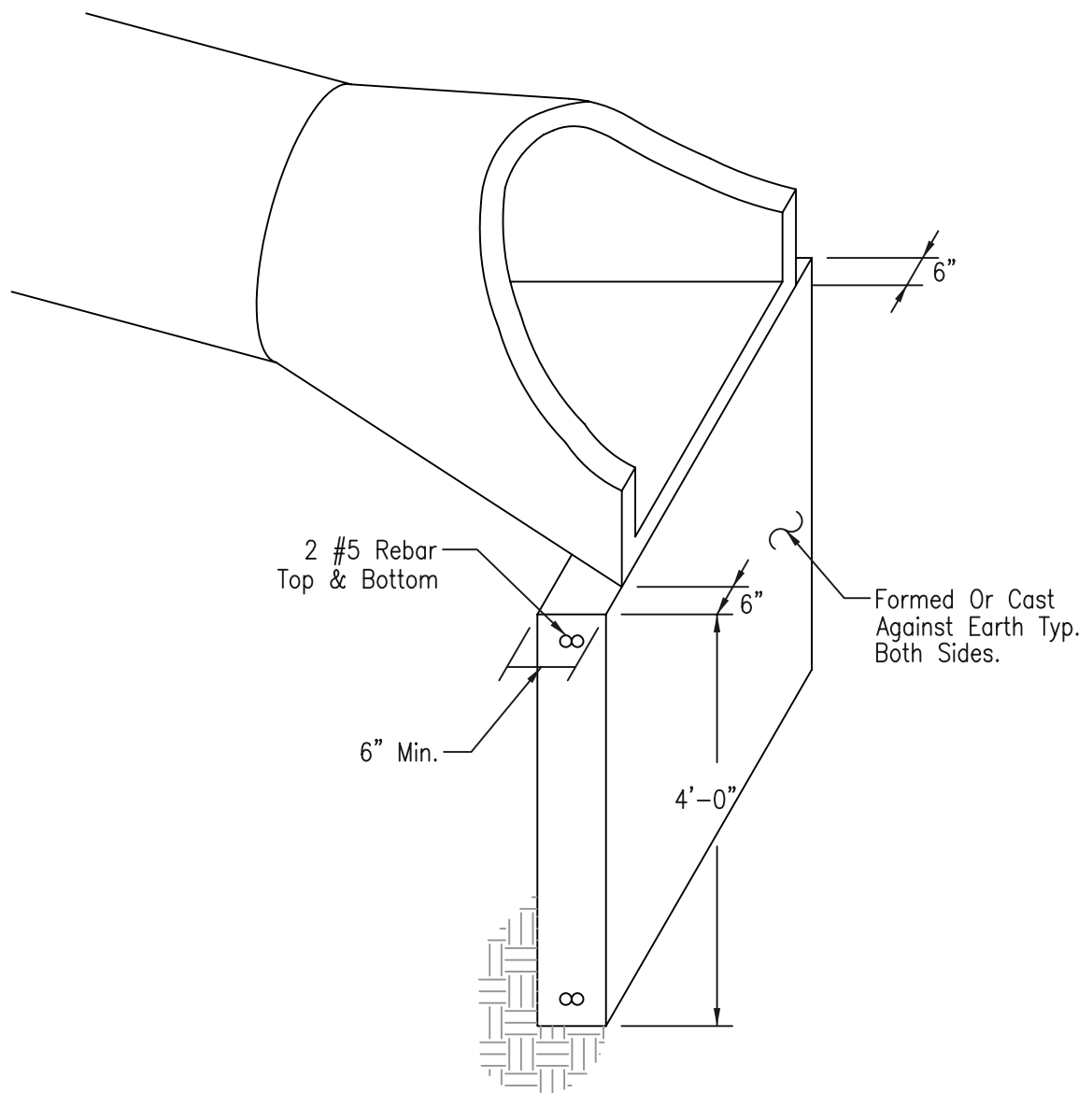
BOLT-DOWN MANHOLE DETAIL
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5000-E
2008 Edition



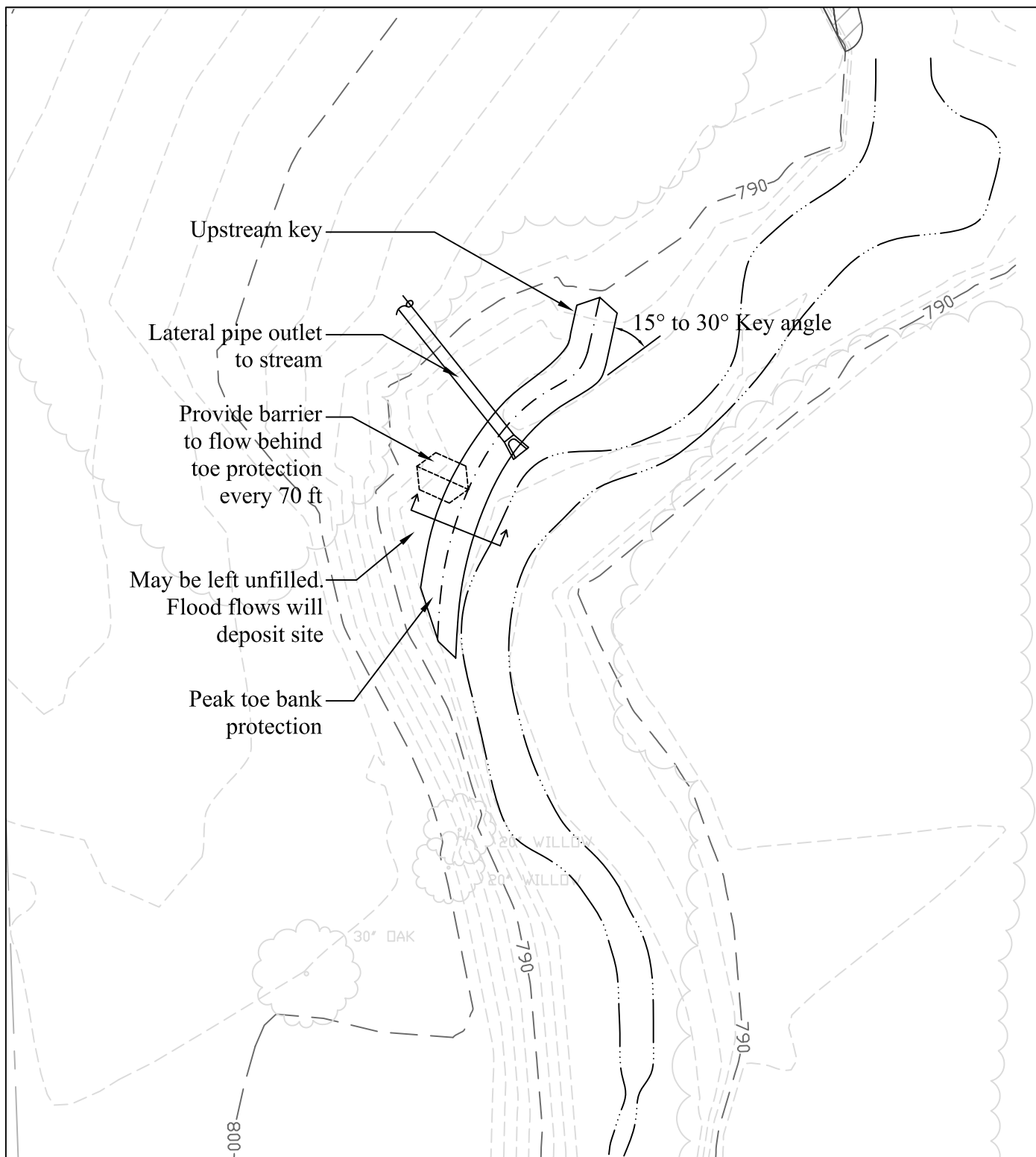
PLUNGE POOL FOR OUTLET IN LINE WITH STREAM
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5200-A
2008 Edition



TOE WALL FOR FLARED END SECTION
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5200-B
 2008 Edition

