

# LOWER MONTOYAS ARROYO BANK STABILIZATION PROJECT

# BID AND CONTRACT DOCUMENTS

## VOLUME 2 of 2: SPECIFICATIONS

# Southern Sandoval County Arroyo Flood Control Authority

IFB # 2022-01

SSCAFCA PROJECT NUMBER: MO-P0029-01



#### **SPECIFICATIONS**

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#### SECTION 101

#### PORTLAND CEMENT CONCRETE

101.1.1 GENERAL: Portland cement concrete, prestressed concrete, post tensioned concrete, shotcrete, gunite, and light weight structural concrete shall consist of a mixture of Portland cement, aggregates, water, and admixtures, proportioned, batched and delivered as specified herein. All materials and design mixes used in Portland cement concrete, either batched at or delivered to a project shall be certified in accordance with the requirements of these specifications. Each design mix submitted and authorized for use under this Specification shall be identified by a design mix number, unique to that design mix. If either a change in material(s) or material supplier(s) from that specified in the authorized design mix occurs during a project, authorized use of the job mix formula on the project may be canceled as directed by the ENGINEER. A concrete design mix shall not be used on a project without written authorization of the ENGINEER. A design mix, upon request by a concrete supplier, may be authorized by the OWNER for use on OWNER and OWNER-related projects for a period of 14 months from the date of sampling of reference aggregates in the design mix.

101.1.2 For construction and reconstruction projects requiring portland cement concrete continuous placement(s) equal or greater than either 100 cubic yards of concrete per day, the CONTRACTOR shall have a full time portland cement concrete construction supervisor on site to direct the construction operations. The supervisor shall be certified either as an ACI certified Concrete Field Testing Technician Grade I, or the equivalent National Institute for Certification of Engineering Technologies Technician, with Specialty Concrete Work Elements Level I 82001, 82002, and Level II 84002, 84003, 84004, The supervisor shall be identified by the 84010. CONTRACTOR at the preplacement conference and shall be the contact person for the ENGINEER during concrete construction.

#### 101.1.3 Pre-Placement Conference

A Pre-Placement Conference shall be held by the CONTRACTOR, as directed by the ENGINEER, no later than seven (7) calendar days prior to the start of construction for concrete continuous placement(s) equal or greater than either 100 cubic yards of concrete per day. The following meeting agenda/assigned responsibilities shall be accomplished at the conference.

#### I. ENGINEER/OWNER

- A. Scope of the project.
- B. Identify construction management team and contact telephone numbers.
- C. Review CONTRACT requirements for construction.
- D. Review Quality Assurance Program.

**II.CONTRACTOR** 

- A. Review construction schedules.
  - 1. Placement schedules.
- 2. Proposed construction schedule for duration of the project.
- B. Identify construction personnel and contact telephone numbers.
  - 1. Contractor Staff
  - 2.Sub-Contractor (s)
  - 3.Supplier (s)
  - 4. Safety Manger
- C. Present construction placement procedure plans. 1.Equipment Schedule
  - 2.Concrete Design Mix
  - 3. Construction methodology
  - 4. Concrete pumping plan
  - 5. Traffic Control Plan
  - 6. Quality Control Plan
- III. DISCUSSION AND COMMENT
- 101.2 REFERENCES
- 101.2.1 American Society for Testing and Materials (Latest Edition) (ASTM)
- C31 Making & Curing of Concrete Test Specimens in the Field
- C33 Specification for Concrete Aggregates
- C39 Test for Compressive Strength of Cylindrical Concrete Specimens
- C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- C78 Test for Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
- C94 Specification for Ready-Mixed Concrete
- C125 Definition of Terms Relating to Concrete and Concrete Aggregates
- C138 Air Content (Gravimetric), Unit Weight, and Yield of Concrete
- C143 Test for Slump of Portland Cement Concrete specification. If required, certification
- C150 Specification for Portland Cement
- C172 Sampling Fresh Concrete
- C173 Test for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C192 Making & Curing of Concrete Test Specimens in the Laboratory
- C227 Test for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar Bar Method)
- C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
- C260 Specification for Air Entraining Admixtures for Concrete
- C330 Specification for Lightweight Aggregates for Structural Concrete
- C441 Test for Effectiveness of Mineral Admixtures in

Preventing Excessive Expansion of Concrete Due to Alkali-Aggregate Reaction

- C494 Specification for Chemical Admixtures in Concrete
- C567 Unit Weight of Structural Lightweight Concrete
- C617 Capping Cylindrical Concrete Specimens
- C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- C685 Specification for Concrete Made by Volumetric Batching & Continuous Mixing
- C803 Test for Penetration Resistance of Hardened Concrete
- C805 Test for Rebound Number of Hardened Concrete
- D2419 Sand Equivalent Value of Soils and Fine Aggregates
- 101.2.2 American Concrete Institute (Latest Editions)
- ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- ACI 211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete
- ACI 318-89 Building Code Requirements for Reinforced Concrete
- 101.2.3 This Specification:
- SECTION 337 PORTLAND CEMENT CONCRETE PAVEMENT
- SECTION 340 PORTLAND CEMENT CONCRETE CURBS, GUTTERS, WALKS, DRIVEWAYS, ALLEYS, INTERSECTIONS, SLOPE PAVING, AND MEDIAN PAVING
- SECTION 346 TEXTURED CONCRETE
- SECTION 349 CONCRETE CURING
- SECTION 420 TRAFFIC SIGNAL AND STREET LIGHTING CONDUIT, FOUNDATIONS AND PULL BOXES
- SECTION 510 CONCRETE STRUCTURES
- SECTION 512 PRECAST PRESTRESSED MEMBERS
- SECTION 602 PORTLAND CEMENT CONCRETE FOR CHANNEL LINING AND DIKE AND DAM SURFACING
- SECTION 701 TRENCHING, EXCAVATION AND BACKFILL
- SECTION 800 INSTALLATION OF WATER TRANSMISSION, COLLECTOR AND DISTRIBUTION LINES
- SECTION 900 SANITARY AND STORM SEWER FACILITIES

SECTION 915 STORM DRAINAGE APPURTENANCES SECTION 1500 MONUMENTS

- 101.3 PORTLAND CEMENT
- 101.3.1 Portland cement to be used or furnished under

this Specification shall comply either with the requirements of ASTM C150, Types I LA, II LA, III LA, and V LA, cements, or as specified herein, in the Supplementary Technical Specifications, Drawings, or as approved by the ENGINEER. The CONTRACTOR shall submit certification of compliance signed by the cement manufacturer, identifying the cement type and source (plant location), stating the Portland cement furnished to the project, and or used in the concrete delivered to the project complies with this Specification. If required, certification of the Portland cement used for each day's concrete placement shall be submitted to the ENGINEER for each type of cement and each design mix used on the project.

101.3.2 Portland cement specified in an authorized design mix shall be of the same source and type for all concrete batched at and/or delivered to a project under the authorized design mix identification number.

101.3.3 When suitable facilities (such as those recommended by the Concrete Plant Manufacturer's Bureau and/or approved by the ENGINEER) are available for handling and weighing bulk cement, such facilities shall be used. Otherwise, the cement shall be delivered in original unopened bags of the Manufacturer and the type of cement plainly marked thereon, each bag to contain 94 pounds (42.6 kg) of cement.

101.3.4 Cement shall be stored in such a manner as to permit ready access for the purpose of inspection and be suitably protected against damage by contamination or moisture. Should any lot of bulk cement delivered to the site show evidence of contamination, the ENGINEER may require that such lot be removed from the site.

101.3.5 Portland cement shall be measured by weight, lbs, (mass, kg) for concrete produced in accordance with the requirements of ASTM C94 and by volume for concrete produced accordance with the requirements of ASTM C685.

#### 101.4 AGGREGATES:

101.4.1 Aggregates shall comply with the requirements of ASTM C33 and as amended herein, or as specified in the Supplementary Technical Specifications and Drawings, or as approved by the ENGINEER. Aggregates shall be certified to comply with the requirements of this Specification and authorized for use by the ENGINEER before the materials may be incorporated in the construction. Prior to delivery of the aggregates or material containing the aggregates, The CONTRACTOR may be required to furnish samples of the aggregates to the ENGINEER for testing. The CONTRACTOR's daily production aggregate gradations used in concrete shall be submitted to the ENGINEER upon request. Aggregates specified in an authorized design mix shall be of the same source and type for all concrete batched and delivered under the authorized design mix identification number.

101.4.2 In placing materials in storage or in moving them from storage to the mixer, no method shall be employed which may cause the segregation, degradation, or the combining of materials of different grading which will result in any stockpile not meeting specified requirements.

101.4.3.1 Aggregates supplied under this Specification shall be assumed to be "alkali-silica reactive", ASR. Variance from this position for a particular aggregate source may be authorized by The ENGINEER. Application for a variance may be made to The ENGINEER.

101.4.3.2 An aggregate may be classified non-alkali-silica reactive if, when tested in accordance with ASTM C227, using low alkali cement demonstrates an expansion at one (1) year not greater than 0.05%, and the rate of expansion is negative decreasing, based on test measurements at 1 month, 3 months, 6 months, 9 months, and 15 months, as authorized by the ENGINEER.

101.4.3.3 Portland cement concrete design mixes using non alkali-silica reactive aggregates complying with 101.4.3.2 will not be required to be proportioned with Class F fly ash.

101.4.4.1 Coarse aggregates shall meet the gradation limits as specified in Table 2 of ASTM C33. Fine aggregates shall comply with the gradation requirements of ASTM C33, Section 4, Grading. The sand equivalent of fine aggregate, when tested in accordance with ASTM D2419, Sand Equivalent Value of Soils and Fine Aggregates, shall be greater than 75.

101.4.4.2 The maximum size aggregate shall comply with either these specifications, or the requirements of Table 101.A, or the Supplementary Technical Specifications, or the recommendations of ACI 318-89, paragraph 3.3.2, or as required by the ENGINEER.

101.4.5 Aggregates shall be measured by weight (mass) for concrete batched under the requirements of ASTM C94 and by volume for concrete batched in accordance with the requirements of ASTM C685.

TABLE 101.A
MAXIMUM SIZE AGGREGATE

	Application	Size, in
I.	Pavement, Sidewalk, Curb and Gutter, Drive Pads, Wheel Chair Ramps, Slab on grade, Foundations, and Structures,	1
		1.4/0

II. Channels, minimum 5% retained on I-1/2 the

1 in sieve

- III. High Early Release Concrete, 3/4 minimum 5% retained on the ½ in sieve
- IV. Stamped, Patterned, Stairs and 1/2 Steps, minimum 5% retained on the 3/8 in sieve
- V. Formed Concrete
- A. 1/5 the narrowest dimension between sides of forms,
- B. 1/3 the depth of slab,
- C. 3/4 of the minimum clear spacing between individual reinforcing bars or wires, bundles of bars, or prestressing tendons or ducts, or reinforcing and forms.

#### 101.5 WATER

Water used in Portland cement concrete shall be clean and free from injurious amounts of oil, acids, alkalis, salts, organic materials, or other substances that may be deleterious to the concrete or reinforcement. Non-potable water shall not be used unless the requirements of ACI 318.3.4.3.2 are met. Water shall be measured by weight or volume for concrete batched under the requirements of ASTM C94 and by volume for concrete batched in accordance with the requirements of ASTM C685.

#### 101.6 ADMIXTURES:

101.6.1 Admixtures shall comply with the requirements of this specification. The CONTRACTOR shall submit a certification of compliance signed by the admixture manufacturer, identifying the admixture and its source (plant location), stating the admixture furnished to the project and/or used in the concrete delivered to the project complies with this Specification. Certification laboratory testing of an admixture shall be submitted by the CONTRACTOR to the ENGINEER upon request. Admixtures specified in an authorized design mix shall be of the same source and type for all concrete batched and delivered as defined under a design mix identification number. Admixtures shall be measured accurately by mechanical means into each batch by equipment and in a method approved by the ENGINEER. An admixture shall not be used on a project without authorization by the ENGINEER.

101.6.2 Air-entraining agent, conforming to ASTM C260, shall be measured accurately by mechanical means into each batch by equipment and in a method approved by the ENGINEER. The air-entraining agent used shall not contain more than 0.035% chloride by weight. Air-entrainment content shall comply with the requirements Table 101.B., the Supplementary Technical Specifications, or the recommendations of ACI 318, latest

edition.

Nominal Maximum Size Aggregate,	Air Conte (?	nt Range, %)
in.	min	max
1/2	5.5	8.5
3/4	4.5	7.5
1	4.5	7.5

101.6.3 Chemical admixtures shall conform to either the requirements of ASTM C494, or as specified in the Supplementary Technical Specifications, or as specified by the ENGINEER. Chemical admixtures shall not contain more than 0.035% chloride by weight.

101.6.4.1 Mineral admixtures shall be class "F" fly ash complying with the requirements of ASTM C618 including the requirements of TABLE 4, UNIFORMITY REQUIREMENTS, and the requirements of this Specification.

101.6.4.2 Mineral admixtures, when tested in accordance with ASTM C441, shall conform to the following:

Reduction in expansion @ 14 days, % , min, 65.0 100% Reliability

Mortar expansion @ 14 days, max, % 0.20

Expansion must be less than control sample expansion.

101.6.4.3 The "Reactivity with Cement Alkalis" shall be determined using new Dow Corning glass rod base for aggregate. If a fly ash does not comply with the above requirement using the specified cement type, it may be authorized if the criteria is met using the low alkali Portland cement typically available to the Albuquerque area, as directed by the ENGINEER.

101.6.4.4 Mineral admixtures used or furnished under this Specification shall be certified quarterly, in a calendar year, to comply with this Specification by the supplier. Certification shall include test results and specifications, source and location.

101.6.4.5 Mineral admixtures shall be measured by weight (mass) for concrete batched under the requirements of ASTM C94 and by volume for concrete batched in accordance with the requirements of ASTM C685.

101.6.5 Accelerating admixtures may be used in Portland cement concrete batched and supplied under this Specification only when approved by the ENGINEER. The accelerating admixture used shall be a non-chloride type. A design mix proportioned with an accelerating admixture shall be submitted as specified in paragraph 101.8.8. and authorized by the ENGINEER, prior to use on a project.

#### 101.7 PROPORTIONING

101.7.1 Portland cement concrete shall he proportioned in accordance with the requirements of ACI 318, latest edition, Chapter 5, either ACI 211.1 or ACI 211.2 (latest editions), and Table 101.C of this Specification, either field experience or trial mixtures, and the construction placement requirements selected by the CONTRACTOR. The CONTRACTOR shall be solely responsible for the portland cement concrete design mix proportions for concrete either batched at, or delivered to, placed and finished at the site. Certification of a design mix and all component materials, including all formulations of a mix and any and all admixtures which may be used under special construction conditions and environments with that mix to include high range water reducers (super-plasticizer), accelerating admixtures and retarders, and any other admixture, shall comply with the requirements of this Specification.

101.7.1.1 Design mix(es) shall be prepared in a laboratory accredited in accordance with the requirements of the New Mexico State Highway and Transportation Department "Procedure for Approval of Testing Laboratories to Perform Inspection, Testing, and Mix Design Services", April 13, 1998 Edition, and operated under the direct supervision of a New Mexico registered Professional Engineer.

101.7.1.2 The testing equipment used in the design development testing shall be calibrated annually with calibration standards traceable to the National Bureau of Standards. Certificates of calibration shall be maintained at the laboratory for review by the ENGINEER. A copy of the certifications shall be submitted to the ENGINEER upon request. A portland cement concrete design mix shall not be batched at and/or delivered to a job site without written authorization of the ENGINEER.

101.7.1.3 A design mix shall be prepared under the direct supervision of a New Mexico Registered Professional Engineer.

101.7.2 Portland cement shall be proportioned to comply with the requirements specified in Table 101.C, or as specified in the Supplemental Technical Specifications, or Plans, or as authorized by the ENGINEER.

101.7.3 The mineral admixture Class F fly ash shall be proportioned by weight of cement to provide a fly ash to portland cement ratio not less than 1:4, not less than 20 per cent of the total cementitious material. Portland cement concrete submitted under this Specification shall be proportioned with Class F fly ash, unless a variance is authorized by the ENGINEER.

107.7.4 The water to total cementitious material ratio shall not be greater than specified in Table 101.C, or the maximum determined from a "trial mix" compressive strength vs. water to cementitious ration curve, defined in accordance with ACI 318, latest edition, Chapter 5. The trial mix compressive strength water to cementitious material ratio curve shall be developed with the target slump at design application maximum,  $\pm 0.75$  inches, and the target entrained air content at design application maximum,  $\pm 0.5$  per cent, using materials specified in the design submittal. The cementitious material shall be defined as the total weight of portland cement and Class F fly ash in design mix.

101.7.5.1 A design mix submittal shall include but not be limited to the following information, as directed by the ENGINEER.

A. Certification of compliance of the design mix with the requirements of this Specification and by the New Mexico Registered Professional Engineer in responsible charge of the design mix development;

B. Certification of compliance of design mix's component materials by a manufacturer/supplier. The certification shall include laboratory test results of companion samples of the component material used in the laboratory prepared design mix, verifying the component materials comply with the specifications. For a mix design based on statistical methods, certification(s) of component materials shall be based on results performed within two (2) months of the submittal date.

C. Plastic characteristics of the design mix to include concrete temperature, slump, entrained air content, wet unit weight, yield and cement factor, reported in English and metric units;

D. Performance characteristics of the hardened concrete to include the compressive strength of all test cylinders averaged for a respective test and the corresponding average compressive strength reported in English units;

E. Compressive strength test (3 cylinder tests each point) shall be reported for each water to cementitious material ratio design mix proportioned at 3, 7, 14 and 28 days laboratory cure normal concrete; and, 1 day, 3 days, 7 days and 28 days laboratory cure for high early release concrete.

F. The "trial mix" compressive strength vs. water to cementitious ratio curve graphically plotted to include the water to cementitious ratio for the proposed design mix. A proposed design mix water to cementitious ratio outside the limits of a trial mix curve shall be rejected.

G. When a proposed design mix is based on statistical analysis of historical data, certification that the design mix represented by the historical data was batched with the same or similar materials from the same sources as the materials proposed in the design mix shall be included in the submittal. Under this design certification procedure, the proposal shall include a statistical analysis for a period of 12 months prior to sampling aggregates of the characteristics of a) slump, b) entrained air, and c)  $f_c@28$ day compressive strength test. A compressive strength test shall be the average of two (2) cylinders tested at 28 days. An annual average aggregate gradation analysis may be used if the data represents the 12 month period prior to sampling for a design mix. A minimum of three production gradations per month will be required in the data base, as directed by the ENGINEER.

H. Batch proportions for concrete made by Volumetric Batching and Continuous Mixing, ASTM C685, shall include 1) component batch weights, 2) component batch volumes, and 3) gate settings for each type of batching equipment the design mix that may be batched.

J. High Range Water Reducing Admixture(s) (hrwra), Superplastizers

- a.A prescription for use of the hrwra in a design mix shall be provided by the CONTRACTOR to include but not limited to the following
  - 1.Maximum dosage per cubic yard (meter) by standard measure, ozs/yd<sup>3</sup>;
  - 2. Admixture introduction location (plant or Job site);
  - 3. Minimum mixing after admixture introduction (drum revolution count at mixing speed);
  - 4. Air entrainment dosage adjustment, if required;
  - 5. Base mix water reducing admixture (wra) dosage adjustment, if required;
  - 6.Consistency (slump) targets for before and after admixture introduction;
  - 7. Concrete temperature limitations, if required; and,
- b. Laboratory demonstrated performance of the design mix, at the specified maximum admixture dosage, shall be reported, including slump, entrained air content, unit weight, water to cementitious materials ratio, seven (7) and twenty eight (28) day compressive strength (fc), and three (3) days and seven (7) day compressive strength (fc) for high early release concrete. Submittal compressive strength shall be based on the average value of three cylinders required.
- K. Accelerating Admixture(s)
  - a.A prescription for use of the accelerating admixture in a design mix shall be provided by the CONTRACTOR to include but not limited to the following:
    - 1. Maximum dosage per cubic yard (meter) by standard measure, ozs/yd<sup>3</sup>;
    - 2. Concrete temperature limitations, if required;
    - 3. Admixture introduction location, plant or project;

- 4. Restrictions of use in combination with other admixtures, as applicable; and,
- b.Special considerations for mixing, placing, and curing, as applicable.
- L.Color Admixture(s)
  - a. A prescription for use of a color admixture in a design mix shall be provided by the CONTRACTOR to include but not limited to the following:
    - 1.Maximum dosage per cubic yare (meter) by standard measure, ozs/yd<sup>3</sup>;
    - 2. Admixture introduction location, plant or project;
    - 3. Restrictions of use in combination with other admixtures; and
  - b.Special considerations for mixing, placing, and curing, as applicable.
- M. Submittal Format

- a.A standard design mix submittal may include some or all of the above information as directed by the CONTRACTOR to define use as "optional" admixture(s). The standard design mix code would be the same for applications with and without the optional admixture(s)
- b.A specific design mix submittal can be made to include either color, or accelerating, or high range water reducing admixture for use under a specified application only. Separate design mix submittals will be required to include the information specified above.

101.7.5.2 A submittal shall be rejected if it does not include the specified information and samples. A design mix submittal shall be accepted or rejected within ten (10) days of receipt by the ENGINEER.

TABLE 101.C - DESIGN MIX SPECIFICATIONS-PORTLAND CEMENT CONCRETE [1, 2, 3]

Application	Use In Section(s)	f 'c @ 28	Entrained Air Range	Slump, Not To Exceed, nte [5]	Portland Cement	w:(c+fa) max [7]
		1	01-6			

		days psi, min	[11]	Discourset	<u>ir</u>	nches	min, lbs./yd <sup>3</sup>	
		[4]		Placement	Norm	HRWRA		
Interior Concrete (heated areas) Foundations and slab on grade.	510	3,000	(See par.101.7.2)	Hand Place	4	6	423	0.50
Exterior Concrete a) Structure, foundations, slab on grade, steps/stairs; b) sidewalks, drive pads, wheel chair ramps, stamped pattern concrete, curb & gutter, and valley gutter; c) storm drain structures, channels, drop inlets, and manhole bases; d) retaining walls; and, e) miscellaneous concrete.	340, 346, 420, 510, 511, 602 [12,13], 701, 800, and, 1500	3,000	(See par.101.7.2)	Hand Place	4	6	470	0.45
				Slip Formed	2	3		
Pavement For design of PCCP, use MR= 600 lbs/in <sup>2</sup> [4]	337	4,000	(See	Hand Place	4	6	564	0.40
<b>v</b>			par.101.7.2)	Slip Formed	2	3		
<u>Hydraulic Structures</u> Reservoirs	510 and	3.500	(See	Hand Place	4	7	517	0.40
	512	-,	par.101.7.2)	Slip Formed	2	3		
<u>Structures</u> Buildings, bridges/bridge decks, and parking structures	500	4,000 [8, 9]	(See par.101.7.2)	Hand Place	4	7	564	0.40
			, ,	Slip Formed	2	3		
Sanitary Sewer Facilities Structures, manholes and bases.	900	4,000	(See	Hand Place	4	7	658 [6]	0.40
		[8, 9]	par.101.7.2)	Slip Formed	2	3	[-]	
High Early Release Concrete fcr= 3,400 lbs/in <sup>2</sup> @ release to service [10]	All	4,000 @ 7	(See	Hand Place	4	7	Desian	Design
	applications	davs	par.101.7.2)	Slip Formed	2	3	Doolgii	

1. Use of material(s) not defined by this specification must be approved by the ENGINEER.

2. Maximum size aggregate shall comply with the requirements of par. 101. 4.4.2.

- 3. Portland cement concrete shall be proportioned with Class F fly ash complying with the requirements of 101.6.4, proportioned 1: 4, minimum, fly ash to portland cement, by weight.
- 4. *MR*-Modulus of Rupture, *fc*-compressive strength at 28 days.
- 5. When authorized by the ENGINEER, a high range water reducing admixture (HRWRA), super plasticizer, may be used to increase slump. When a HRWRA is proposed for use on a project. The design mix shall be proportioned to include the HRWRA. The use of a HRWRA in a design mix that was not originally proportioned with a HRWRA is not acceptable under this specification. Higher slump(s) may be used, as directed by the ENGINEER.
- 6. If portland cement complying with ASTM C150 Type VLA is used, a minimum of 564 lbs/cy may be used.
- 7. "w : (c+fa)" is defined as *water to cementitious* materials ratio: w-water; (c+fa)-cementitious material as the sum of the portland cement and fly ash. Units are lbs/yd<sup>3</sup>.
- 8. Lightweight structural concrete for structures, parking decks, and bridge decks shall be proportioned with a minimum compressive strength of f'c= 4,750 lbs/in<sup>2</sup> @ 28 days.
- 9. Minimum requirements for prestressed/post tensioned concrete. Actual criteria may differ as specified in the plans and supplemental technical specifications.
- "High Early Release Concrete" may be used where early release of structure to either service or construction loads may be required (< 3 days), as authorized by the ENGINEER. "fcr" is the minimum compressive strength for release, as determined by field cured cylinders. Maximum size aggregate shall be 3/4 inch.</li>
- 11. Designated interior concrete, placed, finished, cured, and maintained by the Contractor in a temperate environment of 40°F or greater, may be constructed with non air entrained concrete complying with all other

requirements of this specification for the calendar period after April 30 and before October 1, as authorized by the Engineer. Concrete for wet exposures, showers and wash down areas, vehicle repair and storage floors shall not be included in this variance.

#### 101.8 BATCHING

101.8.1 Portland cement concrete shall be batched in accordance with the requirements of either ASTM

C94, or ASTM C685, and the requirements of this Specification, as authorized by the ENGINEER. Batching facilities, mixing, and transporting equipment shall be certified within 12 months prior to batching of a design mix. The plant shall be certified by a NM Registered Professional Engineer, to comply with the requirements of this Specification. The certification shall have been competed within 12 months of batching an authorized portland cement concrete design mix. Written certification shall be available for review at the plant by the ENGINEER, and, submitted to the ENGINEER upon request.

101.8.2.1 Ready-mix concrete batch plants shall be certified to comply with the requirements of this Specification. Written certification of compliance shall be available for review at the batch plant by the ENGINEER.

101.8.2.2 Central-Mix Batch Plants shall be certified to comply with this Specification and standards of the National Ready-Mix Concrete Association. The central-mixers rated capacity shall be posted at the batch plant in the operator's area.

101.8.2.3 Portable batch plants shall be certified after erection at a project and prior to batching concrete to be used at the project site. The batch plants rated capacity shall be posted at the batch plant in the operator's area.

101.8.2.4 Ready-mix concrete trucks shall be certified to comply with the requirements of this Specification and the "Standards for Operation of Truck Mixers and Agitators of the National Ready-Mix Concrete Association", and the "Truck Mixer Manufacturer Bureau", latest editions. Written certification of compliance shall be carried in/on the vehicle for verification by the ENGINEER. The manufacturers rated capacity, mixing and agitating speeds shall be posted on the truck mixer. Mixers shall have an operable mixer drum revolution counter and water metering system to measure temper water that may be added to a mixer after batching and prior to discharge of a load.

101.8.2.5 Shrink-mixed concrete batching shall be certified to comply with the requirements of this Specification. Written certification of the program to include a) maximum concrete volume defined for the process/equipment, b) minimum time of mixing in the stationary mixer of materials after the addition of all cementitious material, and, c) minimum supplemental mixing revolutions in the transit mix truck. A copy of the certified procedure shall be shall be available at the batch plant for review by the ENGINEER, and submitted upon request. the ENGINEER shall be notified by the CONTRACTOR in writing which concrete supplied to a project is produced with this procedure. Shrink mixed batching shall not be used on a project without authorization by the ENGINEER.

101.8.2.6 Volume batching central mix and concrete mobile trucks shall be certified to comply with this Specification. Certification shall include

discharge gate settings/material weight batching references for each material carried and a certified water meter and calibration chart to define water settings. Discharge calibration settings shall be established for each production batching rate and authorized design mix batched. The equipment shall be recalibrated if a change in materials or source of materials occurs. Written certification of compliance shall be carried in/on the vehicle for verification by the ENGINEER.

101.8.2.7 On-site batching and mixing equipment for concrete volumes of less than 1 cubic yard shall conform to the requirements of ASTM C192, and shall be approved by the ENGINEER. On-site batched concrete for volumes less than 1 cubic yard shall be either "Redi-2-Mix", "Quikrete", or equal prepackaged concrete mix. The concrete shall be proportioned with water not to exceed a maximum of 1.5 gallons per 60 lbs./bag or equivalent. Concrete batched under this paragraph shall not be used for finished, interior and/or exterior exposed concrete surfaces.

