

DIVISION 2 SITE WORK

1 2001/04/30

2 **SECTION 02072**
3 **DEMOLITION, CUTTING AND PATCHING**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

- 6 A. Section Includes:
- 7 1. Demolition, cutting and patching of existing construction where shown on Drawings, or as
8 required to accommodate new work shown or specified.
- 9 B. Related Sections include but are not necessarily limited to:
- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
- 11 2. Division 1 - General Requirements.
- 12 3. Section 03348 - Concrete Finishing and Repair of Surface Defects.
- 13 4. Section 09905 - Painting and Protective Coatings.

14 **1.2 SUBMITTALS**

- 15 A. Shop Drawings:
- 16 1. See Section 01340.
- 17 2. Indicating manufacturer and type of:
- 18 a. Proposed nonshrink grout.
- 19 b. Epoxy bonding adhesive.
- 20 c. Proposed materials and methods to be used for matching and repairing existing
21 construction.

22 **1.3 DELIVERY, STORAGE, AND HANDLING**

- 23 A. General:
- 24 1. Salvage items, designated for Owner's salvage, as a functional unit.
- 25 2. Clean, list and tag for storage.
- 26 3. Protect from damage and deliver to location designated.
- 27 4. Salvage each item with auxiliary or associated equipment required for operation.

28 **1.4 PROJECT CONDITIONS**

- 29 A. Perform preliminary investigations as required to ascertain extent of work.

30 **1.5 SEQUENCING AND SCHEDULING**

- 31 A. Coordinate and reschedule work as required to preclude interference with other operations.

32 **PART 2 - PRODUCTS**

33 **2.1 ACCEPTABLE MANUFACTURERS**

- 34 A. Subject to compliance with the Contract Documents, the following manufacturers are
35 acceptable:
- 36 1. Nonshrink grout:
- 37 a. Supreme Grout by Gifford Hill.
- 38 b. Masterflow 713 by Master Builders.
- 39 c. Sika Grout 212 by Sika.
- 40 2. Epoxy bonding adhesive:
- 41 a. Euco No.452 MV by Euclid Chemical Co.

- 1 b. Sikadur 32, Hi-Mod by Sika Corporation.
- 2 B. Submit requests for substitution in accordance with Specification Section 01640.
- 3 **2.2 MATERIALS**
- 4 A. Temporary Partitions:
- 5 1. Plywood: 1/2 IN minimum for interior or exterior use.
- 6 2. Paneling: 1/4 IN minimum for interior use.
- 7 B. Nonshrink Grout:
- 8 1. Nonmetallic, noncorrosive and nonstaining.
- 9 2. Premixed with only water to be added in accordance with manufacturer's instructions at
- 10 jobsite.
- 11 3. Grout to produce a positive but controlled expansion. Mass expansion not to be created by
- 12 gas liberation or by other means.
- 13 4. Minimum compressive strength at 28 days to be 6500 psi.
- 14 5. Coat exposed edges of grout with a cure/seal compound recommended by grout
- 15 manufacturer.
- 16 C. Epoxy Bonding Adhesive:
- 17 1. Two component, moisture insensitive adhesive manufactured for the purpose of bonding
- 18 fresh concrete to hardened concrete.

19 **PART 3 - EXECUTION**

20 **3.1 PREPARATION**

- 21 A. Provide temporary partitions as required in public areas.
- 22 1. Construct partitions of braced plywood in exterior areas.
- 23 2. Adequately braced paneling may be used in interior areas.
- 24 B. Provide covered passageways where necessary to ensure safe passage of persons in or near areas
- 25 of work.
- 26 C. Provide substantial barricades and safety lights as required.
- 27 D. Provide temporary dustproof partitions where indicated or necessary.
- 28 1. Prevent infiltration of dust into occupied areas.
- 29 E. Provide temporary weather protection as necessary.

30 **3.2 INSTALLATION**

- 31 A. Cutting and Removal:
- 32 1. Remove existing work indicated to be removed, or as necessary for installation of new
- 33 work.
- 34 2. Neatly cut and remove materials, and prepare all openings to receive new work.
- 35 3. Remove masonry or concrete in small sections.
- 36 B. Modification of Existing Concrete:
- 37 1. Where indicated, remove existing concrete and finish remaining surfaces as specified in
- 38 Section 03348.
- 39 a. Protect remaining concrete from damage.
- 40 b. Make openings by sawing through the existing concrete.
- 41 c. Concrete may be broken out after initial saw cuts in the event concrete thickness
- 42 prevents cutting through.
- 43 d. Where sawing is not possible, make openings by drilling holes around perimeter of
- 44 opening and then chipping out the concrete.
- 45 1) Holes shall be sufficient in number to prevent damage to remaining concrete.

- 1 2. Oversize required openings in existing concrete 1 IN on all sides and build back to required
2 opening size by means of nonshrink grout epoxy bonded to the existing concrete.
3 3. Where oversized openings cannot be made, remove the concrete to the required opening
4 size and cut back exposed reinforcing 1 IN from face of concrete and fill resulting holes
5 with nonshrink grout.
- 6 C. Removal of Existing Anchor Bolts or Other Protruding Elements:
7 1. Removal within a distance of 8 FT above finished floor or operating level elevation.
8 2. Removed to a depth of 1/2 IN from finished surface.
9 3. Fill void with non-shrink grout.
- 10 D. Matching and Patching:
11 1. Walls, ceilings, floors or partitions:
12 a. Repair abutting walls, ceilings, floors or partitions disturbed by removal.
13 b. Match and patch existing construction disturbed during installation of new work.
14 2. Methods and materials:
15 a. Similar in appearance, and equal in quality to adjacent areas for areas or surfaces being
16 repaired.
17 b. Subject to review of Engineer.
- 18 E. Existing Bulk Chemical Storage Tank Containment Basin:
19 1. Completely remove existing coating from all interior surfaces in preparation for application
20 of new coating as specified in Section 09905 - including but not limited to, walls, bottoms,
21 top edges, sumps.
- 22 F. Salvaged Items:
23 1. Thoroughly dry and clean all metal surfaces.
24 2. Prime all bare metal in accordance with Section 09905.
25 3. Clean and lubricate motors and other moving parts.
26 4. Brace motors attached to flexible mountings until reinstallation.
27 5. Dispose of items or materials not designated for Owner's salvage or reuse. Promptly remove
28 from site.
29 6. Do not store or sell Contractor salvaged items or materials on site.
- 30 G. Clean Up:
31 1. Transport debris and legally dispose of off site.

32

END OF SECTION

1 1996/08/09

2 **SECTION 02110**
3 **SITE CLEARING**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

6 A. Section Includes:

7 1. Site clearing, tree protection, stripping topsoil and demolition.

8 B. Related Sections include but are not necessarily limited to:

- 9 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
10 2. Division 1 - General Requirements.
11 3. Section 02200 - Earthwork.
12 4. Section 02221 -- Trenching, Backfilling, and Compacting for Utilities.
13 5. Section 02260 - Topsoiling and Finished Grading.
14 6. Section 02270 - Soil Erosion and Sediment Control.

15 C. Scheduling And Sequencing

- 16 1. Prepare site only after adequate erosion and sediment controls are in place. Limit areas
17 exposed uncontrolled to erosion during installation of temporary erosion and sediment
18 controls.

19 D. Quality Assurance

- 20 1. Obtain Owner's approval of staked clearing, grubbing, and stripping limits prior to
21 commencing clearing grubbing, and stripping.

22 **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

23 **PART 3 - EXECUTION**

24 **3.1 PREPARATION**

- 25 A. Owner will obtain authority for removal and alteration work on adjoining property.
26 B. Arrange for and verify location of utility services prior to beginning operations.

27 **3.2 SITE CLEARING**

28 A. Limits

- 29 1. As follows, but not to extend beyond Project limits.
30 a. Excavation Including Trenches: 5 feet beyond top of cut slopes.
31 2. Fill:
32 a. Clearing and Grubbing: 5 feet beyond toe of permanent fill.
33 b. Stripping and Scalping: 5 feet beyond toe of permanent fill.
34 3. Staging Area:
35 a. Clearing: 5 feet beyond perimeter.
36 b. Scalping and Stripping: Not required.
37 c. Grubbing: Around perimeter as necessary for neat finished appearance.
38 4. Other Areas: As shown.

39 B. Topsoil Removal:

- 40 1. Strip topsoil to depths encountered.
41 a. Remove heavy growths of grass before stripping.

2 **SECTION 02200**
3 **EARTHWORK**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

- 6 A. Section Includes:
- 7 1. Earthwork.
- 8 B. Related Sections include but are not necessarily limited to:
- 9 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
- 10 2. Division 1 - General Requirements.

11 **1.2 QUALITY ASSURANCE**

- 12 A. Referenced Standards:
- 13 1. ASTM International (ASTM):
- 14 a. C33, Standard Specification for Concrete Aggregates.
- 15 b. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard
- 16 Effort (12,400 ft-lbf/ft³).
- 17 c. D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil
- 18 Classification System).
- 19 d. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory
- 20 Table.
- 21 e. D4254, Test Methods for Minimum Index Density of Soils and Calculation of Relative
- 22 Density.
- 23 f. E1745, Standard Specification for Water Vapor Retarders Used in Contact with Soil or
- 24 Granular Fill Under Concrete Slabs.
- 25 2. Texas Department of Transportation (TxDOT):
- 26 a. Standard Specifications for Construction of Highways, Streets and Bridges, 1993
- 27 Edition – Otherwise referred herein as TxDOT Standard Specifications.

28 **1.3 SUBMITTALS**

- 29 A. Shop Drawings:
- 30 1. See Section 01340.
- 31 2. Product technical data including:
- 32 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 33 b. Manufacturer's installation instructions.
- 34 3. Certifications.
- 35 4. Test reports:
- 36 a. Soils inspection and testing results.

37 **PART 2 - PRODUCTS**

38 **2.1 MATERIALS**

- 39 A. Fill and Backfill: Selected material approved by Soils Engineer from site excavation or from off
- 40 site borrow.
- 41 B. Structural Fill Material Under Slab Foundations: Crushed limestone base material meeting the
- 42 requirements of 1993 TxDOT Item 247, Type A, Grade 3 or better.

- 1 C. Vapor Barrier: ASTM E1745, Class C, or polyethylene sheet, ASTM D4397, not less than 10
2 mils thick.
3 1. Non-woven, polyester-reinforced, polyethylene coated sheet; 10 mils thick.

4 **PART 3 - EXECUTION**

5 **3.1 PROTECTION**

- 6 A. Protect existing surface and subsurface features on-site and adjacent to site as follows:
7 1. Provide barricades, coverings, or other types of protection necessary to prevent damage to
8 existing items indicated to remain in place.
9 2. Protect and maintain bench marks, monuments or other established reference points and
10 property corners. If disturbed or destroyed, replace at own expense to full satisfaction of
11 Owner and controlling agency.
12 3. Verify location of utilities. Omission or inclusion of utility items does not constitute non-
13 existence or definite location. Secure and examine local utility records for location data.
14 a. Take necessary precautions to protect existing utilities from damage due to any
15 construction activity.
16 b. Repair damages to utility items at own expense.
17 c. In case of damage, notify Engineer at once so required protective measures may be
18 taken.
19 4. Maintain free of damage, existing sidewalks, structures, and pavement, not indicated to be
20 removed. Any item known or unknown or not properly located that is inadvertently
21 damaged shall be repaired to original condition. All repairs to be made and paid for by
22 Contractor.
23 5. Provide full access to public and private premises, fire hydrants, street crossings, sidewalks
24 and other points as designated by Owner to prevent serious interruption of travel.
25 6. Maintain stockpiles and excavations in such a manner to prevent inconvenience or damage
26 to structures on-site or on adjoining property.
27 7. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.
28 B. Salvageable Items: Carefully remove items to be salvaged, and store on Owner's premises
29 unless otherwise directed.
30 C. Dispose of waste materials, legally, off site. Burning, as a means of waste disposal, is not
31 permitted.

32 **3.2 SITE EXCAVATION AND GRADING**

- 33 A. The work includes all operations in connection with excavation, borrow, construction of fills and
34 embankments, rough grading, and disposal of excess materials in connection with the
35 preparation of the site(s) for construction of the proposed facilities.
36 B. Excavation and Grading: Perform as required by the Contract Drawings.
37 1. Contract Drawings may indicate both existing grade and finished grade required for
38 construction of Project. Stake all units, structures, piping, roads, parking areas and walks
39 and establish their elevations. Perform other layout work required. Replace property corner
40 markers to original location if disturbed or destroyed.
41 2. Preparation of ground surface for embankments or fills: Before fill is started, scarify to a
42 minimum depth of 6 IN in all proposed embankment and fill areas. Where ground surface is
43 steeper than one vertical to four horizontal, plow surface in a manner to bench and break up
44 surface so that fill material will bind with existing surface.
45 3. Protection of finish grade: During construction, shape and drain embankment and
46 excavations. Maintain ditches and drains to provide drainage at all times. Protect graded
47 areas against action of elements prior to acceptance of work. Reestablish grade where
48 settlement or erosion occurs.

1 C. Borrow: Provide necessary amount of approved fill compacted to density equal to that indicated
2 in this Specification. Include cost of all borrow material in original proposal. Fill material to be
3 approved by Soils Engineer prior to placement.

4 D. Construct embankments and fills as required by the Contract Drawings:

- 5 1. Construct embankments and fills at locations and to lines of grade indicated. Completed fill
6 shall correspond to shape of typical cross section or contour indicated regardless of method
7 used to show shape, size, and extent of line and grade of completed work.
8 2. Provide approved fill material which is free from roots, organic matter, trash, frozen
9 material, and stones having maximum dimension greater than 6 IN. Ensure that stones larger
10 than 4 IN are not placed in upper 6 IN of fill or embankment. Do not place material in layers
11 greater than 8 IN loose thickness. Place layers horizontally and compact each layer prior to
12 placing additional fill.
13 3. Compact by sheepsfoot, pneumatic rollers, vibrators, or by other equipment as required to
14 obtain specified density. Control moisture for each layer necessary to meet requirements of
15 compaction.
16 a. Compaction of Select Fill material is to be observed by a representative of the Soils
17 Engineer.