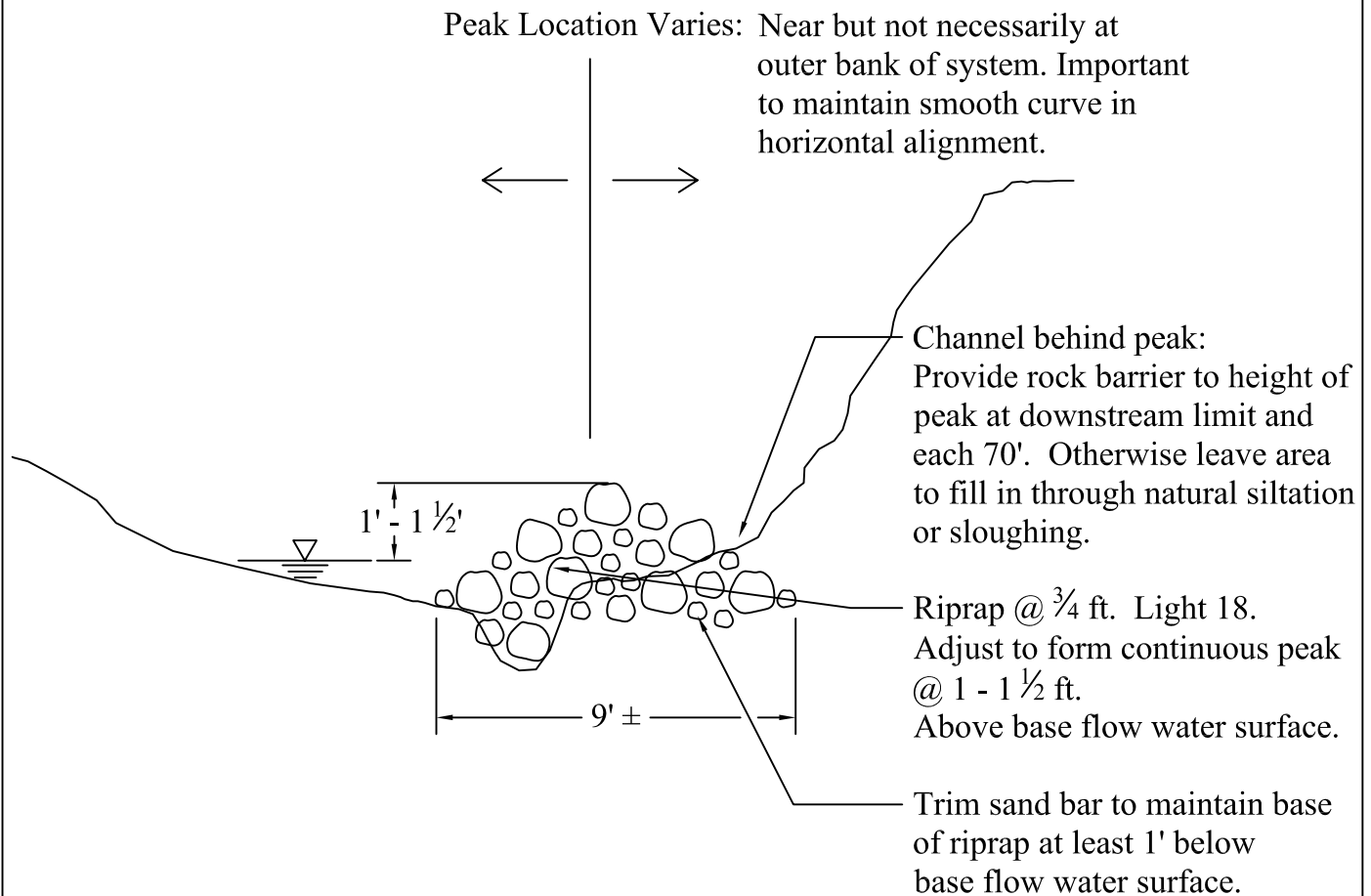


STORM SEWER OUTLET LATERAL TO STREAM, SHEET 1 OF 2
PLAN VIEW

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 5200-C
2008 Edition



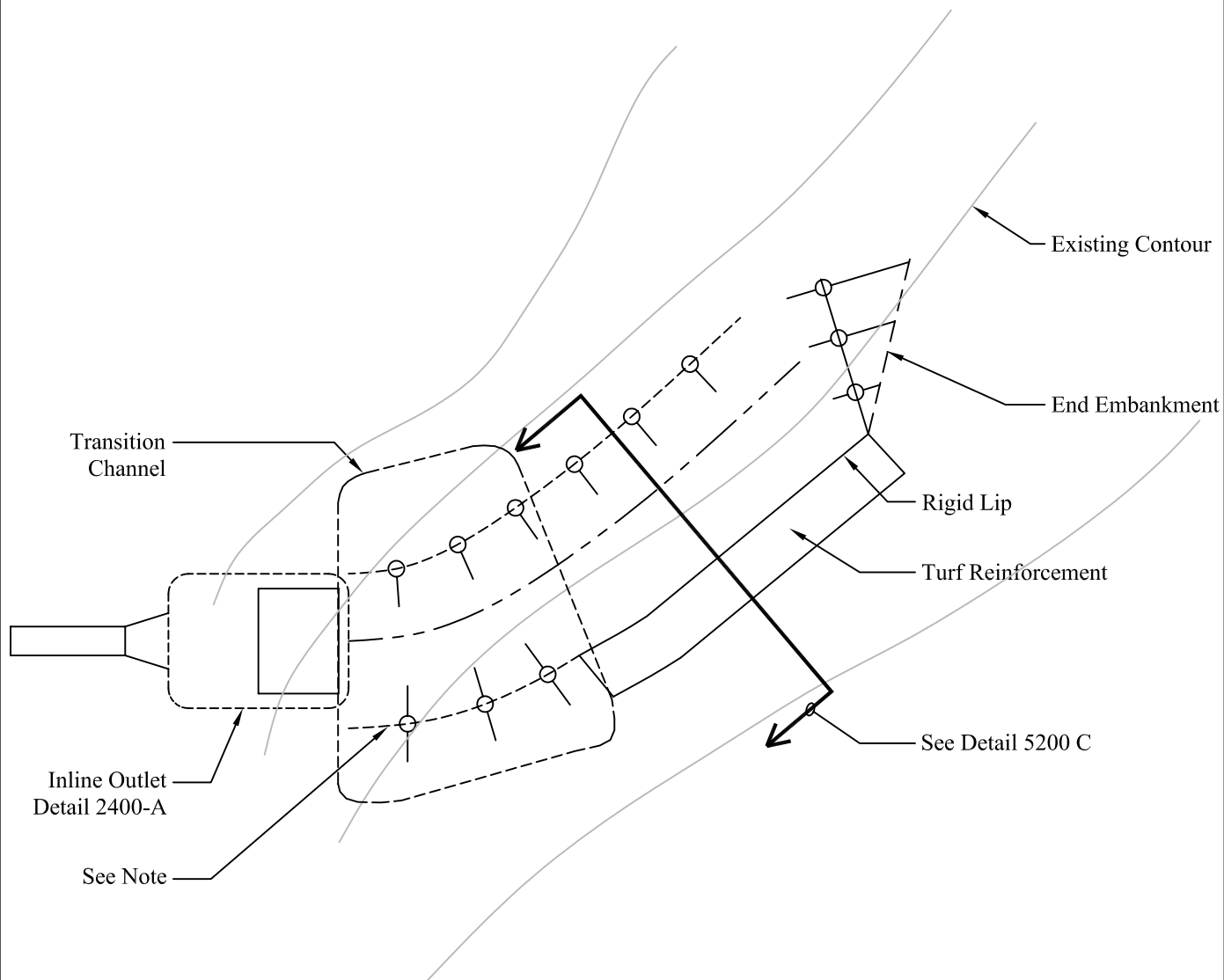
NO SCALE

STORM SEWER OUTLET LATERAL TO STREAM, SHEET 2 OF 2
TOE BANK PROTECTION

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UG 5200-D
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NOTE:

Top Bank Of Transition Channel & End Embankment
To Be A Minimum Of 6" Above Rigid Lip.