101.9 MIXING

101.9.1 Concrete batched in accordance with ASTM C94, shall be mixed in accordance with the requirements of that Specification and as follows.

101.9.2 Central-Mixed Plants: Concrete mixed in a stationary mixer and transported to the point of delivery shall be mixed from the time all the solid materials are in the drum. The batch shall be so charged with some water in advance of the aggregates and cementitious materials, and all water shall be in the drum by the end of one-fourth the specified mixing time. Mixing time shall be a minimum of 1 minute for the first cubic yard plus 15 seconds for each additional cubic vard, or fraction there of additional capacity. Where mixer performance tests have been conducted in accordance with ASTM C94, with the mixer to rated capacity, the mixing time may be reduced to the time at which satisfactory mixing defined by the performance tests shall have been accomplished. When the mixing time is so reduced the maximum mixing time shall not exceed this reduced time by more than 60 seconds for air entrained concrete. Certified concrete uniformity tests shall be conducted in accordance with ASTM C94. If the uniformity requirements are not met, that mixer shall not be used until the condition is corrected.

#### 101.9.3 Shrink-Mixed Concrete:

Concrete mixed in a shrink mix production program shall be mixed in accordance with the certified shrink mix program as defined by the CONTRACTOR. Concrete shall be mixed in a stationary mixer not less than the certified minimum mixing time after all ingredients are batched into the drum, and not less than the minimum mixing revolutions specified for the transit mix truck after the load is transferred into the transit mix truck. Mixing in the transit mix truck shall not exceed the maximum requirements of paragraph 101.9.4. Shrink-mixed concrete procedures shall be certified to provide concrete that complies with the uniformity specifications of ASTM C94 as determined by uniformity tests specified in ASTM C94, for the maximum batch volume of concrete defined by the CONTRACTOR. If uniformity requirements are not met for the combination of stationary plant and transit mixers , the shrink mix program shall not be used. Tempering of shrink mix concrete at the job site shall comply with the requirements of 101.10 and 101.11.

#### 101.9.4 Truck-Mixed Concrete:

Concrete mixed in a truck mixer shall be mixed after all ingredients including water, are in the drum at least 70 revolutions and not more than 100 revolutions at the mixing speed as defined by the Manufacturer. The mixing speed for the mixer shall be identified on the mixer. Certified concrete uniformity tests shall be conducted on transit mixer trucks in accordance with ASTM C94 and annually. If the uniformity requirements are not met, that mixer shall not be used until the condition is corrected. Mixing beyond the number of revolutions at mixing speed found to produce the required uniformity of concrete shall be at the agitation speed defined by the mixer manufacturer. The manufacturer's recommended mixing and agitation speeds shall be posted on the truck mixer.

#### 101.9.5 Volume Batched Concrete:

Concrete batched in accordance with ASTM C685, shall be mixed in accordance with the requirements of this Specification and the Manufacturer's recommendations. The continuous mixer shall be an auger type mixer or any other type suitable for mixing concrete to meet the requirements for uniformity specified in ASTM C685,

#### 101.10 TEMPERING BATCHED CONCRETE

101.10.1.1 The slump of a concrete mix sampled at final discharge shall comply with the requirements of TABLE 101.C. Non complying material shall be removed from the structure as directed by the ENGINEER.

101.10.1.2 A load of concrete may only be tempered with water after the mix cycle is complete when, upon arrival at the job site, the slump of the concrete is less than specified, and the time limit and revolution limit specified in 101.9 are not exceeded.. When additional water is required, the total water in the truck shall not exceed the maximum water to cementitious ratio specified in the authorized design mix when the concrete is discharged. When tempering is required and allowed as defined by the water to cementitious ratio for the design mix, the water shall be injected into the mixer and the drum or blades turned a minimum of 30 revolutions at mixing speed before discharge as long as the revolution limit specified in 101.9 is not exceeded.. Additional water shall not be added to the batch after tempering without authorization by the ENGINEER.

101.10.1.3 When the slump of a sample taken within the time limits specified in 101.9 the specification requirements of TABLE 101.C, the mixer truck may be mixed a minimum of 15 revolutions at mixing speed, as long as the revolution limit specified in 101.9 is not exceeded, sampled and tested. If the slump of the second sample exceeds the maximum specified slump by 0.25 in (6 mm), the load may be rejected as directed by the ENGEINEER.

101.10.2.1 The air content in air entrained concrete, when sampled from the transportation unit at the point of discharge, shall comply with the requirements of this specification. Non complying material shall be removed from the structure as directed by the ENGINEER.

101.10..2.2 When a preliminary sample taken within the time limits specified in 101.9 and prior to discharge for placement shows an air content below the minimum specified level, the CONTRACTOR may add additional air entraining admixture to achieve the specified air content, if the revolutions on the drum counter are less than 300, and the total revolutions, after air entrainment addition will not exceed 300 following mixing a minimum of 30 revolutions at mixing speed after dosage with the admixture. Additional air entraining admixture may not be added to the batch after the initial air entraining admixture tempering. Air entraining admixture shall be batched in accordance with 101.7.2. In addition to sampling and testing for compliance after tempering with the air entraining admixture, a sample shall be taken during discharge from the second half of the load to verify slump and entrained air compliance through the load with the specification.

101.10.2.3 When the entrained air exceeds the specified requirements, the load may be mixed a minimum of 15 revolutions, sampled and tested, if the drum revolutions do not exceed 300, and will not exceed 300 following mixing. If the entrained air exceeds the specification by 0.1 %, the load may be rejected as directed by the ENGINEER.

101.10.3 High range water reducing admixtures, superplasticizers shall be batched as recommended by the manufacturer.

101.10.4 Aggregates and cementious material may not be used to temper a batched load of portland cement concrete.

101.10.5 All samples shall be tested for slump, entrained air, and unit weight after tempering..

101.10.6 The field dosage amounts of admixtures and water shall be reported on the truck ticket.

101.10.7 The OWNER shall pay for quality assurance sampling and testing specified 101.15, or as directed by the ENGINEER.

#### 101. 11 DELIVERY & DISCHARGE:

101.11.1 Discharge of the concrete shall be completed within 1-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. These limitations may be waived by the ENGINEER if (1) the concrete is proportioned and certified for use after mixing/agitation time in excess of 1-1/2 hrs, or (2) is of such a slump that it can be placed and finished, without the addition of water to the batch after the time limit noted above is exceeded. In hot weather or under conditions contributing to quick stiffening of the concrete, a time less than 1-1/2 hrs. may be specified by the ENGINEER.

101.11.2 The minimum discharge temperature of concrete in cold weather shall be equal or greater than the temperature specified in Table 101.D.

TABLE 101.D - Cold Weather Construction Concrete Temperature, min [1]

Ambient Air Temperature	Thin Sections	Heavy Sections & Mass Concrete [2]
30 to 45 $^{\circ}$ F	60°F	50°F
0 to 30 <sup>o</sup> F	65°F	55°F
Below O <sup>O</sup> F	70°F	60°F

- [1] The maximum concrete discharge temperature of all concrete, except "high early release concrete", produced with heated aggregates, heated water, or both, shall be 70°F. The discharge temperature of "high early release concrete" in cold weather shall be 70 °F - 76 °F.
- [2] Sections having dimensions in all directions greater than 2 feet (24 inches)

101.11.3 The discharge temperature of concrete in hot weather should be kept as cool as possible. Concrete supplied to a project site having a discharge temperature greater than 90 °F may be rejected by the ENGINEER if the concrete cannot be placed and finished after a single tempering with water as authorized under 101.10. Retarding admixtures may be used to control setting in hot weather. The discharge temperature of "high early release concrete"in hot weather shall be specified by the CONTRACTOR. 101.11.4 The CONTRACTOR shall provide to the ENGINEER with each batch of concrete batched and/or delivered to the job site, before unloading at the site, a delivery batch ticket on which the information specified in TABLE 101.E is printed, stamped or written, certifying said concrete. One copy of the ticket shall be available for the ENGINEER and one copy of the ticket shall be available for the quality assurance testing program.

#### TABLE 101.E BATCHING TICKET INFORMATION REQUIREMENTS

- A. Name of Concrete Supplier
- B. Delivery Ticket Number
- C. Date of Delivery
- D. Contractor
- E. Project Name (Optional)
- F. Design Mix Number
- G. Volume of Concrete in Load
- H. Time loaded
- J. Batched Weight (mass) of Cement
- K. Batched Weight (mass) of Fly Ash
- L. Batched Weight (mass) of Fine Aggregate
- M. Batched Weight (mass) of Coarse Aggregate(s)
- N. Batched Weight (mass) or Volume of Each Admixture
- O. Weight or volume of water batched at the plant
- P. Design Mix Target Proportions
- Q. Weight or volume (gal.) of temper water added at the site
- R. Weight or volume of each temper admixture added at the site
- S. Signature and name (printed) of CONTRACTOR'S representative who authorized the tempering, if any, at the site and affiliation to project

#### 101.12 PLACEMENT

101.12.1 Portland cement concrete shall be placed to the lines, sections, grades and elevations, with the procedures specified in the CONTRACT documents. The material shall be consolidated to eliminate all voids, internal rock pockets and defects in the finish concrete. Casting subgrade and formed surfaces shall be damp, at the placement of the concrete. Removable forms shall be treated with a form release agent prior to placement of the forms for ease of removal of the forms without damage to the supported concrete. Forms shall be sealed to prevent leakage. Form release agents shall not stain the adjacent concrete. Placement and finishing shall be completed prior to the start of the initial set of the concrete.

101.12.2.1 The CONTRACTOR shall submit a concrete pumping plan to the ENGINEER for review and authorization one week prior to the start of a pumped concrete construction program for placements complying with 101.1.1. The submittal should identify the pump manufacturer, size and type, rated capacity(s) for the line diameter(s) to be used and distance(s) to be pumped.

101.12.2.2 Pumping shall conform to the recommendations of the pump manufacturer. The pump manufacturer's operation manual shall be available on the pump equipment, and submitted to the ENGINEER, upon request.

101.12.2.3 Concrete shall be pumped in a uniform continuous flow to point of discharge, with all lines kept full, during the pumping operation. The CONTRACTOR shall provide either a system for controlled discharge of the concrete, or the last 5 feet of the pump line, immediately prior to the line discharge opening, shall have a slope equal or less than 10:1, horizontal to vertical, during the pumping of concrete, as authorized by the ENGINEER. The concrete shall not be dropped a vertical distance greater than four feet at discharge from the pump line without a tremey. Concrete placed by pump shall conform to the requirements of this specification after discharge from the pump line. Pumping of concrete shall not commence without authorization by the ENGINEER.

101.13 FINISHING

The CONTRACTOR shall finish Portland cement concrete as required by the CONTRACT documents, Supplemental Technical Specifications, or as directed by the ENGINEER.

#### 101.14 CURING CONCRETE

The CONTRACTOR shall cure concrete as required by the CONTRACT documents, SECTION 349 of this specification, the Supplemental Technical Specifications, or as directed by the ENGINEER. A concrete structure or element shall not be released to service loads until it has achieved a minimum of 85% of the design strength, f'c, at the time the structure is placed in service, or the curing program specified in SECTION 349 is completed, or as directed by the ENGINEER. Service loads shall include construction loads, design loads and environmental exposure.

# 101.15 QUALITY ASSURANCE SAMPLING AND TESTING

101.15.1.1 Quality assurance sampling and testing shall be performed in accordance with the requirements of this Specification, the Supplemental

Technical Specifications, or as required by the ENGINEER. Concrete shall be sampled and tested by a technician/engineer certified as either an ACI certified Concrete Field Testing Technician Grade I, or the equivalent National Institute for Certification of Engineering Technologies Technician, with Specialty Concrete Work Elements Level I 82001, 82002, and Level II 84002, 84003, 84004, 84010.

101.15.1.2 Quality assurance testing and analysis shall be performed in a laboratory accredited in accordance with the requirements of the New Mexico State Highway and Transportation Department "Procedure for Approval of Testing Laboratories to Perform Inspection, Testing, and Mix Design Services", April 13, 1998 Edition, under the direct supervision of a New Mexico Registered Professional Engineer.

101.15.1.3 Testing equipment used in the performance of specified testing shall be calibrated annually with calibration standards traceable to the National Bureau of Standards. Certification records shall be maintained at the laboratory for review by the ENGINEER. A copy of the certifications shall be submitted upon request to the ENGINEER. Quality assurance testing shall be directed by the ENGINEER and paid by the OWNER

101.15.2.1 Samples will be taken in the field by the ENGINEER, in accordance with ASTM C172, at discharge to the structure/application after all tempering at the job site has been completed.

101.15.2.2 A sample shall be taken for each design mix of concrete placed each day, once for each 100 cu yd of concrete, once for each 5000 sq.ft. area of slabs or walls, or fractions thereof, whichever is greater, or as directed by the ENGINEER. Hi-lo thermometers will be provided by the CONTRACTOR to monitor field curing concrete temperatures and companion test specimens while in the field, as directed by the ENGINEER.

101.15.3 Slump tests will be performed on each quality assurance sample in the field in accordance with ASTM C143. Concrete used for slump tests shall not be used in specimens for strength tests. The slump shall not exceed the maximum value defined in TABLE 101.C plus 0.25 in (6 mm). Slumps shall be reported to the nearest 1/4 inch (1 mm).

101.15.4 Entrained air tests will be performed on each quality assurance sample in accordance with the requirements of ASTM C231 for normal weight concrete, and ASTM C173, light weight concrete as specified in TABLE 101.C. Concrete used for entrained air tests shall not be used in specimens for strength tests. The entrained air shall not be less than the minimum nor greater than the maximum entrained air specified plus 0.1 %. Entrained air shall be reported to the nearest one tenth of one percent.

101.15.5.1 The cement content per cubic yard for a load of concrete shall be determined on each quality assurance sample in accordance with ASTM C138. The unit weight shall be reported to the nearest one tenth of a pound per cubic foot (one kilogram per cubic meter). The cement factor shall be reported to the nearest pound per cubic yard (kilogram per cubic meter).

101.15.5.2 The portland cement content per cubic yard for a load of concrete shall be calculated by dividing the batched weight of the portland cement reported on the truck ticket for the load represented by a quality assurance test sample, by the yield, in cubic yards, determined in 101.15.1. The cement content shall be reported to nearest one pound per cubic yard. The portland cement content shall not be less than the minimum cement content for the application specified in TABLE 101.C.

101.15.5.3 The water to cementitious ratio for a load of concrete sampled and tested under this specification shall be calculated by comparing the total water in a load, by weight, the batched water reported on the load's batch ticket plus any water added in the field, to the sum of the portland cement and fly ash reported on the batch ticket. The weight of the water shall be divided by the weight of the cementitious materials and reported to the nearest one hundredth value (xx.xx). The water to cementitious ratio shall be less than or equal to the water to cementitious ratio for the application specified in TABLE 101.C.

101.15.6 A non complying field test, slump test, entrained air test, cement content, shall be verified by sampling and testing a second sample from the same load represented by the non complying sample/tests. If the second sample/tests determine the material is in compliance, the load may be authorized for placement and the all quality assurance tests required shall be performed. If the second test confirms the initial test results, the concrete load may be rejected as directed by the ENGINEER. If the second test confirms the initial sample non complying test, the second sampling and testing shall be payed by the CONTRACTOR, as specified. The OWNER shall pay for all complying test.

101.15.7.1 Quality assurance compressive strength concrete specimens/cylinders shall be molded in accordance with ASTM C31. Cylinders shall be sealed metal or plastic molds complying with ASTM C31. The specimens will be submerged in water during the initial field curing at the site when the average ambient temperature is equal or greater than 60 °F, site conditions permitting, as directed by the ENGINEER. If the initial field cure submersion procedure is not used, high-low thermometers shall

be used to monitor the initial field cure temperature of the quality assurance specimens, and the recorded temperatures shall be reported in the sampling and testing report. If the curing temperature recorded on the high-low thermometer exceeds 85 °F, concrete compressive test strengths shall be reported as information only, and the lab of record shall revise the initial cure procedure for the assurance specimens to control the curing temperature to less than 85 °F. Cylinders left in the field longer than the maximum specified time shall be so identified and reported "for information only". A sample may be taken to the testing laboratory for testing and casting provided the cylinders can be molded within 15 minutes after sampling.

101.15.7.2 Strength specimens shall be molded and tested in accordance with ASTM C31, C39, C78 & C93, C192, and this specification. The number and type of compressive strength test cylinders shall be a minimum of four (4) 6"dia. x 12"H cylinders for channel concrete, and normal concrete with nominal maximum size aggregate of 1.5 inch to 2.0 inch. The number and type of compressive strength test cylinders shall be a minimum of four (4) 4" dia x 8" cylinders for normal concrete with nominal maximum size aggregate 1 inch and less. The number and type of cylinders shall be a minimum of six (6) 4" dia x 8" cylinders for high early release concrete compressive strength tests. The number and type of Modulus of Rupture flexure test beams shall be a minimum of three (3) 6"x6"x42" beams or equivalent for Modulus of Rupture Tests, as directed by the ENGINEER. Strength specimens shall be cast using concrete from the same load as the concrete field tests. When 4"dia. x 8" cylinders are used, they shall be cast in two equal lifts, each lift rodded twenty five times with a three eights inch (9.5 mm) diameter rod with a three eights inch (9.5 mm) semi spherical tip. The rodding of a lift placed on a lift of concrete shall penetrate into the top of the preceding lift.

101.15.7.3 When strength tests are required for stripping of forms or release of structure, a minimum of 2 test specimens complying with the specimen type specified in 101.15.7.2 for each test shall be molded and cured at the site under the same conditions as the concrete represented by the specimens. The specimens shall be returned to the Lab at the end of the field curing period and tested in accordance with ASTMC39. The test strength shall be the average of the test strengths of the two specimens. The critical concrete compressive strength ( $f_c$ ) shall be a minimum of 85% of the specified design strength.

101.15.7.4 Concrete strength test specimens shall be tested at 7 days and 28 days. One specimen shall be tested at 7 days and 2 specimens shall be tested at 28 days, and reported to the Engineer. The test strength shall be the average of the test strengths of the two specimens tested at either 28 days, or as specified in the Supplemental Specifications, drawings, or by the ENGINEER.

101.15.7.5 High early release concrete strength test specimens shall be tested at 3, 7, and 28 days for concrete. One specimen shall be tested at 3 days and 2 specimens shall be tested at 7 and 28 days, and reported to the ENGINEER. The test strength for high early release concrete shall be the average of the test strengths of two specimens tested at 7 days, or as specified in the Supplemental Specifications, drawings.

#### 101.15.8. Not Used.

101.15.9.1 Evaluation and acceptance of concrete shall meet the criteria established in Chapter 5, Section 5.6, "Evaluation and acceptance of concrete," ACI 318-89. Each strength test result shall be the average of two cylinders from the same sample tested at 28 days or the specified age. The strength level of the concrete will be considered satisfactory if the averages of all sets of three consecutive strength tests results equal or exceed the required f'c and no individual strength test result falls below the required f'c by more than 500 psi. Quality assurance compressive strength specimens sampled and cast when the average ambient temperature is greater than 60 °F, and cured with an initial field cure procedure other than submersion method specified in

101.15.7.1, shall be evaluated using the highest curing temperature recorded by the high-low thermometer provided for the field cure and Table 101.E. The test compressive strength shall be compared to the estimated strength corresponding to the highest initial cure temperature indicated in Table 101.E. An assurance compressive strength test shall be equal or greater than the compressive strength defined by Table 101.E when the initial field cure temperature is equal or greater than 85 °F and the initial field cure is not the submerged method specified in 101.15.7.1.

#### TABLE 101.E

#### MINIMUM COMPRESSIVE STRENGTH, f<sub>C</sub>

°F [2]	73	80	85	90	95	100	105	110	115	120
Cure Day(s)	) $P_{TI}$ , % of Specified Strength, f <sup>*</sup> <sub>c</sub> [1,3]									
3	100	108	114	120	122	123	125	120	115	110
7	100	101	102	103	100	98	95	91	78	75
28	100	97	95	93	90	88	85	82	78	75

f<sub>c</sub> P<sub>TI</sub> x f'<sub>c</sub> / 100, psi

Notes: 1. Reference ACI 306, 6.6.1

2. The Non Submerged assurance cylinder cure recorded maximum initial field cure temperature. If a high-low thermometer was not used, the highest ambient temperature recorded for the initial cure period by the national weather service will be used as the initial cure temperature. 3.  $f_c$  specified compressive strength

101.15.9.2 If individual tests of either laboratory-cured specimens produce strengths more than 500 psi (3.4 MPa) below f'c, or, if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is adequate. If the presence of low-strength concrete is confirmed and computations indicate that the load-carrying capacity may have been significantly reduced, tests of cores drilled from the area in question shall be required in accordance with ASTM C42, as directed by the ENGINEER. Three cores shall be taken for each case of an individual cylinder test more than 500 psi (3.4 MPa) below f'c or where the average of any set of three consecutive strength test results is below f'c. If the

concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60 to 80 °f and relative humidity less than 60 percent) for seven days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet. If coring is required a coring plan will be prepared by the ENGINEER no later than 42 calendar days after the placement date. Coring shall be completed and a report submitted no later than 56 calendar days after placement. Core sampling for non complying tests shall be taken at the direction of the ENGINEER and paid by the OWNER. The CONTRACTOR shall be responsible for material replacement of the same design mix in adjacent concrete at no cost to the OWNER where samples are removed.

101.15.9.3 Concrete in the area represented by core tests shall be considered structurally adequate if the average strength of three (3) cores is equal or greater than 85% of the specified design strength (fc), and no single core has a compressive strength less than 75% of the specified design strength. To check testing accuracy, locations represented by erratic core strength may be retested. If these strength acceptance criteria are not met by the core tests, and if structural adequacy remains in doubt, The OWNER and ENGINEER may order load tests as outlined in Chapter 20, ACI 318 for the questionable portion of the structure. Load tests shall be

paid for by the CONTRACTOR.

101.15.9.4 If the structure under consideration does not satisfy the above strength acceptance criteria or the criteria of Section 20.2 or 20.4, ACI 318 The OWNER may order The CONTRACTOR to remove and replace any portion of the structure which is not in compliance with the above. If so ordered, the CONTRACTOR shall perform such work at his own expense. The CONTRACTOR shall patch all core sample holes with the same or similar materials adjacent to the core hole. The patching concrete shall be placed and cured in accordance with the requirements of this specification.

#### 101.15.10 TEST REPORTS

101.15.10.1 Test reports shall include but not limited to the following, as directed by the ENGINEER.

- A. Field Data
  - 1 Date of Sampling
  - 2 Time of Sampling
  - 3 City of Albuquerque Project or
  - 4 City of Albuquerque project or Permit Number
  - 5 Contract Title
  - 6 Portland Cement Concrete Supplier
  - 7 Delivery Ticket Number
  - 8 Design Mix Number
  - 9 Sampling location as defined by the Project Plans and Specifications
  - 10 Ambient temperature at time of sampling, <sup>o</sup>F
  - 11 Material temperature at time of sampling, <sup>O</sup>F
  - 12 Mixer drum revolution count at start of discharge of concrete

В.	Field Tests Results, with specifications.	Acci	uracy
	1 Slump, in (mm)	0.25	1
	2 Entrained Air, %	XX	x.x
	3 Unit Weight, pcf (kg/m <sup>3</sup> )	XXX.X	(xxxx)
	4 w:(c+fa) ratio	X.XX	x.xx
	5 Cement Factor, C.F., lbs/yd <sup>3</sup> (kg/m <sup>3</sup> )	XXX	(xxxx)

6 Cement pay factor determined in accordance with 101.16.2

- C. Comments
  - 1 Report any addition of water and materials and amounts by either volume or weight, prior to and after sampling.
  - 2 Report mixer revolutions count at time of discharge.
  - 3 Record number of mixer revolutions after field tempering with water and/or admixtures, and @ what mixer speed, mixing or agitating speed.
- D. Laboratory Tests
  - 1 Calendar reference and day count from date of sampling for each strength test sample
  - 2 fc compressive strength test result reported to psi/ MPa1013 M.R. Modulus of rupture reported to psi/ MPa50.5

E. Analysis & Certification

The testing laboratory shall provide certification the sampling and testing were performed in compliance with the requirements of the specifications. Certification shall be provided by the New Mexico Registered Professional Engineer in direct responsible charge of the laboratory testing program.

101.15.10.2 Test results shall be reported to the ENGINEER, CONTRACTOR, concrete supplier and OWNER in writing, within 7 working days of completion of the test, as directed by the ENGINEER. Non-complying tests shall be reported within one working day of completion of the test.

#### 101.16 MEASUREMENT AND PAYMENT

101.16.1 Measurement for Portland cement concrete supplied under this specification shall be by LOTS as the area, volumes, and as specified in the contract documents, as directed by the ENGINEER.

101.16.2 Payment for Portland cement concrete supplied under this specification shall be for each LOT, at the contract unit price adjusted in accordance with the

formula below and TABLE 101.F, as directed by the ENGINEER. A LOT shall be defined as either the volume or area of concrete for each design mix placed on a project in a day as defined in the CONTRACT. The adjusted unit price shall be calculated using the formula below and the pay factor, CF<sub>P</sub>, defined in TABLE 101.F. The pay factor shall be defined by the number of samples representing a LOT, and, the % variance of the mean/average (M) portland cement content of the LOT from the minimum cement content specified in TABLE 101.C for the application, as determined by field quality assurance sample test results. Acceptance samples for a LOT shall be sampled and tested in accordance with 101.15. All acceptance samples taken in one day for a type of concrete shall represent a LOT of that type of concrete.

#### UP' = PF X UP UP', Adjusted Contract Unit Price PF, Pay Factor , PF= $0.50 \times (1.00 + CF_P)$ UP, Contracted Unit Price

n, number of samples	Deficiency, $D = (C - M)/C$	CF <sub>P</sub>
3, OR MORE	D 0.0	1.00
	0.0 < D 1.0	1.00
	1.0 < D 2.0	0.95
	4.0 < D 6.0	0.90
	6.0 < D 8.0	0.85
	8.0 < D 10.0	[1]
	D > 10.0	Remove and Replace
	~ · · ·	

#### TABLE 101.F - CEMENT PAY FACTOR CALCULATION, CFP

D, Deficient cement content as % of C, minimum

C, Minimum cement content specified for the application in TABLE 101.C

M, Average or mean (M) cement factor for a LOT. The cement factor shall be calculated as the average of cement factors of all tests taken for a LOT, but not less than three tests, determined in accordance with 101.15.6.

[1] If determined by the ENGINEER to be more practical to accept the material, the LOT may be accepted under written agreement between the OWNER and the CONTRACTOR at an assigned pay factor CFp= 0.70.

#### SECTION 102

#### STEEL REINFORCEMENT

#### 102.1 GENERAL

The following specifications set forth the requirements for bar reinforcement, wire reinforcement, and wire mesh reinforcement. The reinforcement shall conform accurately to the dimensions and details indicated on the plans or otherwise prescribed; and before being placed in any concrete work shall be cleaned of all rust, mill scale, mortar, oil, dirt, or coating of any character which would be likely to destroy, reduce, or impair its proper bonding with the concrete. No reinforcing steel will be accepted under this specification until it has been approved by the ENGINEER as conforming with requirements prescribed therefor. When required by the ENGINEER, the CONTRACTOR or vendor shall furnish samples thereof for testing and notify the ENGINEER as to when and where they will Such samples shall be be available. expense furnished at the of the CONTRACTOR or vendor, but the cost of any testing that may be required will be borne by the OWNER. Samples shall only be taken in the presence of the ENGINEER. The CONTRACTOR shall furnish a certificate mill test report for each heat or size of steel when required by the ENGINEER.

#### 102.2 REFERENCES

102.2.1 ASTM

A 82	A 615
A 185	A 616

102.2.2 ACI

318

#### 102.3 BAR REINFORCEMENT

102.3.1 Reinforcing steel bars shall be deformed intermediate grade billet steel conforming with ASTM A 615. Rail steel conforming with ASTM A 616 may be permitted by the ENGINEER. The Grade shall be 40 or 60, unless Grade 60 is specified on the standard detail drawings or on the construction plans.

102.3.2 In testing bar reinforcement, only the theoretical cross-sectional area will be used in all computations.

102.3.3 Bending of steel will conform to requirements of ACI 318. The various grades of steel shall not be used interchangeably in structures. If rail steel is used, shop and field bending shall comply with the following provisions:

102.3.3.1 Continuous and uniform application of force throughout the duration of the bending operation.

102.3.3.2 Unrestricted movement of the bar at points of contact with the apparatus.

102.3.3.3 Close wrapping of the specimen around the pin or mandrel during the bending operations.

102.3.4 Bending or straightening of reinforcing steel shall be accomplished in such a manner and by such means as to insure that no damage to the material will result as a consequence thereof. Bars shall not be heated to perform bending of bars. Kinked bars shall not be used.