18 **3.3 USE OF EXPLOSIVES**

19 A. Blasting with any type of explosive is prohibited.

20 **3.4 FIELD QUALITY CONTROL**

- 21 A. Do not include in bid price the cost of inspection services indicated herein as being performed
22 by the Soils Engineer.
23 B. Moisture density relations, to be established by the Soils Engineer required for all materials to be
24 compacted.
25 C. Extent of compaction testing will be as necessary to assure compliance with Specifications.
26 D. Give minimum of 24 HR advance notice to Soils Engineer when ready for compaction or
27 subgrade testing and inspection.
28 E. Should any compaction density test or subgrade inspection fail to meet Specification
29 requirements, perform corrective work as necessary.
30 F. Pay for all costs associated with corrective work and retesting resulting from failing compaction
31 density tests.

32 **3.5 COMPACTION DENSITY REQUIREMENTS**

- 33 A. Obtain approval from Soils Engineer with regard to suitability of soils and acceptable subgrade
34 prior to subsequent operations.
35 B. Provide dewatering system necessary to successfully complete compaction and construction
36 requirements.
37 C. Remove frozen, loose, wet, or soft material and replace with approved material as directed by
38 Soils Engineer.
39 D. Stabilize subgrade with well graded granular materials as directed by Soils Engineer.
40 E. Assure by results of testing that compaction densities comply with the following requirements:
41 1. Sitework:

42 **LOCATION**

COMPACTION DENSITY

43
44 **UNDER PAVED AREAS:**

45
46 Cohesive soils

95 percent, ASTM D698

1 Cohesionless soils 70 percent relative density
2 per ASTM D4253 and D4254

3
4 UNPAVED AREAS:

5 Cohesive soils 85 percent, ASTM D698
6 Cohesionless soils 60 percent relative density
7 per ASTM D4253 and D4254
8
9

10 2. Structures:

11 LOCATION	12 COMPACTION DENSITY
13 Under slab foundations	14 98 percent, ASTM D698, maximum 15 dry density at -2.0% to +3.0% of the 16 optimum moisture content
17 Scarified existing subgrade 18 under fill material	19 95 percent, ASTM D698, maximum 20 dry density at optimum to +4.0% of 21 the optimum moisture content
22 Outside structures next to walls 23 and any other structure exterior 24 member	25 95 percent, TEX-113-E 26 maximum dry density near optimum 27 moisture content

28 **3.6 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES**

29 A. General:

- 30 1. In general, work includes, but is not necessarily limited to, excavation for structures and
31 retaining walls, removal of underground obstructions and undesirable material, backfilling,
32 filling, and fill, backfill, and subgrade compaction.
33 2. Obtain fill and backfill material necessary to produce grades required. Materials and source
34 to be approved by Soils Engineer. Excavated material approved by Soils Engineer may also
35 be used for fill and backfill.
36 3. In this Section of the Specifications, the word "foundations" includes footings, base slabs,
37 foundation walls, mat foundations, grade beams, and any other support placed directly on
38 soil.
39 4. In the paragraphs of this Section of the Specifications, the word "soil" also includes any
40 type of rock subgrade that may be present at or below existing subgrade levels.

41 B. Excavation Requirements for Structures:

- 42 1. General. Do not commence excavation for foundations for structures until:
43 a. Soils Engineer approves:
44 1) The removal of topsoil and other unsuitable and undesirable material from existing
45 subgrade.
46 2) Density and moisture content of site area compacted fill material meets
47 requirements of specifications.
48 3) Site surcharge or mass fill material can be removed from entire construction site or
49 portion thereof.
50 4) Surcharge or mass fill material has been removed from construction area or
51 portions thereof.
52 b. Engineer grants approval to begin excavations.
53 2. Dimensions:

- 1 a. Excavate to elevations equal to four feet below existing grade and remove soil from
2 building area.
- 3 b. Allow additional space as required for construction operations and inspection of
4 foundations.
- 5 3. Removal of obstructions and undesirable materials in excavation includes, but is not
6 necessarily limited to, removal of old foundations, existing construction, unsuitable
7 subgrade soils, expansive type soils, and any other materials which may be concealed
8 beneath present grade, as required to execute work indicated on Contract Drawings. If
9 undesirable material and obstructions are encountered during excavation, remove material
10 and replace as directed by Soils Engineer.
- 11 4. Remove unsuitable subgrade soils located below foundations. The bottom of the
12 overexcavation shall be located outside the exterior limits of foundations around the
13 perimeter of structure the following horizontal distance, whichever is greater:
14 a. Distance equal to depth of overexcavation below bottom of foundations.
15 b. As directed by Soils Engineer.
- 16 5. Where structural fill material is required below foundations, place structural fill material,
17 conforming to the required density and moisture content. Provide structural fill material as
18 required to fill specified overexcavation to bottom of foundation.
- 19 6. Level off bottoms of excavations to receive foundations, floor slabs, equipment support
20 pads, or compacted fill. Remove loose materials and bring excavations into approved
21 condition to receive concrete or fill material. Where compacted fill material must be placed
22 to bring subgrade elevation up to underside of construction, scarify existing subgrade upon
23 which fill material is to be placed as stated in this Section of Specifications before fill
24 material can be placed thereon. Do not carry excavations lower than indicated for
25 foundations except as directed by Soils Engineer or Engineer. If any part of excavations is
26 carried below required depth without authorization, maintain excavation and start
27 foundation from excavated level with concrete of same strength as required for
28 superimposed foundation, and no extra compensation will be made to Contractor therefore.
- 29 7. Make excavations large enough for working space, forms, dampproofing, waterproofing,
30 and inspection.
- 31 8. Notify Soils Engineer and Engineer as soon as excavation is completed in order that
32 subgrades may be inspected. Do not commence further construction until subgrade under
33 compacted fill material, under foundations, under floor slab foundation, under equipment
34 support pads, and under retaining wall footings has been inspected and approved by the
35 Soils Engineer as being free of undesirable material, being of compaction density required
36 by this specification, and being capable of supporting the allowable foundation design
37 bearing pressures and superimposed foundation, fill, and building loads to be placed
38 thereon. Soils Engineer shall be given the opportunity to inspect subgrade below fill
39 material both prior to and after subgrade compaction.
40 a. Place fill material, foundations, retaining wall footings, floor slab foundation, and
41 equipment support pads as soon as weather conditions permit after excavation is
42 completed, inspected, and approved and after forms and reinforcing are inspected and
43 approved. Before concrete or fill material is placed, protect approved subgrade from
44 becoming loose, wet, frozen, or soft due to weather, construction operations, or other
45 reasons.

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9. Dewatering: Where groundwater is or is expected to be encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade below foundations and fill material, to allow foundations and fill material to be placed in the dry, and to maintain a stable excavation side slope. Groundwater shall be maintained at least 3 FT below the bottom of any excavation. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation. Employ dewatering specialist for selecting and operating dewatering system. Keep dewatering system in operation until dead load of structure exceeds possible buoyant uplift force on structure. Dispose of groundwater to an area which will not interfere with construction operations or damage existing construction. Install groundwater monitoring wells as necessary. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
 10. Subgrade stabilization: If subgrade under foundations, fill material, floor slab foundation, or equipment support pads is in a frozen, loose, wet, or soft condition before construction is placed thereon, remove frozen, loose, wet, or soft material and replace with approved compacted material as directed by Soils Engineer. Remove and replace frozen materials as directed by Soils Engineer. Method of stabilization shall be performed as directed by Soils Engineer. Do not place further construction on the repaired subgrades, until the subgrades have been approved by the Soils Engineer.
 11. Do not place floor slab foundation including equipment support pads until subgrade below has been approved, piping has been tested and approved, reinforcement placement has been approved, and Contractor receives approval to commence slab construction. Do not place building floor slab foundation including equipment support pads when temperature of air surrounding the slab and pads is or is expected to be below 40 DegF before structure is completed and heated to a temperature of at least 50 DegF.
 12. Protection of structures: Prevent new and existing structures from becoming damaged due to construction operations or other reasons. Prevent subgrade under new and existing foundations from becoming wet and undermined during construction due to presence of surface or subsurface water or due to construction operations.
 13. Shoring: Shore, sheet pile, slope, or brace excavations as required to prevent them from collapsing. Remove shoring as backfilling progresses but only when banks are stable and safe from caving or collapse.
 14. Drainage: Control grading around structures so that ground is pitched to prevent water from running into excavated areas or damaging structures. Maintain excavations where foundations, floor slabs, equipment support pads or fill material are to be placed free of water. Provide pumping required to keep excavated spaces clear of water during construction. Should any water be encountered in the excavation, notify Engineer and Soils Engineer. Provide free discharge of water by trenches, pumps, wells, well points, or other means as necessary and drain to point of disposal that will not damage existing or new construction or interfere with construction operations.
 15. Frost protection: Do not place foundations, slab foundation, equipment support pads, or fill material on frozen ground. When freezing temperatures may be expected, do not excavate to full depth indicated, unless foundations, floor slabs, equipment support pads, or fill material can be placed immediately after excavation has been completed and approved. Protect excavation from frost if placing of concrete or fill is delayed.
 - a. Where a concrete slab is a base slab foundation located under and within a structure that will not be heated, protect subgrade under the slab from becoming frozen until final acceptance of the Project by the Owner.
 - b. Protect subgrade under foundations of a structure from becoming frozen until structure is completed and heated to a temperature of at least 50 DegF.
- C. Fill and Backfill Inside of Structure and Below Foundations, Base Slabs, Floor Slabs, Equipment Support Pads and Piping:

- 1 2. General: Subgrade to receive fill or backfill shall be free of undesirable material as
2 determined by Soils Engineer and scarified to a depth of 8 IN and compacted to density
3 specified herein. Surface may be stepped by at not more than 12 IN per step or may be
4 sloped at not more than 2 percent. Do not place any fill or backfill material until subgrade
5 under fill or backfill has been inspected and approved by Soils Engineer as being free of
6 undesirable material and compacted to specified density.
- 7 2. Obtain approval of fill and backfill material and source from Soils Engineer prior to placing
8 the material.
- 9 3. Fill and backfill placement: Prior to placing fill and backfill material, optimum moisture
10 and maximum density properties for proposed material shall be obtained from Soils
11 Engineer. Place fill and backfill material in 6 IN maximum lifts to obtain required
12 compaction density. Compact material by means of equipment of sufficient size and proper
13 type to obtain specified density. Use hand operated equipment for filling and backfilling
14 next to walls. Do not place fill and backfill when the temperature is less than 40 DegF and
15 when subgrade to receive fill and backfill material is frozen, wet, loose, or soft. Use
16 vibratory equipment to compact granular material; do not use water.
- 17 4. Where fill material is required below foundations, place fill material, conforming to the
18 required density and moisture content, outside the exterior limits of foundations located
19 around perimeter of structure the following horizontal distance whichever is greater:
 - 20 a. As required to provide fill material to indicated finished grade.
 - 21 b. 5 FT.
 - 22 c. Distance equal to depth of compacted fill below bottom of foundations.
 - 23 d. As directed by Soils Engineer.
- 24 D. Filling and Backfilling Outside of Structures. This paragraph of these Specifications applies to
25 fill and backfill placed outside of structures above bottom level of both foundations and piping
26 but not under paving. Provide material as approved by Soils Engineer for filling and backfilling
27 outside of structures.
 - 28 1. Fill and backfill placement: Prior to placing fill and backfill material, obtain optimum
29 moisture and maximum density properties for proposed material from Soils Engineer. Place
30 fill and backfill material in thin lifts as necessary to obtain required compaction density.
31 Compact material with equipment of proper type and size to obtain density specified. Use
32 only hand operated equipment for filling and backfilling next to walls and retaining walls.
33 Do not place fill or backfill material when temperature is less than 40 DegF and when
34 subgrade to receive material is frozen, wet, loose, or soft. Use vibratory equipment for
35 compacting granular material; do not use water.
 - 36 2. Backfilling against walls:
 - 37 a. Do not backfill around any part of structures until each part has reached specified 28-
38 day compressive strength and backfill material has been approved. Do not start
39 backfilling until concrete forms have been removed, trash removed from excavations,
40 pointing of masonry work, concrete finishing, dampproofing and waterproofing have
41 been completed.
 - 42 b. Do not place fills against walls until floor slabs at top, bottom, and at intermediate
43 levels of walls are in place and have reached 28-day required compressive strength to
44 prevent wall movement.
 - 45 c. Bring backfill and fill up uniformly around the structures and individual walls, piers, or
46 columns.
- 47 E. Backfilling Outside of Structures Under Piping or Paving: When backfilling outside of
48 structures requires placing backfill material under piping or paving, the material shall be placed
49 from bottom of excavation to underside of piping or paving at the density required for fill under
50 piping or paving as indicated in this Section. This compacted material shall extend transversely
51 to the centerline of piping or paving a horizontal distance each side of the exterior edges of
52 piping or paving equal to the depth of backfill measured from bottom of excavation to underside
53 of piping or paving. Provide special compacted bedding or compacted subgrade material under
54 piping or paving as required by other sections of these Specifications.

1 2002/09/12

2

SECTION 02221

3

TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

4

PART 1 - GENERAL

5

1.1 SUMMARY

6

A. Section Includes:

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1. Excavation, trenching, backfilling and compacting for all underground utilities.

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2. Process piping.

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3. Drain piping.

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4. Water piping (potable, plant, process and non-potable).

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5. Natural gas piping.

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6. Relocation of existing piping.

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7. Chemical feed piping.

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8. Surface drainage conduits and piping.

15

9. Electrical ductbanks, conduits, and direct burial cables.

16

10. All related utility and process appurtenances.

17

B. Related Sections include but are not necessarily limited to:

18

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.