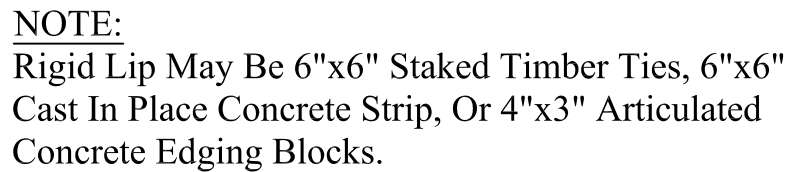
LEVEL SPREADER, SHEET 1 OF 2

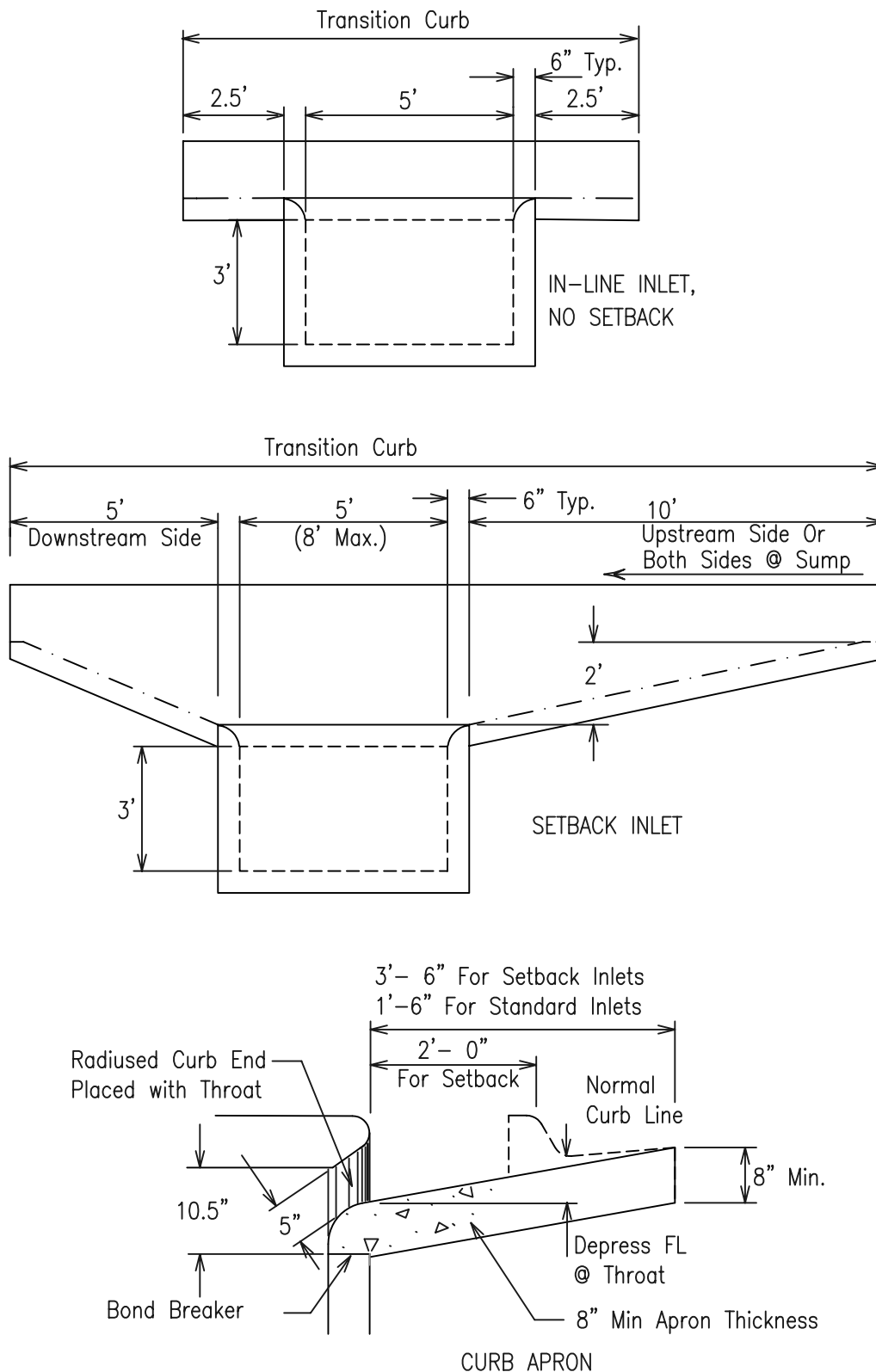
PLAN VIEW

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

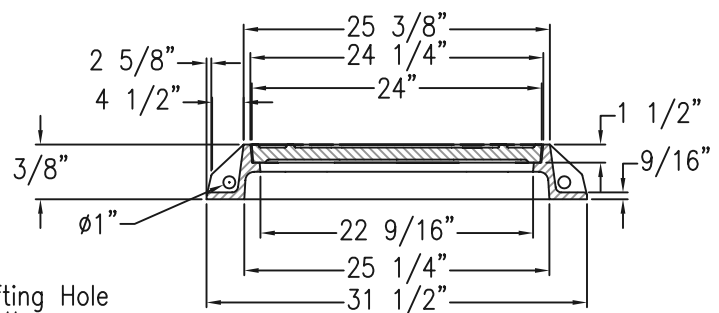
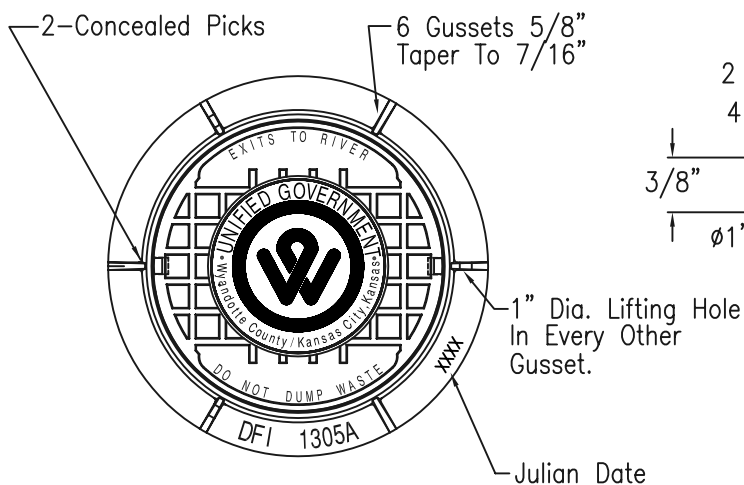
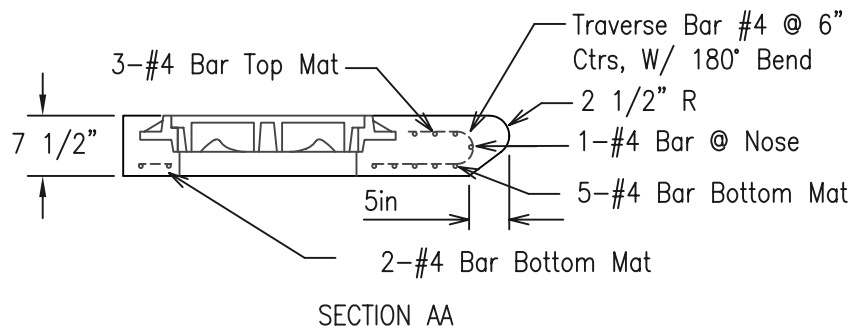
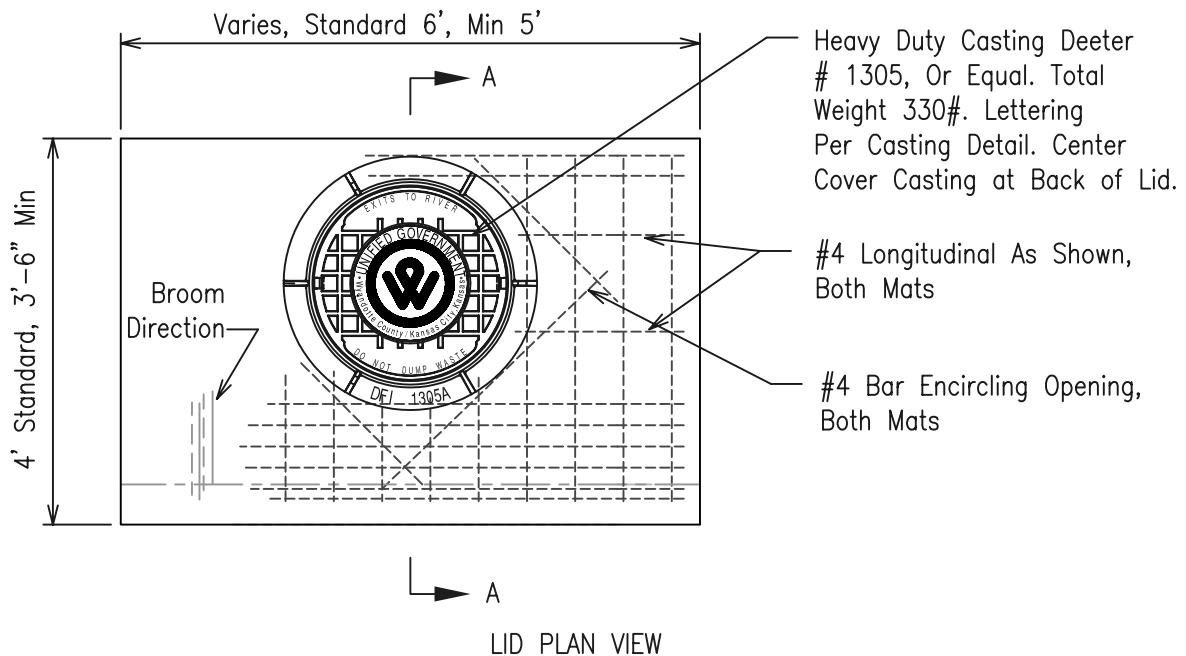
UG 5200-E
2008 Edition

UG 5200–F
2008 Edition



CURB INLET DETAIL, SHEET 1 OF 4
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5500-A
 2008 Edition



NOTE:

- Furnished With Machined Horizontal Bearing Surface.