102.3.5 Cutting reinforcement steel or wire by means of a cutting torch is prohibited.

102.3.6 Welding of reinforcing steel or wire is prohibited.

**102.4 WIRE REINFORCEMENT** 

Wire reinforcement shall, in all respect, fulfill requirements prescribed in ASTM A 82.

#### 102.5 WIRE MESH REINFORCEMENT

Mesh reinforcements shall conform to ASTM A 185. The gauge of the wire and the dimensions of the mesh will be specified in the Supplementary Specifications or shown on the plans. The wire mesh reinforcement shall be so constructed as to retain its original shape and form during the necessary handling. The effective cross- sectional area of the metal shall be equal to that specified or indicated on the plans.

102.6 WIRE TIES

Wire for ties shall be black, annealed, not lighter than 16 gauge.

102.7 CHAIRS

Chairs used for support or spacer of reinforcement shall be approved by the ENGINEER.

102.8 MEASUREMENT AND PAYMENT

Steel reinforcement will be included in the measurement for reinforced concrete per cubic yard or square yard in place, unless otherwise stipulated in the Bid Proposal. Payment will be made at the unit price per cubic yard or square yard as defined in the bid proposal.

#### **RIPRAP STONE**

#### 109.1 GENERAL

The riprap stone provided and installed under this specification shall be angular rock, stone or recycled Portland cement concrete complying with the requirements of this specification. The material shall be certified to comply with these specifications. If a change in material and/or source from that authorized occurs during a project, the CONTRACTOR shall resubmit to include the changed material and/or source for authorization by the ENGINEER. A riprap material shall not be used on a project without written authorization of the ENGINEER.

#### **109.2 REFERENCES**

109.2.1 ASTM:

C88 C127

109.2.2 AASHTO:

T103

109.2.3 This Publication

603 610

#### 109.3 MATERIAL

109.3.1 Riprap stone shall be stone, rock or recycled Portland cement concrete complying with this specification. The material shall be free of seams, fractures and coatings and of such characteristics that it will not disintegrate when subject to the action of flowing water.

109.3.2 The minimum specific gravity of the stone shall be 2.65 for sizes and gradation specified in TABLE 109.A, as determined in accordance with ASTM C127, latest edition. If the specific gravity of a stone is less than 2.65. the minimum size of the stone and the depth of the riprap shall be increased in accordance with TABLE 109.B.

109.3.3 The maximum resistance to abrasion shall be fifty (50) percent determined in accordance with the requirements of ASTM C535.

109.3.4 The maximum soundness loss shall be twenty (20) percent determine in accordance with ASTM C88.

109.3.5 The maximum loss to freeze thaw shall be ten (10) percent for 12 cycles determined in accordance with the AASHTO TI03, Ledge R, Procedure A.

#### 109.4 SHAPE AND GRADATION

109.4.1 Riprap material shall be rectangular in shape rectangular in shape having maximum to minimum dimension ratio not more than 3:1.

109.4.2 Riprap stone shall comply with the gradation requirements of TABLES 109.A and 109.B.

109.4.3 Waste Portland cement concrete complying with the requirements of this specification may be used as riprap as specified in the plans and specification, as directed by the ENGINEER.

#### **109.5 PLACEMENT**

109.5.1 The placement of riprap stone shall be to the line and grade shown on the plans or as authorized by the ENGINEER. The depth of the riprap shown on the plans shall be adjusted based on Table 109.B for the specific gravity of the material provided. The surface tolerances shall be within the maximum variations shown in Table 109.C.

#### 109.6 MEASUREMENT AND PAYMENT

109.6.1 Riprap shall be measured by the cubic yard (cy) placed to the lines and grades in the plans and specifications complete in place.

109.6.2 Payment for riprap will be made at the contract unit price per cubic yard for the type of riprap required, which payment shall include all material, labor and equipment required in placing riprap stone as specified in Section 603 and/or 610.

#### TABLE 109.A CLASSIFICATION GRADATION

C	DESIGNATION	MAX. DIMENSIONS inches (m)	% SMALLER	Km [1]
A.	GABIONS TYPE VL	12 (0.30) 9 (0.25) 50-70 6 (0.15) 35-55 3 (0.08) 10	100	6
	TYPE L	18 (0.45) 12 (0.30) 6 (0.15) 30-55 3 (0.08) 10	100 50-70	9
B.	RIPRAP TYPE M	24 (0.60) 18 (0.45) 12 (0.30) 6 (0.15)	100 50-70 30-55 10	12
	TYPE H	36 (0.90) 24 (0.60) 12 (0.30)	100 50-70 30-55	18
	TYPE VH	48 (1.20) 36 (0.90) 18 (0.45) 9 (0.23)	100 50-70 30-55 10	24

[1] Km = mean particle size

#### TABLE 109.B SPECIFIC GRAVITY MULTIPLIER

SPECIFIC GRAVITY	MULTIPLIER
2.65	1.00
2.65	1.05
2.50	1.15
2.40	1.25
2.30	1.35
<2.30	REJECT

#### TABLE 109.C CONSTRUCTION TOLERANCES

MAXIMUM VARIATION RIPRAP DESIGNATION FROM SPECIFIED FINISH GRADE inches (meters)

TYPE VL +/-	3 (0.08)
TYPE L	6 (0.15)
TYPE M	9 (0.25)
TYPE H	12 (0.30)
TYPE VH +/-	12 (0.30)

#### **SECTION 123**

#### REINFORCED CONCRETE PIPE

#### 123.1 GENERAL

123.1.1 These specifications cover reinforced concrete pipe intended to be used for the construction of storm drains, sewers, and related structures.

123.1.2 The size and class of the concrete pipe to be furnished shall be as shown on the plans or as specified under the item of work for the project of which the pipe is a part.

123.1.3 Unless otherwise specified, pipe will shall be either cast, spun, or manufactured by an approved equal method.

123.1.4 The interior surface shall be smooth and well finished. Joints shall be of such type and design and so constructed as to be adequate for the purpose intended so that, when laid, the pipe will form a continuous conduit with smooth and uniform interior surface.

123.1.5 Bell and spigot shall be free from any deleterious substance or condition which might prevent a satisfactory seal at the joints.

123.1.6 Pipe stronger than that specified may be furnished at the manufacturer's option and at his own expense, provided such pipe conforms in all other respects to the applicable provisions of these specifications.

123.1.7 Reinforced concrete pipe utilized for sanitary sewers shall be fully lined with no longitudinal seams in accordance with Section 122.

#### 123.2 REFERENCES

#### 123.2.1 ASTM:

C-33	
C-76	
C-150	C-260
C-361	C-441
C-443	C-494
C-618	

123.2.2 American Concrete Pipe Association (ACPA)

Concrete Pipe Design Manual

123.2.3 This Publication Section 102 Section 122

#### 123.3 PIPE LINE LAYOUTS

123.3.1 When specials and radius pipe and/or fittings are required, the required number of sets of the pipe line layout be furnished to the ENGINEER prior to the manufacture of the concrete pipe. Storm inlet or inlet connector pipe need not be included in the pipe line layout; however, pipe stubs shall be included. In lieu of including storm inlet connector pipe line layout, a list of storm inlet connector pipes shall accompany the layout. The connector pipe list shall contain the following information:

123.3.1.1 Size, class. and wall type.

123.3.1.2 Station at which pipe joins main line.

123.3.1.3 Number of sections of pipe, length or section, type of sections (straight. horizontal bevel, vertical bevel, etc.).

#### 123.4 MATERIALS

123.4.1 Reinforced Concrete Pipe shall consist of a mixture of Portland cement, water aggregates, and admixtures, proportioned and manufactured accordance with the requirements of ASTM C76, latest edition, and this specification. The pipe shall be certified in accordance with the requirements of these specifications. Certification of compliance shall be submitted by the CONTRACTOR and approved by the ENGINEER prior to manufacture of the Reinforced Concrete Pipe, Reinforced Concrete Pipe shall not be used on a project without written approval of the ENGINEER.

123.4.2 Portland cement shall comply either with the requirements of ASTM C 150. Types I, II, III, and V, Low Alkali (LA) cements, or as specified herein. in the Supplementary Technical Specifications, plans, or as approved by the ENGINEER. CONTRACTOR The shall submit certification of compliance signed by the cement manufacturer, identifying the cement type and source (plant location), stating the portland cement used in the Reinforced Concrete Pipe delivered to the project complies with this specification. Portland cement concrete used in the manufacture of Reinforced Concrete Pipe shall have a minimum cemetitious content of 470 lbs./cu.yd.. except as either specified herein, as specified in the Supplemental Technical Specifications, or as approved by the ENGINEER. Portland cement shall be of the same source and type for all Reinforced Concrete Pipe delivered to a project.

123.4.2.1 Portland cement concrete for Reinforced Concrete Pipe shall be proportioned to provide a minimum cemententitious content of 470 lbs./c.y. (5 sks/c.y.) and a maximum water (W) to cementitious material ratio by weight, W:(C+FA)=0.40. Cementitious material shall consist of portland cement and class F fly ash complying with this specification. The fly ash shall be proportioned to provide a fly ash (FA) to portland cement (C) ratio by weight of 1:5, minimum.

123.4.3 Mineral admixtures shall be "Class F fly ash" and comply with the requirements of ASTM C 618 including Table 4 "Supplementary Optional Physical Requirements."

- A. Uniformity requirements, air entraining agent dosage for 18.0% vol of mortar, shall not vary by more than 20%
- B. Reactivity with cement alkalies: Reduction of mortar bar expansion at 14 days, minimum (ASTM C441) 65%

Reactivity with cement alkalis shall be determined in accordance with the requirements of ASTM C44I, using DOW CORNING glass rod base for aggregates. The CONTRACTOR shall submit certification of compliance identifying the type fly ash and source (plant location), stating the fly ash used in the Reinforced Concrete Pipe delivered to the project complies with this specification. Fly ash shall be of the same source and type for all Reinforced Concrete Pipe delivered to the project.

123.4.4 Admixtures of any type, shall not be used without written approval of the ENGINEER. The CONTRACTOR shall submit certification of compliance signed by the admixture manufacturer, identifying the admixture and its source (plant location), stating the admixture(s) used complies with this specification. Admixtures shall be of the same source for all reinforced concrete Pipe delivered to a project.

123.4.4.1 Air entraining admixtures shall be used in all Reinforced Concrete Pipe provided under this specification. It shall conform to the requirements of ASTM C 260. Entrained air content shall comply with the following requirements:

Nominal Max Size Aggregate Air Cont. Range

(inches)	(%)
3/8, 1/2 & 3/4	4 - 8
1	4 - 7
1-1/2	3 - 6

or as required by the Supplementary Technical Specifications, on the plans and/or as approved by the ENGINEER.

123.4.4.2 Chemical admixtures shall conform to either the requirements of ASTM C 494, and/or as specified in the Supplementary Technical Specifications, on the plans, and/or as approved by the ENGINEER.

123.4.4.3 Neither calcium chloride nor noncalcium chloride accelerating admixtures shall be used in Reinforced Concrete Pipe provided to a project under this specification.

123.4.4 Aggregates shall be assumed to be alkali-reactive. Variance for a specific aggregate may be approved by the Engineer upon written request by the CONTRACTOR and submittal of test data, as required by the ENGINEER. Aggregates shall comply with the requirements of ASTM C 33 and ASTM C 76 and as specified herein. Aggregates shall be of the same source and type for all Reinforced Concrete Pipe manufactured and delivered to the project.

123.4.5 Reinforcement shall comply with the requirements of this specification and Section 102. The CONTRACTOR shall submit certification of compliance signed by the reinforcement manufacturer, identifying the material and its source (plant location), stating the reinforcement complies with this specification. Reinforcement shall be of the same source for all Reinforced Concrete Pipe delivered to the project.

#### 123.5 CAUSES FOR REJECTION

Such inspection of pipe as may be deemed necessary by the ENGINEER will be made at the place of manufacture and pipe may be rejected for any of the reasons described in ASTM C 76, unless it can be repaired in accordance with the requirements noted therein and the approval of the ENGINEER.

#### 123.6 ACCEPTANCE

Basis of acceptance shall be in compliance with ASTM C 76.

# 123.6.1 D-LOAD BEARING STRENGTH METHOD

123.6.1.1 The ENGINEER will select at random at the point of manufacture test specimens of the pipe to be furnished for the project.

123.6.1.2 The required number of test specimens and the test pipe shall conform in all respects to the applicable requirements of ASTM C 76. The pipe shall be tested by one of the two standard methods of testing; namely, (A) the three-edge bearing, (B) the sand bearing, as prescribed in ASTM C 76, and the required strength of the pipe specimens undergoing the bearing tests shall conform with the D-Load requirements designated therein.

#### 123.6.2 STRUCTURAL DESIGN METHOD:

Where structural details of the pipe are shown on the plans, the manufacture of pipe shall be checked by making the appropriate tests on the concrete placed in the pipe forms, by inspection of the steel reinforcing cages that are to be used in the pipe. and by inspection of the fabrication of the pipe.

#### 123.6.3 "DOWNGRADING" OF PIPE:

123.6.3.1 For the purpose of these specifications, "downgraded" pipe shall be defined as pipe which is to be used under loads less than that for which they have been designed.

123.6.3.2 Pipe manufactured in accordance with these specifications which have not met their designed test loads may be "downgraded" by the ENGINEER and used provided that:

123.6.3.2.1 Enough load tests are made to establish the load under which they may be used. The number of tests to be made shall be as determined by the ENGINEER; this may require the testing of each section for acceptance.

123.6.3.2.2 The comply with the test and inspection requirements of these specifications.

123.6.3.3 Individual specimens of pipe embodying major repairs or having numerous hairline cracks extending the full length of the section on the inside of the pipe at the minor axis or on the outside of the pipe at the major axis may be tested for acceptance at the discretion of the ENGINEER.

#### 123.6.4 STOCKPILED PIPE:

123.6.4.1 Stockpiled pipe may be used only when approved by the ENGINEER provided the pipe meets all other specified requirements.

123.6.4.2 For the purpose of these specifications, "stockpiled" pipe shall be defined as pipe manufactured in quantity which will meet requirements of this section but which was not manufactured for use in specific projects; however, pipe which has been rejected by another agency will not be considered as "stockpiled" pipe. nor will such pipe be accepted.

#### 123.7 JOINTS

123.7.1 For circular pipe, rubber gasket joints shall be required. Such joints shall conform to the requirements of ASTM C 443 and the requirements set forth in this document. The joint shall be designed for not less than 15%, or more than 50%

deformation of the rubber gasket when the off-center pipe is ioined with all manufacturing tolerances considered. Minimum manufacturing tolerances shall be assumed to result in a centered annular space of 1.75 times the nominal design annular space. Joint mating surfaces shall be parallel and not be greater than 3.5° slopes. In addition to the hydrostatic joint test requirements per ASTM C 443, the pipe shall be loaded to cause maximum joint annular space to occur at the top. The pipe shall then be subjected to an internal hydrostatic pressure of 13 psi for 10 minutes. The test set up shall include a minimum of (2) pipe sections per lot. Bulkheaded end joints are acceptable, only mating pipe joints are allowed. Moisture or beads of water appearing on the surface of the joint will not be considered as leakage. If leakage of joints should initially occur, the manufacturer shall have the option to allow the pipe to soak under pressure for up to 24 hours and then retest. Any leakage during such retest will constitute failure of the test.

Pipe with beveled ends or pipe joints specifically designed to allow unsymmetrical joint closure may be provided for use around curves, the radii of which are shown on the drawings. Unless otherwise shown on the plans or specified in the Supplementary Specifications, either one or both ends may be beveled up to a maximum of 5 degrees. as required to provide well fitted joints. Beveled ends may conform to the Typical Method of Designing Curved Concrete Pipe sewers, as shown in the ACPA Concrete Handbook. Deflections per joint shall be limited to the manufacturer's standards for each particular diameter and type of pipe used.

123.7.2 For elliptical or arch reinforced concrete pipe, the joints shall be either bell and spigot or tongue and groove. Mastic material, such as RAMNEK, KENT SEAL, or approved equal, will be used to seal the joints.

123.7.3 Cement mortar joint fillers will not be accepted for round, elliptical, or arch reinforced concrete pipe.

123.7.4 If required by the ENGINEER to meet specified laying tolerances, the pipe shall be "match marked" at the place of manufacture, and laying diagrams furnished

to the CONTRACTOR by the manufacturer shall be subject to approval by the ENGINEER.

#### 123.8 DIMENSIONS

#### 123.8.1 LENGTH

123.8.1.1 The nominal length shall be as supplied by the manufacturer unless otherwise specified in the Supplementary Technical Specifications on the plans or required for bends or special joints.

123.8.1.2 Except for special shapes, the plain of the ends of the pipe shall be perpendicular to the longitudinal axis of the pipe, with the exception that variations in laying lengths of two opposite sides of pipe shall be not more than 1/8 inch per foot of diameter with a maximum of 5/8 inch in any length of pipe.

#### 123.8.2 WALL THICKNESS

The wall thickness of pipe shall conform to the requirements indicated for Wall B or Wall C. reinforced concrete pipe specified in ASTM C 76 unless otherwise specified.

#### **123.9 REINFORCEMENT**

Fabrication and placement of reinforcement for the various sizes and strengths of pipe shall conform to the applicable requirements of ASTM C 76.

#### 123.10 CURING REQUIREMENTS

The pipe shall be cured in conformance with the applicable requirements of ASTM C 76.

#### 123.11 MARKINGS:

123.11.1 Each section of pipe shall be conformance with marked in the of ASTM C 76. The reauirements at the ENGINEER mav place of manufacture, indicate his acceptance of the pipe for delivery to the job by marking the pipe with the Contracting Agency's mark. Such acceptance, however, shall not be considered a final acceptance.

123.11.2. If the pipe is subsequently rejected, the mark placed thereon by the ENGINEER shall be defaced. No pipe will be marked, "Reject." Only pipe accepted shall be marked, "Accepted ."

#### 123.12 LOW-HEAD PRESSURE PIPE

Reinforced concrete low-head pressure pipe shall conform to the requirements of ASTM C 361.

#### 123.13 SELECTION FOR CLASS OF PIPE

123.13.1 The classes of reinforced concrete pipe and the D-Load to produce a 0.0l-in. crack for each class of pipe are specified in ASTM C 76.

123.13.2 The appropriate formulas, tables and figures contained in the "Concrete Pipe Design Manual," prepared by the American Concrete Pipe Association, will be used, to determine the class of pipe to be installed between manholes or for a culvert. It is essential that maximum trench width, class of bedding and soil weight be considered in the pipe class selection.

123.13.3 The construction plans will indicate the following information for each length of pipe between manholes or for a culvert: the nominal diameter of the pipe, the class of pipe, the class of bedding and the maximum trench width at top of pipe.

#### 123.14 MEASUREMENT AND PAYMENT

123.14.1 The measurement and payment for the materials specified in this section will be made as specified in section will be made as specified in the applicable section of these specifications or as specified in the supplemental technical specifications or as called for in the plans and as shown in the Bid Proposal.

#### CLEARING AND GRUBBING

#### 201.1 GENERAL

This work shall consist of removing natural and man-made objectionable material from the right-of-way, construction areas, road approaches, material and borrow sites, areas through which ditches and channels are to be excavated, and such other areas as may be shown on the plans. Clearing and grubbing shall be performed in advance of grading operations except that in cuts over 3 feet in depth, grubbing may be done simultaneously with excavation, provided stumps, roots, embedded wood, foundations and slabs are removed as Clearing and grubbing shall be in specified. accordance with the requirements herein specified, such as erosion control requirements. Demolition of structures, other than foundations or slabs, shall be as shown on the plans.

#### 201.2 REFERENCES

#### 201.3 PRESERVATION OF PROPERTY

Existing improvements, adjacent property, utility and other facilities, and trees and plants not to be removed shall be protected from injury or damage resulting from the CONTRACTOR's operations. Only trees and plants designated or marked for removal by the ENGINEER shall be removed.

#### 201.4 CONSTRUCTION METHODS

201.4.1 The natural ground surface shall be cleared of vegetable growth, such as trees, tree stumps, logs, roots or downed trees, brush, grass, weeds, and surface boulders, as well as fences, walls, rubbish, foundations and slabs.

201.4.2 Unless otherwise shown on the plans, the entire area of the project within the limit lines specified below shall be cleared and grubbed. No payment will be made to the CONTRACTOR for clearing and grubbing outside these limits, unless such work is authorized by the ENGINEER.

201.5 LIMIT LINES: Except when limit lines for clearing and grubbing are shown on the plans or are staked by the ENGINEER, clearing and grubbing shall extend only within reasonable limits of the work area.

201.6 REMOVAL OF TREES AND TREE BRANCHES

201.6.1 Trees shall be removed in such a manner as not to injure standing trees, plants, and

improvements which are to remain. Tree branches extending over a roadway and which clear finish grade by 12 feet or less shall be cut off close to the boles in a workmanlike manner.

201.6.2 Trees requiring trimming to facilitate normal construction operations shall be trimmed by a tree surgeon.

201.7 REMOVAL AND DISPOSAL OF DEBRIS

Debris to be removed shall be disposed of outside the right-of-way at a location satisfactory to the ENGINEER, except when burning of combustible debris is permitted. The area to be graded and adjacent areas shall be left with a neat and finished appearance. No accumulation of flammable material shall remain on or adjacent to the property line. In case burning precedes construction operations, the piles may be placed in the center of the area; otherwise, the piles shall be placed in the most convenient location at the side of the area and beyond slope lines where they may be burned without damage to surrounding forest cover or adjacent property. Burning shall be done in conformance with local regulations and at such times and in such manner as to prevent the fire from spreading to areas adjoining the construction site. In areas where burning is prohibited by local regulations, all removed material shall be disposed in an approved solid waste disposal site.

201.8 REMOVAL AND DISPOSAL OF SALVAGEABLE ITEMS

Items and materials of salvage value as shown on the plans or as determined by the ENGINEER, unless incorporated in the new work, shall remain the property of the OWNER and shall be delivered to approved storage areas as directed by the ENGINEER. Such items and materials shall be carefully removed and delivered in such a manner as to permit re-use.

#### 201.9 MEASUREMENT AND PAYMENT

#### 201.9.1 CLEARING AND GRUBBING:

201.9.1.1 When the proposal includes an item for clearing and grubbing, the quantity for measurement shall be as indicated in the Bid Proposal.

201.9.1.2 The unit price per acre paid for clearing and grubbing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in clearing and grubbing as shown on the plans, as provided in these specifications and as directed by the ENGINEER, including the removal and disposal of resulting material.

201.9.1.3 When the Bid Proposal does not include a pay item for clearing and grubbing as above specified and unless otherwise specified in the Supplementary Specifications, full compensation for any necessary clearing and grubbing required to perform construction operations specified shall be considered as included in the price paid for other items of work and no additional compensation will be allowed therefore.

201.9.2 REMOVAL AND DISPOSAL OF TREES: If the Bid Proposal includes separate estimates of quantities for the removal of trees, the trees shall be classified by size as follows:

201.9.2.1 Trees less than 12 inches in circumference at 3 feet above the original ground surface shall be considered as included in the price for clearing and grubbing or excavation, and no additional compensation will be allowed therefor. 201.9.2.2 Trees between 12 and 30 inches in circumference shall be measured as a unit price for each tree in the item provided in the Bid Proposal for trees of this dimension.

201.9.2.3 Trees more than 30 inches in circumference shall be measured as a unit price for each tree in the item provided in the Bid Proposal for trees of this dimension.

#### SECTION 204

#### FILL CONSTRUCTION

#### 204.1 GENERAL

Fill construction shall consist of constructing roadway embankments (including the preparation of areas upon which they are to be placed), the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of suitable materials in holes, pits and other depressions.

204.2 REFERENCES

204.2.1 ASTM

D 1557 D 4254

#### 204.3 PLACING

204.3.1 Unless otherwise specified, the upper 6 inches of the original ground area upon which fills are to be constructed shall be compacted to a density of not less than 90 percent of maximum density as determined by ASTM D 1557, or in soils containing less than 5 percent passing the #200 sieve, a minimum relative density of 70 percent as determined by ASTM D 4254.

204.3.2 Rocks, broken concrete, or other solid materials which are larger than 4 inches in greatest dimension shall not be placed in fill areas where piles are to be placed or driven.

204.3.3 When fill is to be made and compacted on hillsides or where new fill is to be compacted against existing fill or where embankment is built 1/2 width at a time, the slopes of original hillsides and old or new fills shall be started wherever the vertical cut of the next lower bench intersects the existing ground.

204.3.4 Material thus cut out shall be recompacted along with the new embankment material at the CONTRACTOR's expense, unless the width of the bench required exceeds 4 feet, in which case the excavated material in excess of 4 feet will be measured and paid for as excavation.

204.3.5 Clods or hard lumps of earth of 6 inches in greatest dimension shall be broken up before compacting the material in embankment, except as provided in the following paragraph.

204.3.6 When the fill material includes large rocky material or hard lumps, such as hardpan or cemented gravel which cannot be broken readily, such material shall be well distributed throughout the fill. Sufficient earth or other fine material shall be

placed around the larger material as it is deposited so as to fill the interstices and produce a dense, compact fill. However, such material shall not be placed within 2 feet of the finished grade of the fill.

204.3.7 Embankment construction shall not be performed when material is frozen.

#### 204.4 COMPACTING

204.4.1 Fill shall be constructed in compacted layers of uniform thickness and each layer shall be compacted in accordance with the requirements herein specified with the following exception.

204.4.2 Where fills are to be constructed across low, swampy ground which will not support the weight of hauling equipment, the lower part of the embankment may be constructed by dumping successive loads of suitable material in a uniformly distributed layer of a thickness not greater than that necessary to support the equipment while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

204.4.3 The placing and compacting of approved material within the project (where unsuitable material has been removed, and the filling of holes, pits and other depressions has been accomplished) shall conform to all of the requirements herein specified for compacting fills.

204.4.4 The loose thickness of each layer of fill material before compacting shall not exceed 8 inches, except as provided in the following paragraph for rocky material. The ENGINEER may authorize roadway fill materials to be placed in layers in excess of 8 inches thickness if the CONTRACTOR can demonstrate that the required compaction can be achieved for the full depth of the lift. However, in no case shall the loose layer exceed 24 inches. Each layer shall be compacted in accordance with the following requirements to a density of not less than 90 percent of maximum density, as determined by ASTM D 1557, or in soils containing less than 5 percent passing the #200 sieve, a minimum relative density of 70 percent as determined by ASTM D-4254. In areas of new or widened roadways and required appurtenances, the density of the upper 12 inches shall not be less than 95 percent as determined by ASTM D 1557.

204.4.5 When fill material contains by volume over 25 percent of rock larger than 6 inches in greatest dimension, the fill below a plane 3 feet below

finished grade may be constructed in layers of a loose thickness before compaction not exceeding the maximum size of rock in the material but not exceeding 3 feet in thickness. When more than 65 percent is retained on the No. 4 sieve, moisture and density control is not required.

204.4.6 The interstices around the rock in each layer shall be filled with earth or other fine material and compacted. Broken portland cement concrete obtained from the project excavation will be permitted in the fill with the following limitations.

204.4.6.1 The maximum dimensions of any piece used shall be 6 inches.

204.4.6.2 Pieces larger than 4 inches shall not be placed within 12 inches of any structure.

204.4.6.3 Pieces larger than 2 1/2 inches shall not be placed within 12 inches of the subgrade for paving.

204.4.6.4 "Nesting" of pieces will not be permitted.

204.4.7 At locations where it would be impractical to use mobile power compacting equipment, fill layers shall be compacted to the specified requirements, by any approved method that will obtain the specified relative compaction.

204.4.8 At the time of compaction the moisture content of fill material shall be optimum plus or minus 2 percent. Fill material which contains excessive moisture shall not be compacted until the material is dry enough to obtain the required relative compaction. Full compensation for any additional work involved in drying fill material to the required moisture content shall be considered as included in the unit price per Bid Proposal and no additional compensation will be allowed. Fills shall be maintained to the grade and cross sections shown on the plans until the acceptance of the contract.

#### 204.5 MEASUREMENT AND PAYMENT

Fill construction shall include excavation, placement, compaction and all related work, and shall be measured in place after compaction. Payment will be made on the unit price per cubic yard for compacted fill unless otherwise noted on the Bid Proposal.

#### SECTION 301

#### SUBGRADE PREPARATION

#### 301 GENERAL

301.1 The work performed under this specification shall include. but not be limited to providing the equipment. labor and materials for the preparation of soil subgrade and maintenance of the prepared subgrade for the construction of graded aggregate base, asphalt treated base, cement treated base, asphalt concrete, Portland cement concrete, sidewalks, curb and gutter. drive pads, valley gutter, median pavements and/or any other roadway improvements.