19

2. Division 1 - General Requirements.

20

3. Section 02200 - Earthwork.

21

4. Section 02515 - Precast Concrete Manhole Structures.

22

1.2 QUALITY ASSURANCE

23

A. Referenced Standards:

24

1. Texas Department of Transportation (TxDOT):

25

a. Section 14. TEX-113-E, Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials.

26

2. American Association of State Highway & Transportation Officials (AASHTO):

27

a. T99, The Moisture-Density Relations of Soils Using a 5.5 LB Rammer and a 12 IN Drop.

28

b. T180, Moisture-Density Relations of Soils Using a 10 LB Rammer and an 18 IN Drop.

29

3. ASTM International (ASTM):

30

a. C33, Standard Specification for Concrete Aggregates.

31

b. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).

32

c. D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

33

d. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.

34

e. D4254, Minimum Index Density of Soils and Calculation of Relative Density.

35

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37

38

39

B. Qualifications:

40

1. Provide construction materials testing in accordance with Contract Documents for

41

verification that gradations, moisture-density relationships, and compaction for backfilling

42

to assure that all work complies with this Specification.

43

C. Registered professional engineer licensed in Texas for design of trench shoring systems or other trench safety plans.

44

45

46

1.3 DEFINITIONS

- 1 A. Excavation:
2 1. All excavation will be defined as unclassified.

3 **1.4 SUBMITTALS**

- 4 A. Shop Drawings:
5 1. See Section 01340.
6 2. Product technical data including:
7 a. Acknowledgement that products submitted meet requirements of standards referenced.
8 b. Manufacturer's installation instructions.
9 3. Trench Safety Plan and/or trench shoring drawings including current certification of trench
10 shields (trench boxes) if employed.
11 4. Submit respective pipe or conduit manufacturer's data regarding bedding methods of
12 installation and general recommendations.
13 5. Submit sieve analysis reports on all granular materials.
14 B. Miscellaneous Submittals:
15 1. Submit test reports and fully document each with specific location or stationing information,
16 date, and other pertinent information.
17 C. Retain the services of a registered professional engineer to design trench shoring systems or
18 other trench safety plans as required by law.

19 **1.5 PROJECT CONDITIONS**

- 20 A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent
21 slides or caving. Maintain and trim excavated materials in such manner to be as little
22 inconvenience as possible to public and adjoining property owners.
23 B. Provide full access to public and private premises and fire hydrants, at street crossings,
24 sidewalks and other points as designated by Owner to prevent serious interruption of travel.
25 C. Protect and maintain bench marks, monuments or other established points and reference points
26 and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.
27 D. Verify location of existing underground utilities.

28 **PART 2 - PRODUCTS**

29 **2.1 MATERIALS**

- 30 A. Backfill Material:
31 1. As approved by Engineer.
32 2. General.
33 a. The Contractor shall submit descriptive information and evidence that the materials and
34 equipment the Contractor proposes for incorporation into the Work is of the kind and
35 quality that satisfies the specified functions and quality. Material classified by ASTM D
36 2487 as GW, GP, GC, GM, SW, SP, SM, SC, CL, CH, and is free of rocks larger than
37 three (3") inches and having a plasticity index equal to or less than twenty (20) shall be
38 classified as Satisfactory Native Material.
39 b. Unsatisfactory materials shall be materials that do not comply with the requirements for
40 satisfactory material. Unsatisfactory materials include but are not limited to those
41 materials containing roots and other organic matter, trash, debris, frozen materials and
42 stones larger than three (3") inches, plasticity index equal to or greater than twenty-one
43 (21), and materials classified in ASTM D2487 as PT, OH, OL, ML, and MH.
44 Unsatisfactory materials also include man-made fills, refuse, or backfills from previous
45 construction.

1 B. Subgrade Stabilization Materials: Provide subgrade stabilization material consisting of angular
2 crushed stone or crushed gravel: ASTM C33, gradation size No. 1, 3 1/2 to 1 1/2; or gradation size
3 No 2, 2 1/2 to 1 1/2.

4 C. Bedding Materials:

5 1. As approved by the Engineer.

6 2. Pea gravel:

7 a. Pipe bedding shall be clean 3/8" to 1/2" pea gravel free of mud, clay, vegetation or
8 other debris.

9 3. Sand:

10 a. Sand for use as pipe bedding shall be clean, granular and homogeneous material, free of
11 mud, silt, clay lumps or clods, vegetation or debris. The material removed by
12 decantation TxDOT Test Method Tex-406-A, plus the weight of any clay lumps, shall
13 not exceed 4.5 percent by weight.

14 b. Size gradation of sand for bedding shall be as follows:

GRADATION TABLE	
SIEVE SIZE	% RETAINED BY WEIGHT
1/4"	0
#60	75-100
#100	95-100

15
16 D. Cement Stabilized Backfill and Embedment:

17 1. Use sand, silty sand, or gravelly sand soils (non-plastic) as approved by Engineer.

18 2. Uniformly mix 2 sacks of Type I/II dry Portland cement per cubic yard of approved soils.

19 3. Thoroughly mix dry cement into soil using pugmill, rotary mixer, or front-end loader bucket
20 by dumping material back and forth until cement is thoroughly and uniformly distributed.

21 4. Moisture content at the time of placement shall be plus 3% to minus 1% of optimum
22 moisture content per ASTM D558.

23 5. Place in 6 to 8 IN thick loose lifts and compact to not less than 95% of maximum dry
24 density, as determined by ASTM D558. Compact within two hours of mixing.

25 6. For pipe having 10 FT or greater cover, non-potable lines crossing potable water lines, or as
26 otherwise indicated on the Drawings, pipe embedment material shall be cement stabilized
27 soil, as follows:

28 a. Cement stabilized embedment shall consist of moist sandy soil, which complies with
29 Unified Soil Classifications (ASTM D2487) SW or SP having less than 7% passing the
30 No. 200, mixed with 2.5 sacks of Type I/II dry Portland cement per cubic yard of
31 embedment.

32 b. Thoroughly mix dry cement into soil using pugmill, rotary mixer, or front-end loader
33 bucket by dumping material back and forth until cement is thoroughly and uniformly
34 distributed.

35 c. Moisture content at the time of placement shall be plus 3% to minus 1% of optimum
36 moisture content per ASTM D558.

37 d. Place in 6 to 8 IN thick loose lifts and compact to not less than 95% of maximum dry
38 density, as determined by ASTM D558. Compact within two hours of mixing.

39 E. Pipe, Concrete Encasement:

40 1. When indicated on the Drawings or acceptable to the Engineer, concrete encasement shall
41 be placed to protect the pipe.

42 2. Concrete encasement shall extend from 6 inches below to 6 inches above the outer
43 projections of the pipe over the entire width of the trench in accordance with the City of
44 Kerrville Standard Details.

45 3. Materials:

- 1 a. The Portland cement concrete shall conform to Class B Concrete. The cement
- 2 stabilized sand shall have a minimum of 10% (2.5 bags min.) cement per cubic yard
- 3 and shall contain brown coloring for identification. (TNRCC Section 290)
- 4 4. Carefully compacted backfill above concrete encasement.
- 5 F. Duct-Bank, Concrete Encasement:
- 6 1. 3000 psi concrete with red dye and reinforcing per drawings.
- 7 2. Carefully compacted backfill above concrete encasement.

8 **PART 3 - EXECUTION**

9 **3.1 GENERAL**

- 10 A. Remove and dispose of unsuitable materials as directed by Engineer to site provided by
- 11 Contractor.

12 **3.2 EXCAVATION**

- 13 A. Unclassified Excavation:
- 14 1. Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed
- 15 by Owner.
- 16 B. Excavation for Appurtenances:
- 17 1. 12 IN (minimum) clear distance between outer surface and embankment.
- 18 2. See Section 02200 for applicable requirements.
- 19 3. See Section 02515 for applicable requirements.
- 20 C. Trench Excavation:
- 21 1. Excavate trenches by open cut method to depth shown on Drawings and necessary to
- 22 accommodate work.
- 23 a. Support existing utility lines and yard piping where proposed work crosses at a lower
- 24 elevation.
- 25 1) Stabilize excavation to prevent undermining of existing utility and yard piping.
- 26 2. Open trench outside buildings, units, and structures:
- 27 a. No more than the distance between two manholes, structures, units, or 300 LF,
- 28 whichever is less.
- 29 b. Field adjust limitations as weather conditions dictate.
- 30 3. Trenching within buildings, units, or structures:
- 31 a. No more than 100 LF at any one time.
- 32 4. Any trench or portion of trench, which is opened and remains idle for 7 calendar days, or
- 33 longer, as determined by the Owner, may be directed to be immediately refilled, without
- 34 completion of work, at no additional cost to Owner. Said trench may not be reopened until
- 35 Owner is satisfied that work associated with trench will be prosecuted with dispatch.
- 36 5. Observe following trenching criteria:
- 37 a. Trench size.
- 38 1) Trenches for pipes shall be of sufficient width to provide ample working space for
- 39 handling and jointing the pipe in the trenches. In no case shall the width of the
- 40 trench inside sheeting and brace lines be less than sixteen (16") inches greater than
- 41 the normal pipe diameter as follows:
- 42

Pipe Diameter (IN)	Min Trench Width (IN)	Max Trench Width (IN)
6	22	30
8	24	30
10	26	32
12	28	36
18	34	42
24	40	48

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- 2) Excessive Trench Width:
 - a) If the trench width within the pipe zone exceeds this maximum, the entire pipe zone shall be refilled with approved backfill material, thoroughly compacted to a minimum of 95 percent of maximum density as determined by TxDOT Test Method Tex-114-E and then re-excavated to the proper grade and dimensions. Excavation along curves and bends shall be so oriented that the trench and pipe are approximately centered on the centerline of the curve, using short lengths of pipe and/or bend fittings if necessary.
 - b) Where, for any reason, width of the lower portion of the trench as excavated at any point exceeds the maximum permitted, either pipe of adequate strength, special pipe embedment, or arch concrete encasement, as required by loading conditions and as determined by the Engineer, shall be furnished and installed by and at the expense of the Contractor.
- 3) Bell Holes:
 - a) Bell holes shall provide adequate clearance for the tools and methods used in installing the pipe. No part of any bell or coupling shall be in contact with the trench bottom or trench walls when the pipe is jointed.
- 4) Keep trenches free of water. Include cost of dewatering in original proposal.

D. Trenching for Electrical Installations:

- 1. Observe paragraph 3.2C "Trench Excavation"
- 2. Modify for electrical installations as follows:
 - a. Open no more than 600 LF of trench in exterior locations for trenches more than 12 IN but not more than 30 IN wide.
 - b. Any length of trench may be opened in exterior locations for trenches which are 12 IN wide or less.
 - c. Do not over excavate trench.
 - d. Cut trenches for electrical runs with minimum 30 IN cover, unless otherwise specified or shown on Drawings.
 - e. See Division 16 for additional requirements.

3.3 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Over-Excavation:

- 1. As shown on Drawings.
- 2. Backfill with granular bedding material as option.
- 3. Hand place, shovel, slice, and pneumatically tamp all bedding material.
- 4. Form bell holes in trench bottom and ensure that bedding material supports full length of pipe.

B. Rock Excavation:

- 1. Excavate minimum of 6 IN below bottom exterior surface of the pipe or conduit.
- 2. Backfill to grade with suitable earth or granular material.
- 3. Form bell holes in trench bottom.

C. Subgrade Stabilization:

- 1. Stabilize the subgrade when directed by the Owner.
- 2. Observe the following requirements when unstable trench bottom materials are encountered.
 - a. Notify Owner when unstable materials are encountered.
 - 1) Define by drawing station locations and limits.
 - b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
 - 1) Replace with subgrade stabilization with no additional compensation.

3.4 BACKFILLING METHODS

A. Carefully Compacted Backfill and Bedding Material:

- 1. Furnish where indicated on Drawings, specified for trench embedment conditions and for compacted backfill conditions.
- 2. Comply with the following:
 - a. Place backfill in lifts not exceeding 8 IN (loose thickness).
 - b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
 - c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
 - d. Compact each lift to specified requirements.
- B. Common Trench Backfill:
 - 1. Perform in accordance with the following:
 - a. Place backfill in lift thicknesses capable of being compacted to densities specified.
 - b. Observe specific manufacturer's recommendations regarding backfilling and compaction.
 - c. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.
- C. Water flushing for consolidation is not permitted.
- D. Backfilling for Electrical Installations:
 - 1. Observe paragraph 3.4C or D "Backfilling Methods."
 - 2. Modify for electrical installation as follows:
 - a. Observe notes and details on electrical drawings for fill in immediate vicinity of direct burial cables.

3.5 COMPACTION

- A. General:
 - 1. Place and assure bedding, backfill, and fill materials achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work.
 - 2. In no case shall degree of compaction below "Minimum Compaction" specified be accepted.
- B. Compaction Requirements: Unless noted otherwise on Drawings or more stringently by other sections of these Specifications, comply with following trench compaction criteria:

MINIMUM COMPACTIONS

LOCATION	DENSITY
1. Bedding material:	
All locations	75 percent of max relative density by ASTM D4253 and D4254
2. Carefully compacted backfill:	
All applicable areas	95 percent of max dry density by TEX-113-E, at +/- 2% optimum moisture content
3. Common trench backfill:	
Under pavements roadways surfaces, within highway right-of-ways	95 percent of max dry density by TEX-113-E, at +/- 2% optimum moisture content

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Under turfed, sodded
plant seeded, non-
traffic areas

90 percent of max
dry density by TEX-113-E, at
+/- 2 % optimum moisture
content

3.6 FIELD QUALITY CONTROL

A. Testing:

1. Provide construction materials testing as required in Contract Documents.
2. Provide gradation analysis (sieve analysis) for all materials to be compacted. Tests shall be taken for each source of material used, from each different source stockpile, and for every 250 cubic yards or portion thereof of materials used from each source.
 - a. Provide one additional confirmation test on each source at the direction of Owner if field observations warrant confirmation of gradation.
3. Provide moisture density relationships (Proctors) for all materials to be compacted. Tests shall be taken for each source of material used, from each different source stockpile, and for every 250 cubic yards or portion thereof of materials used from each source.
4. Submit test reports to Engineer for documentation that materials meet specified gradation and soil characteristics.
5. Compaction testing shall be sufficient to determine compliance with the Specifications.
6. Provide compaction tests for each 50 linear feet of trench for each material compacted, with a minimum of two tests per location.
7. Provide compaction tests for each different type of material compacted (subgrade, embedment, fill, etc.) at frequency described herein.
8. Should any compaction density test fail to meet Specifications, perform corrective work as necessary.