Material: Gray Cast Iron ASTM A-48, Class 35B.

Weight: Frame 110 Lbs.
Cover 135 Lbs.

Finish: No Paint

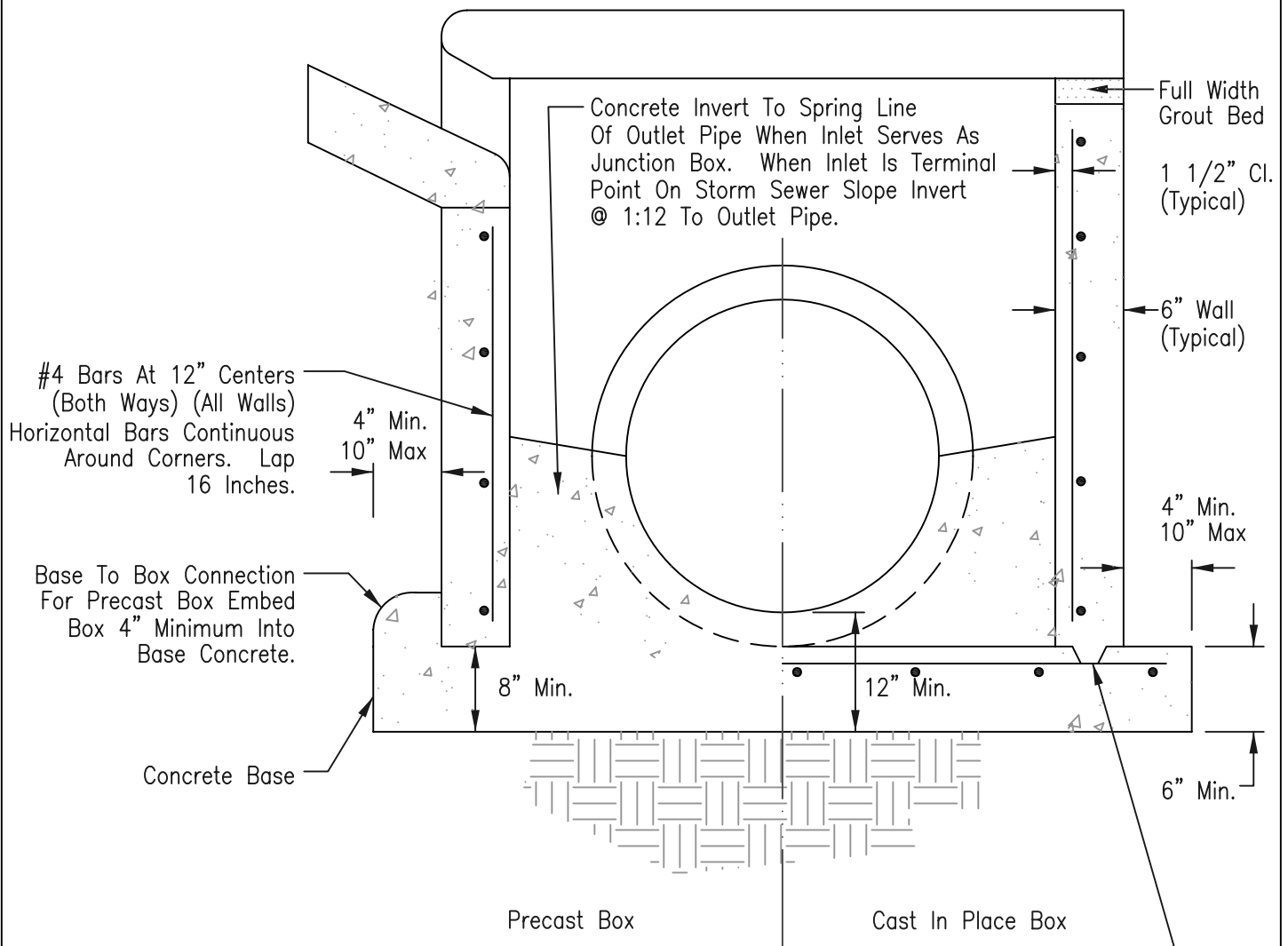
STANDARD CURB INLET CASTING (STORM)

CURB INLET DETAIL, SHEET 2 OF 4

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

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UG 5500-B
2008 Edition



NOTES:

For Street Grades Up To 4% Tip Precast Box To Match Street Grade. For Grades Greater Than 4% Order Box With Appropriate Slope Across Top.

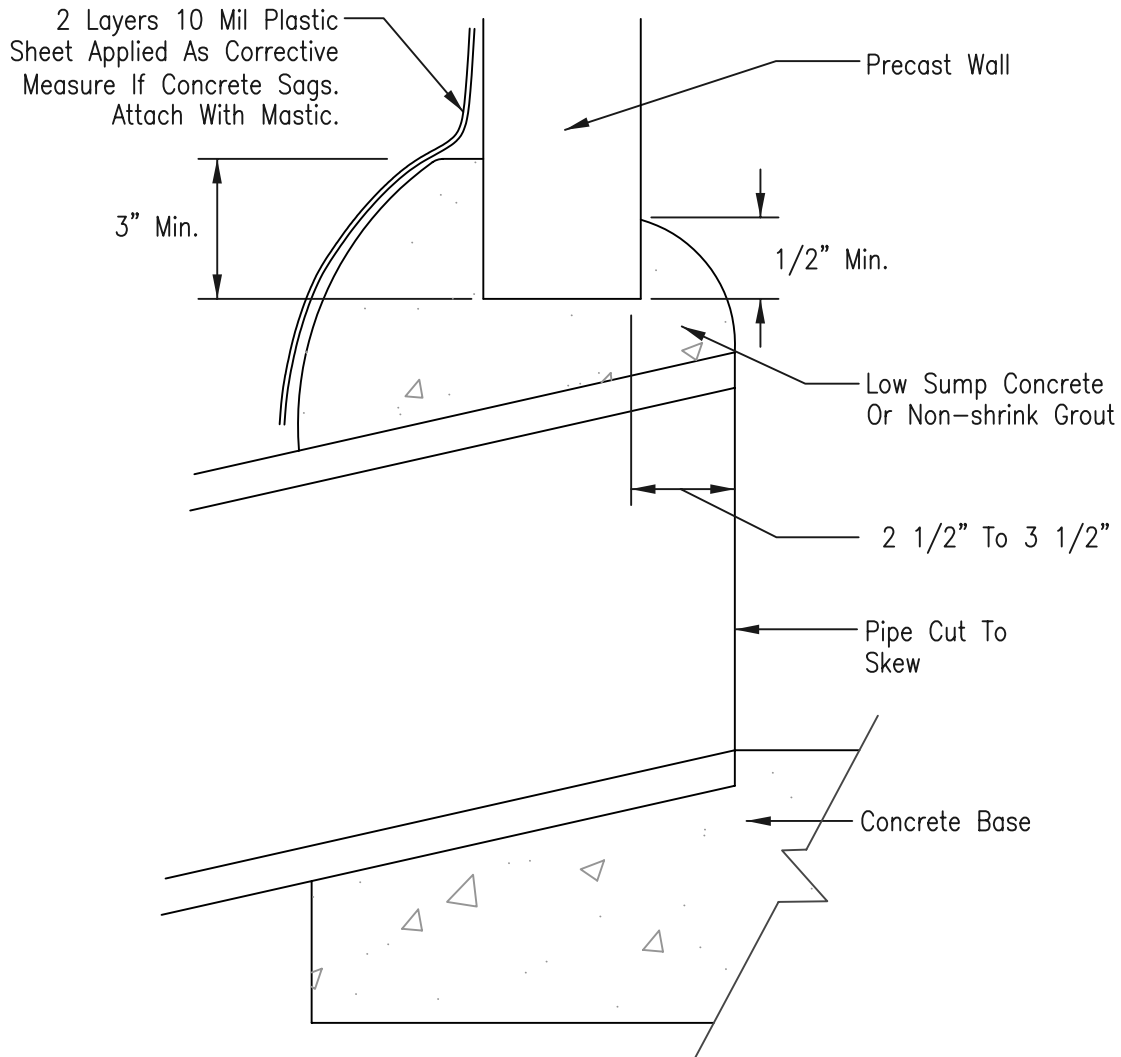
Precast Base May Be Used For Construction Of New Sewer Line But Shall Not Be Used For Replacement Of Existing Inlets.