#### 301.2 REFERENCES

301.2.1 ASTM:

C136	D423
D424	D698
D1140	D1557
D2844	D2922
D3017	

301.2.2 This publication

Section 204

#### 301.3 MATERIAL

301.3.1 Subgrade material may be on site soil, combinations of pulverized asphalt concrete and soil, and/or pulverized Portland cement concrete and soil, imported soils, complying with the requirements of this specification. Flowing, sugar sands shall not be used for subgrade material.

301.3.2 All soft and unstable material and other portions of the subgrade which will not compact readily or serve the intended purposes shall be removed and replaced with suitable material from excavation or borrow or suitable materials shall be added and. by manipulations, be incorporated into the subgrade to produce a material meeting subgrade requirements.

301.3.3 All subgrade material shall have a minimum Resistance Value (R-Value), as determined by ASTM D-2844, equal to or greater than the design R-Value for the pavement section. If the subgrade soils encountered during construction have a R-Value less than the design R-Value, those subgrade materials shall be removed to a depth of not less than two (2') feet below the finished subgrade elevation or as authorized by the ENGINEER and to the horizontal limits authorized by the ENGINEER, and replaced with subgrade material having an R-Value greater than the design R-Value. On small projects, in areas that just involve replacement of existing roadway items or when no design R-Value has been established this R-Valve requirement may be waived if authorized by the ENGINEER.

#### 301.4 SUBGRADE COMPACTION

301.4.1 Subgrade preparation shall extend to one foot (1') beyond the limits of the improvement to be placed on the subgrade except when that improvement abuts an existing structure and/or the limits of the right of way. Where an improvement abuts an existing structure and/or the limits of right of way, the subgrade preparation shall extend to the edge of the existing structure and/or the limits of right of way, as specified in the plans, specifications. supplemental technical specifications or as directed by the ENGINEER. Where existing structures are in the right of way or construction easements, subgrade preparation shall extend to the face of the structure, as specified above. Subgrade preparation shall not extend below the bottom of the foundation of an existing structure without specific authorization by the ENGINEER.

301.4.1.1 Subgrade preparation for roadway improvements shall be performed after completion of earthwork construction, subsurface utility installation and trenching back fill within the limits specified, as directed by the ENGINEER. The subgrade preparation shall extend the full width of the roadway to either one (1) foot back of new curb and gutter, and/or to the face of existing structures. and or the limits of right of way, as specified in the plans and specifications. as directed by the ENGINEER.

301.4.1.2 Subgrade preparation for sidewalks and drive pads shall extend a minimum of one (1') beyond the free edge of the improvement, and/or to the limits of right of way, and/or to the face of existing structures.

301.4.1.-3 The subgrade preparation for roadway construction without curb and gutter, shall extend one (1 ') beyond the edge of the pavement, and/or to the face of existing structures, and/or to the limits of right of way, as specified in the plans and specifications, as authorized by the ENGINEER.

301.4.1.4 Subgrade preparation shall extend the full width of roadway medians four (4) feet wide or less.

In areas that the medians are wider than four feet (4') the subgrade compaction shall extend one foot (1') beyond the median edge of the pavement or back of the median curb.

301.4.2. The subgrade for arterial/collector roadway shall be ripped to a minimum depth of one (1) foot, brought to uniform moisture content, and compacted to the requirements of plans and specification, as authorized by the ENGINEER. Subgrade material with either 20 per cent or more material passing a no. 200 sieve sha11 be uniformly mixed and moisture conditioned using a tractor mounted mixer or disced after ripping, as specified in the plans and specifications, as authorized by the ENGINEER. The subgrade for reconstructed curb and gutter, sidewa1ks, drive pads, residential roadways, bicycle paths and other roadways shall be scarified to a minimum depth of six (6) inches, brought to uniform compaction moisture content, and compacted to the requirements of plans and specification, as authorized by the ENGINEER.

301.4.3 Subgrade area shall be compacted to a dry density greater than 95 per cent of maximum dry density in a moisture range of optimum moisture +/-2% as determined in accordance with ASTM D1557, unless the material contains 35% or more material finer than the No.200 sieve. If the subgrade material has 35% or more material finer than the No.200 sieve, the subgrade shall be compacted to a dry density greater than 95 percent of maximum dry density in a moisture content range of at least optimum moisture to optimum moisture +4%, as determined in accordance with ASTM D698.

301.4.4 Areas on which roadway pavement items are to be placed shall be compacted uniformly to the required subgrade density at the same time. Obtaining the required subgrade density in trench areas at a different time than obtaining the required subgrade density in the adjacent pavement areas will not be permitted. 301.4.5 Upon completion of the subgrade preparation, the CONTRACTOR shall maintain the compacted subgrade density and moisture content at the specified levels until the next lift of material is completed. The CONTRACTOR shall provide continuous moisture protection of the subgrade by either sprinkling or the application of a prime coat, as directed by the ENGINEER.

#### 301.5 SUBGRADE TOLERANCES

Subgrade upon which pavement, sidewalk, curb and gutter, drive pads, or other structures are to be placed shall not vary more than +1/4 inch or -1/2 inch per 10 foot in any direction from the specified grade and cross section. Subgrade upon which base material is to be placed shall not vary more than +1/2 inch or -1 inch per 20 foot in any direction from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

#### 301.6 TESTING:

301.6.1 A sample of each type of soil encountered shall be classified in accordance with the requirements of ASTM D2487, the moisture density relationship determined in accordance either ASTM D698 or D1557, whichever is applicable and an estimated resistance R-value assigned based on plasticity index, PI, and percent material passing the No.200 sieve.

301.6.2 Compaction tests shall be taken for each 500 sy or less, as directed by the ENGINEER. Compaction tests shall be taken in accordance with ASTM D2922 and D3017. Areas represented by non complying tests shall be reworked as specified, and retested for compliance.

301.6.3 Test reports shall include but not be limited to the requirements of TABLE 301.A.

#### TABLE 301.A TEST REPORT INFORMATION

A. Field Data

Date of Sampling/Field Test Project Number or Permit Number Project Title Location of sample/field test as defined by the project plans and specifications Time of Sampling/field testing Field test results with reference specification limits

B. Laboratory Data

Soil classification Soil gradation Plasticity index Liquid limit Optimum moisture/maximum dry density relationship and graph Estimated soil resistance R-Value

301.6.4 Test results shall be reported to the ENGINEER and CONTRACTOR in writing, within 4 working days of completion of the sampling and or field test. Non-complying test shall be reported within 1 working day of completion of the test.

#### 301.7 MEASUREMENT AND PAYMENT:

301.7.1 Measurement for payment of roadway subgrade preparation will be by the square yard to the limits of the surfacing, as authorized by the ENGINEER. Payment for subgrade preparation shall include all labor and equipment required to shape, mix, add moisture, compact, bring to grade and maintaining the prepared subgrade moisture and density until the next course of material is placed.

301.7.2 The measurement of payment for subgrade preparation for non-pavement roadway items such as curb and gutter, valley gutter, drive pads and sidewalks etc., shall be included in that item. No separate payment will be made.
#### SECTION 410

#### FENCES

410.1 GENERAL

This work shall consist of the construction of fences and gates in substantial compliance with the specifications, lines, and grades shown on the plans or established by the ENGINEER.

#### 410.2 REFERENCES

410.2.1 ASTM:

A1	A 153
A 36	A 392
A 116	A 499
A 120	A 525
A 121	A 569
A 123	B 209

410.2.2 AASHTO:

Μ	111
Μ	133
Μ	181

410.2.3 COMMERCIAL STANDARD, U.S. DEPT. OF COMMERCE: 184 246

# 410.3 MATERIALS

#### 410.3.1 GENERAL:

410.3.1.1 The CONTRACTOR shall submit the required number and type of test certificates to the ENGINEER certifying that the fencing materials conform with the requirements herein provided. When the locations of manufacturing plants allow, the plants will be inspected periodically for compliance with specified manufacturing methods, and material samples will be obtained for laboratory testing for compliance with materials quality requirements. This can be the basis for acceptance of manufacturing lots as to quality. All materials will be subject to inspection for acceptance as to condition at the latest practicable time the ENGINEER has the opportunity to check for compliance prior to or during incorporation of materials in the work.

410.3.1.2 All materials shall be new and without flaws or defects of any type.

#### 410.3.2 WIRE FENCE

410.3.2.1 WIRE:

410.3.2.1.1 Barbed wire shall conform to ASTM A 121, Class 3, coating and shall consist of two strands of 12-1/2 gauge wire with 4-point 14-gauge round barbs spaced approximately 5 inches apart. In lieu of Class 3 galvanizing, the wire may be coated with aluminum alloy at the rate of not less than 0.30 ounce per square foot of wire surface and the barbs at the rate of not less than 0.25 ounce per square foot of wire surface.

410.3.2.1.2 Woven wire shall conform to ASTM A 116, design number 832-6-11 (shown in Appendix Table) or as shown on the plans, Class 3 coating or coated with aluminum alloy at the rate of not less than 0.25 ounce per square foot of wire surface. The height shall be 32 inches.

410.3.2.1.3 Staples for fastening fence wire to wood posts shall be galvanized 9 gauge, 1 1/2 inches long.

410.3.2.1.4 Brace wire shall be 9 gauge, galvanized and shall be used in the construction of braces and intermediate braces when wood posts are used.

410.3.2.1.5 Tie wires for fastening barbed wire or woven wire to steel posts shall be not less than 12-1/2 gauge and galvanized. Eleven gauge or heavier wire fasteners or metal clamps may be used in lieu of tie wires when approved by the ENGINEER. Aluminum tie wires will not be accepted.

410.3.2.1.6 Stays for barbed wire fences shall be not less than 9-1/2 gauge galvanized wire conforming with ASTM A 116 and of length and spacing shown on the plans. 410.3.2.2 POSTS: Corner, brace, intermediate brace, gate, and line posts shall be metal or wood and of the type, size, and length shown on the plans and as herein provided. 410.3.2.2.1 Metal posts and braces shall be fabricated from rail, billet, or commercial grade steel conforming with any of the following ASTM Designations: A 1, A 499, and ASTM A 120 (for pipe posts) or Commercial Standard 184, published by the U.S. Department of Commerce and shall be aalvanized or painted as reauired. Galvanizing shall conform with ASTM A 123 painting shall conform with the and requirements shown on the plans. Corner, gate, and intermediate brace posts shall be tubular, section, or angles of the type and dimensions shown on the plans. Corner, gate and intermediate brace posts and braces shall be set in concrete as shown on the plans. Line posts shall have a minimum weight of 1.33 pounds per foot exclusive of anchor plates. A minus tolerance of not to exceed 5 percent of the minimum weight of each post will be permitted. A plus tolerance of 2 inches and a minus tolerance of 1 inch in the length of each post will be permitted. Line posts may be I-beam, T-beam, U-beam, Y-bar, or H-column section. Line posts shall be provided with corrugations, lugs, ribs, or notches spaced approxi- mately 1 inch on centers to engage the required fence wire in designated spaces. Posts with punched tabs intended to be crimped around the wire will not be accepted. Anchor plates shall have an area of not less than 19 square inches, shall weight not less than 0.64 pound each. and shall be securely welded, bradded, or riveted to each line post.

410.3.2.2.2 Wood corner. brace. intermediate brace, gate and line posts shall be southern yellow pine, lodgepole pine, or ponderosa pine and of the length and dimensions shown on the plans. Posts shall be cut from live trees and shall be straight and free from decay and other defects. Line posts may have a single crook in one direction but shall not vary more than 1 1/2 inches from a straight line connecting both ends of the post. All bark shall be peeled and the posts trimmed and smooth of all knots and projections, and both ends of the posts shall be sawed off perpendicular to the centerline.

410.3.2.2.3 Wood corner, brace, intermediate brace, and gate posts shall be of the length shown on the plans. The average

nominal diameter of the top of each post shall be not less than 6 inches. The circumference of corner, brace, intermediate brace, and gate posts shall be measured 6 inches below the top of post and shall not be less than 19 inches. The average nominal diameter of the top of each line post shall be not less than 3 inches. The circumference of line posts shall be measured 6 inches below the top of the post and shall be not less than 9 1/2 inches.

410.3.2.2.4 Wood posts shall be pressure treated with standard creosote oil or petroleum-pentachlorophenol consisting of not more than 95 parts by weight of petroleum and not less than 5 parts by weight of pentachlorophenol. The empty cell process shall be used. The amount of creosote oil retained shall be not less than 6 pounds per cubic foot of wood, and the amount of pentachlorophenol retained shall be not less than 0.3 pound of dry salt per cubic foot of wood. Wood preservatives shall conform with AASHTO M 133.

410.3.2.2.5 Braces for wood posts shall be coast region Douglas fir, New Mexico red spruce or fir and shall conform with dimensions shown on the plans.

410.3.2.3 GATES: Gates shall be only tubular steel frame or tubular steel frame with filters of wire fabric, metal panel, chain link, or barbed wire, conforming with the dimensions and details shown on the panels. Materials and galvanizing shall be in conformity with the requirements of ASTM A 116 Class 3, A 120, A 392, A 525, and A 123 where applicable. Aluminum panel gates shall conform to ASTM B 209, and shall be installed if specifically required by the construction plans. Aluminum gates will not be arbitrarily substituted for tubular steel frame gates.

410.3.2.4 FITTINGS: All fittings, hardware, and appurtenances for fences and gates shall be commercial quality steel, malleable iron or wrought iron and shall be galvanized in accordance with the requirements of ASTM A 153.

# 410.3.3 CHAIN LINK FENCE:

410.3.3.1 Post shall be galvanized steel, tubular or H-column, conforming with the

lengths, dimensions and weights shown on the plans. Tubular posts, braces, and top rails shall conform with the requirements of ASTM A 120 for galvanized standard weight pipe, except that the pipe shall not be threaded nor subjected to hydrostatic test. H-column posts shall conform to ASTM A 36. The galvanizing shall conform to the requirements of AASHTO M 111 (ASTM A 123).

410.3.3.2 Post tops, stretcher bars, hardware and other required fittings shall be of commercial quality steel or malleable iron, and the galvanizing shall conform with the requirements of ASTM A 153.

410.3.3.3 Tie wires for fastening chain link fence to posts and rails shall be 9 gauge and galvanized. Galvanized steel or noncorrosive metal bands or fasteners may be used in lieu of tie wires when approved by the ENGINEER. Aluminum tie wires will not be accepted.

410.3.3.4 Compression braces shall conform with the same requirements as top rails. Tension truss rods shall be not less than 3/8 inch round galvanized rods with drop-forged turnbuckles or other approved tension device.

410.3.3.5 Chain link fabric shall conform to the requirements of AASHTO M 181 or Commercial Standard 246 published by the U.S. Department of Commerce. Unless otherwise provided, the wire shall be No. 9 gauge galvanized wire and the fabric shall be 2 inch mesh.

410.3.3.6 Gates may be double drive, single drive, or single walk and shall conform with the dimensions and details shown on the plans. Gate frames shall be fabricated from galvanized steel pipe conforming with ASTM A 120 and A 123. Chain fabric filler shall conform to the requirements herein provided for chain link fabric.

410.3.3.7 Corner posts shall be 3 inches O.D. with a minimum weight of 5.8 lb. per ft. Line posts shall be 2-1/2 inches O.D. with a minimum weight of 3.66 lb. per ft. Top rail and braces shall be 1-5/8 inches O.D. with a minimum weight of 2.27 lb. per ft.

410.3.3.8 At the option of the CONTRACTOR, posts, rails, braces, and gate framing members may be pipe conforming to ASTM A 120, and coated with a minimum or 1.8 ounces of zinc per square foot or vinyl- bonded pre-galvanized steel chain link fabric and fence components according to U.S. Government Specifications RR-F-191J/GEN. (See Table 410.3.3.8 for Fence Piping Dimensions and Weights.)

410.3.3.9 When outriggers with barbed-wire are installed the lowest strand shall not be less than 8 feet high measured from ground level. The same clearance distance will be required for coiled security wire.

410.4 CONSTRUCTION REQUIREMENTS

410.4.1 CONSTRUCTION METHODS: The CONTRACTOR shall perform such clearing and grubbing as may be necessary to construct the fence to the required grade and alignment. At locations where breaks in a run of fencing are required or at intersections with existing fences, appropriate adjustment in post spacing shall be made to conform to the requirements for the type of closure indicated. When the plans require that posts, braces, or anchors be embedded in concrete, the CONTRACTOR shall install temporary guys or braces as may be required to hold the posts in proper position until such time as the concrete has set sufficiently to hold the posts. permitted Unless otherwise by the ENGINEER, no materials shall be installed on posts or strain placed on guys and bracing set in concrete until 4 days have elapsed from the time of placing of the concrete. The tops of all posts shall be set to the required depth and alignment. Cutting of the tops of posts shall be allowed only with the approval of the ENGINEER and under the conditions specified by him. Wire or fencing of the size and type required shall be firmly attached to the posts and braced in the manner indicated. All wire shall be stretched taut and be installed to the required elevations. At each location where an electric transmission, distribution, or secondary line crosses any of the types of fences covered by these specifications, the CONTRACTOR shall furnish and install a ground conforming to the drawings shown on the plans.

410.4.2 WIRE FENCE:

410.4.2.1 Wire fences shall be constructed in conformity with the details and at locations shown on the plans or staked by the ENGINEER. All posts shall be set plumb and to the depth and spacing shown on the plans. Excavations for footings and anchors shall be to dimensions shown on plans or established by the ENGINEER. Metal line posts may be driven. Post hole backfill shall be placed in thin layers and each layer solidly compacted. Posts set in rock shall be placed as per construction plans.

410.4.2.2 Fence wire shall be stretched by mechanical stretcher or other device designated for such use. Stretching by motor vehicle will not be permitted. The length between pull posts shall not exceed 995 feet for barbed wire and 660 feet for woven wire.

#### 410.4.3 CHAIN LINK FENCE:

410.4.3.1 Chain link fences shall be constructed in conformity with the details and at locations shown on the plans or staked by the ENGINEER. Posts shall be spaced at not more than 10 foot intervals. The intervals shall be measured from center to center of post. All posts shall be set in concrete footings conforming with the dimensions and details shown on the plans. Posts set in rock shall be approved by the ENGINEER. Chain link fabric shall not be attached to posts until the concrete footings have completely set. Pull posts shall be line posts braced to 410.4.2.3 Intermediate braces shall be placed at intervals not to exceed 1000 feet and shall be spaced evenly between corner and gate posts or cattle guards.

410.4.2.4 A corner post and brace shall be placed at the intersection of cross fences with the right-of-way fence. Cross fence wires shall be stretched and firmly attached to the corner posts.

410.4.2.5 Right-of-way fences shall be attached to roadway structures when shown on the plans.

410.4.2.6 Fence materials of the same manufacture, type or process, conforming with the details shown on the plans shall be used throughout the Work unless otherwise authorized in writing by the ENGINEER.

adjacent line posts as shown on the plans. Pull posts shall be spaced at intervals not to exceed 500 feet. End posts shall be not less than 2.875 inches in outside diameter and braced in the same manner as corner posts. Braced tension rods or cables, hardware, and appurtenances shall be installed as shown on the plans.

410.4.3.2 Chain link fabric shall be stretched by mechanical stretcher or other device designed for such use. Stretching by motor vehicle will not be permitted.

#### TABLE 410.3.3.8

Error! Bookmark not defined.Fence Industry O.D. (in)	Nominal Pipe Size <u>I.D. (in)</u>	Decimal Equivalent <u>O.D. (in)</u>	Minimum Wall <u>Thickness (in)</u>	Minimum Weight <u>Ibs per foot</u>
1-5/8	1-1/4 2	1.660 2 375	0.111	1.836
3	2-1/2	2.875	0.160	4.640

#### FENCE PIPING DIMENSIONS AND WEIGHTS

# 410.5 REMOVING AND REBUILDING FENCE

As shown on the construction plans or directed by the ENGINEER existing fences may require removal and re-erected. Such fences shall be reconstructed to the same condition as the original fence or better. The materials in existing fences to be removed and rebuilt shall be salvaged and incorporated in the rebuilt fences. Fence materials damaged beyond reuse during removal or rehandling shall be replaced by the CONTRACTOR at his expense. Posts shall be firmly reset to the line shown on the plans. The spacing of the posts and the material to be strung and secured to the posts shall be the same as the original fence. New tie material or staples shall be used to fasten the fence material to the posts and shall be furnished by the CONTRACTOR at his expense.

# 410.6 MEASUREMENT AND PAYMENT

410.6.1 For new fences the measurement and payment will be by one of the following methods:

410.6.1.1 By the linear foot. Measurement will be along the top of the fence from outside to outside of end posts for each continuous run of fence. The accepted quantities of fence will be paid for at the Bid Proposal's unit price per linear foot complete in place for the specified type of fence.

410.6.1.2 By the square foot. Measurement will be the horizontal distance of the fence from outside to outside of end posts for each continuous run multiplied by the vertical measurement of the material; the product area shall be designated in square feet. Payment will be made on the Bid Proposal's unit price per square foot complete in place for the specified type of fence.

410.6.1.3 Regardless of which method is used, payment shall include the cutting, removal, and replacement of any concrete or asphalt surfacing associated with the fence installation. 410.6.2 Removal and rebuilding of a fence shall be measured by the linear foot of fence removed and rebuilt and payment will be made on the unit price per linear foot for the type of fence as specified in the Bid Proposal.

410.6.3 Removal and disposal of a fence shall be measured by the linear foot of fence removed and disposed of by the CONTRACTOR. Payment will be made on the unit price per linear foot for the type of fence as indicated in the Bid Proposal.

410.6.4 Measurement and payment for gates will be the unit price per each for the type of fencing material specified in the Bid Proposal.

#### SECTION 450

#### TRAFFIC SIGNS AND SIGN STRUCTURES

450.1 GENERAL: This work shall consist of furnishing and installing traffic signs and sign structures in compliance with the specifications and details shown on the plans at the locations shown on the plans, or as established by the ENGINEER.

450.2 REFERENCES

- 450.2.1 Aluminum Association Standards, Latest Edition
- 450.2.2 American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications, Latest Edition
- M120 Zinc (ASTM B6)
- 450.2.3 American Society for Testing and Materials (ASTM) Standard Specifications, Latest Edition
- A123 Zinc (Hot Galvanized) on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips
- A525 Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- B209 Aluminum and Aluminum-Alloy Sheet & Plate
- B545 Electrodeposited Coatings of Tin
- E97 Directional Reflectance of Opaque Specimens by Fiber Photometry
- 450.2.4 Federal Highway Administration (FHWA) Standards, Latest Edition

Highway Signs Color Specifications

- 450.2.5 Government Services Administration (GSA) Standards, Latest Edition
- 450.2.6 Manual on Uniform Traffic Control Devices (MUTCD), Latest Edition
- 450.2.7 This Publication, Latest Edition
- 450.2.8 United States Standards, Latest Edition

Product Standard for Construction and Industrial Plywood

450.3 MATERIALS.

450.3.1 GENERAL: Materials shall be manufactured in conformity with the requirement of GSA L-S-300C and ASTM Standards.

450.3.2 RETROREFLECTIVE SHEETING.

450.3.2.1 The CONTRACTOR shall provide certification that retroreflective sheeting complies with the requirements of GSA L-S-300C. Retroreflective sheeting shall consist of a smooth, flat exterior film with retroreflective elements having a uniform homogeneous appearance. The sheeting shall be weather resistant and shall have a protected pre-coated adhesive backing.

#### 450.3.2.2 COLORS

450.3.2.2.1 The diffuse day color of the retroreflective sheeting shall conform to the requirements of Table I of GSA L-S-300C and shall be determined in accordance with ASTM E 97 Standard Method of Test for 45-Deg., 0-Deg. Directional Reflectance of Opaque Specimens by Filber Photometry. (Geometric characteristics must be confined to illumination incident with 10 of, and centered about, a direction of 45 from the perpendicular to the test surface; viewing is within 15 of and centered about the perpendicular to the test surface. Conditions of illumination and observation must not be interchanged.) The standards to be used for reference shall be the Musnell Papers designated in Table 1. Papers shall have been recently calibrated on a spectrophotometer.

450.3.2.2.2 The test instrument shall be one of the following:

1. Advanced retrotechnology Model G920.

2.Gardner Multipurpose Reflectometer or Model XL20 and XL23 color and color difference meter

450.3.2.2.3 Colors shall be matched visually and shall be within the limits shown on the Color Tolerance Charts issued by the Federal Highway Administration, Office of Traffic Operations. The CONTRACTOR shall provide certification that the diffuse day color of the reflective sheeting will conform to the requirements of GSA L-S-300C, Table I, determined in accordance with the requirements of ASTM E 97.

450.3.2.2.4 If a dispute arises about the results of instrumental testing using diffuse lighting and unidirectional viewing, acceptance of the material will be based on the results of the visual test using the appropriate color tolerance chart. Daytime color and nighttime color shall conform to the Standard Highway Signs Color Specification issued by FHWA.

# 450.3.2.3 SPECIFIC INTENSITY

450.3.2.3.1 The sign faces shall have the minimum specific intensity per unit area (SIA) values at 0.2 and 0.5 observation (divergence) angles expressed as average candlepower per footcandle per square foot (candles per lux per square meter) of material as shown in Tables 1,2, 3, 4, 5, and 6. Measurements shall be conducted in accordance with photoelectric testing procedures for reflective sheeting as provided in paragraph 4.4.7 of GSA L-S-300C and paragraph 441.02(a) of FHWA Specification FP-85.

450.3.2.3.2 Measurements shall be made with the entrance (incidence) and observation angles positioned in the same place.

	TABLE 1 Type II Sheeting (Enclosed Lens)							
MINIMUM REFLECTIVITY (Average Candlepower Per Footcandle Per Square Foot)								
O A	EA	W ht	Or	Ye I	Re d	Gr n	BI u	Br n
0.2	-4	70. 0	25. 0	50. 0	14. 5	9.0	4.0	1.0
0.2	30	30. 0	7.0	22. 0	6.0	3.5	1.7	0.3
0.5	-4	30. 0	13. 5	25. 0	7.5	4.5	2.0	0.3
0.5	30	15. 0	4.0	13. 0	3.0	2.2	0.8	0.2

Where	OA = Obs	ervation Angle in	Degrees
	EA = Entra	ance Angle in De	grees
Wh	t = White	Or = Orange	Yel = Yellow

Grn = Green	Blu = Blue	Brn = Brown

TABLE 2 Type II-A Sheeting (Enclosed Lens)								
(4	Avera	MINI ge Ca	IMUM ndlepo Squ	REFL ower F lare Fo	ECTI Per Fo oot)	VITY otcan	dle Pe	r
O A	EA	W ht	Or	Ye I	Re d	Gr n	BI u	Br n
0.2	-4	14 0.	60. 0	10 0.	30. 0	30. 0	10. 0	5.0
0.2	30	60. 0	22. 0	36. 0	12. 0	10. 0	4.0	2.0
0.5	-4	50. 0	20. 0	33. 0	10. 0	9.0	3.0	2.0
0.5	30	28. 0	12. 0	20. 0	6.0	6.0	2.0	1.0
Where W	e OA EA /ht = V	= Obs = Entr Vhite	ervati ance Or	on An Angle = Ora	gle in in Deg nae	Degre grees Yel :	es = Yello	w

-			-	-	-
Blu	ı = Blu	ie l	Brn =	Brov	мn

	TABLE 3 Type III Sheeting (Encapsulated Lens)							
(	MINIMUM REFLECTIVITY (Average Candlepower Per Footcandle Per Square Foot)							
O A	EA	W ht	Or	Ye I	Re d	Gr n	BI u	Br n
0.2	-4	25 0	10 0	17 0	45	45	20	12
0.2	30	15 0	60	10 0	25	25	11	8.5
0.5	-4	95	30	62	15	15	7.5	5
0.5	30	65	25	45	10	10	5	3.5

Grn = Green

Where OA = Observation Angle in Degrees EA = Entrance Angle in Degrees

Wht = White	Or = Örange	Yel = Yellow
Grn = Green	Blu = Blue	Brn = Brown

450.3.2.4 RETROREFLECTIVE SHEETING ADHESIVE: Retroreflective sheeting shall include a pre-coated pressure sensitive adhesive (GSA L-S-300C, Class I) or a tack free, heat activated adhesive (GSA L-S-300C, Class II), either of which can be applied without necessity of additional adhesive coats on the sheeting or application surface. The protective liner attached to the adhesive backing shall be removable by peeling without soaking in water or other solvent and shall be easily removed after accelerated storage for four (4) hours at 150 degrees F under weight of 2.5 pounds per square inch. During removal, the liner shall not break, tear, nor adhesive be removed.