END OF SECTION

1 2001/09/17

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SECTION 02260
TOPSOILING AND FINISHED GRADING

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

6

A. Section Includes:

7

1. Topsoiling and finished grading.

8

B. Related Sections include but are not necessarily limited to:

9

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.

10

2. Division 1 - General Requirements.

11

3. Section 02110 - Site Clearing.

12

4. Section 02200 - Earthwork.

13

5. Section 02270 - Soil Erosion and Sediment Control.

14

6. Section 02930 - Seeding, Sodding and Landscaping.

15

C. Location of Work: All areas within limits of grading and all areas outside limits of grading

16

which are disturbed in the course of the work.

17

1.2 SUBMITTALS

18

A. Shop Drawings:

19

1. See Section 01340.

20

2. Project Data: Test reports for furnished topsoil.

21

1.3 PROJECT CONDITIONS

22

A. Verify amount of topsoil stockpiled and determine amount of additional topsoil, if necessary to

23

complete work.

24

PART 2 - PRODUCTS

25

2.1 MATERIALS

26

A. Topsoil:

27

1. Original surface soil typical of the area.

28

2. Existing topsoil stockpiled under Section 02110.

29

3. Capable of supporting native plant growth.

30

2.2 TOLERANCES

31

A. Finish Grading Tolerance: 0.1 FT plus/minus from required elevations.

32

PART 3 - EXECUTION

33

3.1 PREPARATION

34

A. Correct, adjust and/or repair rough graded areas.

35

1. Cut off mounds and ridges.

36

2. Fill gullies and depressions.

37

3. Perform other necessary repairs.

38

4. Bring all sub-grades to specified contours, even and properly compacted.

- 1 B. Loosen surface to depth of 2 IN, minimum.
- 2 C. Remove all stones and debris over 2 IN in any dimension.
- 3 **3.2 ROUGH GRADE REVIEW**
- 4 A. Reviewed by Engineer in Section 02110, Site Clearing, Article 3.3.
- 5 **3.3 PLACING TOPSOIL**
- 6 A. Do not place when subgrade is wet or frozen enough to cause clodding.
- 7 B. Spread to compacted depth of 4 IN for all disturbed earth areas.
- 8 C. If topsoil stockpiled is less than amount required for work, furnish additional topsoil at no cost to
- 9 Owner.
- 10 D. Provide finished surface free of stones, sticks, or other material 1 IN or more in any dimension.
- 11 E. Provide finished surface smooth and true to required grades.
- 12 F. Restore stockpile area to condition of rest of finished work.
- 13 **3.4 ACCEPTANCE**
- 14 A. Upon completion of topsoiling, obtain Engineer's acceptance of grade and surface.
- 15 B. Make test holes where directed to verify proper placement and thickness of topsoil.

16

END OF SECTION

1 1996/08/09

2

3

SECTION 02270
SOIL EROSION AND SEDIMENT CONTROL

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

6 A. Section Includes:

7 1. Soil erosion and sediment control in compliance with the requirements of the EPA
8 stormwater program for EPA Region VI.

9 B. Related Sections include but are not necessarily limited to:

- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
11 2. Division 1 - General Requirements.
12 3. Section 01340 – Shop Drawings, Product Data and Samples, O&M Manuals, and
13 Miscellaneous Submittals.

14 **1.2 QUALITY ASSURANCE**

15 A. CONTRACTOR is responsible for and must implement all stormwater controls prior to any site
16 work within the project area. Controls must remain in place until after the completion of
17 permanent restoration and erosion control measures.

18 B. Referenced Standards:

- 19 1. Federal Register, Volume 63, No. 128, dated Monday, July 6, 1998, "Part II –
20 Environmental Protection Agency – Reissuance of NPDES General Permits for Storm
21 Water Discharges from Construction Activities in Region 6; Notice
22 2. Erosion control standards specified in the NPDES General Permit for Storm Water
23 Discharges from Construction Activities in Region 6".
24 3. Refer to the permit for a complete discussion of the associated requirements.

25 **PART 2 - PRODUCTS**

26 **2.1 MATERIALS**

- 27 A. Pipe Riser and Barrel: 16 GA corrugated metal pipe (CMP) of size indicated.
28 B. Stone for Rock Berm: 2 IN graded gravel or crushed stone.
29 C. Grass Seed: Annual ryegrass.
30 D. Silt Fence: Reinforced filter fabric
31 E. Coarse aggregate for construction exit: 4" to 8" graded coarse aggregate.

32 **PART 3 - EXECUTION**

33 **3.1 PREPARATION**

34 A. Prior to General Stripping, Excavating, or disturbing of earth:

- 35 1. Install perimeter dikes and swales.
36 2. Excavate and shape sediment basins and traps.
37 3. Construct pipe spillways and install stone filter where required.
38 4. Install silt fences and rock filter dams.
39 5. Machine compact all berms, dikes and embankments for basins and traps.

- 1 B. Construct sediment traps where indicated on Drawings during rough grading as grading
- 2 progresses.
- 3 C. Temporarily seed basin slopes and topsoil stockpiles:
- 4 1. Rate: 1/2 LB/1000 SF.
- 5 2. Reseed as required until good stand of grass is achieved.
- 6 D. Install construction entrances.

7 **3.2 DURING CONSTRUCTION PERIOD**

- 8 A. Inspect at least every 7 days, and no more than 24 hours after a rainfall.
- 9 B. Maintain Basins, Dikes, Traps, Stone Filters, Etc.:
- 10 1. Inspect regularly especially after rainstorms.
- 11 2. Repair or replace damaged or missing items.
- 12 C. After rough grading, sow temporary grass cover over all exposed earth areas not draining into
- 13 sediment basin or trap.
- 14 D. Provide necessary swales and dikes to direct all water towards and into sediment basins and
- 15 traps.
- 16 E. Do not disturb existing vegetation (grass and trees).
- 17 F. Excavate sediment out of basins and traps when capacity has been reduced by 50 percent.
- 18 1. Remove sediment from behind bales to prevent overtopping.
- 19 G. Topsoil and Fine Grade Slopes and Swales, Etc.:
- 20 1. Seed and mulch as soon as areas become ready.

21 **3.3 NEAR COMPLETION OF CONSTRUCTION**

- 22 A. Eliminate basins, dikes, traps, etc.
- 23 B. Grade to finished or existing grades.
- 24 C. Fine grade all remaining earth areas, then seed and mulch.

25

END OF SECTION

2 **SECTION 02444**
3 **CHAIN LINK FENCE**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

- 6 A. Section Includes:
7 1. Chain link fencing and gates.
- 8 B. Related Sections include but are not necessarily limited to:
9 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
10 2. Division 1 - General Requirements.
11 3. Section 01340 – Shop Drawings, Product Data and Samples; O&M Manuals; and
12 Miscellaneous Submittals
13 4. Section 02200 - Earthwork.
14 5. Division 3: Concrete.

15 **1.2 QUALITY ASSURANCE**

- 16 A. Referenced Standards:
17 1. ASTM International (ASTM):
18 a. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
19 b. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
20 c. A428, Test Method for Weight of Coating on Aluminum Coated Iron or Steel Articles.
21 d. A824, Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for use
22 with Chain-Link Fence.
23 e. F552, Terminology Relating to Chain-Link Fencing.
24 f. F567, Standard Practice for Installation of Chain Link Fence.
25 g. F626, Standard Specification for Fence Fittings.
26 h. F669, Standard Specification for Strength Requirements of Metal Posts and Rails for
27 Industrial Chain Link Fence.
28 i. F900, Standard Specification for Industrial and Commercial Swing Gates.
29 j. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized)
30 Welded, for Fence Structures.
31 k. F1184, Standard Specification for Industrial and Commercial Horizontal Slide Gates.
32 1. F2200: Standard Specification for Automated Vehicular Gate Construction.
33 2. Chain Link Manufacturer's Institute for "Galvanized Steel Chain Link Fence Fabric and
34 Accessories."
- 35 B. Qualifications:
36 1. Installer bonded and licensed in the state of Texas.
37 2. Installer shall have a minimum 2 years experience installing similar fencing.
38 3. Utilize only AWS certified welders.

39 **1.3 DEFINITIONS**

- 40 A. See ASTM F552.
41 B. NPS: Nominal pipe size, in inches.
42 C. Installer or Applicator: Installer or applicator is the person actually installing or applying the
43 product in the field at the Project site.
44 1. Installer or applicator are synonymous.

45 **1.4 SUBMITTALS**

- 1 A. Evidence of Supplier or Installer qualifications.
- 2 B. Shop Drawings:
- 3 1. See Section 01340.
- 4 2. Product technical data including:
- 5 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 6 b. Manufacturer's installation instructions.
- 7 c. Detailed information and specifications for materials, finishes, and dimensions.
- 8 3. Scaled plan layout showing spacing of components, accessories, fittings, and post
- 9 anchorage.
- 10 4. Mill certificates.
- 11 5. Source quality control test results.

12 **1.5 SCHEDULING AND SEQUENCING**

- 13 A. Complete necessary site preparation and grading before installing fence and gates.

14 **PART 2 - PRODUCTS**

15 **2.1 GENERAL**

- 16 A. Match style, finish, and color of each fence component with that of other fence components.

17 **2.2 ACCEPTABLE MANUFACTURERS**

- 18 A. Subject to compliance with the Contract Documents, the following manufacturers are
- 19 acceptable:
- 20 1. Fence systems:
- 21 a. Cyclone.
- 22 b. Page-Wilson Corporation (Page Fence Division).
- 23 c. Anchor Fence, Inc.
- 24 d. Or approved equal.
- 25 B. Submit requests for substitution in accordance with Specification Section 01640.

26 **2.3 COMPONENTS**

- 27 A. Chain Link Fabric:
- 28 1. Fabric type:
- 29 a. ASTM A392:
- 30 1) Class I: galvanized after weaving.
- 31 2. Height: 72 inches, unless otherwise shown.
- 32 3. Wire gage: No. 9 Bare Wire.
- 33 4. Mesh size: 2 IN diamond shape.
- 34 5. Diamond Count: Manufacturer's standard and consistent for fabric furnished of same height.
- 35 6. Selvage treatment:
- 36 a. Loops of Knuckled Selvages: Closed or nearly closed with space not exceeding
- 37 diameter of wire.
- 38 b. Wires of Twisted Selvages:
- 39 1) Twisted in a closed helix three full turns.
- 40 2) Cut at an angle to provide sharp barbs that extend minimum 1/4-inch beyond twist.
- 41 B. Concrete: See Division 3.
- 42 C. POSTS
- 43 1. General:
- 44 a. Strength and Stiffness Requirements: ASTM F669-90a, Heavy Industrial Fence, except
- 45 as modified in this section.
- 46 b. Steel Pipe: ASTM F1083-90.

- 1 c. Lengths: Manufacturer's standard with allowance for minimum embedment below
- 2 finished grade of 36 inches.
- 3 d. Protective Coatings:
- 4 e. Zinc Coating: ASTM F1234-90a, Type A external and internal coating.
- 5 2. Line Posts:
- 6 a. Steel Pipe:
- 7 1) Outside Diameter: 2-3/8-inch.
- 8 2) Weight: 3.65 pounds per foot.
- 9 3. End, Corner, Angle, and Pull Posts:
- 10 a. Steel Pipe:
- 11 1) Outside Diameter: 2-7/8-inch.
- 12 2) Weight: 5.79 pounds per foot.
- 13 D. Tension Wire:
- 14 1. Top and bottom of fabric:
- 15 a. Zinc-coated steel marcelled tension wire conforming to ASTM A824-86, Type II, Class
- 16 2.
- 17 E. Barbed Wire
- 18 1. Zinc-Coated Barbed Wire: ASTM A121-86, Chain Link Fence Grade:
- 19 a. Line Wire: Three strands of No. 12-1/2 gauge.
- 20 b. Barbs:
- 21 1) Number of Points: Four.
- 22 2) Length: 3/8-inch minimum.
- 23 3) Shape: Round.
- 24 4) Diameter: No. 14-gauge.
- 25 5) Spacing: 5 inches.
- 26 F. Fence Fittings
- 27 1. General: In conformance with ASTM F626-90, except as modified by this article.
- 28 2. Post and Line Caps: Designed to accommodate passage of top rail through cap, where top
- 29 rail required.
- 30 3. Tension and Brace Bands: No exceptions to ASTM F626-90.
- 31 4. Tension Bars:
- 32 a. One-piece.
- 33 b. Equal in length to full height of fabric.
- 34 5. Truss Rod Assembly: 3/8-inch diameter.
- 35 6. Barb Arms: 45-degree arms facing into the site for supporting three strands of barbed wire.

36 2.4 SOURCE QUALITY CONTROL

- 37 A. Test related fence construction materials to meet the following standards:
- 38 1. Posts and rails:
- 39 a. ASTM F669, Heavy Industrial.

40 PART 3 - EXECUTION

41 3.1 PREPARATION

- 42 A. Establish locations of fence lines, gates, and terminal posts.

43 3.2 INSTALLATION

- 44 A. Install in accordance with:
- 45 1. Manufacturer's instructions.
- 46 2. Lines and grades shown on Drawings.