Steps Not Required.

Base To Box Connection For Cast In Place
3 1/2" x 1 1/2" Keyway
(All Sides)

CURB INLET DETAIL, SHEET 3 OF 4
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5500-C
2008 Edition



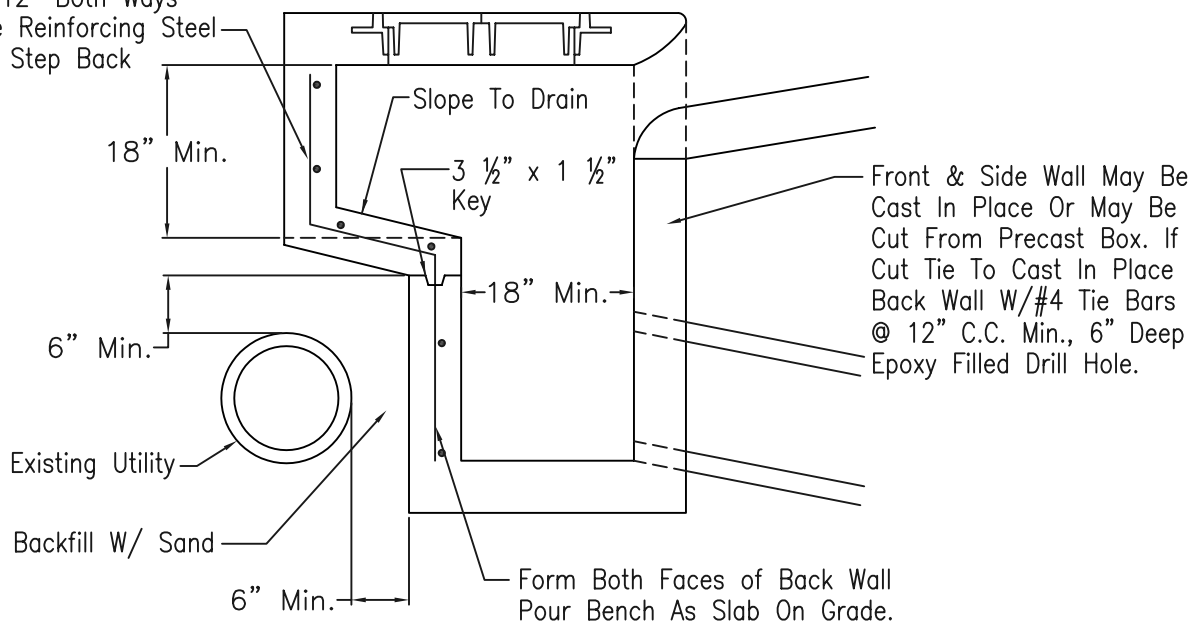
NOTES:

For Cast In Place Box, Place Pipe First &
Cast Wall To Fully Bond With Pipe.

CURB INLET DETAIL, SHEET 4 OF 4
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5500-D
2008 Edition

4 @ 12" Both Ways
Continue Reinforcing Steel
Through Step Back
Section.



NOTES:

See Curb Inlet Detail For Other Requirements.

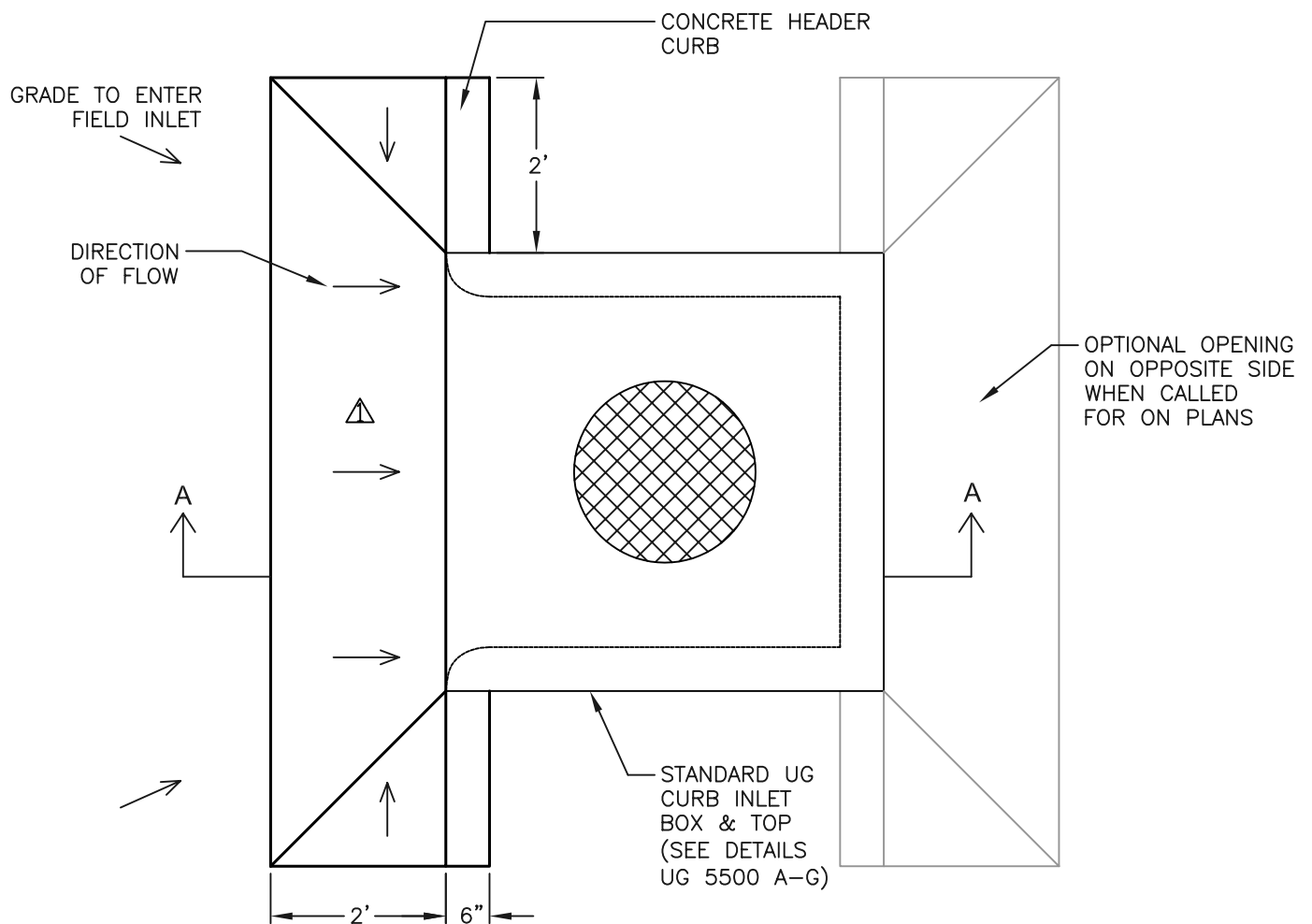
For Use Only When Approved By Engineer To Avoid Conflict With An Existing Utility.

STEPPED BOX DETAIL FOR CURB INLET

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

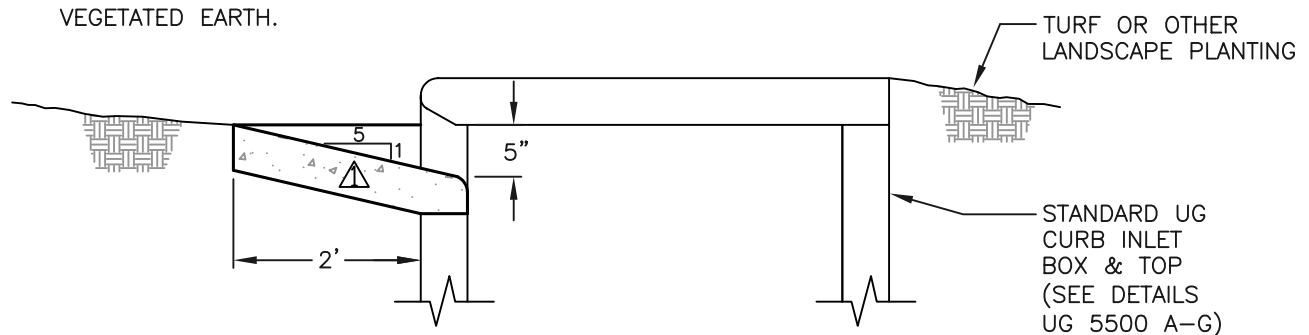
UNIFIED GOVERNMENT

UG 5500-E
2008 Edition



PLAN VIEW

NOTE: FIELD INLET IS A SIDE OPENING INLET LOCATED AWAY FROM PAVEMENT & SURROUNDED BY VEGETATED EARTH.