# 450.3.2.5 RETROREFLECTIVE SHEETING DURABILITY AND WORKMANSHIP

450.3.2.5.1 Retroreflective sheeting shall have sufficient strength and flexibility to be handled, and processed. applied according to the recommendations of the sheeting manufacturer without appreciable stretching. When processed and applied in accordance with recommended procedures, retroreflective material shall be weather resistant and following cleaning shall show no appreciable discoloration, cracking, crazing, blistering, or dimensional change. Retroreflective material, when exposed to normal traffic and weather, shall not support fungus growth or accumulate dirt to the extent that the retroreflective brightness before cleaning is less than 75 percent of the retroreflective brightness after cleaning, when measured at 0.2 divergence and -4 incidence. The sheeting surface shall be readily refurbished by cleaning and clear overcoating in accordance with the manufacturer's recommendations.

450.3.2.5.2 Retroreflective sheeting shall be applied to properly treated substrate as recommended by the sheeting manufacturer. Paints and sealers shall be dry before succeeding coats are applied and before packaging. Finished signs shall show careful workmanship and have a smooth and uniform surface. All letters and numbers shall be clean-cut and sharp.

450.3.2.5.3 The sheeting surface of Type II and Type II-A sheeting shall be solvent resistant to gasoline, VM&P naphtha, mineral spirits, turpentine and methanol.

450.3.2.5.4 The sheeting surface of Type III A, B, C and Type IV, sheeting shall be solvent resistant such that it can be cleaned with a soft, clean cloth dampened with VM&P naphtha or mineral spirits.

450.3.2.6 RETROREFLECTIVE SHEETING DELIVERY AND HANDLING: Retroreflective sheeting shall be delivered in good condition and shall have a good appearance, free from ragged edges, cracks, and extraneous materials. When retroreflective sheeting is furnished in continuous rolls, splices shall be smooth with no discernible line of demarcation, and the sheeting shall be suitable for continuous application. Retroreflective sheeting shall be packaged so that no damage or defacement can occur during shipment or storage. Sheeting shall be used within the time frame recommended by the manufacturer. 450.3.2.7 MULTIPLE PIECES OF SIGN SHEETING: Sign faces comprising two (2) or more pieces or panels of retroreflective sheeting shall match in color and provide uniform appearance and brilliance by day and night. The entire face of each sign panel shall be covered with one (1) unspliced sheet of retroreflective sheeting, except that splicing is permissible where the substrate panel exceeds 48 inches in vertical dimension. No vertical splicing of sheeting shall be used. Materials shall be color-matched and the top piece shall overlap the bottom by a minimum of ½ inch in order to eliminate water penetration.

450.3.2.8 SCREENING INKS AND PROCESS PASTE

450.3.2.8.1 Unless otherwise prohibited, screening inks, process pastes or film overlays can be used, in lieu of manufactured colors at the option of the sign manufacturer, to produce both the legend and background. Only the film overlays or screened colors of green, blue, red, brown and black may be used. Only those screening inks, process pastes or film overlays recommended by the retroreflective sheeting manufacturer shall be used. Said recommendations shall be obtained in writing and a copy filed in accordance with the requirements of this Section 450.

450.3.2.8.1.1 OUTDOOR WEATHERABILITY: The outdoor weatherability of the applied screening inks, process paste or film overlay shall be comparable to the outdoor durability of the retroreflective sheeting.

450.3.2.8.1.2 ADHERENCE: No screening inks, process pastes or film overlay shall be removed when tested by applying cellophane tape over a properly cured, color processed area and removing the tape with one quick motion. The tape shall be 3/4 inch wide 3M Company Scotch Brand Cellophane Tape No. 600, or approved equal.

450.3.2.8.1.3 SOLVENT RESISTANCE: After proper curing, screened sign faces shall be solvent resistant to cleaning solvents recommended by the manufacturer of the retroreflective sheeting and the screening inks, process pastes, and film overlay.

450.3.2.8.1.4 VANDAL RESISTANCE: Screened sign faces shall be resistant to aromatic type solvents. The process and materials used shall be as recommended by the manufacturers of the retroreflective sheeting, screening inks, process pastes, and film overlay in order to facilitate the removal of paints or other oil based matter sprayed or painted on signs.

450.3.2.8.1.5 COLOR: The color of the screened sign faces surface as specified shall meet all applicable requirements and shall conform to the Standard

Highway Signs Color Specification issued by the FHWA.

450.3.2.8.1.6 RETROREFLECTIVE INTENSITY (Transparent Colors)

450.3.2.8.1.6.1 Transparent colored inks or transparent colored film overlays shall be processed and applied in accordance with the recommendations of the sheeting manufacturer.

450.3.2.8.1.6.2 The minimum retroreflective intensity value of the transparent color area processed on white sheeting shall be not less than those specified below in Table 7, 8, 9, 10, 11 and 12 for each color at 0.2 degrees observation and -4 degrees entrance angles, expressed in candelas per footcandle per square foot of processed area.

450.3.2.8.1.7 PROCESS COLORS ON SHEETING.

TABLE 4 Type II Retroreflective Intensity			
Process Color on Type II Enclosed Lens Sheeting (White Reflective Sheeting Per Retroreflective Intensity Value)			
(Candelas Pe	er Footcandle Per	Square Foot)	
RED BLUE GREEN			
10	3	6	

TABLE 5 Type II Retroreflective Intensity				
Process Color on Type II-A Enclosed Lens Sheeting (White Reflective Sheeting Per Retroreflective Intensity Value)				
(Candelas Per Footcandle Per Square Foot)				
RED BLUE GREEN				
21	7	21		

TABLE 6 Type III-A Retroreflective Intensity

TABLE 6 Type III-A Retroreflective Intensity		
Process Color on Type III-A Enclosed Lens Sheeting (White Reflective Sheeting Per Retroreflective Intensity Value)		
(Candelas Per Footcandle Per Square Foot)		
RED	BLUE	GREEN
31.5	14	31.5

TABLE 7	
Type III-B Retroreflective Intensity	

Process Color on Type III-B Enclosed Lens Sheeting (White Reflective Sheeting Per Retroreflective Intensity Value)

(Candelas Per Footcandle Per Square Foot)

RED	BLUE	GREEN
31.5	14	31.5

TABLE 8	
Type III-C Retroreflective Intensity	

Process Color on Type III-C Enclosed Lens Sheeting (White Reflective Sheeting Per Retroreflective Intensity Value)

(Candelas Per Footcandle Per Square Foot)

RED	BLUE	GREEN
24.5	14	24.5

TABLE 9 Type IV Retroreflective Intensity		
Process Color on Type IV Enclosed Lens Sheeting (White Reflective Sheeting Per Retroreflective Intensity Value)		
(Candelas Per Footcandle Per Square Foot)		
RED	BLUE	GREEN
24.5	14	24.5

TABLE 10

TABLE 10				
Min. Color Contrast Ratios of Fully Reflectorized Sign (For Information Only)				
Sheetin g Type	White/ Red	White/ Green	White/ Blue	White/ Brown
II	5:1	8:1	17:1	70:1
IIA	5:1	5:1	14:1	25:1
111	6:1	6:1	13:1	18:1

# 450.3.3 SIGN LEGENDS AND SHEETING.

450.3.3.1 The word "legend" used herein and on the plans indicates all letters, numerals, symbols, arrows, borders, or other accessories that contain and convey the sign message and shall be either a sign sheeting with integral, semi-rigid, 0.005 inch minimum thickness aluminum backing, or sign sheeting applied to a demountable 0.030 inch minimum thickness 6061-T6 or 5052-H38 aluminum alloy; or approved self-adhering machine cut sheeting. Retroreflective sheeting for legends including letters, numerals, symbols, borders and route markers, shall be white as specified in Table 3 of this Section 450. Legends shall conform with the details shown on the plans and the provisions of MUTCD. Color, reflectorization, and configuration of legends shall be as shown on the plans and herein provided:

450.3.3.1.1 PLYWOOD AND ALUMINUM SIGNS: The legend may be a sign sheeting with integral, semirigid 0.005 inch and minimum thickness aluminum backing; or sign sheeting applied to demountable 0.030 inch minimum thickness 6061-T6 or 5052-H38 aluminum alloy; or approved self adhering; machine cut sheeting as specified in Table 3 of this Section 450; or reverse screened using a weatherproof screen process enamel that is compatible with the background and that will provide the designated colors and reflectorization of the sign; or reverse film overlaid with an approved film overlay. These legends shall be applied edge sealed, reverse screened, clear coated, and finished as applicable, as recommended by the manufacturer of the retroreflective sheeting.

#### 450.3.4 SIGN BACKGROUNDS

450.3.4.1 Color and configuration of sign backgrounds shall be as shown on the plans. The sign face shall provide a plane surface free from warps, dents, burrs, mars, or other defects resulting from fabrication, shipment, storage, or installation. The entire sign face may be rejected because of any of these defects or because of dirty, marred, or defective background or legend. Completed sign faces mounted in place will be inspected at night.

450.3.4.1.1 Plywood and aluminum signs shall be surfaced with Type II sheeting as specified in Table 1 of this Section 450.

#### 450.3.5 PLYWOOD PANEL SIGNS

450.3.5.1 Plywood shall be classed as group 1, 5/8 inch thick, 5 ply, grade B-B or better, high density overlay on both sides, exterior type plywood conforming to the requirements of the current U.S. Product Standard for Construction and Industrial Plywood marked with a trademark by an approved testing agency, or Canadian Standards Association, bearing legible grade marking of the American Plywood Association or the Canadian Council of Forest Industries.

450.3.5.1.1 Edges shall be finished to produce a smooth surface without holes. All edges and corners of the sign panels shall be rounded to eliminate edge sharpness and chipping. All edges shall receive two thick coats of exterior type, polysilicone alkyd resin base enamel paint or one thick coat of ready-mixed polysilicone alkyd resin primer followed by one thick coat of polysilicone alkyd resin base enamel. The paint must be thick enough so the individual plys are not visible. The first coat of paint or primer shall be either white or yellow and the second coat shall be either brown or black.

450.3.5.1.2 All painting shall be completed before the retroreflective sheeting is placed.

450.3.5.1.3 The plywood sign blank shall be prepared for retroreflective sheeting as specified by the facing material manufacturer. Retroreflective sheeting, legend and clear coat, shall be applied in accordance with manufacturer's recommendations, this Section 450. Hardware for mounting plywood panel signs shall comply with the requirements of this Section 450.

450.3.6 ALUMINUM PANEL SIGNS.

450.3.6.1 Aluminum panel signs under 24 inches in width shall be 0.080-inch minimum thickness 6061-T6 or 6062-H38 aluminum alloy. Aluminum panel signs 24 inches and over in width shall be 0.125-inch minimum thickness 6061-T6 or 5052-H38 aluminum alloy. All aluminum alloys shall conform to the requirements of ASTM B 209 and shall be supplied as flat stock material. All aluminum panel signs shall have smooth edges and corners.

450.3.6.2 The aluminum sign blank shall be prepared for retroreflective sheeting as specified by the facing material manufacturer. Retroreflective sheeting,

legend, and clear coat, shall be applied in accordance with manufacturer's recommendations, this Section 450 Retroreflective Sheeting and this Section 450 Sign Legends and Sheeting. A copy of the manufacturer's recommendations shall be kept on file as specified in this Section 450 for review by the ENGINEER during the periodic inspections of the manufacture's sign shop. The aluminum sign panel shall have a square punched hole to receive a carriage bolt or a lock washer for use with a carriage bolt and tamper proof nut. Hardware for mounting aluminum panel signs shall comply with the requirements of this Section 450, Sign Structures and Hardware.

450.3.7 SIGN STRUCTURES AND HARDWARE

450.3.7.1 Steel posts and base posts for plywood or aluminum panel signs shall be of the dimensions and cross section shown on the plans. Steel posts and base posts shall either be finished by one of the following methods:

450.3.7.1.1 Hot dipped galvanized in accordance with the requirements of ASTM A 525 or ASTM A 123;

450.3.7.1.2 Hot dip galvanized zinc coating in accordance with the requirements of AASHTO M 120, followed by a chromate conversation coating and a cross-linked polyurethane acrylic exterior coating;

450.3.7.1.3 Painted with a green paint meeting the requirements of GSA 595-A, (Color No. 14109). Said green paint shall be a minimum of one (1) mil in thickness.

450.3.7.2 Hardware for post assembly shall be hot dipped galvanized or cadmium plated in accordance with ASTM A 165, stainless steel, or mechanically galvanized in accordance with ASTM B 545 (Class Fe/Sn 20). Post assembly hardware shall be of the dimensions shown on the plans.

450.3.8 BOLTS: Size 5/16 inch-18 UNC for sign attachment shall be a tamper proof carriage bolt, either hot dipped galvanized, cadmium plated in accordance with ASTM A 165, stainless steel, or mechanically galvanized in accordance with ASTM B 545 (Class Fe/Sn 20). Tamper resistant nuts, size 5/16 inch-18 UNC shall be used and fabricated from C1008 hot rolled steel, case hardened to R55-60, and plated with zinc yellow dichromate, 0.002 inch and 0.005 inch thick.

450.4 CONSTRUCTION REQUIREMENTS.

450.4.1 CERTIFICATION OF MANUFACTURER: The CONTRACTOR shall submit, in writing, the name of the proposed sign manufacturer, project number, and certification that all sign materials comply with the specifications. 450.4.2 SIGN IDENTIFICATION

450.4.2.1 The following identification labels shall be affixed to all signs and shall include the information as listed:

450.4.2.1.1 MANUFACTURING IDENTIFICATION LABELS: These labels shall include the wording: "Manufactured By", the initials of the sign fabricator, the month and year of fabrication, the initials of the reflective sheeting manufacturer and the wording "Theft is a Crime";

450.4.2.1.2 CONTRACTORS IDENTIFICATION LABEL: This label shall include the CONTRACTOR's Name, Date Installed, Month and Year.

450.4.2.2 The above labels may be either die stamped in 3/8 inch letters and numerals, or made with high-tack adhesive sign sheeting (reflective or non-reflective) prepared with screened ink in ½ inch letters and numerals.

450.4.2.3 The labels shall be placed on the lower back side of the sign, and located so as not to fall behind any post or frame member. Die stamping shall be performed in a manner that will not damage the finished sign. The label shall have similar weather resistance characteristics as the sheeting and shall last for at least the expected service life of the sign. The labels shall be affixed at the time the sign is manufactured.

450.4.3 APPROVAL OF SHOP DRAWINGS.

450.4.3.1 Standard signs shall be constructed in accordance with the detail drawing furnished to the CONTRACTOR. The CONTRACTOR shall submit detailed shop drawings of all special code signs (those other than the standard MUTCD coded signs) to the ENGINEER for approval. The CONTRACTOR shall not begin fabrication of special coded signs until the shop drawings are approved by the ENGINEER. These drawings shall show the complete legend, arrangement of letters and numerals, letter and numeral height, letter series, symbols, borders and dimensions.

450.4.3.2 The CONTRACTOR shall not erect the signs until the shop drawings are approved.

450.4.3.3 The CONTRACTOR must verify the post lengths with the ENGINEER before installation operations are started.

450.4.4 INSPECTION

450.4.4.1 All material and finished signs shall be

subject to inspection and release or installation by the ENGINEER at the Project site prior to installation, and shall be subject to final inspection at the project after installation. The entire sign may be rejected if there are mars, damages, stains, discolorations, or defacements resulting from fabrication, storage, shipment or installation.

450.4.4.2 The ENGINEER shall at all times during work hours, have free entry to the parts of the sign manufacturing plant that are involved in the manufacture and production of signs. Adequate facilities required for inspection shall be furnished without charge to the ENGINEER for inspection of signs and to verify the manufacturer's Q.C. Program.

450.4.4.3 Test panels, twelve (12) inches by twelve (12) inches representative of each state of production, shall be furnished on request, to the ENGINEER. These panels shall be processed along with regular production run and witnessed by the ENGINEER. Should there be any question as to validity of a test panel, a completed sign shall be furnished upon request. Signs not conforming in all respects to the requirements of these specifications may be rejected and the manufacturer's Q.C. Program may be withdrawn. The ENGINEER may select a sign at random for further inspection. The ENGINEER will return the sign to the CONTRACTOR in time for the sign to be installed in accordance with the CONTRACTOR's schedule.

450.4.5 PACKAGING AND SHIPPING: All signs shall be suitably packaged and protected for proper shipment and storage. Signs shall be delivered undamaged to the project site.

#### 450.4.6 FABRICATION

450.4.6.1 Material ½ inch thick or less may be sheared, blanked, sawed, or milled. Material over ½ inch thick shall be sawed or milled. Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be filleted by drilling prior to cutting. Unless the plans show otherwise, flame cutting will not be permitted.

450.4.6.2 Bolt holes shall be drilled to finish sizes.

450.4.6.3 Steel surfaces to be in contact with aluminum shall be galvanized or of stainless steel.

450.4.6.4 Aluminum surfaces to be in contact with concrete or earth shall be given a heavy coat of an alkali-resistant bituminous paint.

450.4.7 INSTALLATION AND REMOVAL OF SIGNS: The CONTRACTOR shall erect traffic sign structures at locations shown on the plans. Existing

traffic control signs removed by the CONTRACTOR shall be delivered to locations designated by the ENGINEER. The CONTRACTOR shall verify the sign locations with the ENGINEER prior to their installations.

450.4.8 USE OF CERTIFIED SIGNS ONLY: The CONTRACTOR's sign manufacturer must supply signs with an identification on the back of the sign as specified in this Section 450 which matches the approved sign manufacturer identified on the documentation letter. The CONTRACTOR shall not install permanent signs until the ENGINEER has verified that the shipment of signs delivered has a manufacturer's check list and has given the CONTRACTOR authorization to begin sign installations. The CONTRACTOR must use the manufacturer for which certification was requested.

450.4.9 SIGN STORAGE: The CONTRACTOR shall store material, including posts, under a roof or otherwise covered for protection against the elements. Materials shall be stored so as not to be on the ground or come in contact with surface runoff water.

450.4.10 REMOVING AND RESETTING PLYWOOD OR ALUMINUM PANEL SIGNS: The CONTRACTOR shall remove existing designated plywood or aluminum panel signs, sign posts, and base posts and stockpile sign posts and base posts at locations designated by the ENGINEER, or as shown in the plans. Removed plywood or aluminum panel signs shall be reset on new steel sign posts and base posts in compliance with this Section 450 and details shown on the plans.

450.4.11 SCHEDULE: A written schedule for the removal and resetting of existing traffic signs shall be submitted to the ENGINEER for approval prior to commencement of sign removal.

450.5 MEASUREMENT AND PAYMENT.

450.5.1 Steel posts and base or anchor posts for plywood or aluminum panel signs will be measured per each post, complete in place.

450.5.2 Plywood or aluminum panel signs will be measured by the square foot of sign face area mounted on drive-down posts, complete in place.

450.5.3 Removing and resetting of plywood or aluminum panel signs and signs will be measured by the unit, complete in place.

450.5.4 The accepted quantities of traffic signs and sign structures will be paid for at the contract price per unit of measurement for each of the pay items listed as shown on the bid proposal.

# SECTION 701 TRENCHING, EXCAVATION AND BACKFILL

#### 701.1 GENERAL

Trench excavation and backfill for underground utilities, sanitary sewer, storm sewer, water lines, and appurtenances shall conform to these specifications or as specified in the Supplemental Technical Specifications or as authorized, in writing, by the ENGINEER.

701.2 REFERENCES 701.2.1 ASTM:

D-2487 D-2922 D-3017 D-4318

701.2.2 This Publication: Section 207 Section 301 Section 302 Section 336 Section 337 Section 340

# 701.3 TERMINOLOGY

701.3.1 For the purpose of these specifications in this Section, the descriptive terms "flexible," "plastic" and "non-rigid" are similarly interchangeable as utilized in these specifications and appurtenant reference material.

701.3.2 Rigid pipe: shall be reinforced concrete, concrete cylinder, and vitrified clay pipes.

701.3.3 Flexible pipe shall be polyvinyl chloride, polyethylene, ductile iron, and corrugated metal pipes.

701.3.4 Standard Detail Drawings show the trench cross-sections which identify the meaning and limits of terminology used in these specifications for the terms "foundation, bedding, haunching, initial backfill, final backfill, embedment, pipe zone, cover, springline, and pipe width."

701.3.5 The Unified Soil Classification System in ASTM D2487 Shall be utilized for the purpose of material classifications. See Table 701.3.A for a listing of referenced soil classes.

# 701.4 NOTIFICATION OF FORTHCOMING WORK

701.4.1 To assure that the construction work progresses in a timely manner and that good public relations are maintained with the property owners, the following actions are considered essential: D-422 D-698 D-1557 D-2321 701.4.1.1 Prior to the start of construction the CONTRACTOR shall assist the ENGINEER in notifying the adjacent property owners as to when construction will start, the estimated completion date, anticipated access blockages.

TABLE 701.3.A

		DECODIDION	
	SULTIPE	DESCRIPTION	1/0
CLASS I SUILS*		Manufactured angular, granular material, <sup>1</sup> / <sub>4</sub> to 1-	1/2
		Inches (6 to 40 mm) size, including materials hav	ring
		regional significance such as crushed stone of ro	DCK,
		broken coral, crushed slag, cinders, or crushed s	nells,
		complying to the requirements of Class II soils.	
	GW	vveil-graded gravels and grav	el-
	GP	sand mixtures, little or no fine	S.
	SW	50% or more of coarse fractio	n
CLASS II SUILS**	SP	retained on No. 4 sieve. More	than
		95% retained on No. 200 siev	e.
		Clean.	1
		Poorly graded gravels and gra	avei-
		50% or more of operation	S.
		50% of more of coarse fraction	thon
		05% rotained on No. 200 sion	
		Clean	e.
		Well graded sands and grave	llv
		sands little or no fines. More	than
		50% of coarse fraction passes	
		4 sieve More than 95% retain	and on
		No. 200 sieve. Clean	
		Poorly graded sands and gray	بوالبر
		sands little or no fines. More	than
		50% of coarse fraction passes	s No
		4 sieve More than 95% retain	ned on
		No. 200 sieve. Clean.	
CLASS III SOILS***	GM	Silty gravels, gravel-sand-silt	
CLASS III SOILS***	GC	mixtures, 50% or more of coa	rse
CLASS III SOILS***	SM	fraction retained on No. 4 siev	/e.
CLASS III SOILS***	SC	More than 50% retained on N	0.
		200 sieve.	-
		Clayey gravels, gravel-sand-c	lay
		mixtures. 50% or more of coa	rse
		fraction retained on No. 4 siev	/e.
		More than 50% retained on N	0.
		200 sieve.	
		Silty sands, sand-silt mixtures	6.
		More than 50% of coarse frac	tion
		passes No. 4 sieve. More that	n 50%
		retained on No. 200 sieve.	
		Clayey sands, sand-clay mixt	ures.
		More than 50% of coarse frac	tion
		passes No. 4 sieve. More that	n 50%
		retained on No. 200 sieve.	
		inorganic silts, very fine sands	S,
		rock tiour, slity or clayey fine s	sanos.
		Liquid limit 50% of less. 50%	or
CLASS IV SUILS	СП	more passes No. 200 sieve.	
		norganic clays of low to mean plasticity, grouply clays, cond	un v
		clave silty clave lean clave l	iauid
		limit 50% or less 50% or more	-iquiu A
			C
		Inorganic silts micaceous or	
		diatomaceous fine sands or s	ilts
		elastic silts. Liquid limit greate	er
		than 50% 50% or more passe	es No
		Inorganic clavs of high plastic	itv. fat
		clays. Liquid limit greater than	1 50%.
		50% or more passes No. 200	
Page 48 of 142		sieve.	

CLASS V SOILS	OL	Organic silts and organic silty clays
CLASS V SOILS	OH	or low plasticity. Liquid limit 50% or
CLASS V SOILS	PT	less. 50% or more passes No. 200
		sieve.
		Organic clays of medium to high
		plasticity. Liquid limit greater than
		50%. 50% or more passes No. 200
		sieve.
		Peat, muck and other highly
		organic soils.

\* Soils are as defined in ASTM D2487, except for Class I Soil which is defined in ASTM D2321

\*\* In accordance with ASTM D2487, less than 5% passes No. 200 sieve.

\*\*\* In accordance with ASTM D2487, soils with 5% to 12% passing No. 200 sieve fall in a borderline classification that is more characteristic of Class II than of Class III.

701.4.1.2 Prior to the start of trenching opera-tions, including pavement cutting and removal, the CONTRACTOR should coordinate with the ENGINEER any problem areas and involving traffic control, access to private properties, stockpiling of excavated materials, and other utility conflicts.

701.4.1.3 The CONTRACTOR shall provide the ENGINEER with the name and telephone number of at least two contact persons during non-working hours.

# 701.5 TRENCH SAFETY

The CONTRACTOR shall be responsible for maintaining all trenches in a safe condition; thereby protecting the workers and the general public. Trench slopes and other protection shall be in accordance with applicable regulations such as the Department of Labor's Occupational Safety and Health Administration Standards 29CFR Part 1926, subpart P or any applicable amendments.

# 701.6 BRACING EXCAVATIONS

701.6.1 Excavation for pipe shall normally be by open unsupported trenches unless local conditions warrant trench bracing.

701.6.2 Excavations shall be braced and sheeted. to provide complete safety to persons working therein and bracing shall comply with applicable

Federal (OSHA), State and local laws and ordinances. Support systems for trenches in excess of 20 feet deep and adjacent to existing improvement or subject to vibrations or ground water shall be in accordance with OSHA regulations. The CONTRACTOR shall be fully responsible for sufficiency and adequacy of bracing excavations with respect to work under construction and adjacent utility lines and private property.

701.6.3 If the soil conditions within the trench area require support, the CONTRACTOR may elect to use tight sheeting, skeleton sheeting, stay bracing, trench jacks, or movable trench shield to support the trench during pipe laying operations, such as: bedding preparation, pipe laying, backfilling of haunches and initial zone.

701.6.4 No sheeting shall be permitted to remain in the trench except when, in the opinion of the ENGINEER, field conditions or type of sheeting or methods of construction used by the CONTRACTOR, warrant the supports must remain. The ENGINEER may opt to have the lower portion (within the pipe zone) of the sheeting to remain. If the CONTRACTOR plans on removing the sheeting, he shall submit method to the ENGINEER for approval to treat the void created by the removal of the sheeting within the pipe zone and below.

701.6.5 When a movable trench shield is used, the trailing half of the shield should be notched to the height of the top of the pipe. This will allow the haunch area of the pipe to be compacted properly to the wall of the trench. If the trench shield is not notched, a subtrench shall be excavated for pipe installation such that the bottom of the trench shield does not enter the pipe zone.

# 701.7 DEWATERING

701.7.1 Trenching and pipe laying operations may encounter standing water or ground water which would preclude the proper placing of bedding, backfilling, and laying pipe. The water shall be removed by pumps and associated equipment, such as well points, to lower the water level. Dewatering shall continue for a minimum 24 hours after placement of any concrete.

701.7.2 Dewatering operations shall remove the water to achieve a stable foundation for pipe embedment and backfilling. The ENGINEER shall determine if adequate foundation has been attained. The ground water shall be lowered and initiation depth of 6 inches below pipe grades. Should over excavation be necessary due to unsuitable foundation conditions, the ground water shall be additionally lowered as necessary.

701.7.3 The CONTRACTOR shall submit a plan for approval by the ENGINEER as to how and where the waste water will be disposed. Waste water will not be discharged into traffic and pedestrian lanes or onto private properties.

701.7.4 The CONTRACTOR shall obtain permit from the New Mexico State Engineer prior to commencing dewatering operations.

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701.7.5 The CONTRACTOR shall also responsible for any adverse effect his dewatering operation has to private property, including providing temporary water to residences and/or business necessitated by the effect on private wells.

701.7.6 The CONTRACTOR shall arrange dewatering operation in a neat and orderly manner such that access to adjacent, properties is maintained, the discharge system does not leak and that any power generation complies with applicable noise limit regulations.

# 701.8 REMOVAL OF EXISTING PAVEMENT SIDEWALK, AND DRIVEWAY

701.8.1 Existing concrete pavement, sidewalk, or driveway removed in connection with construction shall be replaced, neatly sawed edges. Cuts shall be neat and to true straight lines with no shatter outside the removal area. If a saw cut would fall within 30 inches of a construction joint, cold joint, expansion joint, or edge, the concrete shall removed and replaced to the joint or edge. Concrete sidewalk and/or driveway may removed so that a minimum of 30-inch square is replaced. If the saw cut would fall within 12 inches of a score mark, the score mark.