- 1 3. In accordance with ASTM F567, except as modified in this section, and in accordance with
- 2 fence manufacturer's recommendations, as approved by OWNER. Erect fencing in straight
- 3 lines between angle points.
- 4 B. Provide all necessary hardware for a complete fence installation.
- 5 C. Do not start fence installation before final grading is complete and finish elevations are
- 6 established.
- 7 D. Drill holes in firm, undisturbed or compacted soil.
- 8 E. Place fence with bottom edge of fabric at maximum clearance above grade, as shown on
- 9 Drawings. Correct minor irregularities in earth to maintain maximum clearance.
- 10 F. Post setting
 - 11 1. Driven posts are not acceptable.
 - 12 2. Post Hole Depth:
 - 13 3. Minimum 40 inches below finished grade.
 - 14 4. 4 inches deeper than post embedment depth below finish grade.
 - 15 5. Backfill post holes with concrete to 2 inches above finished grade.
 - 16 6. Before concrete sets, crown and finish top of concrete to readily shed water.
 - 17 7. Space line posts at equal intervals not exceeding 10 FT OC.
 - 18 8. Provide post braces for each gate corner pull and terminal post and first adjacent line post.
 - 19 9. Install post top at each post.
- 20 G. Bracing
 - 21 1. Brace corner posts diagonally to adjacent line posts to ensure stability.
 - 22 2. Install bracing assemblies at all end posts, as well as side, corner, and pull posts.
 - 23 a. Locate compression members at mid-height of fabric.
 - 24 b. Extend diagonal tension members from compression members to bases of posts.
 - 25 3. Install so that posts are plumb when under correct tension.
- 26 H. Top rails
 - 27 1. Install top rail sleeves with springs at 105 feet maximum spacing to permit expansion in rail.
 - 28 2. Rails: Fit rails with expansion couplings of outside sleeve type.
 - 29 a. Rails continuous for outside sleeve type for full length of fence.
 - 30 3. Provide expansion couplings in top rails at not more than 20 FT intervals.
 - 31 4. Anchor top rails to main posts with appropriate wrought or malleable fittings.
- 32 I. Chain link fabric
 - 33 1. Do not install fabric until concrete has cured minimum 7 days.
 - 34 2. Install fabric with twisted and barbed selvage at top.
 - 35 3. Install tension bars full height of fabric.
 - 36 4. Pull fabric taut and secure to posts and rails.
 - 37 a. Secure so that fabric remains in tension after pulling force is released.
 - 38 b. Secure to posts at not over 15 IN OC, and to rails at not over 24 IN OC, and to tension
 - 39 wire at not over 24 IN OC.
 - 40 c. Use U-shaped wire conforming to diameter of pipe to which attached, clasping pipe and
 - 41 fabric firmly with ends twisted at least two full turns.
 - 42 d. Bend ends of wire to minimize hazards to persons or clothing.
- 43 J. Barbed wire
 - 44 1. Install three strands of barbed wire on brackets, tighten, and secure at each bracket.
 - 45 Brackets to be angled inward.

46 **3.3 FIELD QUALITY CONTROL**

- 47 A. Provide Manufacturer's Field Services as defined in Section 01650 to provide the following
- 48 services:
 - 49 1. Assistance during installation to include observation, guidance, instruction of
 - 50 CONTRACTOR's assembly, erection, installation or application procedures.

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2. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.
3. Revisiting the site as required to correct problems and until installation and operation are acceptable to OWNER.
4. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
5. Assistance during Demonstration Period functional and performance testing, and until product acceptance by the OWNER.
6. Training of OWNER's personnel in the operation and maintenance of respective product as required herein.
 - i. See Section 01650 for duration and scheduling of training sessions required.
 - ii. Training may be specified as either during the Pre-Demonstration Period or Post Demonstration.
7. Completion of Manufacturer's Certificate of Proper Installation as include in Section 01650 with applicable certificates for proper installation and initial, interim, and final test service.
8. Complete Certificate of Successful Start-up as defined in Section 01650.

END OF SECTION

2 **SECTION 02502**
3 **CONCRETE SIDEWALK**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

6 A. Section Includes:

- 7 1. This item shall govern for concrete sidewalk composed of Portland Cement concrete, con-
8 structed as herein specified on an approved subgrade, in conformity to the lines, grades and
9 details shown on the plans or as established by the ENGINEER.

10 B. Related Sections include but are not necessarily limited to:

- 11 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
12 2. Division 1 - General Requirements.
13 3. Section 01340 - Shop Drawings, Product Data and Samples, O&M Manuals, and
14 Miscellaneous Submittals.
15 4. Section 02200 - Earthwork.
16 5. Division 3 - Concrete.

17 **1.2 QUALITY ASSURANCE**

18 A. Referenced Standards:

- 19 1. American Association of State Highway and Transportation Officials (AASHTO):
20 a. M74, Sheet Materials for Curing Concrete.
21 b. M148, Liquid Membrane-Forming Compounds for Curing Concrete.
22 c. M153, Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint
23 Fillers (ASTM D1752) for Concrete Paving and Structural Construction.
24 d. M171, Sheet Materials for Curing Concrete.
25 e. M182, Burlap Cloth Made from Jute or Kenef.
26 f. M213, Standard Specification for Preformed Expansion Joint Fillers (ASTM D1751)
27 for Concrete Paving and Structural Construction.
28 g. M224, Protective Coatings for Portland Cement Concrete.
29 h. M233, Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.
30 2. American Concrete Institute (ACI):
31 a. 211, Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
32 b. 214, Recommended Practice for Evaluation of Strength Test Results for Concrete.
33 c. Refer to Section 03308, Section 03311 and Section 03350 for additional standards.
34 3. ASTM International (ASTM):
35 a. A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete
36 Reinforcement.
37 b. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete
38 Reinforcement (Including Supplementary Requirements S1).
39 c. C33, Standard Specification for Concrete Aggregates.
40 d. C150, Standard Specification for Portland Cement.
41 e. C174, Measuring Length of Drilled Concrete Cores.
42 f. C227, Standard Test Methods for Potential Alkali Reaction.
43 g. C289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates
44 (Chemical Method).
45 h. C295, Practice for Petrographic Examination of Aggregates for Concrete.
46 i. C309, Standard Specification Liquid Membrane-Forming Compounds for Curing
47 Concrete.
48 j. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard
49 Effort (12,400 ft-lbf/ft³).

- k. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding Bituminous Type).
 - l. D1752, Standard Specification for Preformed Sponge Rubber and Cork Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.
 - m. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
 - n. D4254, Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.
4. Federal Specification (FS):
 - a. SS-S-1614, Sealants, Joint, Jet-Fuel-Resistant, Hot-Applied for Portland Cement and Tar Concrete Pavements.
 - b. TT-P-115, Paint, Traffic (Highway, White and Yellow).
 - c. TT-S 00227 E(3), Sealing Compound: Elastomeric Type, Multi-Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
 5. National Ready Mixed Concrete Association (NRMCA).
 6. Plant Manufacturer's Bureau of NRMCA.

1.3 SUBMITTALS

- A. Shop Drawings:
 1. See Section 01340.
 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 3. Mix design in accordance with Section 03308 and Section 03350.
 4. Qualifications of concrete installer.
 5. Material certificates, signed by the material producer and the Contractor certifying that each material item complies with or exceeds specified requirements.
 6. Drawings detailing all reinforcing.
 7. Test reports:
 - a. Concrete cylinder test results from field quality control.
- B. Samples:
 1. See Section 01340.
 2. Samples of fabricated jointing materials and devices.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Chemical admixtures:
 - a. Sika Chemical Corporation.
 - b. Master Builders Company.
 - c. Protex Industries.
 - d. W.R. Grace and Company.
 - e. Or approved equal.
- B. Submit requests for substitution in accordance with Specification Section 01640.

2.2 MATERIALS

- A. Portland Cement:
 1. ASTM C150, Type I or II.
- B. Aggregates:
 1. ASTM C33, gradation size #67, 3/4 IN to #4.

- 1 C. Water:
- 2 1. Potable quality.
- 3 D. Admixtures:
- 4 1. Comply with Section 03308.
- 5 E. Reinforcing Bars:
- 6 1. ASTM A615, Grade 60.
- 7 F. Welded Wire Fabric:
- 8 1. ASTM A185.
- 9 2. Flat.
- 10 3. Clean, free from dirt, scale, rust.
- 11 G. Preformed Joint Filler:
- 12 1. Nonextruding cork, self-expanding cork, sponge rubber or cork rubber.
- 13 2. Meet AASHTO M153 or M213.
- 14 H. Hot-Poured Joint Sealing Material:
- 15 1. Fed Spec SS-S-1614.
- 16 I. Sidewalk Joint Sealant:
- 17 1. Two compound, polyurethane sealant.
- 18 2. Class A, Type 1.
- 19 3. Self-leveling.
- 20 4. Nontracking.
- 21 5. Fed Spec TT-S 00227 E(3).
- 22 J. Membrane Curing Compound:
- 23 1. ASTM C309.
- 24 K. Cover Materials for Curing:
- 25 1. Burlap:
- 26 a. AASHTO M182.
- 27 b. Minimum Class 2, 8 OZ material (1 YD x 42 IN).
- 28 2. Polyethylene film:
- 29 a. AASHTO M171.
- 30 L. Paper Subgrade Cover:
- 31 1. AASHTO M74 or polyethylene film.
- 32 2. Meet AASHTO M171.
- 33 M. Concrete Treatment:
- 34 1. Boiled linseed oil mixture.
- 35 2. Meets AASHTO M233.
- 36 N. Forms:
- 37 1. Steel or wood.
- 38 2. Size and strength to resist movement during concrete placement and to retain horizontal and
- 39 vertical alignment.
- 40 3. Free of distortion and defects.
- 41 4. Full depth.
- 42 5. Metal Side Forms:
- 43 a. Minimum 7/32 IN thick.
- 44 b. Depth equal to edge thickness of concrete.
- 45 c. Flat or rounded top minimum 1-3/4 IN wide.
- 46 d. Base 8 IN wide or equal to height, whichever is less.
- 47 e. Maximum deflection 1/8 IN under center load of 1700 LBS.
- 48 f. Use flexible spring steel forms or laminated boards to form radius bends.

49 2.3 MIXES

- 1 A. Mix design to provide 4,000 psi 28-day compressive strength, 1-1/2 IN +1 IN slump, 6 percent
- 2 air.
- 3 B. Comply with Section 03308 and Section 03311.

4 **PART 3 - EXECUTION**

- 5 A. Subgrade Preparation:
 - 6 1. Prepare using methods, procedures, and equipment necessary to attain required compaction
 - 7 densities, elevation and section.
 - 8 2. Scarify and recompact top 6 IN of fills and embankments which will be sidewalk and step
 - 9 areas.
 - 10 3. Remove soft or spongy areas. Replace with aggregate material.
 - 11 4. Compact to the following densities:
 - 12 a. Cohesive soils: 95 percent per ASTM D698.
 - 13 b. Non-cohesive soils: 75 percent relative per ASTM D4253 and D4254.
 - 14 5. Assure moisture content is within limits prescribed to achieve required compaction density.
 - 15 6. Following compaction, trim and roll to exact cross section. Check with approved grading
 - 16 template.
 - 17 7. Perform density tests on subgrade to determine that subgrade complies with the
 - 18 specification.
- 19 B. Aggregate Course:
 - 20 1. Place material in not more than 6 IN thick layers.
 - 21 2. Spread, shape, and compact all material deposited on the subgrade during the same day.
 - 22 3. Compact to 75 percent relative per ASTM D4253 and D4254.
- 23 C. Loose and Foreign Material:
 - 24 1. Remove loose and foreign material immediately before application of paving.
- 25 D. Appurtenance Preparation:
 - 26 1. Provide for joint construction as detailed and dimensioned on Drawings.
 - 27 2. Adjust manholes, inlets, valve boxes and any other utility appurtenances to design grade.
 - 28 a. Secure to elevation with concrete.
 - 29 b. Place concrete up to 5 IN below design grade.
 - 30 3. Clean and oil forms.

31 **3.2 ERECTION, INSTALLATION AND APPLICATION**

- 32 A. Concrete Production:
 - 33 1. Comply with Section 03311.
- 34 B. Forms:
 - 35 1. Form support:
 - 36 a. Compact soil foundation and cut to grade to support forms.
 - 37 b. Use bearing stakes driven flush with bottom of form to supplement support as
 - 38 necessary.
 - 39 c. Do not use earth pedestals.
 - 40 2. Staking forms:
 - 41 a. Joint forms neatly and tightly.
 - 42 b. Stake and pin securely with at least three pins for each 10 FT section.
 - 43 3. Clean and oil forms prior to placement of concrete.
 - 44 4. Set forms sufficiently in advance of work (minimum 2 HRS) to permit proper inspection.
 - 45 5. Previously finished pavement or curb and gutter contiguous with new work may serve as
 - 46 side form when specifically approved.
- 47 C. Reinforcing:
 - 48 1. Lap mats one full space.
 - 49 2. Tie end transverse member of upper mat securely to prevent curling.

- 1 3. Lap non-welded bars 12 IN minimum.
- 2 4. Support:
- 3 a. Place bars securely on chairs at called-for height.
- 4 b. Place other fabric on the first of a two-course pour and cover promptly with final pour,
- 5 or place fabric by a fabric-placer if procedure is reviewed and approved by Engineer.

- 6 D. Joints:
- 7 1. Hold locations and alignment to within + 1/4 IN.
- 8 2. Finish concrete surface adjacent to previous section to within + 1/8 IN, with tooled radius of
- 9 1/4 IN.
- 10 3. Metal keyway joints:
- 11 a. Form by installing metal joint strip, left in place.
- 12 b. Stake and support like side form.
- 13 c. Provide dowels or tie bars.
- 14 4. Weakened plane joints:
- 15 a. Locate at 6 FT intervals.
- 16 b. Tool groove in freshly placed concrete with tooling device.
- 17 c. Groove dimensions shall be 3/8 IN at surface and 1/4 IN at root.
- 18 5. Install construction joints at end of day's work or wherever concreting must be interrupted
- 19 for 30 minutes or more.
- 20 6. Expansion joints:
- 21 a. Locate at 48 FT intervals and at all intersection curb returns.
- 22 b. Stake in place load transfer device consisting of dowels.
- 23 c. Supporting and spacing means and premolded joint filler as per Drawing details.
- 24 d. Provide preformed joint filler at all junctions with existing sidewalks, steps, or other
- 25 structures.
- 26 7. Thoroughly clean and fill joints with joint sealing material as specified.
- 27 8. Upper surface of filled joint to be flush to 1/8 IN below finish surface.