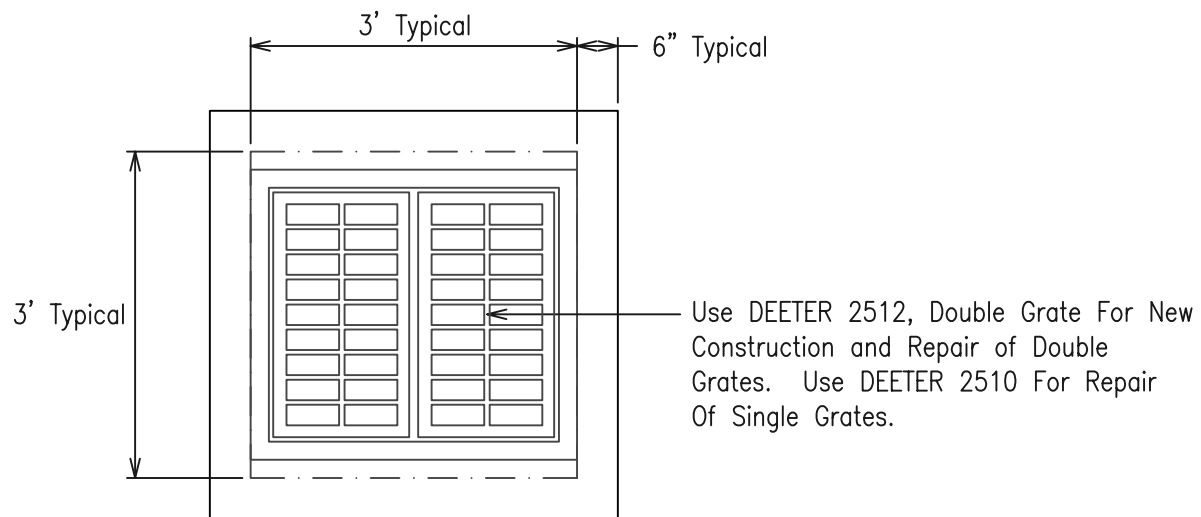
SECTION A-A

△ INSTALL CONCRETE THROAT IN ORIENTATION CALLED FOR ON PLANS

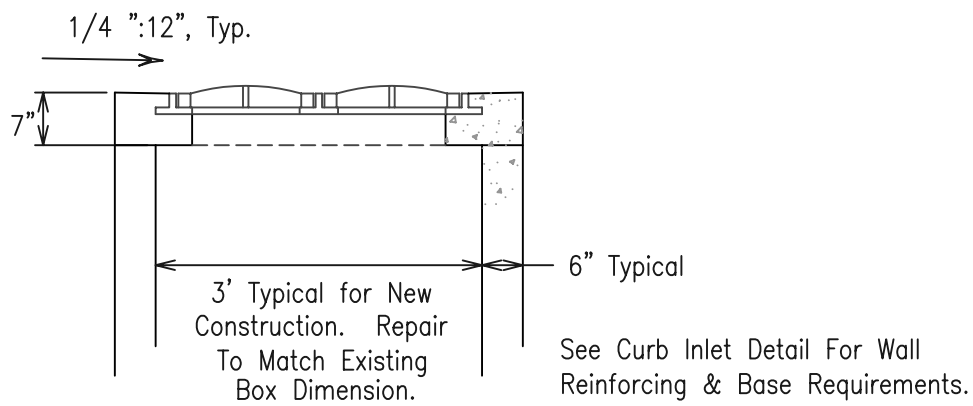
FIELD INLET

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5500-F
2008 Edition



PLAN VIEW



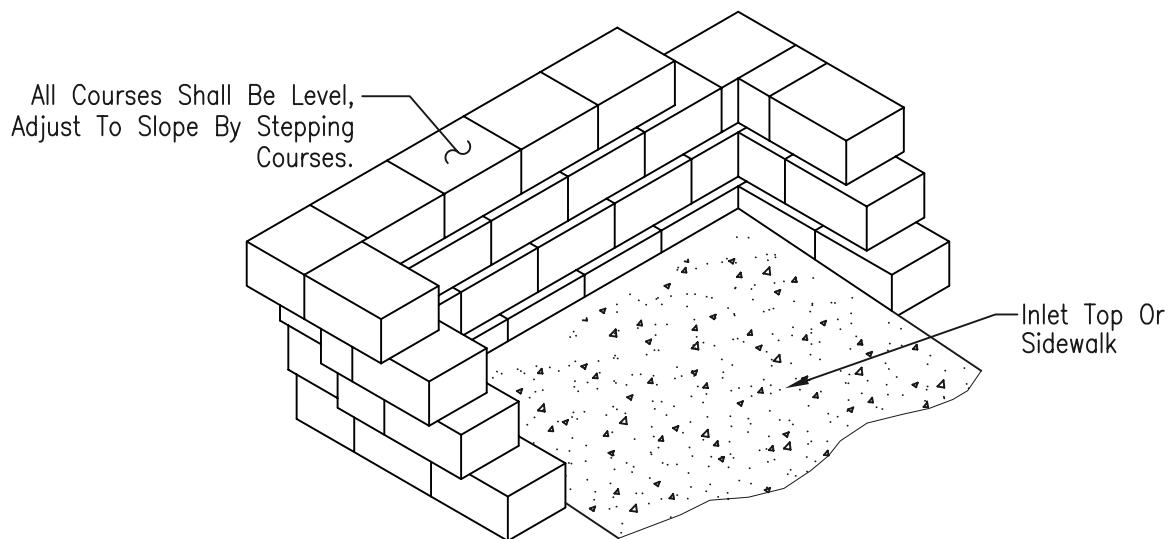
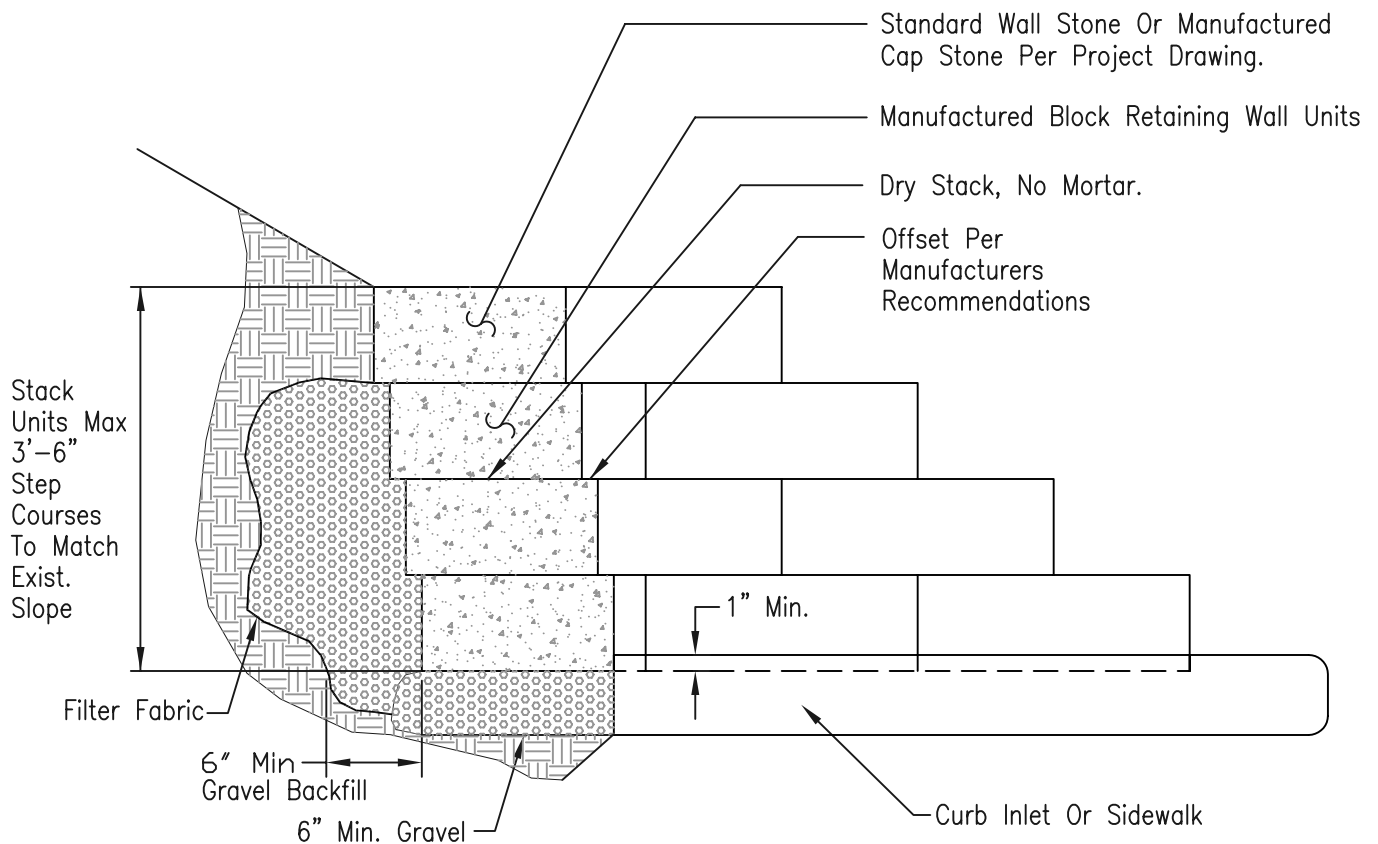
SECTION