701.8.2 Existing bituminous pavement removed in connection with construction shall be cut with a saw, pavement break cutting wheel, or other suitable tool approved by the ENGINEER. Care shall taken to assure that the edge of removed pavement does not vary from a straight line more than 2 inches from r mean.

701.8.3 Saw cutting shall be 1-1/2 inches in depth or 1/4 the thickness of the pavement, sidewalk, or driveway, whichever is greater. All saw cuts or other scoring shall be made perpendicular to the surface of the material to be cut.

701.8.4 Any unnecessarily irregular breakage or cracking caused by the CONTRACTOR shall be removed and replaced by the CONTRACTOR without added expense to the OWNER.

701.8.5 The CONTRACTOR shall be responsible for the disposal of removed materials.

701.8.6 Saw cutting is required on all concrete or asphalt paving on State maintained streets or roads.

701.8.7 Paving cuts for manholes and valve boxes and other utility appurtenances shall be square and at dimensions specified the Standard Detail Drawings or on the construction plans.

# 701.9 MAXIMUM LENGTH OF OPEN TRENCH

In developed areas, no more than 300 feet of trench shall be opened in advance of pipe laying operations. This distance may be reduced due to traffic control considerations. Backfilling shall begin as soon as pipe is laid and inspected and shall keep pace with the pipe laying. In advance of trenching operations in undeveloped areas, the CONTRACTOR shall submit in writing or on plans for the ENGINEER'S approval, the maximum length of trench that will be open at anyone time. Except by permission of the ENGINEER, the maximum length of open trench in anyone location where concrete structures are cast in -p1ace will be that which is necessary to permit uninterrupted progress. Construction shall be pursued as follows: excavation, formwork, and setting of reinforcing steel, placing of floor slab, walls, and cover slab or arch shall follow each other without anyone of these operations preceding the next nearest operation by more than 200 feet. Failure by the CONTRACTOR to comply with the limitations specified herein or as may be specifically authorized by the ENGINEER may result in a written order from the ENGINEER to halt progress of the work until such time as compliance with this paragraph has been achieved and the work can be proceeded in an orderly sequence of operations.

#### 701.10 WIDTH OF TRENCHES

Trench widths will vary according to the type of pipe used, size of pipe, depth of trench, and soil conditions, The minimum width requirements, indicated below, are for proper laying, aligning and jointing of pipe as well as trench grading, bedding preparation, and backfilling.

701.10.1 TRENCH WIDTH FOR RIGID PIPE MATERIALS: Trench widths from bottom of pipe to a point 12 inches above the top of the pipe shall be kept to the practical minimum required for properly laying, aligning, grading, jointing, and backfilling of the pipe, but no less width than pipe outside diameter plus 16 inches. For stable soils which will stand a vertical cut, the maximum trench width at a point 12 inches above the top of pipe or at a point 5 feet above the bottom of the trench, whichever is less, shall be as follows:

- The pipe outside diameter plus 2 feet for pipes 27 inches in diameter and smaller.
- 1.6 times the nominal diameter for pipes 30 inches in diameter or larger.

701.10.1.3 When soil will not stand vertical. the trench sides shall be sloped to provide not less than the outside diameter plus 16 inches at the pipe invert.

701.10.2 TRENCH WIDTH FOR NON-RIGID PIPES: The minimum clear width of the trench measured at the springline of the pipe should be 1 foot greater than the outside diameter of the pipe. The maximum clear width of the trench at a point 1 foot above the top of the pipe is equal to the pipe outside diameter plus 2 feet. If the maximum recommended

trench width must be exceeded or if the pipe is installed in a compacted embankment, then pipe embedment should be compacted to a point of at least 2-1/2 pipe diameters from the side of the pipe or to the trench walls.

#### 701.11 ROCK EXCAVATION

701.11.1 Rock is defined as material which cannot be excavated without drilling and blasting. All stone or boulders less than 8 cubic feet in volume will be classified as earth; all larger boulders shall be classified as rock. If blasting is necessary to excavate such materials as shale, hardpan, soft sandstone, cemented gravel, or loose rock which normally can be classified as earth excavation, then this excavation shall be classified as rock excavation. Whenever a ledge of solid rock encountered with earth below it or where alternate layers of solid rock and earth occur, the earth shall be included in the allowance for rock when the thickness of the layer of earth is less than 12 inches, thus requiring it to be removed by blasting along with the ledges of rock. Blasting will be considered necessary when the soil and rock cannot be excavated at a rate of 50 cubic yards per hour by a competent operator with a back-hoe that has a minimum bucket curling force of 25,000 pounds (John Deere 690 or equivalent).

701.11.2 Whenever rock is encountered in the trench or elsewhere in any excavation required to be made, it shall be excavated to the line and grade as shown on the plans and within the limits described therein, unless otherwise authorized, in writing, by the ENGINEER.

701.11.3 For trenches, rock shall be excavated to a depth of 6 inches minimum below the outside bottom of the conduit except at points of rock and earth transitions at which points the rock shall be excavated to a minimum of 12 inches below the outside bottom of the conduit as shown on the detail sheets for trench cuts and backfill of rock. Any depression in the bottom of the trench caused by overshoot and/or excavating and being 6 inches or greater in depth from a theoretical bottom of trench grade shall be filled to the theoretical bottom of the trench with select soils. The trench shall be backfilled with select backfill material to a point 1 foot above the top of the conduit. The remainder of the trench shall be backfilled as specified herein. The complete trench backfill from the bottom through to the top of the subgrade shall meet the compaction and/or moisture requirements as specified herein.

701.11.4 BLASTING: Suitable weighted covering or mats shall be provided to confine all materials lifted by the blasting within the limits of the trench and to prevent injury of persons or damage to property. Blasting shall be under the supervision of a person qualified and experienced in the use and handling of explosives. All blasting operations shall be done in accordance with applicable local, state, and federal laws, ordinances, and codes regulating the transportation, storage, and use of explosives. Forty-eight hours prior to blasting operations, the CONTRACTOR shall notify the local law enforce-ment agency.

#### 701.12 FOUNDATION

701.12.1 All pipe shall be bedded on a stable foundation in a trench which is completely free of water. The ENGINEER shall determine the adequacy of the foundation. Class V soils shall not be used as a foundation. If Class V soils are encountered at the bottom of the trench it shall be removed to the depth authorized by the ENGINEER and replaced with Class I, II or III soils.

701.12.2 Where an unstable foundation condition is encountered, it must be stabilized before laying pipe or alternative foundation methods utilized. The CONTRACTOR will be paid for foundation stabilization when required by the ENGINEER. Failure to notify the ENGINEER of an obvious unstable foundation condition prior to proceeding with placement of the pipe shall result in complete removal of the affected pipe, foundation stabilization, and replacement of the pipe at the CONTRACTOR'S expense.

701.12.3 Should the trench be inadvertently over-excavated below the foundation, the area of over-excavation shall be filled with select material in 6 inch lifts and compacted to a density of not less than 95 percent of maximum density, as deter-mined by ASTM D 1557.

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701.12.4 Unless specifically approved in writing by the ENGINEER, the CONTRACTOR shall not proceed with pipe embedment in a trench where water is present or the foundation is saturated. Adequate dewatering, as specified in Section 701.7, shall be utilized.

# 701.13 PIPE EMBEDMENT

701.13.1 GENERAL:

701.13.1.1 The class of bedding used for each pipe shall be as shown on the plans or as specified in the Supplemental Technical Specifications.

701.13.1.2 The CONTRACTOR may request a change in the class of bedding required on a pipe, if authorized by the ENGINEER, all increase in the cost of labor and materials required to include upgrading of the pipe class will be at the CONTRACTOR'S expense with no additional cost to the OWNER.

# 701.13.2 RIGID PIPE EMBEDMENT:

701.13.2.1 The trenches shall be excavated in conformance with the trench width requirements in Section 701.10 and

701.13.2.2 Embedment material shall be Class I, II, III, or IV soils, or lean fill as specified in Section 207.

701.13.2.3 All soil in the embedment zone shall be placed in lifts not exceeding 8 inches in uncompacted depth, except that material along the side of the pipe shall not be placed above the spring1ine until the haunch area of the pipe is adequately filled and sliced such that no voids remain.

701.13.2.4 All soil shall be compacted to a density not less than 90 percent of maximum density, as determined by ASTM D 1557. The CONTRACTOR shall take care to assure that the pipe is not damaged or misaligned during compaction of the embedment.

# 701.13.3 FLEXIBLE PIPE EMBEDMENT:

701.13.3.1 Proper placement of soils in the embedment zone is extremely important in achieving a satisfactory installation of flexible pipe. The CONTRACTOR shall be aware that the soil classes have differing requirements relative to embedment. There are also differing requirements for embedment in dry and wet conditions (wet conditions meaning that the embedment zone will be subject to ground water).

701.13.3.2 Embedment material shall be Class I, II, or III soils, or lean fill as specified in Section 207.

701.13.3.3 Embedment soil shall be placed in lifts not exceeding 8 inches loose depth. The haunch shall be properly compacted by hand tampers utilizing due caution such that the pipe is not damaged or misaligned. Mechanical tampers shall not be utilized directly over the pipe in the embedment zone.

701.13.3.4 The CONTRACTOR may utilize acceptable on site soils in the embedment area which are in conformance with these specifications. The CONTRACTOR has the option of importing a different soil, however, additional compensation will only be allowed if the on site soils are Class IV or V.

701.13.3.5 Class I soil shall comply with the requirements of Section 302, AGGREGATE BASE COURSE.

701.13.3.6 Class II and III soils shall be compacted to a density of not less than 95 percent of maximum density in the embedment area, as determined by ASTM D 1557. The moisture content shall not exceed 5 percent above optimum.

701.14 FINAL BACKFILL

701.14.1 Final backfill shall consist of homogene-ous soil except that boulders, frozen clumps, rubble, and Class V soils are excluded.

701.14.2 Final backfill shall be compacted to a density of not less than 90 percent of maximum density, as determined by ASTM D 1557 unless otherwise specified in the Contract Documents.

701.14.3 The upper portion of the final backfill may require specific soils and compaction in order to provide a suitable foundation for pavements, curb and gutter, sidewalk, or other type of structure.

# 701.15 COMPACTION METHODS

701.15.1 The CONTRACTOR shall be responsible for the compaction method utilized during foundation preparation, embed ment placement, and final backfill except as otherwise specified herein or in the Supplemental Technical Specifica-tions.

701.15.2 The use of mechanical vibratory compactors directly over the pipe is prohibited in the embedment area. Extreme care shall be taken when utilizing mechanical compactors in the haunch and initial backfill area in order to avoid damage to or misalignment of the pipe. The ENGINEER shall examine any damaged pipe and has the authority to direct that it be replaced with new pipe at no additional cost to the OWNER.

701.15.3 Flooding or jetting shall be allowed if the subsurface soils are compatible to its usage, as authorized by the ENGINEER. It shall not be used for compaction of flexible pipe, when the soil has a plastic limit of 7 or greater, and in areas of collapsible soils. The CONTRACTOR shall take any necessary precautions to minimize to negligible flotation of the pipe.

701.15.4 The CONTRACTOR shall, at the direction of the ENGINEER, excavate the compacted fill as necessary for the purpose of determining the adequacy of the compaction.

# 701.16 PAVEMENT

701.16.1 Either new street construction or pavement replacements shall satisfy the following design and construction requirements:

701.16.1.1 Unless permanent pavement is specified to be placed immediately, a temporary dust-free patch shall be placed wherever excavation is made through existing pavements, sidewalks, or driveways. The patch shall be placed, rolled, and maintained by the CONTRACTOR to provide a smooth surface for traffic until a permanent pavement is constructed within the time frame specified by the ENGINEER.

701.16.1.2 The subgrade preparation of the area to be paved shall be in accordance with Section 301 of these specifications. The asphalt pavement placed shall be in accordance with Section 336 and the concrete pavement shall be in accordance with Section 337. The placement of the other roadway items shall be in accordance with Section 340.

701.16.1.3 Material thickness for all pavement replacements within residential or arterial streets shall conform to the plans or the Standard Detail Drawings or match the existing pavement as authorized by the ENGINEER.

701.16.1.4 Pavement cuts of 8 ft. or more in width and 100 ft. or more in length shall be paved with a laydown machine.

701.16.1.5 When authorized by the ENGINEER, asphalt concrete base course may be used to replace surface course thickness requirements on streets that are scheduled for overlay.

701.16.1.6 The edges of all trenches at the base course level shall be neatly trimmed before beginning any paving replacement. All edges of the existing pavement adjacent to the trench cut shall be inspected. Undermined, broken, cracked, or unevenly cut portions shall be removed and the pavement edges retrimmed prior to pavement replacement. All vertical edges of the existing asphalt pavement adjacent to the trench cut and all surface areas for a width of at least 4 inches and no greater than 8 inches, shall be thoroughly cleaned and a tack coat applied prior to placing any hot mix asphalt. The finished surface of the pavement replacement shall be graded to conform to the existing contour both in cross section and profile.

701.16.1.7 Concrete pavement to replace cuts made in concrete paved streets, arterials, etc., shall conform to the Standard Detail Drawings for concrete pavement or in accordance with New Mexico Department of Transportation requirements where applicable.

701.16.1.8 When more than one-half of the surface area of a manhole, lamphole or valve box is found to extend into the area to receive a permanent asphaltic hot-mix surfacing and/or base pavement replacement, the existing pavement surrounding the manhole, lamphole, or valve box shall be removed to within those limits which will permit a permanent pavement replacement to be made in accordance with the approved plans.

701.16.1.9 Asphaltic hot mix shall not be placed upon the concrete collar, nor shall traffic be permitted upon the collar for at least 24 hours, or longer, if so directed by the ENGINEER. A tack coat of asphaltic emulsion may be applied after the concrete has taken its final set. During this time adequate barricading of the area shall be maintained by the CONTRACTOR.

701.16.1.10 If in the course of a pavement removal, a manhole, lamphole, and/or valve box is encountered and has a concrete collar about it and the collar is performing adequately, no special construction need be made in the permanent pavement replacement.

701.16.1.11 The CONTRACTOR shall make any small grade or alignment adjustment of the manhole, lamphole, and/or valve box encountered that is necessary to provide a smooth riding surface between the existing pavement and the patch and/or within the patch itself.

# 701.16.1.12 TESTING

701.16.1.12.1 A sample of each type of soil encountered shall be classified in accordance with the requirements of ASTM D2487, and the moisture density relationship determined in accordance either ASTM D698 or D1557, whichever is applicable.

701.16.1.12.2 A compaction test shall be taken for each 2 feet depth per 200 feet trench length or less, as directed by the ENGINEER. Compaction tests shall be taken in accordance with ASTM D2922 and D3017. Areas represented by non-complying tests shall be reworked and re-tested for compliance.

701.17 MEASUREMENT AND PAYMENT

701.17.1 TRENCHING, BACKFILLING, AND COMPACTION:

701.17.1.1 Trenching, backfilling, and compaction shall be combined into one unit and shall be measured and paid for as follows:

701.17.1.2 Measurement shall be made along the center1ine of the pipe.

701.17.1.3 The unit of measurement shall be by the linear foot per pipe diameter per specified increment of depth.

701.17.1.4 The following depth increments will apply:

701.17.1.4.1 For water line installations the costs for trenching, backfilling and compaction shall be included in the unit price per linear foot of pipe per pipe diameter for maximum depth, such as: 4 to 14 inch diameter at 6 feet, 16 to 24 inch diameter pipe at 7 feet and all pipe larger than 24 inch at 8 feet. Separate payment will be specified in the Bid Proposal when required depths exceed the above depths.

701.17.1.4.2 For sewer installations the increments shall be 8 feet or less, 8 feet to 12 feet, 12 feet to 16 feet, 16 feet to 20 feet and thereafter at 4 foot intervals.

701.17.1.4.3 All depths shall be measured to the nearest foot.

701.17.1.5 All depths shall be measured from the invert of the pipe to the top of existing ground elevation. The existing ground elevation shall be the elevation of the surface that exists along the centerline of the pipe at the time of construction staking for said trenching.

701.17.1.5.1 Whenever a special pipe embedment detail is specified, on the plans, the trench depth shall be measured from the bottom of the embedment to the top of existing ground elevation. However, no additional trench depth shall be measured as a result of inadvertent over-excavation nor to accommodate trench dewatering.

701.17.1.6 Payment will be made at the unit price per linear foot per diameter of pipe per depth increment as specified in the Bid Proposal, and will include trenching, backfilling, and compaction for all trench zones. No additional payment will be made for compacted materials to bring trench backfill up to required depth.

701.17.2 OVER-EXCAVATION: Required over-excavation for foundation stabilization shall be measured by the cubic yard of material removed and replaced with compacted suitable material. Payment will be made at the unit price per cubic yard of compacted replacement material and shall include excavation, backfill material, and compac-tion.

701.17.3 ROCK EXCAVATION: Rock excavation will be measured by the cubic yard within the specified limits of the trench configuration. Blasting will be included in the rock excavation. Payment will be made at the unit price per cubic yard.

701.17.4 UNSUITABLE MATERIALS: Removal and disposal of unsuitable materials from the construction site shall be measured by the cubic yard of excavated material. Payment will be made at the unit price per cubic yard of excavated material.

701.17.5 PAVEMENT. SIDEWALK, AND DRIVEWAYS: Removal and disposal of existing pavement, sidewalks, and driveways will be measured by the square yard or square foot whichever is apropos. Payment will be made at the unit price per square yard or square foot as specified in the Bid Proposal.

701.17.6 SELECT MATERIALS: Where selected material is required in the backfilling operations, the quantity of material will be measured by the cubic yard of compacted material in place in the trench. Payment will be made at the unit price per cubic yard of select material as indicated above.

701.17.6.1 Whenever a special pipe embedment detail is specified, measurement and payment shall be as identified in the Bid Proposal.

701.17.7 DEWATERING: Dewatering operations for trench work shall be measured by the linear foot along the centerline of that portion of the trench which requires dewatering. Payment will be made at the unit price per linear foot of dewatered trench.

701.17.8 PAVEMENT:

701.17.8.1 Permanent or temporary pavement surfacing shall be measured and paid for in accordance with the paving section elements as defined under Section 300 for the specific item of work.

701.17.8.2 Permanent resurfacing or permanent surface patching will be measured on the basis of the square yard for new surfacing as provided in the applicable section of these specifications. For payment purposes, the normal maximum pavement cut width shall be as defined in the Table No. 701.17.8.2

TABLE No. 701.17.8.2

NORMAL MAXIMUM PAVEMENT CUT WIOTHS ALLOWED FOR PAYMENT PURPOSES Soil Trench Pipe Max. Pavement Stability Depth (TD) Size Cut Width Stable. Soil Less than or equal ND less than or 00 + 2 feet stands in to 5 feet equal to 27" a vert. cut " Greater than 5' ND less than TD + 2 feet or equal to 54" " " ND greater than 1.6 X ND + 54" TD + 3' Unstable. Soil does Any Any 2 X TD + OD not stand in vert. cut

NOTES: 1. TD is trench depth; ND is nominal pipe diameter; and OD is outside pipe diameter.

2. Individual locations or conditions may warrant greater cut widths than those specified above. The ENGINEER shall authorize in writing the increase in the above pavement cut widths.

# NATIVE GRASS SEEDING

#### 1012.1 GENERAL:

Work under this section consists of preparing all area indicated on the plans for native grass seeding, furnishing and installing all seed, fertilizer and soil amendments as specified herein and on the plans, or as authorized by the ENGINEER.

#### 1012.2 REFERENCES:

1012.2.1 This Publication:

Section 1011

# 1012.3 WORK AREA/TIMING:

1012.3.1 Areas that are disturbed by the CONTRACTOR that are outside the construction limits shown on the plans or authorized by the ENGINEER shall be seeded with native grasses as specified herein at no cost to the OWNER.

1012.3.2 The seeding of disturbed areas shall commence upon completion of the other work in the area.

1012.4 MATERIALS:

1012.4.1 Native Seed: The native seed species and rate of application shall be as shown below and shall be used based on the type of soil or as specified on the plans or in the Supplemental Technical Specification.

1012.4.1.1 Sandy Soils. Seed rate is given in pounds of pure live seed (P.L.S.) per acre.

<u>Variety/</u> Common Name	<u>Genus</u> / <u>Species</u>	P.L.S/Acre
"Paloma"Indian Rice grass	Oryzopsis	5.0
"Viva" Galleta	Hilaria jamesii	1.0
grass "Niner" Side	Bouteloua	3.0
oats grama "Hatchita" Blue	Bouteloua	1.0
grama Sand dropseed	gracilis Sporobolus	1.0
Fourwing saltbush (NM Region)	Atriplex canescens (de-winged)	<u>1.0</u>
Total rate		12.0 lbs/ acre

1012.4.1.2 Clay, Clay Loam, and Sandy gravelly clay loam soils. Seed rate is given in pounds of pure live seed (P.L.S.) per acre.

Common Name	Genus/species	PLS/acre
"Paloma" Indian rice	Oryzopsis hymenoides	2.0
grass "Viva" Galleta	Hilaria jamesii	2.0
grass "Niner"	Bouteloua curti	2.0
Sideoats grama "Hatchita" Blue	pendula Bouteloua	3.0
grama Sand dropseed	gracilis Sporobolus	1.0
(NM Region)	cryptandrus Atriplex	10
Saltbush	canescens	1.0
Total rate	(de-winged)	11.0 lbs/ac

NOTE: If the area to be seeded is along a recreational trail of any type the seed mixes for either type of soil listed above shall exclude the one (1) pound per acre of Four-wing saltbush. The seeding rate shall be lowered by one (1) pound per acre.

1012.4.1.3 Seeds may be pre-mixed by a seed dealer. Each bag of seed shall be sealed and labeled by the seed dealer in accordance with Federal Seed Laws and New Mexico Department of Agriculture Labeling Laws. This includes: variety, kind of seed, lot number, purity, germination, percent crop, percent inert, percent weed (including noxious weeds), origin, test data and net weight. Federal Seed Laws require that analysis shall be no older than 5 months for seed shipped interstate and no older than 9 months for seed shipped intra-state. The ENGINEER shall receive all labels from all bags of seed used for verification.

1012.4.2 Fertilizer and Soil Amendments: Unless otherwise specified on the plans or in the Supplemental Technical Specification, no fertilizer or other soil amendments are required on areas specified to receive native seeding. If fertilizer and/or other soil amendments are required they shall be in accordance with Section 1011 of these specifications.

1012.4.3 MULCH:

1012.4.3.1 Hay Mulch: Perennial native or introduced grasses of fine-stemmed varieties shall be used unless otherwise specified on the plans. At least 65 percent of the herbage by weight of each bale of hay shall be 10 inches in length or longer. Hay with noxious seed or plants will not be acceptable. Rotted, brittle, or moldy hay will not be acceptable. Marsh grass or prairie hay composed of native grass of species to be seeded will be acceptable. Tall wheat grass, intermediate wheat grass, switch grass, or orchard hay will be acceptable if cut prior to seed formation. Marsh grass hay shall be composed of mid and tall native, usually tough and wiry grass and grass-like plants found in the lowland areas within the Rocky Mountain region. Hay shall be properly cured prior to use. Hay which is brittle, short fibered or improperly cured is not acceptable.

1012.5.2 Straw Mulch: Small grain such as wheat, barley, rye, or oats will not be allowed except by prior approval of the ENGINEER and with the concurrence of the Air Division, Environmental Health Department. Alfalfa or the stalks of corn, maize or sorghum is not acceptable. Material which is brittle, shorter than 10 inches or which breaks or fragments during the crimping operation will not be acceptable.

1012.4.3.3 Gravel Mulch: Gravel mulch shall be crushed or screened gravel 3/4" to 1" maximum size with a minimum of one fractured face unless otherwise specified.

1012.4.3.4 Erosion Control Matts, Fabric or Blankets: The type of erosion control mats, fabric or blankets used shall be as specified or allowed on the plans or in the Supplemental Technical Specifications.

1012.5 SEED BED PREPARATION:

1012.5.1 General:

1012.5.1.1 Prior to the starting of any seed bed preparation the final grades of all earth work shall be inspected and approved by the ENGINEER.

1012.5.1.2 No preparation shall be performed when the surface is wet or muddy or when the soil moisture content is such that the soil is not fully loosened by the discing operation.

1012.5.1.3 The extent of seed bed preparation shall not exceed the area on which seeding, mulching and crimping operations can be completed prior to crusting or wind or water erosion of the prepared surface. If erosion, crusting or re-compaction occurs, the affected area shall be re-worked beginning with seed bed preparation. Depth of preparation must be approved by the ENGINEER prior to the seeding and mulching operations.

1012.5.2 Mechanical Preparation: The seed bed shall be loosened to a minimum depth of 6" (six inches) by means of disc or harrow. Area of heavy or compacted soil may require additional preparation such as chiseling or ripping if discing alone does not result in preparation to the full minimum depth of 6". The soil shall be worked to a smooth surface free of clods, stones 4" and larger or any other debris or foreign material that could interfere with seeding or crimping equipment operations.

1012.5.3 Hand Preparation: Areas which cannot be prepared with mechanized equipment because of small size irregular shape or slope angle may be prepared to a minimum depth of 2" using hand tools or a rototiller. Any such areas will be specified on the plans.

1012.6 SEEDING:

1012.6.1 General:

1012.6.1.1 Seeding shall not start until the seed bed preparation has been inspected and approved by the ENGINEER.

1012.6.1.2 No more area may be seeded than can be covered with mulch and crimped, or covered with gravel mulch or erosion control mats by the end of the work day. No seeding operations may be conducted when steady wind speed exceeds 10 miles per hour. If winds exceed 10 mph while seeding is underway, seeding operations will be halted and any areas seeded to that point completed.

1012.6.2 Seed Application:

1012.6.2.1 Drill Seeding: Drill seeding is required unless otherwise specified on the plans or in the Supplemental Technical Specifications. Seed shall be applied with a "rangeland" type seed drill equipped with packer wheels. Seed shall be drilled to a maximum depth of 1/2" unless otherwise specified. Direction of seeding shall be across slopes and on the contour whenever possible.

1012.6.2.2 Broadcast Seeding: Seed may be applied using the broadcast method when size, irregular shape or slope angle exceeding 3.1 prevents the use of a seed drill. Seed may be broadcast by hand or by means of a mechanical seeder provided that the seed is evenly distributed over the seeding area. Areas of broadcast seeding will be hand raked to cover seed. Areas which are broadcast seeded shall be seeded at rate which is double that used for drill seeding.

1012.6.2.3 Seeding With Gravel Mulch: Areas to receive gravel mulch will be seeded at the broadcast seed rate with 1/2 the seed applied prior to application of gravel and 1/2 the seed applied on the surface of the gravel. Water shall be applied in quantity sufficient to wash seed from the surface and into the gravel.

1012.6.2.4 Hydro Seeding: Hydro seeding will not be allowed on areas of non-irrigated native grass seeding unless specified on the plans or in the Supplemental Technical Specifications or authorized by the ENGINEER.

1012.7 MULCHING:

1012.7.1 General:

1012.7.1.1 All seeded areas shall be mulched unless otherwise specified on the plans or in the Supplemental Technical Specifications.

1012.7.1.2 On seeded areas that are level or have slopes 3:1 or less, any of the four (4) types of mulching or erosion control specified herein may be used. On seeded areas that have slopes steeper than 3:1 only gravel mulch or erosion control materials may be used as specified on the plans and in the Supplemental Technical Specifications.

1012.7.2 Hay Mulch: Hay mulch shall be applied at a minimum rate of 1.5 tons per acre of air dry hay.

1012.7.3 Straw Mulch: Straw mulch shall be applied at a minimum rate of 2.5 tons per acre of air dry straw.

1012.7.4 Crimping: Hay and/or Straw mulch shall be crimped into the soil. The mulch shall be spread uniformly over the area either by hand or with a mechanical mulch spreader. When spread by hand, the bales of mulch shall be torn apart and fluffed before spreading. Mulching will not be permitted when wind velocity exceeds 15 miles per hour. The mulch shall be wetted down and allowed to soften for 15 to 20 minutes prior to crimping. A heavy disc such as a mulch-tiller, with flat serrated discs at least 1/4 inch in thickness, having dull edges and the disc spaced 6 inches to 8 inches apart shall be used to crimp (or anchor) the mulch into the soil to a minimum depth of 2 inches or as specified on the plans or the Supplemental Technical Specifications. The discs shall be of sufficient diameter to prevent the frame of the equipment from dragging the mulch.

The crimping operations shall be across the slope where practical but not be parallel to prevailing winds or by tight interlocking "S" curves to avoid straight crimp lines.

If small grain straw mulch is used it shall be crimped in two (2) directions in a cross-hatch pattern.