- 28 E. Place Concrete:
- 29 1. Comply with Section 03311.
- 30 2. Construct driveway openings and other features as per Drawing details.

- 31 F. Cold and Hot Weather Concreting:
- 32 1. Cold weather:
- 33 a. Cease concrete placing when descending air temperature in shade falls below 40 DegF.
- 34 b. Do not resume until ambient temperature has risen to 40 DegF.
- 35 c. If placing is authorized below 40 DegF by Engineer, maintain temperature of mix
- 36 between 60 and 80 DegF.
- 37 d. Heat aggregates or water or both.
- 38 e. Water temperature may not exceed 175 DegF.
- 39 f. Aggregate temperature may not exceed 150 DegF.
- 40 g. Remove and replace frost damaged concrete.
- 41 h. Salt or other antifreeze is not permitted.
- 42 i. Comply with ACI 306R.
- 43 2. Hot weather:
- 44 a. Cease concrete placing when plastic mix temperature cannot be maintained under 90
- 45 DegF.
- 46 b. Aggregates or water or both may be cooled.
- 47 c. Cool water with crushed ice.
- 48 d. Cool aggregates by evaporation or water spray.
- 49 e. Never batch cement hotter than 160 DegF.
- 50 f. Comply with ACI 305R.

- 51 G. Finishing:
- 52 1. As soon as placed, strike off and screed to crown and cross section, slightly above grade, so
- 53 that consolidation and finishing will bring to final Drawing elevations.
- 54 2. Maintain uniform ridge full width with first pass of first screed.

- 1 3. Test with 6 FT straightedges equipped with long handles and operated from sidewalk.
- 2 4. Draw excess water and laitance off from surface.
- 3 5. Float finish so as to leave no disfiguring marks but to produce a uniform granular or sandy
- 4 texture.
- 5 6. Broom finish after floating.
- 6 7. Tool edges with suitable edger.
- 7 8. Provide exposed aggregate surfaces in areas indicated on the Drawings.
- 8 9. Provide method such as abrasive blasting, bush hammering, or surface retarder acceptable to
- 9 the Engineer.

10 H. Curing:

- 11 1. Apply membrane curing compound complying with ASTM C309, and in accordance with
- 12 manufacturer's directions but at a rate of minimum 200 SF per gallon.
- 13 2. Apply curing compound within 4 HRS after finishing or as soon as surface moisture has
- 14 dissipated.
- 15 3. Cure for minimum of 7 days.
- 16 4. When average daily temperature is below 50 DegF, provide insulative protection of 12 IN
- 17 minimum thickness loose dry straw, or equivalent, for 10 days.
- 18 5. Linseed oil sealant:
- 19 a. For concrete sidewalk and step, seal surface with linseed oil.
- 20 b. Apply linseed oil to clean surface as per AASHTO M224 after concrete has cured for 1
- 21 month.
- 22 c. Apply first application at rate of 67 SY per gallon.
- 23 d. Apply second application to a dry surface at rate of 40 SY per gallon.

24 I. Protection of Concrete:

- 25 1. Protect new sidewalk, steps, and their appurtenances from traffic for a minimum of 14 days.
- 26 2. Repair or replace parts of sidewalk and steps damaged by traffic, or other causes, prior to
- 27 final acceptance.

28 J. Opening to Traffic:

- 29 1. After 14 days, area may, at Owner's discretion, be opened to traffic if job cured cylinders
- 30 have attained a compressive strength of 3000 LBS per square inch when tested in
- 31 accordance with ASTM standard methods.
- 32 2. Prior to opening to traffic, clean and refill joints as required with specified filler material.

33 K. Clean Up:

- 34 1. Assure clean-up work is completed within 2 weeks after sidewalk has been opened to
- 35 traffic.
- 36 2. No new work will begin until clean-up work has been completed, or is maintained within 2
- 37 weeks after sidewalk has been opened to traffic.

38 L. Handrails:

- 39 1. Provide handrails where required and as per Drawing details.

40 **3.3 FIELD QUALITY CONTROL**

- 41 A. Provide test cylinders in accordance with Division 3 for each 50 CY of concrete placed.
- 42 B. Contractor to provide testing services in accordance with Division 3.

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END OF SECTION

2 **SECTION 02513**
3 **ASPHALTIC CONCRETE VEHICULAR PAVING**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

6 A. Section Includes:

- 7 1. Asphaltic concrete vehicular paving: This section shall govern for the construction of a base
8 course, a level-up course, a surface course or any combination of these courses as shown on
9 the plans, each course being composed of a compacted mixture of aggregate and asphalt
10 cement mixed hot in a mixing plant, in accordance with the details shown on the plans and
11 the requirements herein.

12 B. Related Sections include but are not necessarily limited to:

- 13 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
14 2. Division 1 - General Requirements.
15 3. Section 01340 – Shop Drawings, Product Data and Samples; O&M Manuals; and
16 Miscellaneous Submittals.
17 4. Section 02200 – Earthwork.

18 **1.2 QUALITY ASSURANCE**

19 A. Referenced Standards:

- 20 1. Federal Specifications (FS):
21 a. AASHTO Guide for Design of Pavement Structures 1993 Edition.
22 2. Materials and mix designs used in the production of asphaltic concrete, unless otherwise
23 shown in the plans or specified herein, shall generally conform to the standards presented in
24 the Standard Specification for Construction of Highways, Streets and Bridges published by
25 the Texas Department of Transportation (1993).

26 B. Miscellaneous:

- 27 1. Should conflicts arise between standard specifications of government agencies mentioned
28 herein and Contract Documents, Contract Documents shall govern.

29 **1.3 SUBMITTALS**

30 A. Shop Drawings:

- 31 1. Product technical data including:
32 a. Acknowledgement that products submitted meet requirements of standards referenced.
33 b. Manufacturer's installation instructions.
34 2. Asphalt design mix.
35 3. A list identifying the types and sources of materials proposed for this work.
36 4. Laboratory test reports demonstrating compliance with these specifications for each mix
37 design proposed for use.
38 5. Material certificates, signed by the material producer and the CONTRACTOR, certifying
39 that each material item complies or exceeds specified requirements.

40 **1.4 PERMITS**

- 41 A. Contractor is responsible for obtaining City of Kerrville and Kerr County driveway access
42 permits, coordinating required inspections, and paying all associated fees.

1 **PART 2 - PRODUCTS**

2 **2.1 GENERAL**

3 A. Materials and mix designs used in the production of asphaltic concrete, unless otherwise shown
4 in the plans or specified herein, shall generally conform to the standards presented in the
5 Standard Specification for Construction of Highways, Streets and Bridges published by the
6 Texas Department of Transportation (1993).

7 **2.2 MATERIALS**

- 8 A. Hot mix asphaltic concrete paving mixtures:
- 9 1. Paving mixtures used shall be Type D . The paving mixtures shall consist of a uniform
10 mixture of aggregate, hot asphalt cement, and additives if allowed or required. The mix
11 shall be designed in accordance with TXDOT Construction Bulletin C-14 and Test Method
12 Tex-204-F. The mixture shall be designed to produce an acceptable mixture at an optimum
13 density of 96.0 percent, when tested in accordance with Test Method Tex-207-F and Test
14 Method Tex-227-F. The operating range for control of laboratory density during production
15 shall be optimum density plus or minus 1.5 percent. The materials used in the mixture
16 design shall produce a mixture with a stability value of at least 35, unless otherwise shown
17 on the plans, when tested in accordance with Test Method Tex-208-F.
 - 18 2. The aggregate gradation of the job mix formula shall conform to the master grading limits
19 shown in Table 1 for the type of mix specified in the plans.
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Table 1
Master Grading
Percent Passing by Weight or Volume

Sieve Size	Type
	D
	Fine Surface
1-1/2"	
1-1/4"	
1"	
7/8"	
5/8"	
1/2"	100
3/8"	85-100
1/4"	
No. 4	50-70
No. 10	32-42
No. 40	11-26
No. 80	4-14
No. 200	1-6*
VMA	14
% minimum	

22 * 2 - 8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

23
24 3. The gradation of the aggregate and the asphalt cement content of the produced mix shall not
25 vary from the job-mix formula by more than the tolerances shown in Table 2. When within
26 applied tolerances, the gradation of the produced mixture may fall outside the master
27 grading limits for any of the sieve sizes from the largest sieve on which aggregate may be
28 retained down through the No.80 sieve. Only the quantity passing the No. 200 sieve is
29 further restricted to conform to the master grading limitations shown in Table 1 or as
30 modified in Test Method Tex-299-F. A tolerance of 2 percent is allowed on the sieve size
31 for each mixture type which shows 100 percent passing in Table 1.
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Table 2
Tolerances
Percent by Weight or Volume, as applicable

Passing the 1-1/4" to No. 10 sieve	Plus or minus 5
Passing the No. 40 to No. 200 sieve	Plus or minus 3
Asphalt weight	Plus or minus 0.5
Asphalt volume	Plus or minus 1.2

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- B. Asphaltic base:
 - 1. Flexible Base: Flexible base shall conform to the requirements of Item No. 247, "Flexible Base" of the Texas Department of Transportation Standard Specifications. Type of material shall be Type "A", Grade 1.
 - 2. Asphaltic Material: Asphalt for the mixture shall be type D and shall meet the requirements of Item No. 300, "Asphalt, Oils and Emulsions" of the Texas Department of Transportation Standard Specifications.
 - 3. Paving Mixture: The paving mixture shall consist of a uniform mixture of mineral aggregate and asphaltic material. It shall be designed in accordance with TxDOT Test Method Tex-126-E and Tx Dot Item No. 345 Asphalt Stabilized Base (Plant Mixed). Asphaltic material shall be between 4.0 and 9.0 percent of the mixture by weight, the exact amount to be determined by the test design mixture. The asphaltic material shall not vary from that proportion designated by more than 0.5 percent dry weight based upon the total mixture.
- C. Prime Coat:
 - 1. The asphaltic material for Prime Coat shall meet the requirements for Cut-Back Asphalt, "MC-30", Emulsified Asphalt "EA-11M" or "EA-10S", or other asphalts or emulsions as shown on the plans, or as directed, or approved, by the Engineer. Asphalts and Emulsions shall conform to the requirements of Item 300, "Asphalts, Oils and Emulsions" of the Standard Specifications of the Texas Department of Transportation. Where Emulsified Asphalts are used, the amount of emulsified asphalt as a percentage by volume of the total mixture shall be within the limits shown on the plans, or shall be of a percentage as directed by the Engineer.

PART 3 - EXECUTION

3.1 GENERAL

- A. It shall be the responsibility of the CONTRACTOR to produce, transport, place and compact the specified paving mixture in accordance with the requirements herein.
- B. The CONTRACTOR shall construct to line, grade and section as shown on Drawings and in accordance with referenced State Specifications.
- C. Tolerance of Finished Grade: ± 0.10 FT from required elevations.
- D. The asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall be placed when the air temperature is at least 50°F and rising.
- E. The asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is below 55°F and is falling, but may be placed when the air temperature is above 45°F and is rising. The air temperature shall be taken in the shade away from artificial heat. The maximum depth of asphalt mixture placed with a motor grader will not exceed 5 inches of compacted material.
- F. Mat thickness of 1½ inches and less shall not be placed when the temperature of the surface on which the mat is to be placed is below 50°F.

- 1 G. It is further provided that the tack coat or asphaltic mixture shall be placed only when the
2 humidity, general weather conditions, temperature and moisture condition of the base, in the
3 opinion of the ENGINEER are suitable.
- 4 H. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic
5 mixture falls below 200°F, all or any part of the load may be rejected and payment will not be
6 made for the rejected material.

7 3.2 PREPARATION OF SUBGRADE

- 8 A. Subgrade preparation for the proposed pavement sections should consist of clearing, stripping,
9 proof-rolling, lime-fly ash stabilizing for flexible pavement.
- 10 1. Strip the surface soil to suitable depths. In areas where soft, compressible or loose soils are
11 encountered, additional stripping may be required. Stripping should extend a minimum of
12 two feet beyond the edge of the proposed pavement.
- 13 2. Surfaces exposed after stripping should be proof-rolled with heavy equipment, such as a
14 loaded dump truck, to identify any underlying zones or pockets of soft soils and to remove
15 such weak materials. If backfill is required, the fill material should be prepared as described
16 in Section 02200.
- 17 3. Scarify the upper six inches of exposed surface as required, mix with about 2 percent lime
18 and 8 percent fly ash (by dry weight) and compact it to 95 percent of standard Proctor
19 maximum density as determined by TEX-114-E.
- 20 B. Construction of lime-fly ash treated subgrade and compacted base should conform to TxDOT
21 Standard Specifications for Construction of Highways, Streets and Bridges Item 266. Also,
22 cement stabilized subgrade should conform to TxDOT Standard Specifications for Construction
23 of Highways, Streets and Bridges Item 275.

24 3.3 ASPHALTIC BASE

- 25 A. Mixing Plants: Mixing plants that will not consistently produce a paving mixture meeting all the
26 requirements of this specification will be condemned. Mixing plants may be of the weight-
27 batching type, the continuous mixing type or the dryer-drum type meeting all the requirements
28 of Item No. 345, "Asphalt Stabilized Base (Plant Mix)" of the Texas Department of
29 Transportation Standard Specifications and subsequent revisions and Special Provisions thereto.
- 30 B. Asphalt Material Heating Equipment: Asphalt material heating equipment shall conform to
31 Paragraph 345.4(3) of Item No. 345, "Asphalt Stabilized Base (Plant Mix)" of the Texas
32 Department of Transportation Standard Specifications and subsequent revisions and Special
33 Provisions thereto.
- 34 C. Spreading and Finishing Machine: The spreading and finishing machine shall be equipped with a
35 heated compacting screed, and shall be capable of producing a surface that will be smooth and
36 true to the established line, grade and cross section and acceptable to the Engineer. Unacceptable
37 finish shall be corrected by the addition of mixture placed and finished at the entire expense of
38 the Contractor.
- 39 D. Construction Methods: Refer to Item 205: "Hot Mix Asphaltic Concrete Pavement" for
40 Construction Methods.
- 41 E. In Place Density: It is the intent of this specification that the material be placed and compacted
42 to a density of 95 to 100 percent of that density developed in the laboratory test method for
43 molding stability specimens (TXDOT Test Method Tex-206-5.). A minimum of one density
44 tests per location per day will be made in order to determine that the compaction procedure used
45 by the Contractor is adequate and proper to accomplish the intent as stated above. The field
46 specimens utilized for the in place density testing may be either cores or sections of asphalt-
47 treated base. Other methods of determining in place density which correlate satisfactorily with
48 those results obtained through use of TXDOT Test Method Tex 207-F may be used.
- 49 F. Protection of the work: Sections of the newly finished base course shall be cleaned prior to
50 laying the surface course or additional base courses.