NOTE:

Tops Cast Monolithic With Boxes
Are Acceptable.

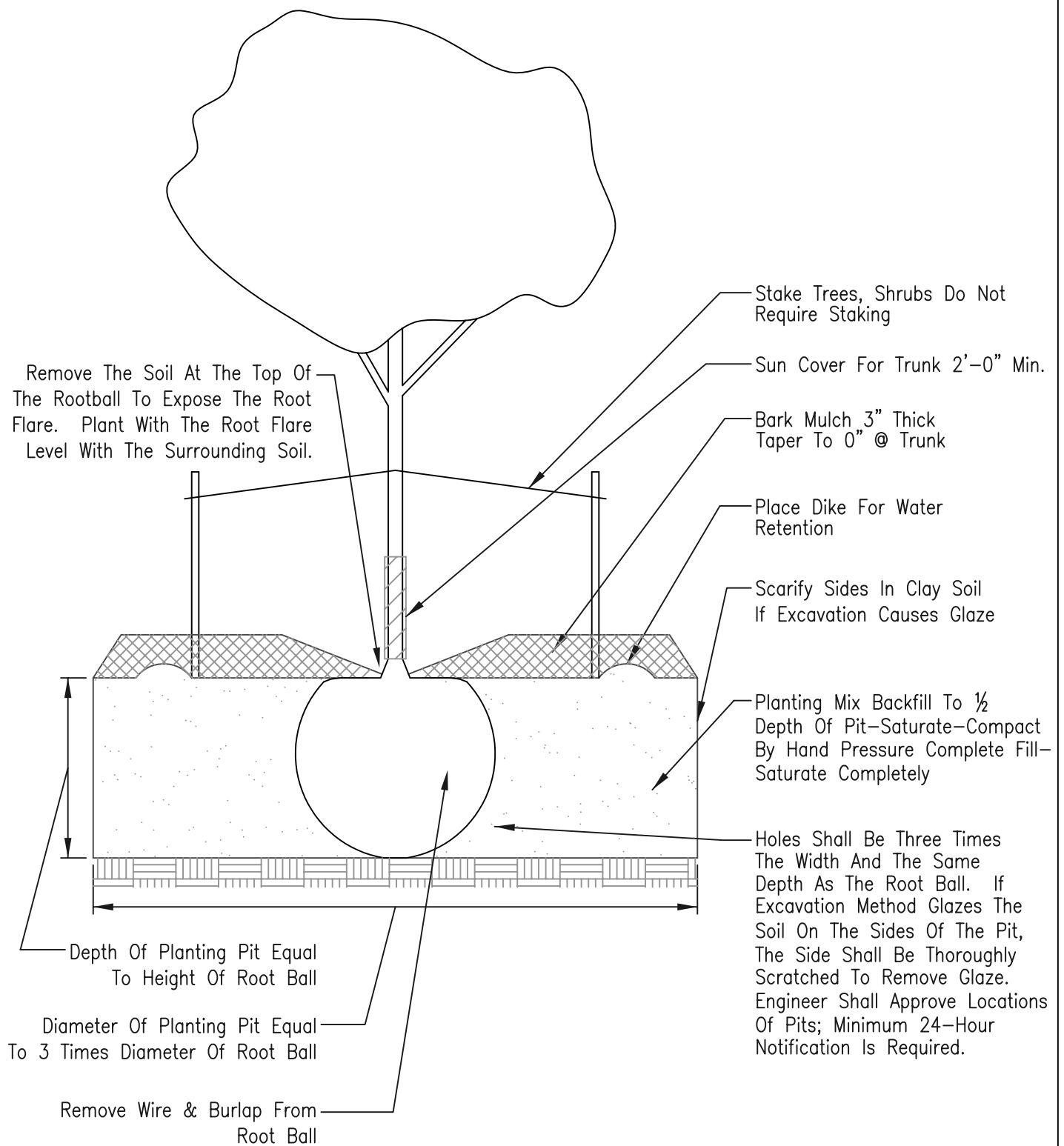
GRATED AREA INLET
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT

UG 5500-G
2008 Edition



**MANUFACTURED BLOCK RETAINING WALL
FOR USE WITH INLET OR SIDEWALK
PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION
UNIFIED GOVERNMENT**

UG 6500-A
2008 Edition



TREE PLANTING

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

UNIFIED GOVERNMENT

UG 7100-A
2008 Edition

LOG OF REVISIONS

TECHNICAL PROVISIONS SECTIONS

(All of the following changes were applied in April 2008.)

SECTION 1000 GENERAL REQUIREMENTS – Previous version was September 2006

- 1.06 SUBMITALS, B – Revised
- 1.12 NOTICE OF CONSTRUCTION – Added
- 3.03 PHOTOGRAPHIC RECORD – Revised
- Attachment 1000-A FLYER FOR ADJACENT OWNER NOTIFICATION – Moved from UG 1000-C and revised from March 2006 version

SECTION 1300 TRAFFIC CONTROL – Previous version was March 2003

- 1.04 ROAD CLOSURE PERMITS – Revised

SECTION 1400 CONSTRUCTION PERIOD POLLUTION PREVENTION

This entire section underwent extensive revision from March 2003 version

SECTION 1500 INSPECTION OF LAND DEVELOPMENT – Previous version was July 2007

- 1.13 MAINTENANCE BOND – Revised
- 3.03 INSPECTION FIRM'S OBSERVATIONS AND TESTS – Revised
- 3.03 INSPECTION FIRM'S OBSERVATIONS AND TESTS, H – Revised
- Attachment 1500-A MAINTENANCE BOND – Moved from UG 1500-A and revised from August 2005 version

SECTION 2300 BLASTING – Previous version was March 2003

- 1.04 PREBLAST SURVEY, second paragraph – Revised

SECTION 2400 RIPRAP AND GABIONS – Previous version was December 2006

- 2.02 GROUT FOR RIPRAP – Deleted
- 2.04 ROCK FOR GABIONS – Revised
- 3.01 RIPRAP, first paragraph – Revised
- 3.01 RIPRAP, B – Revised
- 3.01 RIPRAP, C – Revised

SECTION 3000 PLANT MIX ASPHALT – Previous version was April 2005

- 1.02 RELATED WORKS – Revised
- 2.03 ASPHALT PAVING MIXTURES – Revised
- 2.04 AMENDED MIXTURE FOR HIGH VOLUME ROADS – Added

SECTION 4000 CONCRETE MATERIALS AND METHODS – Previous version was March 2007

- 2.03 CONCRETE MIXES, C – Revised
- 3.03 HOT WEATHER CONCRETING – Revised
- Attachment 4000-A CONCRETE MIXES TABLE – Added

SECTION 4100 CONCRETE PAVEMENT AND FLATWORK – Previous version was May 2007

- 2.02 EXPANSION JOINTS, C – Revised
- 2.02 EXPANSION JOINTS, D – Deleted
- 2.03 DETECTABLE WARNING – Revised
- 3.05 CONTRACTION AND CONTROL JOINTS, A – Revised
- 3.05 CONTRACTION AND CONTROL JOINTS, C – Added