1012.7.5 Gravel Mulch: Gravel mulch shall be placed by hand or by mechanized equipment that provides full coverage at a uniform thickness of 2 inches in depth.

1012.7.6 Erosion Control Matts, Fabric or Blankets: the type of erosion control mats, fabric or blankets used shall be as specified on the plans or the Supplemental Technical Specifications or as approved by the ENGINEER. The anchoring of the erosion control items shall be as per the manufacturer's recommendations.

1012.8 PROTECTION OF NATIVE GRASS SEEDED AREA:

1012.8.1 GENERAL: The CONTRACTOR shall be responsible for protecting and caring for seeded areas until final acceptance of the work and shall repair at his expense any damage to seeded areas caused by pedestrian or vehicular traffic or vandalism.

1012.9 INSPECTION FOR NATIVE GRASS AREA:

1012.9.1 The following inspection shall be the minimum required inspections to native grass during the course of construction. Additional inspections shall be made at any time at the discretion of the ENGINEER.

1012.9.2 It shall be the responsibility of the CONTRACTOR to notify the ENGINEER, in writing, 48 hours in advance of each required inspection.

1012.9.3 The sequence of required inspections shall not be changed from the sequence listed below. The CONTRACTOR shall not proceed with work of the next sequence without written approval of the work of the previous sequence. Payment will not be approved for items which have not been inspected and approved in writing.

1012.9.3.1 Each phase of soil preparation shall be inspected in process.

1012.9.3.2 Finish grade shall be inspected.

1012.9.3.3 Seed shall be inspected prior to seeding.

1012.9.3.4 Seeded area shall be inspected after completion.

1012.9.3.5 Final inspection of the project and acceptance.

# 1012.10 MEASUREMENT AND PAYMENT

1012.10.1 MEASUREMENT: The measurement of native grass seeding shall be by the acre.

1012.10.2 Payment: Payment shall be made at the contract unit price per acre of native grass seeding complete in place, which shall include the seed, fertilizer, (if required) area preparation, seeding, soil amendments, (if required) and mulching.

# SECTION 1200

# TEMPORARY TRAFFIC CONTROL

# 1200.1 GENERAL

This section pertains to barricading and temporary traffic control:

# 1200.2 CONTENTS

Section No.	Title

1200

Barricading and Temporary Traffic Control

#### SECTION 1200

#### BARRICADING AND TEMPORARY TRAFFIC CONTROL

1200.1 GENERAL: The work under this section includes, but is not limited to, traffic control standards needed to ensure safety to motorists, the public, construction workers, and special event participants when City roadways are temporarily disrupted due to construction efforts or special events.

1200.2 REFERENCES

- 1200.2.1 Manual on Uniform Traffic Control Devices, (MUTCD), Part VI, FHWA.
- 1200.2.3 The American Traffic Safety Services Association (ATSSA), Quality Standards for Work Zone Traffic Control Devices.

1200.2.3 This Publication, Latest Edition

SECTION 400 TRAFFIC CONTROL

1200.3 BARRICADING STANDARDS

1200.3.1 Before construction begins all traffic control signs and barricades must be installed in accordance with the approved traffic control plan, construction plans, barricading detour plan or as directed by the OWNER. No construction signing and barricading shall commence until CONTRACTOR is assured that all equipment, manpower, and resources are available to start and complete the work. Where applicable, all signs, barricades, and/or barrels will be moved forward as the construction progresses.

1200.3.2 The name and telephone number of the owner shall be permanently stenciled on all barricades and traffic control equipment. The name and telephone number shall be a non-retroreflective color not over 2 inches in height, and be placed on a non-retroreflective surface of all equipment. Graffiti shall be promptly removed from any all barricades and traffic control equipment. If notified by the OWNER or the ENGINEER, graffiti shall be removed, or the equipment replaced with clean equipment, within four hours or the barricade permit is subject to revocation.

1200.3.3 All advance warning signs approaching a construction zone shall be double indicated (one sign each on left and right sides of approaching traffic) for all multiple-lane roadways with painted or raised medians and where adequate space is available. All double indicated signs shall be the same size. When a sign is placed in a painted median, especially a two-way continuous left-turn lane, a reflectorized barricade must be placed on the back side of the sign to alert motorists approaching from the opposite direction.

1200.3.4 It shall be the responsibility of the CONTRACTOR to remove all construction barricades, signing, and traffic control devices not required at the end of the working day.

1200.3.5 All advance warning signs shall be a minimum of thirty-six inches by thirty-six inches in size with super engineering grade sheeting or better. On high-speed (posted 45mph and above), rural section roadways where adequate pedestrian space is available, forty-eight inch by forty-eight inch signs is preferred. The use of forty-eight inch signs shall be required at locations as published on a list by the ENGINEER. All advance-warning signs not directly applicable shall be removed when not needed, and shall not be left in public right-of-way. All construction signing shall be black on a reflectorized orange field unless otherwise specified.

1200.3.6 Existing posts may be used at some locations, with approval of the ENGINEER. Portable sign supports will be acceptable as an alternate for signs which are to be in place for less than three (3) weeks. The bottom of advance warning signs mounted on barricades or temporary sign supports shall be no less than one foot above the traveled way. All regulatory and advisory signs shall be mounted on sign stands or as otherwise approved by ENGINEER. The placement of portable sign supports shall not block or impede pedestrian access. All signs ground mounted on single or double posts shall have the bottom of the sign seven (7) feet above pavement level.

1200.3.7 Barrels and different types of barricades are generally not intended to be intermixed in the same series of channelization. All barrels may have sand or water ballast limited to one hundred (100) pounds. All barricades shall be placed correctly with diagonal stripes sloping downwards in the direction traffic is to pass. Where barricades extend entirely across a roadway, the stripes must slope downward in the direction toward which traffic must turn. Where both right and left turns are provided, the stripes must slope downward in both directions from the center of the barricade or barricades. Where no turns are intended, the stripes must slope downward toward the center of the barricade or barricades.

1200.3.8 The CONTRACTOR shall inspect and maintain all barricades at least once each day except for barricades on or adjacent to arterial and collector streets which shall be checked twice daily, including inspection during hours of darkness. A log of these inspections showing project, location, date, and time

shall be kept and a copy sent to the Construction Coordination Division upon request. Upon request, the CONTRACTOR shall immediately produce current traffic control logs. Failure to do so may result in suspension of work or revocation of barricade permit.

1200.3.9 All traffic control devices required within traveled lanes after dark are to be equipped with warning lights. Type (A) flashing warning lights shall be used on all devices which are intended to warn motorists or pedestrians of hazards or obstructions in or near the travel path. Type © steady burn lights shall be used on all devices which are intended to define the travel path. All lights shall be operational. Traffic control devices that are damaged, dirty or have substandard reflectorization shall be immediately brought up to standard. Reflectorized sheeted panels shall not be considered as a replacement for a required warning light. Warning lights shall be incidental to payment for traffic control.

1200.3.10 Equipment and materials are not to be stored within fifteen (15) feet of a traveled lane during non-working hours, unless approved by the ENGINEER, which approval cannot be unreasonably withheld.

1200.3.11 CONTRACTOR shall provide and maintain a safe and adequate means of channelizing pedestrian traffic around all work areas throughout the periods of construction. All such channelization shall be arranged to prevent pedestrians from having to enter the roadway in order to pass around the work area. Where required, pedestrian detour signs will be installed by the CONTRACTOR. Where construction impedes or obstructs sidewalk access, CONTRACTOR shall barricade sidewalks and place "Sidewalk Closed" signs accompanied with the appropriate pedestrian detour signing. Pedestrian detour signs shall be incidental to payment for traffic control.

1200.3.12 CONTRACTOR shall provide and maintain a safe and adequate means of channelizing bicycle traffic around all work area throughout the periods of construction when existing bicycle trails, lanes, or routes are designated. Where possible, adequate space for bicyclists must be provided, and bicycle detour signs, including "Share the Road" signs shall be installed. When adequate space is not available to provide for bicycle access, the bicycle facilities shall be adequately detoured around the construction site. The detour route shall minimize out-of-direction travel distance, and shall be adequately signed and directed. Bicycle detour signs shall be incidental to payment for traffic control.

1200.3.13 All barricades, signs, and traffic control equipment shall be properly and adequately ballasted for normal wind loads. For equipment placed for

extended periods (seven days or more), or during the months of February through May, additional ballast shall be required.

1200.3.14 The use of roll-up advance warning signs is allowed, so long as the reflectivity required in the MUTCD is provided. Such signs shall be adequately braced to resist rotation under normal wind loads.

1200.3.15 The use of orange warning flags mounted atop construction warning signs is encouraged and is required in certain instances. Flags mounted atop construction signs is required on all "Reduced Speed Ahead (R2-5a)" signs, "Reduced Speed (R2-5b and R2-1)" signs, all "Double Fine Zone" signs, "Road Closed Ahead (W20-3)" signs, "Detour Ahead (W20-2)" signs, "Flagger Ahead (W20-7)" signs, "Flagger Symbol (W20-7a)" signs, and "Be Prepared to Stop (W20-7b") signs.

1200.3.16 Cones are an acceptable traffic control device under certain situations. Traffic cones are not to be used to separate traffic traveling in different directions. All cones must be a minimum of 28 inches tall. The use of cones as traffic control devices is not allowed during nighttime hours; however if used, all cones used at night must include white, reflectorized bands per MUTCD standards. The use of cones is encouraged for daytime moving closure operations, projects in duration of two hours or less, and special events.

1200.3.17 Type III barricades must be used at all road closures. Multiple type III barricades of the same configuration placed next to each other in the same direction is allowed. A type III barricade or illuminated arrow panel must be used for each lane closure. A minimum of two feet of exposed railing is required on the traveled side (open lanes) of type III barricades. The minimum length of type III barricade for each lane closure is eight (8) feet per lane twelve (12) feet or less in width, and the minimum length of type III barricade required for a sidewalk closure is four (4) feet. The minimum length of type III barricades for a double lane closure is sixteen (16) feet. Additional barricades above the minimum required may be required to fill in gaps for wide lanes, multiple lane closures, or shoulder areas.

1200.3.18 Road closures shall be pre-warned by the use of a "Road Closed to Through Traffic" (R11-4) sign, where appropriate. These signs shall be placed at intersections approaching the road closure with appropriate detour signing. When mounted on a three rail barricade support, the maximum width of sign support shall be six feet. If the detour route is more than one intersection before the road closure, then additional R11-4 signs shall be placed at each intersection between the detour route and the road closure. "Road Closed to Through Traffic" signs are encouraged to be placed on or near the center of the roadway, but R11-4 signs shall not be placed in an area that block sight distance for motorists and pedestrians. Where sight distance becomes a problem, low-volume intersections may be temporarily converted to a four-way Stop condition, with the approval of the ENGINEER.

1200.3.19 Illuminated arrow panels with a minimum size of 32 square feet may be used in lieu of type III barricades for lane and roadway closures. Arrow panels must be battery or solar powered. The use of diesel, or other noise generating power sources, is not allowed. For roadways with a previously posted speed limit of 35 mph or higher, the use of arrow panels is required for all lane closures. An arrow panel is required for each lane reduction, but is not required for shifting tapers. In residential areas where the arrow panel will be used at night, directional lighting limited to 30 degrees or less must be used to reduce glare into nearby properties. When illuminated arrow panels are used for a lane closure, then the use of vertical panels at the regular MUTCD minimum spacing for the lane reduction taper is allowed.

1200.3.20 For work expected to last one hour or less and for moving closures, reduced barricading may be allowed as approved by the ENGINEER. Reduced barricading on arterial or collector roads shall consist of a minimum of one advance warning sign, a minimum of a three barricade or cone taper, and an illuminated arrow panel.

1200.3.21 For emergency utility work on arterial or collector roadways, the CONTRACTOR must notify the traveling public. If a variable message board is not required by the ENGINEER, a "Utility Emergency Ahead" sign must be installed for each direction of arterial / collector traffic approaching the work site. The "Utility Emergency Ahead" sign must be placed in addition to, and preceding, the three normally required advance warning signs at the same spacing required in the MUTCD for advance warning signs.

1200.3.2 Double fine zones shall be delineated by the

use of "Double Fine Zone" signs as outlined in this section. Double fine zones shall be delineated for construction zones and construction curtilage zones at the request of either the OWNER or ENGINEER. In addition, double fine zones are required on all arterial / collector roadways where there is a: 1.) reduced speed limit; 2.) lane reduction; 3.) reduced design speed; or 4.) traffic hazard. Double fine zones are required for all flagging operations, and work zones with an imminent danger to workers, regardless of the roadway classification. The beginning of the double fine zone shall be clearly marked with a sign stating:

"*Construction* - Begin Double Fine Zone". The end of the double fine zone shall be clearly marked with a sign stating: "*Construction* - End Double Fine Zone". If the double fine zone extends beyond one-half mile in length, intermittent signs must be placed no more than one-half mile apart stating: "*Construction* - Double Fine Zone". Additional intermittent signs are needed following side street entrances. Details for the double fine zone signs are on file with the ENGINEER. Placement of the Begin Double Fine Zone sign shall be immediately following the "Road Work Ahead" sign. Placement of the End Double Fine Zone sign shall be immediately preceding the "End Road Work" sign.

1200.3.23 On arterial or collector roadways with multiple lane closures, the advance warning signs shall indicate the correct number of lanes closed. Arrow panels are required for each lane closure of multiple lane closures on arterial or collector roadways, regardless of the previously posted speed limit.

1200.4 CONFLICTS WITH EXISTING SIGNING, STRIPING, AND SIGNALS

1200.4.1 CONTRACTOR shall not remove, realign, or adjust any official OWNER traffic control device including stop signs, warning signs, or any other traffic or parking control signs, unless approved by the OWNER. CONTRACTOR shall give the OWNER three (3) working day's prior notice of any official OWNER traffic control device that needs to be moved. The OWNER shall take all appropriate actions as soon as practical thereafter. When CONTRACTOR places regulatory signing reducing the posted speed limit as approved by the OWNER, the CONTRACTOR must temporarily cover any and all conflicting speed limit signs. Such covers must be immediately removed once the temporary speed limit reductions are removed.

1200.4.2 The CONTRACTOR is responsible for obliteration of any conflicting striping and responsible for all temporary striping. For temporary situations lasting seven days or less, conflicting pavement markings may be addressed with the proper use of channelization devices and signing, unless otherwise approved or required by the ENGINEER.

1200.4.3 When the construction activity or traffic detouring plans result in less than two signals being visible in any direction at a signalized intersection, additional temporary traffic signals shall be required. A minimum of two signals must be visible within a twenty degree horizontal and vertical cone of vision, as measured from the stop bar for each lane approaching a signalized intersection.

1200.5 STREET AND LANE CLOSURES

1200.5.1 CONTRACTOR shall maintain access to all public and private facilities adjacent to the construction area at all times, including businesses and/or residents. When denying access is unavoidable, CONTRACTOR must coordinate access restriction to times and locations that are reasonably convenient to the property owners and/or residents affected. CONTRACTOR shall construct and maintain access roads, including paved ramps, where deemed necessary by ENGINEER to maintain traffic flow. Business access signs may be required to direct traffic to existing businesses, as directed by ENGINEER or OWNER. No more than three businesses shall be placed on a single sign. In areas of multiple adjacent businesses, only generic "Business Access Only (arrow)" signs are required. For shopping centers with multiple business tenants, the name of the shopping center shall be placed on a sign at each access location. Access signs shall have 5 inch high, white letters with a directional arrow on a reflectorized blue background. Business access shall be rectangular in shape, no taller than wide, and shall be no larger than four feet wide by three feet tall. Business access signs shall not be placed where they block sight distance for either motorists or pedestrians.

1200.5.2 CONTRACTOR shall notify the following services forty-eight (48) hours in advance of any complete street or access closures: Police Department, Fire Department, U.S. Postal Service, Solid Waste Department, Ambulance Services, local schools, and the Transit Department. The CONTRACTOR shall also notify all businesses and residents directly affected by the road closure. For the total closure of arterial or collector roadways, a variable message board must be installed for a minimum of two days prior to the road closure notifying motorists of the dates and times for the closure. A minimum of one variable message board is required for each direction of closure. For the total closure of a local roadway, a sign must be installed for a minimum of two days prior to the road closure notifying motorists and residents of the dates and times of the closure. A minimum of one sign is required for each direction of closure.

1200.5.3 The CONTRACTOR shall be responsible, and shall make appropriate accommodation, for garbage and trash collection, mail delivery, and other essential services needed by residents and businesses affected by CONTRACTOR operations. This effort shall include coordination with U.S. Post Office, Solid Waste Department, and other agencies. Where required, CONTRACTOR shall notify all residents in writing at least two days prior. Such notice shall include at a minimum: dates and times of construction activities and the name and telephone number of the CONTRACTORS contact person. CONTRACTOR shall collect all trash and garbage in the project area and deliver to an accessible location for collection by 7:00 a.m. on the designated trash collection day. Such trash and garbage cannot be deposited onto private property, must not block access, and shall be immediately cleaned up by CONTRACTOR upon pick up by the Solid Waste Department or private trash collection company.

1200.5.4 Total or partial closure of some streets may be restricted to certain hours of the day by the OWNER. Streets having working hour limitations may be noted on the approved construction plans. In cases of emergency work or permit work, streets having working hour limitations will be designated by the ENGINEER. Waivers of the working hour limitations can be obtained from the ENGINEER.

1200.5.5 If construction on streets with working hour limitations is expected to extend past the allowed working hours, plating of the trench and/or temporary asphalt concrete pavement shall be provided so that the roadway is opened to traffic within the allowable work hours. Such excavations must be plated, temporarily patched or resurfaced prior to opening to traffic. A minimum width of 11 feet for each lane of traffic shall be provided, unless otherwise directed by the ENGINEER.

1200.5.6 When detouring low and moderate-volume traffic onto a previously unpaved area, see Table 1200.1 for surfacing requirements.

Table	1200.1
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Time	Shoulder Residential	Shoulder (Other)	Local / Residential	Major Local	Collector	Arterial
Under one day	Compacted Subgrade	Compacted Subgrade	Compacted Subgrade	Compacted Subgrade	Gravel or millings	Gravel or millings
1-3 days	Compacted Subgrade	Gravel or millings	Gravel or millings	Gravel or millings	Treated Millings	2" Asphalt
4-7 days	Gravel or millings	2" Asphalt	Gravel or millings	Treated Millings	2" Asphalt	2" Asphalt
8-30 days	Treated Millings	2" Asphalt	Treated Millings	2" Asphalt	4" Asphalt	4" Asphalt

# Table Notes:

The contractor shall be responsible to continually maintain all detours, providing a smooth, drained, and safe roadway surface. All compacted subgrade areas shall be graded regularly to provide a smooth driving surface, and must be treated regularly with water or other approved dust control palliative. During periods of dry and/or windy weather, a water truck must be on-site at all times, and frequent watering may be necessary.

Gravel, millings, or treated millings must be bladed and compacted to provide a stable, smooth driving surface prior to opening to traffic. Such surfacing shall be regularly maintained to provide a smooth and stable driving surface. All temporary asphalt pavement shall be placed upon a compacted subgrade which shall be graded to drain. Treated millings includes millings stabilized with an applied emulsive asphalt.

# 1200.6 MEASUREMENT AND PAYMENT

1200.6.1 Measurement and payment for barricading and temporary traffic control shall be per lump sum per project except for the items listed below. Payment of additional items will only be made if such traffic control device or services is either approved in the construction plan set or requested by the OWNER in writing. Payment shall include the cost of obtaining all permits and approvals; preparation of traffic control plans; working restricted or extended hours when required; notification to all affected residents, businesses, agencies, or other public contacts; setting and resetting barricades, maintaining barricades, daily removal of barricades when required, flagman operations when required, installation of temporary traffic signals when not required by the OWNER or in the construction plans; coordination with ENGINEER on traffic signal re-timing; hiring of off-duty Police Department Officers; and any and all other costs associated with temporary traffic control except the following:

1200.6.1.1 Measurement and payment of the installation of temporary striping shall be made per lineal foot of striping installed per four inch wide.

1200.6.1.2 Measurement and payment of business access and special signs shall be made on a per square foot basis project duration.

1200.6.1.3 Measurement and payment of Variable Message Boards shall be made per each on a per day (24-hour period) basis.

1200.6.1.4 Measurement and payment of illuminated arrow boards required by the OWNER, or required in the construction plans, shall be made per each on a per day (24-hour) basis.

1200.6.1.5 Measurement and payment of temporary wall barrier shall be made per lineal foot of wall barrier installed and removed at each location per project.

1200.6.1.6 Measurement and payment for temporary traffic signals required by the OWNER, or required in the construction plans, shall be made per each per project duration at each location.

# SSCAFCA Specifications (SSCAFCA)

# SUPPLEMENTAL TECHNICAL SPECIFICATION

# SECTION 1503

#### MOBILIZATION

#### 621.1 DESCRIPTION

This work shall consist of preparatory and final work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to and from the project site; for the establishment of all offices, buildings and other facilities necessary for work on the project; and, for all other work and operations which must be performed or costs incurred prior to beginning work on the project.

#### 621.2 MOBILIZATION ADMINISTRATION REQUIREMENTS

#### 621.2.1 DEFINITIONS

The following definitions shall apply:

- a) Total original contract amount shall mean the total amount bid as compensation for the contract.
- b) Total original contract amount less mobilization and demobilization shall mean the total amount bid as compensation for the contract less the amounts bid for mobilization.

#### 621.2.2 GENERAL

It is the intent of this specification to provide for the Contractor to:

a) Receive 100% of the amount bid for mobilization by the time the Contractor has performed 10% of the total original contract amount bid less the amount bid for mobilization.

#### 621.2.3 PAYMENT PROCEDURES FOR MOBILIZATION

The following will apply in effecting mobilization payments:

- a) When the Contractor is eligible for payment of less than 5% of the total original contract amount bid less mobilization, the Contractor will be paid 25% of the amount bid for mobilization.
- b) When the Contractor is eligible for payment of from 5% to less than 10% of the total original amount bid less mobilization, the Contractor will be paid 50% of the amount bid for mobilization minus any mobilization amount already paid.
- c) When the Contractor is eligible for payment of 10% or more of the total original contract amount less mobilization, the Contractor will be paid 100% of the amount bid for mobilization minus any mobilization amount already paid.

# 621.2.4 PAYMENT CALCULATIONS

Рм	=	Mobilization Payment
М	=	Total amount bid for Mobilization
fм	=	Mobilization payment percentage factor
	=	0.25, or 0.50, or 1.0, as applicable
Рм	=	M x f <sub>M</sub>

#### EXAMPLE 1 MOBILIZATION

Total Original Contract Amount Bid	. \$1 <sup>-</sup>	10,000
Amount Bid for Mobilization	. \$	5,000
Total Original Contract Amount Less Mobilization	\$10	05,000

Percent of Work Completed	f <sub>M</sub>		М		Рм	
<5% of \$102,000		0.25	х	5,000	=	\$1,250
>5% to <10% of \$102,000		0.50	х	5,000	=	\$2,500*
≥10% of \$102,000		1.00	х	5,000	=	\$5,000*
*minus previously paid amounts						

### 621.3 METHOD OF MEASUREMENT

Mobilization will be measured by lump sum unit.

#### 621.4 BASIS OF PAYMENT

Mobilization will be paid for at the contract price per Mobilization Bid Item. The amount Bid for Mobilization shall not exceed 5% of the Total Base Bid.

No additional payments will be made for demobilization and remobilization due to shutdowns or suspensions of the work or for other mobilization and demobilization activities required to complete the contract.
#### SUPPLEMENTAL TECHNICAL SPECIFICATION

#### SECTION 1504

#### NPDES COMPLIANCE

#### 630.1 SCOPE OF WORK

The work under this section includes compliance with the U.S. Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES) Regulations for Storm Water Discharges from construction sites. A Storm Water Pollution Prevention Plan (SWPPP). This work consists of developing and maintaining this plan to control erosion, pollution, sediment and runoff during the construction of the project.

#### 630.2 MEASUREMENT AND PAYMENT

**630.2.1 UNIT PRICE BID PROPOSALS:** For Unit Price Bid Proposals, NPDES compliance shall be paid for as follows:

**630.2.1.1** Fifteen (15) percent of the Lump Sum unit price amount shall be paid after the Contractor has completed an EPA Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity Under a NPDES General Permit, or a Low Erosivity Waiver (LEW) form, if applicable. A copy of the EPA acceptance of the NOI or LEW must be delivered to the Owner. All required erosion control measures sufficient to begin construction must also be in place. This will be defined in the plan specifications and/or the SWP3.

**630.2.1.2** Payment for an additional sixty (60) percent of the Lump Sum unit price amount shall be prorated based on the Actual Percent Complete on the *Application for Payment* as approved by the Architect, Engineer or Landscape Architect. For example, if the Contractor is 20% complete, the contractor can take the 20% (0.2) and multiply it by half of the Lump Sum unit price amount, and receive that portion.

In order to receive payments, the field inspection forms must be sent in with the *Application for Payment* each month. If there are deficiencies maintaining or implementing the SWP3 and its Best Management Practices (BMPs), the payment will be withheld until the deficiencies are corrected.

**630.2.1.3** The remaining twenty-five (25) percent of the Lump Sum unit price amount will be based on the completion and submittal to EPA of an EPA Notice of Termination (NOT) of Coverage Under a NPDES General Permit for Storm Water Discharges Associated with Construction Activity, and BMP removal. A copy of the NOT acceptance verification from EPA must be delivered to the Owner. BMPs must be removed as defined in the plan specifications or SWP3. This is done in case there are some BMPs that must remain until final stabilization is met, and that there are no more NPDES concerns for the Contractor.

#### SUPPLEMENTAL TECHNICAL SPECIFICATION

#### SECTION 1507

#### **TESTING AND QUALITY ASSURANCE**

#### 1507.1 GENERAL

- A. This Section includes testing and quality control measures required on this project. The Section is additional to requirements specified for testing and quality assurance in the standard specifications and other supplemental specifications.
- B. Materials and equipment are subject to inspection, sampling, and testing before acceptance of the work.

#### 1507.2 RELATED WORK

A. General and Supplemental General Conditions of the Contract.

#### **1507.3 REFERENCES AND DEFINITIONS**

- A. All materials and equipment shall be tested, by the CONTRACTOR, pursuant to their technical specification (unless otherwise specified herein) and the manufacturer's recommendations.
- B. Structure shall include but is not limited to: parking lots, pavement, sidewalk, curb and gutter, foundations, structural concrete, piping, wet-wells, manholes, retaining walls, junction boxes, and buildings.

#### 1507.4 SUBMITTALS

- A. Test Reports from tests performed by independent testing firm: Submit for acceptance, complete test reports from approved independent testing laboratories certifying that product conforms to performance characteristics and testing requirements specified herein and in other supplemental/standard specifications. Independent firm to submit reports to the ENGINEER and CONTRACTOR, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- B. Test Reports from tests performed by CONTRACTOR: Submit for acceptance, complete test reports from CONTRACTOR certifying that product conforms to performance characteristics and testing requirements specified herein and in other supplemental/standard specifications.

#### **1507.5 QUALITY ASSURANCE**

- A. Quality Assurance/Control of Installation The CONTRACTOR shall:
  - 1. Comply fully with manufacturers' instructions, including each step in sequence.

- 2. Request clarifications from ENGINEER before proceeding should manufacturers' instructions conflict with Contract Documents.
- Request clarification from ENGINEER before proceeding should specified reference standards conflict with Contract Documents. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- 4. Comply with specified standards as a minimum quality for the work except when more stringent specified tolerances, codes, or requirements indicate higher standards or more precise workmanship are required.
- 5. Make sure work is performed by qualified persons.
- 6. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
- B. Testing Laboratory Services
  - 1. Reports will be submitted by the independent firm to the ENGINEER and CONTRACTOR, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

#### 1507.6 TESTING METHODS

Testing methods shall comply with ASTM Standards and as specified in the technical specifications for the project.

#### 1507.7 EXECUTION

- A. Testing Laboratory Services
  - 1. The CONTRACTOR will employ and pay for services of an independent testing firm to perform testing.
  - 2. The independent firm will perform tests and other services specified in individual Specification Sections and as required by the OWNER.
  - 3. CONTRACTOR shall:
    - a) Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
    - b) Notify ENGINEER and independent firm 8 hours prior to expected time for operations requiring services.
    - c) Make arrangements with independent firm and pay for additional samples and tests required for CONTRACTOR'S use.

B. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the ENGINEER. No additional payment will be made for retesting due to failing tests.

#### 1507.8 TESTING FREQUENCY AND TYPE OF TESTING

Frequency and type of testing shall be per the requirements listed in the specifications for each type of Work. The Engineer may increase and/or add testing for any Work items. The Testing Allowance will be adjusted for increases in testing by Section 1507.9.D.