1 **3.4 PRIME COAT**

- 2 A. Upon Approval, the surface shall be cleaned by sweeping with a vacuum sweeper or other
3 approved methods as directed by the Inspector. If directed by the Inspector, the surface shall be
4 lightly sprinkled with water just prior to application of the asphaltic material. The asphaltic
5 material shall be applied on the clean surface by an approved type of self-propelled pressure
6 distributor so operated as to distribute the prime coat at a rate not to exceed 0.20 gallon per
7 square yard [0.2 liters per square meter] of surface, evenly and smoothly, under a pressure
8 necessary for proper distribution. During the application of prime coat, care shall be taken to
9 prevent splattering of adjacent pavement, curb and gutters or structures. Prime Coat shall not be
10 applied when the air temperature is below 60 °F [16 °C] and falling, but it may be applied when
11 the air temperature is above 50 °F [10 °C] and is rising; the air temperature being taken in the
12 shade and away from artificial heat. Asphaltic material shall not be placed when general
13 weather conditions, in the opinion of the Inspector, are not suitable.

14 **3.5 TRANSPORTING ASPHALTIC CONCRETE**

- 15 A. The asphaltic mixture shall be hauled to the work site in tight vehicles previously cleaned of all
16 foreign material. The dispatching of the vehicles shall be arranged so that all material delivered
17 is placed and all rolling completed during daylight hours unless otherwise on the plans. In cool
18 weather or for long hauls, covering and insulating of the truck bodies may be required. If
19 necessary, to prevent the mixture from adhering to the inside of the truck body, the inside of the
20 truck may be given a light coating of release agent satisfactory to the ENGINEER.

21 **3.6 PLACING OF HMAC AND ASPHALTIC BASE**

- 22 A. The asphaltic mixture shall be dumped and spread on the approved prepared surface with the
23 laydown machine. When properly compacted, the finished pavement, shall be smooth, of
24 uniform texture and density and shall meet the requirements of the typical cross sections and the
25 surface tests. In addition, the placing of the asphaltic mixture shall be done without tearing,
26 shoving, gouging or segregating the mixture and without producing streaks in the mat.
- 27 B. Unloading into the finishing machine shall be controlled so that bouncing or jarring the
28 spreading and finishing machine shall not occur and the required lines and grades shall be
29 obtained without resorting to hand finishing.
- 30 C. When approved by the ENGINEER, level-up courses may be spread with a motor grader.
- 31 D. The spreading and finishing machine shall be operated at a uniform forward speed consistent
32 with the plant production rate, hauling capability, and roller train capacity to result in a
33 continuous operation. The speed shall be slow enough that stopping between trucks is not
34 ordinarily required. If, in the opinion of the ENGINEER, sporadic delivery of material is
35 adversely affecting the mat, the ENGINEER may require paving operations to cease until
36 acceptable methods are provided to minimize starting and stopping of the paver.
- 37 E. The hopper flow gates of the spreading and finishing machine shall be adjusted to provide an
38 adequate and consistent flow of material. These shall result in enough material being delivered
39 to the augers so that they are operating approximately 85 percent of the time or more. The
40 augers shall provide means to supply adequate flow of material to the center of the paver.
41 Augers shall supply an adequate flow of material for the full width of the mat, as approved by
42 the ENGINEER and should be kept approximately one-half to three-quarters full of mixture at
43 all times during the paving operation.
- 44 F. When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or
45 used to level up small areas of an existing pavement, or placed in small irregular areas where the
46 use of a finishing machine is not practical, the finishing machine may be eliminated when
47 authorized by the ENGINEER.
- 48 G. Adjacent to flush curbs, gutters and structures, the surface shall be finished uniformly high so
49 that when compacted it will be slightly above the edge of the curb or structure.

- 1 H. Provide construction joints so successive courses of asphaltic material shall be offset at least 6
2 inches. Construction joints on surface courses shall coincide with lane lines, or as directed by
3 the ENGINEER.
- 4 I. If a pattern of surface irregularities or segregation is detected, the CONTRACTOR shall make
5 an investigation into the cause and immediately take the necessary action. With the approval of
6 the ENGINEER, placement may continue for no more than one full production day from the
7 time the CONTRACTOR is first notified and while corrective actions are being taken. If the
8 problem still exists after that time, paving shall cease until the CONTRACTOR further
9 investigates the causes and the ENGINEER approves further corrective action to be taken.

10 3.7 COMPACTING

- 11 A. The pavement shall be compacted thoroughly and uniformly with the necessary rollers to obtain
12 the compaction and cross section of the finished paving mixture meeting the requirements of the
13 plans and specifications.
- 14 B. Asphaltic concrete shall be placed and compacted to contain from 5 to 9 percent air voids. The
15 percent air voids will be calculated using the maximum theoretical specific gravity of the
16 mixture determined according to Test Method TEX-227-F.
- 17 C. The Contractor shall be responsible for determining the number and type of rollers to be used to
18 obtain compaction to within the air void range required herein.
- 19 D. When rolling with the three-wheel, tandem or vibratory rollers, rolling shall start by first rolling
20 the joint with the adjacent pavement and then continue by rolling longitudinally at the sides and
21 proceed toward the center of the pavement, overlapping on successive trips by at least 1 foot,
22 unless otherwise directed by the ENGINEER. Alternate trips of the roller shall be slightly
23 different in length. On super-elevated curves, rolling shall begin at the low side and progress
24 toward the high side, unless otherwise directed by the ENGINEER.
- 25 E. When rolling with vibratory steel-wheel rollers, equipment operation shall be in accordance with
26 the manufacturer's recommendations, unless otherwise directed by the ENGINEER. Vibratory
27 rollers shall not be left vibrating while not rolling or when changing directions. Unless
28 otherwise shown on the plans or approved by the ENGINEER, vibratory rollers shall not be
29 allowed in the vibrating mode on mats with a plan depth of less than 1 ½ inches. In case of over
30 vibration resulting in disruption of the compacted material, the CONTRACTOR shall rework
31 and recompact or replace the damaged material at his own expense. The vibratory roller shall be
32 operated at a speed that will produce not less than 10 impacts (blows) per liner foot unless
33 otherwise shown on the plans or approved by the ENGINEER. The drums of the vibratory roller
34 shall be kept in a moist condition with water.
- 35 F. The motion of the rollers shall be slow enough to avoid other than usual initial displacement of
36 the mixture. If any displacement occurs, it shall be corrected to the satisfaction of the
37 ENGINEER. The roller shall not be allowed to stand on pavement which has not been fully
38 compacted. To prevent adhesion of the surface mixture to the steel-wheel rollers, the wheels
39 shall be kept thoroughly moistened with water, but an excess of water will not be permitted.
40 Necessary precautions shall be taken to prevent the dropping of diesel, gasoline, oil, grease or
41 other foreign matter on the pavement, either when the rollers are in operation or when standing.
- 42 G. The edges of the pavement along curbs, headers and similar structures, and all places not
43 accessible to the roller, or in such positions as will not allow thorough compaction with the
44 rollers, shall be thoroughly compacted with lightly oiled tamps.
- 45 H. Rolling with a trench roller will be required on widened areas, in trenches and other limited
46 areas where satisfactory compaction cannot be obtained with the approved rollers.

47 3.8 IN-PLACE COMPACTION CONTROL

- 48 A. In place compaction control is required for all mixtures.

- 1 B. Ordinary Compaction Control. One (1) three-wheel roller, one (1) pneumatic-tire roller, and one
2 compaction operation except as provided below or approved by the ENGINEER. The use of a
3 tandem roller may be waived by the ENGINEER when the surface is already adequately smooth
4 and further steel-wheel rolling is shown to be ineffective. With approval of the ENGINEER, the
5 CONTRACTOR may substitute a vibratory roller for the three-wheel roller and/or the tandem
6 roller. Use of at least one (1) pneumatic-tire roller is required. Additional or heavier rollers
7 shall be furnished if required by the ENGINEER.
- 8 C. Rolling patterns shall be established by the CONTRACTOR to achieve the maximum
9 compaction. The selected rolling pattern shall be followed unless changes in the mixture or
10 placement conditions occur which affect compaction. When changes in the mixture or
11 placement conditions occur, a new rolling pattern shall be established.
- 12 D. Compaction Cessation Temperature. Regardless of the method required for in-place compaction
13 control, all rolling for compaction shall be completed before the mixture temperature drops
14 below 175°F.

15 **3.9 OPENING TO TRAFFIC**

- 16 A. If the surface ravel, flushes, ruts or deteriorates in any manner prior to final acceptance of the
17 work, it will be the CONTRACTOR's responsibility to correct this condition at his expense, to
18 the satisfaction of the Inspector and in conformance with the requirements of this specification.

19 **3.10 FIELD QUALITY CONTROL**

- 20 A. Provide in-place testing of percent lime incorporated into subgrade every 500 cubic yards or
21 portion thereof of material placed.
- 22 B. Provide gradation analysis (sieve analysis) and percent asphalt testing for asphaltic base. Tests
23 shall be taken for each source of material used, from each different source stockpile, and for
24 every 300 cubic yards or portion thereof of materials used from each source.
- 25 C. Provide compaction tests for each course of material including subgrade, asphaltic base,
26 structural fill, and asphaltic concrete, for each 400 square yards or portion thereof of material
27 placed.
- 28 D. Provide testing to demonstrate asphalt materials meet specifications for each 50,000 gallons of
29 product supplied.

30 **END OF SECTION**

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2 **SECTION 02515**
3 **PRECAST CONCRETE MANHOLE STRUCTURES**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

- 6 A. Section Includes:
- 7 1. Precast concrete manhole structures and appurtenant items.
 - 8 a. Chemical feed manholes and appurtenances.
- 9 B. Related Sections include but are not necessarily limited to:
- 10 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 11 2. Division 1 - General Requirements.
 - 12 3. Section 02221 - Trenching, Backfilling, and Compacting for Utilities.
 - 13 4. Division 3 - Concrete.
 - 14 5. Section 09905 - Painting and Protective Coatings.

15 **1.2 QUALITY ASSURANCE**

- 16 A. Referenced Standards:
- 17 1. American Association of State Highway and Transportation Officials (AASHTO):
 - 18 a. M198, Standard Specification for Asbestos-Cement Underdrain Pipe.
 - 19 2. ASTM International (ASTM):
 - 20 a. A48, Standard Specification for Gray Iron Castings.
 - 21 b. A536, Standard Specification for Ductile Iron Castings.
 - 22 c. C150, Standard Specification for Portland Cement.
 - 23 d. C478, Precast Reinforced Concrete Manhole Sections.
 - 24 e. C923, Resilient Connectors Between Reinforced Concrete Manhole Structures and
 - 25 Pipes.
 - 26 f. D1227, Emulsified Asphalt Used As a Protective Coating for Roofing.
 - 27 g. D4022, Standard Specification for Coal Tar Roof Cement, Asbestos Containing.
 - 28 3. Occupational, Health and Safety Administration (OSHA).

29 **1.3 SUBMITTALS**

- 30 A. Shop Drawings:
- 31 1. See Section 01340.
 - 32 2. Product technical data including:
 - 33 a. Acknowledgement that products submitted meet requirements of standards referenced.
 - 34 b. Manufacturer's installation instructions.
 - 35 3. Fabrication and/or layout drawings:
 - 36 a. Include detailed diagrams of manholes showing typical components and dimensions.
 - 37 b. Itemize, on separate schedule, sectional breakdown of each manhole structure with all
 - 38 components and refer to drawing identification number or notation.
 - 39 c. Indicate knockout elevations for all piping entering each manhole.

40 **1.4 PROJECT CONDITIONS**

- 41 A. For this project, the groundwater elevation is influenced by seasonal and climatic conditions and
- 42 the water level of the nearby Guadalupe River. Groundwater should be anticipated in
- 43 accordance with the Geotechnical Investigation provided in Section 00220.

1 **PART 2 - PRODUCTS**

2 **2.1 ACCEPTABLE MANUFACTURERS**

3 A. Subject to compliance with the Contract Documents, the following manufacturers are
4 acceptable:

- 5 1. Manhole rings, covers and frames:
6 a. Neenah Foundry.
7 b. Deeter Foundry.
8 2. Black mastic joint compound:
9 a. Kalktite 340.
10 b. Tufflex.
11 c. Plastico.
12 3. Premolded joint compound:
13 a. Ram Nec.
14 b. Kent Seal.
15 4. Fibered asphalt compound:
16 a. Sonneborn Hydrocide 700B Semi-Mastic.

17 B. Submit request for substitutions in accordance with Specification Section 01640.

18 **2.2 MANHOLE STRUCTURE COMPONENTS**

19 A. Manhole Components:

- 20 1. Reinforcement: ASTM C478.
21 2. Minimum wall thickness: 5 IN.
22 3. Minimum base thickness: 12 IN.
23 4. Provide the following components for each manhole structure:
24 a. Base (precast) with integral bottom section or (cast-in-place).
25 b. Precast bottom section(s).
26 c. Precast barrel section(s).
27 d. Precast eccentric transition section.
28 e. Precast adjuster ring(s).
29 f. Precast concrete transition section.
30 g. Precast flat top.
31 5. Unless dimensioned or specifically noted on Drawings, provide manhole section with
32 minimum 60 IN inside dimensions.