SECTION 4200 CONCRETE STRUCTURES – Previous version was March 2003

- 2.01 CASTINGS - Revised

SECTION 5100 SANITARY SEWER MAIN – Previous version was March 2006

- 1.03 FEES AND PERMITS, A – Revised
- 1.03 FEES AND PERMITS, B – Revised
- 1.03 FEES AND PERMITS, D – Added
- 1.05 KDHE REQUIREMENTS – Revised
- 2.01 SANITARY SEWER PIPE FOR GRAVITY MAINS, B – Revised
- 2.02 SANITARY SEWER SERVICE LINES – Added
- 2.08 PIPE MATERIAL FOR SPOT REPAIR – Revised
- 3.05 SERVICE LINES – Revised
- 3.11 TIGHTNESS TESTING, B – Revised
- 3.11 TIGHTNESS TESTING, E – Added
- Attachment 5100-A KDHE POLICIES FOR SEPARATION OF WATER MAINS
AND SEWERS – Added

SECTION 5200 STORM SEWER – Previous version was March 2003

- 2.01 STORM SEWER AND CULVERT PIPE, B. Corrugated Metal Pipe – Deleted
- 2.01 STORM SEWER AND CULVERT PIPE, B. HDPE – Revised

SECTION 5300 CURED-IN-PLACE PIPE – Previous version was March 2003

- 1.05 PREQUALIFICATIONS – Revised
- 3.03 SPOT REPAIRS, C – Added
- 3.05 PLACEMENT AND CURING, B. Installation by Pulled-in-Place... – Deleted

SECTION 5350 PIPE BURSTING AND PIPE REAMING – Previous version was March 2003

- This entire section was – deleted

SECTION 5400 LINING EXISTING MANHOLE – Previous version was March 2003

- 2.02 LINER MATERIAL, A – Revised

SECTION 5500 STORM SEWER INLETS – Previous version was September 2006

- 1.06 NOMENCLATURE, B. Radiused Catch Basin – Deleted

SECTION 6000 GUARDRAILS – Previous version was March 2003

- 1.04 STORAGE OF GALVANIZED MATERIAL – Revised
- 2.01 GUARDRAIL PLATES – Revised
- 2.02 POSTS – Revised
- 2.03 CORROSION PROTECTION – Revised
- 2.04 FIELD PRESERVATIVE – Revised
- 2.05 POST BACKFILL – Revised
- 3.01 GENERAL – Revised

SECTION 6200 UNIT PAVERS – Previous version was March 2003

Section title changed to “UNIT PAVERS” from “PRECAST CONCRETE PAVERS”

- 1.02 RELATED WORK – Revised
- 2.02 JOINT SAND and 2.03 BEDDING MATERIALS – created by splitting and revising 2.02 BEDDING AND JOINT SAND

SECTION 6300 CHAIN LINK FENCE – Previous version was March 2003

- 1.01 SCOPE – Revised

SECTION 6500 MODULAR BLOCK RETAINING WALL SYSTEM – Previous version was March 2003

- 2.01 MATERIALS, C – Revised

SECTION 7000 SEEDING, SODDING, AND MULCHING

This entire section underwent extensive revision from March 2003 version

SECTION 7100 TREES AND SHRUBS – Previous version was March 2003

- 2.04 PLANTING SOIL – Revised

STANDARD DETAILS

UG 1000-A Project Sign – April 2008

Revised September 2006 version

UG 1400-A Construction Vehicle Entry – April 2008

Revised March 2003 version

UG 1400-B Steep Slope Protection – April 2008

Replaced UG 1400-B Diversion Dike/Ditch & Silt Fence Installations Erosion Control Slope Protection

UG 1400-C Diversion Dike

UG 1400-D Compost Berm And Compost Stock

UG 1400-E Silt Fence Installation

UG 1400-H Rope Barrier

UG 1400-I Sediment Basin Outlet, Sheet 1 of 2

UG 1400-J Sediment Basin Outlet, Sheet 2 of 2

UG 1400-K Sediment Trap Outlet

(1400-C, D, E, H, I, J, & K added – April 2008)

UG 1400-F Slope Drain – April 2008
Renumbered, (formerly UG 1400-C) and revised from March 2003 version

UG 1400-G Minimum Erosion Control For Single Family Residential Lot – April 2008
Renumbered, (formerly UG 1400-D) and revised from March 2003 version

UG 2100-C Platform For Exposed Pipe Installation – April 2008
Revised September 2006 version

UG 2250-A Asphalt Pavement Patch, All Classifications, Age 5 Years Or Less – April 2008
Deleted

UG 2250-A Asphalt Pavement Patch – April 2008
Renumbered, (formerly UG 2250-B)

UG 2250-B Pavement Patch In Failed Pavements – April 2008
Renumbered, (formerly UG 2250-C)

UG 2250-C Concrete Pavement Patch – April 2008
Renumbered, (formerly UG 2250-D)

UG 2250-D Patch Merging – Case 1 – April 2008
Renumbered, (formerly UG 2250-E)

UG 2250-E Patch Merging – Case 2 – April 2008
Renumbered, (formerly UG 2250-F)

UG 2400-B Standard Culvert & Stormsewer Outlet Pipe Perpendicular To Receiving Channel – April 2008
Deleted

UG 4100-A Concrete Pavement Joint Details – April 2008
Revised March 2003 version

UG 4100-C Curb And Gutter Sections – April 2008
Revised July 2006 version

UG 4100-D Curb And Gutter Installation (Asphalt Streets) – April 2008
Revised March 2004 version

UG 4100-H ADA Typical Curb Ramp Section
UG 4100-I ADA New Construction – Large Returns
UG 4100-J ADA Reconstruction – Small Returns – All Elevation Change
UG 4100-K ADA Reconstruction – Small Returns – Small Elevation Change
UG 4100-L ADA Mid-Block Ramps
(4100-H through L where deleted – April 2008)

UG 4100-F ADA Ramp For New Construction – April 2008
Added

UG 4100-G Driveway Layout – Sheet 1 of 2 – General – April 2008
Renumbered, (formerly UG 4100-F) and revised from July 2006 version

UG 4100-H Driveway Layout – Sheet 2 of 2 – For ADA Accessibility – April 2008
Renumbered, (formerly UG 4100-G)

UG 4100-I Driveway Dimensions & Materials – Sheet 1 of 6 – Construction Entrance – April 2008
Renumbered, (formerly UG 4100-N)

UG 4100-J Driveway Dimensions & Materials – Sheet 2 of 6 – Field Entrance – April 2008
Renumbered, (formerly UG 4100-M)

UG 4100-K Driveway Dimensions & Materials – Sheet 3 of 6 – Residential – April 2008
Renumbered, (formerly UG 4100-O) and revised from July 2006 version

UG 4100-L Driveway Dimensions & Materials – Sheet 4 of 6 – Long Driveway, Residential – April 2008
Renumbered, (formerly UG 4100-P) and revised from July 2006 version

UG 4100-M Driveway Dimensions & Materials – Sheet 5 of 6 – Commercial/Industrial – April 2008
Renumbered, (formerly UG 4100-R)

UG 4100-N Driveway Dimensions & Materials – Sheet 6 of 6 – Side Property Line Setback – April 2008
Renumbered, (formerly UG 4100-Q)

UG 5000-A Standard Manhole Detail, Sheet 1 of 3 – April 2008
Revised March 2003 version

UG 5000-D Drop Manhole Detail – April 2008
Revised March 2003 version

UG 5200-A Plunge Pool For Outlet In Line With Stream – April 2008
Renumbered, (formerly UG 2400-A) and revised from March 2003 version

UG 5200-B Toe Wall For Flared End Section – April 2008
Renumbered, (formerly UG 5200-A)

UG 5200-C Storm Sewer Outlet Lateral To Stream – Sheet 1 of 2 – Plan View – April 2008
Renumbered, (formerly UG 2400-C)

UG 5200-D Storm Sewer Outlet Lateral To Stream – Sheet 2 of 2 – Toe Bank Protection – April 2008
Renumbered, (formerly UG 2400-D)

UG 5200-E Level Spreader – Sheet 1 of 2 – Plan view – April 2008
Added

UG 5200-F Level Spreader – Sheet 2 of 2 – Rigid Lip Cross Section – April 2008
Added

Revised April 2008

UG 5500-E Stepped Box Detail For Curb Inlet – April 2008
Renumbered, (formerly UG 5500-F)

UG 5500-F Field Inlet – April 2008
Renumbered, (formerly UG 5500-H) and revised from September 2006 version

UG 5500-G Alternate Precast Inlet Box – April 2008
Deleted

UG 5500-G Grated Area Inlet – April 2008
Renumbered, (formerly UG 5500-E)

UG 7100-A Tree Planting – April 2008
Revised March 2003 version