33 B. Nonpressure Type Frames and Cover:

- 34 1. Cast iron frame and covers: ASTM A48, Class 35 (minimum).
35 2. Use only ductile iron of best quality, free from imperfections and blow holes.
36 3. Furnish frame and cover of heavy-duty construction a minimum total weight of 450 LBS.
37 4. Machine all horizontal surfaces.
38 5. Furnish unit with solid nonventilated lid with concealed pickholes.
39 6. Ensure minimum clear opening of 24 IN DIA.

40 C. Special Coatings and Joint Treatment:

- 41 1. Joints of precast sections:
42 a. Black mastic compound: ASTM D4022.
43 2. Aluminum components embedded in concrete:
44 a. See Section 09905 for protective coating for aluminum embedded in concrete.
45 3. Vertical wall surfaces:
46 a. Emulsified fibrated asphalt compound meeting ASTM D1227 Type I for all exterior
47 vertical wall surfaces.

48 D. Sanitary Sewer Manhole Concrete:

- 49 1. Provide all sanitary manholes constructed with Portland ASTM C150, Type I or II cement
50 with a tricalcium aluminate content not to exceed 8 percent.
51 2. Mix aggregate shall be a minimum of 50 percent crushed limestone.

1 3. Provide 3000 psi non-shrink grout.

2 **PART 3 - EXECUTION**

3 **3.1 MANHOLE CONSTRUCTION**

4 A. General:

5 1. Construct cast-in-place concrete base slabs.

6 2. On all straight runs, lay pipe through manhole and cut out top half of pipe. See detail on
7 Drawings.

8 B. Build each manhole to dimensions shown on plans and at such elevation that pipe sections built
9 into wall of manhole will be true extensions of line of pipe.

10 C. For all horizontal mating surfaces between concrete and concrete or concrete and metal, above
11 established high groundwater elevation shown trowel apply to clean surface black mastic joint
12 compound to a minimum wet thickness of 1/4 IN immediately prior to mating the surfaces.

13 D. For horizontal joints that fall below established high groundwater elevation shown, install a
14 resilient O-ring type gasket or pre-molded joint compound.

15 E. Seal all pipe penetrations in manhole. Form pipe openings smooth and well shaped. After
16 installation, seal cracks with, non shrink grout. After grout cures, wire brush smooth and apply
17 two coats emulsified fibered asphalt compound to minimum wet thickness of 1/8 IN to ensure
18 complete seal.

19 F. Set and adjust frame and cover final 6 IN (minimum) to 18 IN (maximum) to match finished
20 pavement or finished grade elevation using precast adjuster rings.

21

END OF SECTION

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2 **SECTION 02930**
3 **SEEDING**

4 **PART 1 - GENERAL**

5 **1.1 SUMMARY**

- 6 A. Section Includes:
- 7 1. Seeding, sodding and landscape planting:
 - 8 a. Soil preparation.
 - 9 b. Lawn-type seeding.
 - 10 c. Native grass seeding.
 - 11 d. Maintenance of new and transplanted materials.
 - 12 e. Replacement of dead or impaired materials at the end of the first growing season.
 - 13 B. Related Sections include but are not necessarily limited to:
 - 14 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 15 2. Division 1 - General Requirements.
 - 16 3. Section 02260 - Topsoiling and Finished Grading.

17 **1.2 QUALITY ASSURANCE**

- 18 A. Referenced Standards:
- 19 1. American Standard for Nursery Stock (ASNS).
 - 20 2. ASTM International (ASTM):
 - 21 a. D997, Drop Test for Loaded Cylindrical Containers.
 - 22 b. D2028, Standard Specification for Cutback Asphalt.
 - 23 3. Standard Methods of the Association of Official Agricultural Chemists.
 - 24 4. United States Department of Agriculture, (USDA):
 - 25 a. Federal Seed Act.

26 **1.3 SUBMITTALS**

- 27 A. Shop Drawings:
- 28 1. See Section 01340.
 - 29 2. Layout drawings:
 - 30 a. Scaled site plan (scale 1 IN = 20 FT or equal to scale of Project site plan drawing) on
31 reproducible drawing to show:
 - 32 1) Structures, sidewalks, pavement, and fences.
 - 33 2) Limits of seeded areas.
 - 34 3. Product technical data including:
 - 35 a. Acknowledgement that products submitted meet requirements of standards referenced.
 - 36 b. Manufacturer's installation instructions.
 - 37 c. Signed copies of vendor's statement for seed mixture required, stating botanical and
38 common name, place of origin, strain, percentage of purity, percentage of germination,
39 and amount of Pure Live Seed (PLS) per bag.
 - 40 4. Certification:
 - 41 a. Certify each container of seed delivered will be labeled in accordance with Federal and
42 State Seed Laws and equals or exceeds Specification requirements.
 - 43 5. Other documents:

- 1 a. Copies of invoices for fertilizer used on Project showing grade furnished, along with
 2 certification of quality and warranty. If Engineer determines fertilizer requires sampling
 3 and testing to verify quality, testing will be done at Contractor's expense, in accordance
 4 with current methods of Association of Official Agricultural Chemists. Upon
 5 completion of Project, a final check of total quantities of fertilizer used will be made
 6 against total area seeded. If minimum rates of application have not been met,
 7 Contractor will be required to distribute additional quantities to make up minimum
 8 application specified.

9 **1.4 DELIVERY, STORAGE, AND HANDLING**

- 10 A. Furnish seed in sealed standard containers labeled with producer's name and seed analysis.
 11 Remove from the site seed which has become wet, moldy, or otherwise damaged in transit.
 12 B. Furnish fertilizer uniform in composition, free flowing and suitable for application with
 13 approved equipment, delivered to site in bags or other containers, each fully labeled and bearing
 14 the name, and warranty of the producer.

15 **1.5 SEQUENCING AND SCHEDULING**

- 16 A. Installation Schedule:
 17 1. Provide schedule showing when groundcovers are anticipated to be planted.
 18 2. Show schedule of when lawn type and other grass areas are anticipated to be planted.
 19 3. Indicate planting schedules in relation to schedule for finish grading and topsoiling.
 20 4. Indicate anticipated dates Engineer will be required to review installation for initial
 21 acceptance and final acceptance.

22 **PART 2 - PRODUCTS**

23 **2.1 MATERIALS**

- 24 A. Seed Quality: Fresh, clean, new-crop seed labeled in accordance with U.S. Department of
 25 Agriculture Rules and Regulations under Federal Seed Act in effect on date of bidding. Provide
 26 seed of species, proportions, and minimum percentages of purity, germination and maximum
 27 percentage of weed seed as specified. Approval of all seed for use shall be based on the
 28 accumulative total of PLS specified for each phase of work.
 29 B. Lawn-Type Seed Mixture:
 30

BOTANICAL AND COMMON NAME	PERCENT BY WEIGHT (PLS)	MINIMUM PERCENT GERMINATION	MINIMUM PERCENT PURITY
Hulled Bermuda Grass (Cynoden dactolyn)	85	85	95

- 32 C. Native Grass Seeding: Certified seed of locally adapted strains.
 33 1. Seed mixture: Distributed by Native American Seed, 800-728-4043 or approved equal.
 34

GRASSES	PERCENT BY WEIGHT
Blue grama(Bouteloua gracilis)	29.85%
Buffalo grass(Buchloe dactyloides)	62.69%
Purple three-awn(Aristida purpurea)	7.48%

- 35
 36 D. Mulch:

- 1 1. For seeded areas: Clean, seed-free, threshed straw of oats, wheat, barley, rye, beans,
2 peanuts, or other locally available mulch material which does not contain an excessive
3 quantity of matured seeds of noxious weeds or other species that will grow or be detrimental
4 to seeding, or provide a menace to surrounding land. Do not use material which is fresh or
5 excessively brittle, or which is decomposed and will smother or retard growth of grass.
6 2. Native grass seeded areas. Weed-free hay, excluding brome or bluegrass hay, used on slopes
7 4:1 or greater.
- 8 E. Fertilizer: Commercial fertilizer meeting applicable requirements of State and Federal law.
9 Cyanic compound or hydrated lime not permitted in mixed fertilizers.
- 10 1. Mix:
11 a. Nitrogen: 10
12 b. Phosphoric Acid: 10.
13 c. Potash: 10.
- 14 F. Water: Water free from substances harmful to grass or sod growth. Provide water from source
15 approved prior to use.

16 **PART 3 - EXECUTION**

17 **3.1 SOIL PREPARATION**

- 18 A. General:
19 1. Limit preparation to areas which will be planted soon after.
20 2. Provide facilities to protect and safeguard all persons on or about premises.
21 3. Protect existing trees designated to remain.
22 4. Verify location and existence of all underground utilities. Take necessary precaution to
23 protect existing utilities from damage due to construction activity. Repair all damages to
24 utility items at sole expense.
- 25 B. Preparation for Lawn-Type Seeding:
26 1. Loosen surface to minimum depth of 4 IN. Remove stones over 1 IN in any dimension and
27 sticks, roots, rubbish, and other extraneous matter.
28 2. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable
29 device if the soil has become hard or compacted. Correct any surface irregularities in order
30 to prevent pocket or low areas which will allow water to stand.
31 3. Distribute fertilizer uniformly over areas to be seeded:
32 a. For lawn-type seeding: 30 LBS per 1000 SF.
33 4. Incorporate fertilizer into soil to a depth of at least 2 IN by disking, harrowing, or other
34 approved methods. Remove stones or other substances from surface which will interfere
35 with turf development or subsequent mowing operations.
36 5. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture. Roll and
37 rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine
38 grading to areas which can be planted soon after preparation.
39 6. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading
40 and before planting.
- 41 C. Native Grass Seeding:
42 1. Leave surface (seedbed) hard to discourage weed growth and erosion. Ground should be
43 undisturbed and uncultivated.

44 **3.2 INSTALLATION**

- 45 A. Lawn-Type Seeding:
46 1. Do not use seed which is wet, moldy, or otherwise damaged.
47 2. Perform seeding work from March 15 to May 1 for spring planting, and September 1 to
48 October 15 for fall planting, unless otherwise approved by Engineer.

3. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, or mechanical hand seeders, or other approved equipment.
4. Distribute seed evenly over entire area at rate of application not less than 2 LBS (PLS) of seed per 1000 SF, 50 percent sown in one direction, remainder at right angles to first sowing.
5. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds excessive moisture, or other factors. Resume work only when favorable conditions develop.
6. Lightly rake seed into soil followed by light rolling or cultipacking.
7. Immediately protect seeded areas against erosion by mulching. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.
8. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer. Protect seeded areas against traffic or other use by erecting barricades and placing warning signs.
9. Immediately following spreading mulch, anchor mulch using a rolling coulter or a wheatland land packer having wheels with V-shaped edges to force mulch into soil surface, or apply evenly distributed emulsified asphalt at rate of 10-13 GAL/1000 SF. SS-1 emulsion in accordance with ASTM D997 or RC-1 cutback asphalt in accordance with ASTM D2028 are acceptable. If mulch and asphalt are applied in one treatment, use SS-1 emulsion with penetration test range between 150-200. Use appropriate shields to protect adjacent site improvements.

B. Native Grass Seeding:

1. Planting seasons:
 - a. Warm-season grasses: Late spring or early summer; avoid late summer or fall planting.
2. Seed with a grass drill. Operate drill as near to contour as practical. (A Nisbet grass drill has been proven to be successful in this operation).
3. Areas of 1 acre or less may be sown by hand-broadcasting, mixing seed with generous amount of damp sand to ensure even distribution. Harrow or rake seed into ground following seeding to minimum 1/4 IN and maximum 1 IN depth
4. If area is seeded without cover crop, protect newly seeded areas from erosion by mulching with weed-free straw in a continuous blanket using 2 tons per acre and anchor to ground with rolling coulter or a wheatland land packer.
5. Provide initial watering after installation as appropriate for planting conditions.

3.3 MAINTENANCE AND REPLACEMENT

A. General:

1. Begin maintenance of planted areas immediately after each portion is planted and continue until final acceptance or for a specific time period as stated below, whichever is the longer.
2. Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep planted areas uniformly moist as required for proper growth.
3. Protection of new materials:
 - a. Provide coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain. Repair and pay for all damaged items.
4. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

B. Seeded Lawns:

1. Maintain seeded lawns: 90 days, minimum, after installation and review of entire project area to be planted.
2. Maintenance period begins at completion of planting or installation of entire area to be seeded or sodded.
3. Engineer will review seeded or sodded lawn area after installation for initial acceptance.
4. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, uniform lawn, free of weeds and eroded or bare areas.

- 1 5. Lay out temporary lawn watering system and arrange watering schedule to avoid walking
2 over muddy and newly seeded areas. Use equipment and water to prevent puddling and
3 water erosion and displacement of seed or mulch.
 - 4 6. Mow lawns as soon as there is enough top growth to cut with mower set at recommended
5 height for principal species planted. Repeat mowing as required to maintain height. Do not
6 delay mowing until grass blades bend over and become matted. Do not mow when grass is
7 wet. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 IN.
8 Do not mow lower than 1-1/2 IN.
 - 9 7. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance
10 operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
 - 11 8. Unacceptable plantings are those areas that do not meet the quality of the specified material,
12 produce the specified results, or were not installed to the specified methods.
 - 13 9. Replant bare areas using same materials specified.
 - 14 10. Engineer will review final acceptability of installed areas at end of maintenance period.
 - 15 11. Maintain repaired areas until remainder of maintenance period or approved by Engineer,
16 whichever is the longer period.
- 17 C. Native Grass Seeding:
- 18 1. Do not mow bed native grass. When weeds are shading out 70 percent of (minimum 6 IN)
19 native grass seed, shred weeds back to height of seedlings with a rotary shredder. Do not
20 allow weeds to exceed a height of 8 IN.

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END OF SECTION