#### **1507.9 MEASUREMENT AND PAYMENT**

Testing shall be paid for as an allowance on a Lump Sum basis. The Contractor may request percent of LS cost payments during construction, however, the Contractor shall provide actual testing lab invoices as back-up for the percent complete that is being requested in a Pay Application.

Testing allowances are provided as part of the project and invoiced for testing will be paid for through this allowance.

Costs included in testing price include:

- A. Cost of engaging an independent testing firm, execution of tests by the testing firm, and reporting results by the testing firm.
- B. Costs of incidental labor and facilities required to assist testing firm.
- C. Costs of testing laboratory services used by CONTRACTOR separate from Contract Document requirements
- D. Costs of re-testing due to failure of previous tests will be included in the cost for testing and no additional payment will be made for this work.

The CONTRACTOR shall submit two copies of the testing firm's invoice to OWNER with Pay Application. Reimbursement to the Contractor will be for actual invoiced costs and no mark-up will be added to this invoice. The Contractor shall receive reimbursement for actual invoice of testing firm upon certification that payment has been made to the testing laboratory. Payment will be made at the next application for payment from OWNER.

#### SUPPLEMENTAL TECHNICAL SPECIFICATION

#### SECTION 1508

#### **PROJECT RECORD DOCUMENTS**

#### 1508.1 GENERAL

This Section includes administrative and procedural requirements for Project Record Documents, including the following:

- 1. Record Drawings.
- 2. Record Specifications.
- 3. Record Product Data.

#### 1508.2 RECORD DRAWINGS

Record Prints: Maintain one set of red-lined prints of the Contract Drawings and Shop Drawings. These prints shall be updated no less frequently than once per week. These prints will be reviewed for verification of updates by the construction observer on a regular basis, depending on the length of the contract. Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with ENGINEER.

**1508.2.1** Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Mark whichever drawing is most capable of showing field conditions fully. Require individual or entity who obtained record data, whether individual or entity is Installer, SUB-CONTRACTOR, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

- **1508.2.2** Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-references on the Contract Drawings.
- **1508.2.3** Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
- **1508.2.4** Note Construction Change Directive numbers (field orders or Request for Information changes), alternate numbers, Change Order numbers, and similar identification, where applicable.
- **1508.2.5** Verification of current record prints status will be included in the monthly payment approval process that will be noted by the construction's observer's field reports.

#### **1508.3 RECORD SPECIFICATIONS**

Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later. Note related Change Orders, field order notes, Request for Information (RFI) notes, Record Product Data, and Record Drawings where applicable.

#### **1508.4 MISCELLANEOUS RECORD SUBMITTALS**

Assemble Certifications, Lab Test Reports, and Field Test Reports required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

#### 1508.5 SUBMITTALS

See New Mexico Standard Specifications For Public Works Construction Section 1502.

#### **1508.6 RECORDING AND MAINTENANCE**

- **1508.6.1** Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur.
- **1508.6.2** Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. It is not advisable to use Project Record Documents for construction purposes. Provide access to Project Record Documents for Engineer's reference on the project site.

#### **1508.7 MEASUREMENT AND PAYMENT**

The cost of project record documents shall be incidental to the Work and no separate payment shall be made for this effort. However, the Project Record Documents shall be reviewed per Section 1508.2.5 and they shall be updated prior to pay applications being processed.



## TECHNICAL SPECIFICATION 1510

## EXCAVATION, BORROW, AND FILL Revised 09/16/2021

#### 1510.1 GENERAL

1510.1.1 Excavation, borrow, and fill shall consist of all earthwork operations involved in grading and construction in accordance with the plans and specifications, except for excavation and backfill for structures; excavation and backfill for trenching; and any other earthwork operations separately designated.

#### 1510.2 REFERENCES

This section incorporates the following publications by reference:

- ASTM D-1557 This publication:
- ASTM D-422
  NM APWA Section 201
- ASTM D-4318
  Tech
  - Tech. Spec. 1513
- ASTM D-6938
- Tech. Spec. 1514

#### 1510.3 MATERIAL CLASSIFICATIONS

#### 1510.3.1 UNSUITABLE MATERIAL

Unsuitable materials shall include all material that contains debris, roots, organic matter, stones or boulders too large to be used in the intended construction, or other materials that are determined by the Engineer to be unsuitable. Otherwise suitable materials which are unsuitable due to excess moisture content will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration or blending with other materials satisfactorily as determined by the Engineer.

Material that is unsuitable for the intended use shall be excavated and removed from the site or otherwise disposed of as approved by the Engineer. Unsuitable material shall be disposed in accordance with environmental requirements and as approved by the Project Manager.

The removal and disposal of such unsuitable material will be paid for as excavation, removal and disposal for the quantities involved.

#### 1510.3.2 FILL MATERIAL

All fill material shall be free of vegetation and debris. Clods or hard lumps of earth of 6 inches in greatest dimension shall be broken up. Fill materials shall be free of



vegetation and debris and contain no rocks larger than 3 inches. All fill and backfill material, including selection and blending of material, shall be subject to approval by the Geotechnical Engineer. All fill material shall conform to the requirements for Structural Fill as outlined below.

#### 1510.3.3 STRUCTURAL FILL AND BACKFILL

Structural fill and backfill shall consist of material excavated from on-site or Borrow Material that meets the requirements described in this section. The blended excavated site soils from within the area will be generally suitable for use as structural fill. Blending of soils shall be considered incidental to the Work and no separate payment will be made for this effort. Gradation of the fill material, as determined in accordance with ASTM D-422, shall be as follows:

Sieve Size (Square Openings)	Percent Passing (by Weight)	
3 inch	100	
No. 4	60-100	
No. 200	5-40	

All structural fill shall be blended as necessary to produce a homogeneous material. The plasticity index of the structural fill shall be no greater than 15 when tested in accordance with ASTM D-4318.

#### 1510.3.4 BORROW MATERIAL

Borrow material is defined as material obtained from an approved borrow source to be used as structural fill material for construction. If borrow material is required, the Contractor shall identify a borrow site and tests will be performed to verify compliance of the material with structural fill requirements per this specification. The Contractor shall not import any borrow material prior to verification that material meets the requirements contained herein and he has received approval to import the material by the Owner.

#### 1510.3.5 SURPLUS MATERIAL

The Contractor shall make all arrangements for disposal of surplus material in accordance with environmental requirements and as approved by the Project Manager. If the material is disposed of on-site, the Contractor shall place material in locations as designated by the Owner. Do not remove materials from the project limits without the approval of the Owner. The Contractor shall satisfy himself that there is



sufficient material available for the completion all items requiring fill material before disposing of any indicated surplus material inside or outside of the project area. Any shortage of material caused by premature disposal of surplus material by the Contractor shall be replaced by the Contractor and no payment will be made for such replacement.

#### 1510.4 CONSTRUCTION REQUIREMENTS

#### 1510.4.1 GENERAL

Contractor shall perform necessary clearing, grubbing and stripping in accordance with Section 201 of the Specifications and Supplemental Technical Specification 201, "Clearing and Grubbing", prior to any excavation, grading, or other earthwork operations. Excavation, fill construction and backfill shall be finished to reasonably smooth and uniform surfaces.

All slopes and cuts should be made in accordance with CFR 29 Part 1926 Subpart P, and all other applicable regulations.

#### 1510.4.2 EXCAVATION

Excavation shall consist of the removal of earth involved in grading and construction according to the plans, except other excavations separately designated.

Temporary construction excavations shall be made in accordance with CFR 29 Part 1926 Subpart P, and all other applicable regulations. Surface water shall be routed such that it does not flow down the face of the excavation slopes. Where insufficient space exists for open cut excavations, a shoring system will be required. All required shoring systems shall be considered incidental to the cost of excavation and no additional payment will be made for this item. All excavations shall comply with all applicable safety regulations.

#### 1510.4.3 FILL CONSTRUCTION

Fill construction shall consist of constructing embankments, the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of suitable materials in holes, pits, and other depressions.

#### 1510.4.4 PLACING AND COMPACTING

Fill or backfill, consisting of soil approved by the Engineer and/or project's Geotechnical Report, should be placed in controlled compacted layers not exceeding 8 inches (compacted) with approved compaction equipment. All fill material should be blended as necessary to produce a homogeneous fill. The fill should be raised uniformly and should be benched into the native soils. All compaction should be



accomplished to a minimum of 95 percent of maximum dry density. No lifts of high permeability material or material differing substantially from the lift below shall be permitted.

At locations where it would be impractical to use mobile power compacting equipment, fill layers shall be compacted to the specified requirements by any approved method that will obtain the specified compaction.

#### 1510.5 TESTING

1510.5.1 Tests for degree of compaction should be determined in accordance with ASTM D-1556 or ASTM D-6938.

Continuous, full time observation and field tests should be conducted during fill and backfill placement by a representative of the Engineer to assist the contractor in evaluating the required degree of compaction. If less than the required compaction is required, additional compaction effort should be made with adjustment of the moisture content as necessary until 95 percent compaction is obtained.

#### 1510.6 MEASUREMENT AND PAYMENT

#### 1510.6.1 EXCAVATION

Payment will be made on the unit price per cubic yard for unclassified excavation as provided in the Unit Price Bid Proposal. Payment will include the cost for all excavation, removal, storage and disposal of unsuitable material, hauling of surplus material to the designated location(s), and hauling of select material within the construction site. No payment will be made for excavation of stockpiled materials, structural excavation of previously placed materials and over depth cuts. No payment will be made for shrink or swell. Excavation beyond the authorized cross section will not be included in measurement or payment.

#### 1510.6.2 BORROW

Borrow material will be measured by the cubic yard in-place after compaction. Field topographic surveys, as described in SSCAFCA Technical Specification 1513 or 1514 "Construction Staking", will be used to determine in-place quantities.

Payment will be made on the unit price per cubic yard for Borrow. Payment will include excavation & haul from Borrow Area, moisture conditioning, required blending of soils, placement, compaction, and other related work.



## TECHNICAL SPECIFICATION 1512

## CONTROL OF STORM WATER AND NUISANCE FLOW Revised 07/24/2020

#### 1512.1 DESCRIPTION

This work covers the control of storm and nuisance flow water in the vicinity of this project.

#### 1512.2 CONSTRUCTION REQUIREMENTS

All permanent work shall be performed in areas free from water. The CONTRACTOR shall construct and maintain all dikes and drainage ditches necessary for the elimination of water from work areas and shall furnish, install, maintain, and operate all necessary pumping and other dewatering equipment required for dewatering the various work areas. Two (2) types of flow can be expected;

1) Continuous or intermittent flow through the main arroyo;

2) Local sheet flow from adjacent properties or adjacent streets.

The CONTRACTOR is responsible for adequacy of the scheme or plans, or for furnishing all equipment, labor and materials necessary for dewatering the work areas and breaking up and removing such ice or snow as may have formed or settled in the work area. The CONTRACTOR shall be fully responsible for all dewatering operations, and the cost of all dewatering operations shall be included in the lump sum price for this work. The CONTRACTOR shall also be responsible for removal of any sediment deposited by storm and nuisance water, and the cost of sediment removal work shall be included in the lump sum price for this work.

In the event that storm flow, snowmelt or other water flows overtop the Contractor's diversion method, the Contractor will be responsible for any and all damage, including damage to the existing channel and any damage to new work and is responsible for immediate resolution and repair in a manner acceptable to SSACFCA.

Diversion methods may be by use of sandbag diversion channels, sandbag dams, pumping or piping around or over the work areas, or any method or combination.

#### 1512.3 BASIS OF PAYMENT

The bid item for this effort will be on a Lump Sum (LS) basis. Providing and maintaining the diversion and care of water, regardless of the amount of water actually handled, shall be paid for as follows:



Payment will be made as a percentage of the dollar amount of work completed to date minus the Mobilization bid item.

Pay Item Control of Storm Water and Nuisance Flow <u>Pay Unit</u> LS

SSCAFCA Technical Specifications



## TECHNICAL SPECIFICATION 1513

### CONSTRUCTION STAKING Revised 09/16/2021

#### 1513.1 DESCRIPTION

This work consists of construction staking lines, grades, and layouts by the Contractor in accordance with the plans and specifications and as directed by the Engineer for the control and completion of the project.

#### 1513.2 MATERIALS

The Contractor shall furnish all stakes, templates, straightedges, surveying equipment and other devices necessary for establishing, checking, marking, and maintaining points, including P.I.'s, P.C.'s, P.T.'s, and lines, grades and layouts. As directed by the Engineer, points shall be referenced so that they may later be re-established.

#### 1513.3 CONSTRUCTION REQUIREMENTS

The Contractor shall be responsible for all control, slope stakes, cut stakes, offset stakes, benchmarks, blue tops or other staking necessary for proper execution of the work, or as requested by the Project Manager, to assure compliance with the plans.

#### 1513.4 CONSTRUCTION SURVEYS

The contractor shall obtain and pay for the services of a Professional Surveyor licensed in the State of New Mexico to perform surveys consisting of the following phases:

**Phase 1:** A topographic survey, with a contour resolution of 1-ft or greater, to determine the Project Site (including Borrow Area, if applicable) existing ground elevations prior to construction, after clearing and grubbing and after removal of trash and debris. Data collected shall be of sufficient detail, including all breaks in the terrain, to be able to create an original ground digital terrain model (DTM). The Project Site & Borrow Area (if applicable) "original ground" DTM shall be submitted to the Engineer for review and acceptance prior to proceeding with excavation and export of material. Survey data must be sufficient to determine future earthwork quantities.

**Phase 2:** A topographic survey, with a contour resolution of 1-ft or greater, to determine the Borrow Area (if applicable) finished ground elevations post-construction, after all required



borrow material is removed. Data collected shall be of sufficient detail, including all breaks in the terrain, to be able to create a finished ground digital terrain model (DTM). The Borrow Area "finished ground" DTM shall be submitted to the Engineer for review and acceptance prior to payment for "Borrow" Bid Item. Survey data must be sufficient to determine earthwork quantities.

**Phase 3:** A topographic survey, with a contour resolution of 1-ft or greater, will be completed for the project site (excluding borrow area) after construction to demonstrate compliance with the design grades, structure elevations, inverts, alignments/profiles, etc. shown on the plan set. Phase 3 Survey will also include the update and completion of as-built survey for the project. It is the responsibility of the contractor to coordinate with the surveyor on a regular basis to provide as-built information to incorporate in the survey.

All surveys must be certified by the Professional Surveyor and include complete documentation. Borrow Area surveys (Phases 1 and 2) must be used by the Professional Surveyor to compute the quantity of excavation, subject to the provisions for measurement in Technical Specification 1510. Volume shall be determined based on the "average end area" computation. All computations of excavation must be submitted to the Engineer in sufficient detail. This submittal shall be such that methods and computations can be fully verified and are subject to approval by the Engineer. The Contractor shall also submit the electronic survey point files, including break lines, in a format compatible with AutoCAD Civil3D such that the Engineer can use the data for verification of cut/fill quantities.

At the end of the Project, the Engineer will transcribe the as-built information provided by the Contractor onto the Record Drawing. The Contractor's Professional Surveyor will be required to stamp, sign and certify the information shown on the as-built drawings.

#### 1513.5 METHOD OF MEASUREMENT

Submit a construction-staking schedule of values as part of each Pay Application to the Project Manager for approval.

#### 1513.6 BASIS OF PAYMENT

Pay Item	Pay Unit
Construction Staking	Lump Sum

1513.7 SSCAFCA will make partial payments in accordance with the approved construction-staking schedule of values.



## TECHNICAL SPECIFICATION 1515

## REMOVAL OF STRUCTURES & OBSTRUCTIONS Revised 11/16/2021

#### 1515.1 DESCRIPTION

This work shall consist of removing and disposing of surface and subsurface features to clear the project site for construction. This includes concrete debris, fences, structures, pavements, curb and gutter, sidewalks, buried pipes, and any other items listed within the construction plans. All removal and salvage features included in these items will be designated in the contract.

#### 1515.2 MATERIALS

Suitable materials are those materials which can be compacted to the required embankment densities and meet all other contract requirements for embankment materials. If applicable, the project Geotechnical Report would include this information.

#### **1515.3 CONSTRUCTION REQUIREMENTS**

#### 1515.3.1 Suitable Materials

Suitable materials are those materials which can be compacted to the required embankment densities and meet all other contract requirements for embankment materials. If applicable, the project Geotechnical Report would include this information.

#### 1515.3.1.1 Marking of Removal Limits

Prior to work on the site, the Contractor shall establish the right-of-way lines and construction limits confining the removal operations and will designate those surface and subsurface features for removal and those for preservation. The Owner or designee shall be offered the opportunity to review the removal limits before work commences.

#### 1515.3.1.2 Temporary Erosion Control

Ensure all erosion control requirements and all necessary temporary sediment and erosion control protection devices (TESCP), if called for in the contract, are installed prior to initiating removal operations on the construction site. The TESCP items will be paid for under the SWPPP pay item.

#### 1515.3.1.3 Protection of Site Features

The Contractor shall preserve and protect all existing improvements, adjacent property, utilities, and surface or subsurface features not to be removed from injury or damage resulting from their operations. This may require the Contractor to install



temporary signing, temporary fencing, or other temporary features at their cost. Should any damage occur to these site features due to the Contractor's operations, the Owner or designee may withhold payment until the damage is remediated or require the damaged items to be replaced at the Contractor's expense.

#### 1515.3.2 Removal and Salvage Operations

Remove all surface features and subsurface features designated for removal in the contract and dispose of them at a properly permitted disposal site. Provide the Owner or designee with a copy of the written permission from the property owner and copies of any other necessary disposal permits or approvals.

Carefully remove and salvage all surface features and subsurface features designated for salvage in the contract and store and deliver these materials in accordance with the contract requirements. The Contractor shall repair any damage to salvageable items that occurs during their removal, storage, or delivery operations at no cost to the Owner.

Backfill holes created by structure or obstruction removals as per SSCAFCA Standard Specification 1510 with suitable materials, unless the area is within the area of new construction.

#### 1515.3.2.1 Removal of Pavements, Sidewalks, Curb and Gutter

Pavements, sidewalks, and curb and gutter shall be removed to neat saw cut lines as identified in the Contract, and dispose of them off the project site.

#### 1515.3.2.2 Removal of Culverts and Drainage Structures

The Contractor shall sequence the removal of existing culverts and drainage structures so drainage is maintained on the project. This may require installation of temporary drainage features at Contractor's sole cost.

#### 1515.3.2.3 Removal of Sanitary Sewer and Water Utilities

The Contractor shall sequence the removal of existing sanitary sewer and water utilities to minimize the impacts to local businesses and residents. The sequencing of removals shall be coordinated with the City Utilities Department or designee prior to performing removal operations in the field.

#### 1515.3.2.4 Removal of Bridges and Arroyo Features

If the Contract includes the removal of a bridge or feature in an arroyo, remove the existing structures down to the arroyo bottom elevation OR an elevation sufficient to allow for proposed grading, proposed over-excavation, or proposed installation of infrastructure, as shown in the Contract documents.

Remove existing structures outside the arroyo to one (1) foot below ground surface, unless otherwise directed in the Contract.



#### 1515.3.2.5 Removal and/or Salvage of Fencing

If the contract includes removal of fencing materials, remove all fence materials, including posts and post foundations and backfill holes with suitable materials.

If the Contract includes salvaging of fencing materials, place barbed wire into singlestrand rolls and minimize the damage to fence posts when pulling them.

#### 1515.3.2.6 Hauling and Stockpiling Salvageable Material

If the Contract requires the Contractor to haul and stockpile salvageable material, load, haul, unload, and stockpile the materials in accordance with the Contract.

Place the salvageable material on blocks or other approved materials and maintain the stockpile area, as directed by the Owner or designee.

#### 1515.3.2.7 Site Appearance

The site shall have a neat and finished appearance when removal operations are finished, except for areas where construction activities are planned.

#### 1515.3.2.8 Disposal

Dispose of all removal items outside the project at a permitted location. If applicable, a disposal plan, including written permission from private property owners used for debris material disposal, shall be submitted to the Owner or designee prior to commencement of disposal activities.

#### 1515.3.2.9 Burying

No burying of any removed debris will be allowed on the project site.

#### 1515.3.2.10 Burning

No burning of any removed debris will be allowed on the project site. In addition, no accumulation of combustible materials shall be stored on the project site near property lines or areas where an unexpected fire could cause damage to existing site features.

#### **1515.4 METHOD OF MEASUREMENT**

No measurement will be made for lump sum removal of structures and obstructions.

No measurement of the removal of surfacing will be made if the lump sum basis of payment is used.

Removal of surfacing will be made by the Square Yard if Square Yard basis of payment is used.



#### 1515.5 BASIS OF PAYMENT

Pay Item Removal of Structures and Obstructions Removal of Surfacing Pay Unit Lump Sum Lump Sum or Square Yard

Removal of Structures and Obstructions payment shall be considered all-inclusive of the costs of the work including: marking the removal limits; installation of temporary features to protect the site; saw- cutting, removing, and salvaging all items as designated in the Contract; filling depressions associated with the work; providing temporary drainage features associated with the removals; obtaining disposal locations and disposing of debris; and, removing, stockpiling, transporting, and unloading salvaged items.

Removal of Surfacing payment shall be considered all-inclusive of the costs of the work including: removing the surfacing to neat lines; filling depressions associated with the work; providing temporary drainage features associated with the removals; obtaining disposal locations and disposing of debris; and, removing, stockpiling, transporting, and unloading items.

Additional payment for minor removals not specified in the Contract shall not be made.

Unknown buried features not identified in the Contract are not included in this item.

Payments shall be made based on percentage of the pay item completed at the date of monthly Pay Application submittal.

# SSCAFCA Supplemental Specifications (STS)

SSCAFCA Supplemental Technical Specifications



# APWA (2006) SECTION 101

## PORTLAND CEMENT CONCRETE

Revised 09/16/2021

1. In the Subsection 101.15 QUALITY ASSURANCE SAMPLING AND TESTING, paragraph 101.15.2.2, delete the first sentence and replace with the following:

At least one sample from each of the first three concrete loads delivered to the site shall be tested at the <u>point of placement</u> for slump, air content, and unit weight. Example: If a concrete pump is used, the point of placement location would be the end of the pump's outlet hose/nozzle.

One set of compressive strength test cylinders shall be obtained from one of the first three loads, as directed by SSCAFCA. Beginning with the fourth load of concrete delivered to the project, one load from each sub-lot of ten (10) loads will be randomly selected for testing to include slump, air content, unit weight, cement content per cubic yard, and one set of compressive strength test cylinders. Sample requirements are subject to change at the discretion of the Engineer.



## APWA (2006) SECTION 201

## CLEARING AND GRUBBING Revised 07/24/2020

- 1. In the Subsection 201.1 GENERAL, delete the second sentence and replace with the following: Clearing and grubbing shall be performed in advance of the grading operations.
- 2. In the Subsection 201.4.1 CONSTRUCTION METHODS, add the following:

Clearing and grubbing operations shall include stripping of the existing ground surface. Stripping shall be achieved only by cutting, i.e., ground depressions or narrow sections of tributary arroyos should not be inadvertently filled during the foundation preparation. The resulting area shall be cut to provide a uniform, relatively level surface.

3. In Subsection 201.5 LIMIT LINES, add the following:

Unless otherwise approved by the Engineer or otherwise specifically designated on the plans, limits of clearing & grubbing shall not exceed slope limits as shown with finished grade contours on plans.



## APWA (2006) SECTION 1012 – SUPPLEMENTAL SPEC

## NATIVE GRASS SEEDING Revised 07/24/2020

1. In subsection 1012.4 MATERIALS delete paragraphs 1012.4.1.1 and 1012.4.1.2 in their entirety and replace with the following:

Grass Seed Mix shall include the following species and rates:

Indian Rice Grass	5 lb/ac
Galleta	5 lb/ac
Sideoats Gramma	5 lb/ac
Blue Gramma	5 lb/ac
Sand Dropseed	5 lb/ac

Total Grass Seed Mix application rate = 25.0 lbs / acre

Wildflower Seed Mix shall include the following species and rates:

Globemallow	1 lb/ac
Purple Aster	1 lb/ac
Blue Flax	1 lb/ac
Mexican Hat	1 lb/ac
Blanket Flower	1 lb/ac

Total wildflower seed mix application rate = 5.0 lbs / acre

Seed rate is given in pounds of pure live seed (P.L.S.) per acre.

# City of Rio Rancho (CoRR)

**Specifications** 

These Standards amend or supplement the American Public Works Association New Mexico Chapter (NMAPWA) Current Edition as indicated below in red. All sections, which are not so amended or supplemented, remain in full force and effect.

121.1 GENERAL: Plastic pipe for pressure and non-pressure uses shall be manufactured from polyvinyl chloride (PVC), high-density polyethylene (HDPE), or ultra-high molecular weight materials.

- 121.2 REFERENCES:
- 121.2.1 American Society for Testing and Materials (ASTM) (Latest Edition):
- D1248 Specification for Polyethylene Plastics Molding and Extrusion Materials
- D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
- D1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings
- D1601 Test Method for Dilute Solution Viscosity of Ethylene Polymers
- D1693 Test Method for Environmental Stress -Cracking of Ethylene Plastics
- D1784 Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- D2239 Specifications for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
- D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- D2657 Heat-Joining Polyolefin Pipe and Fittings D2737 Specification for Polyethylene (PE) Plastic Tubing

- D2737 Specification for Polyethylene (PE) Plastic Tubing.
- D3034 Specification for type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

#### Add the following:

- D3261 Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
- F477 Specification for Elastomeric Seals (Gaskets) for joining Plastic Pipe
- F679 Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

#### Add the following:

- F714 Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
- F794 Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
- F894 Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
- 121.2.2 American Water Works Association (AWWA) (Latest Edition):

#### Add the following:

- C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm) for Water Service
- C900 AWWA Standards for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in. for Water.

C905 AWWA Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameter 14 in through 36 in.

#### Add the following:

C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.

#### Delete C909 in its entirety

- 121.2.3 THIS PUBLICATION:
- SECTION 800 WATER TRANSMISSION, COLLECTOR DISTRIBUTION AND SERVICE LINES
- SECTION 900 SANITARY AND STORM SEWER FACILITIES.
- SECTION 1502 SUBMITTALS

121.3 CERTIFICATION: The CONTRACTOR shall submit certification from the manufacturer of the pipe as specified in Section 1502 as to the pipe material and that the pipe meets or exceeds the required testing. Only pipe manufactured in the United States of America will be acceptable.

121.4 GENERAL PLASTIC PIPE REQUIREMENTS:

121.4.1 POSITIVE IDENTIFICATION: All plastic pipe shall be coded in accordance with the applicable material standard to eliminate future confusion and prevention accidental damage and service interruption of the facilities.

Delete Section 121.4.2 in its entirety and substitute the following:

121.4.2 LINE LOCATOR: See Section 801.9.9 for line locator requirements.

Delete "or PVCO" from 121.4.3.

121.4.3 PIPE STORAGE: All types of plastic pipe shall be stored in a manner that the pipe will not be deformed as recommended by the manufacturer. PVC pipe is subject to potential degradation when exposed to prolonged periods of sunlight. Material degradation is generally indicated by a discoloration of the pipe. PVC pipe shall be stored inside a building, under a cover or covered up totally. All discolored pipe shall not be installed and shall be immediately removed from the project.

#### 121.4.4 JOINING SYSTEMS:

121.4.4.1 All plastic pipe which is connected to a manhole, junction box, inlet or similar structure shall be installed with an approved manhole connection adapter or water-stop such that each connection is leak-free and that there is no detrimental affect resulting from the material property characteristic differences between the plastic pipe and the structure.

121.4.4.2 BELL AND SPIGOT JOINTS: Pipe with gasket joints shall be manufactured with a socket configuration, which will prevent improper installation of the gasket and will ensure that the gasket remains in place during joining operations. The gasket shall be manufactured from a synthetic elastomer material and shall conform with the requirements of ASTM F477. The spigot end of each joint of pipe shall be marked circumferentially to indicate the proper home mark. Pipe, which is field- cut, shall be chamfered and the home mark identified in accordance with the applicable criteria.

121.4.4.3 HEAT-WELDED JOINTS: HDPE pipe, which is manufactured without the standard bell and spigot joint configuration shall be joined by a heated fusion process in accordance with ASTM D2657.

121.5 MATERIALS AND UTILIZATION:

121.5.1 POLYVINYL CLORIDE (PVC) AND MOLECULAR ORIENTED POLYVINYL CHLORIDE (PVCO) PRESSURE PIPE:

Delete "and PVCO" and "Also, the material in PVCO pipe shall be in accordance with Molecular Oriented and Polyvinyl Chloride." from 121.5.1.1.

121.5.1.1 The material in PVC pipe shall be in accordance with ASTM D1784.

121.5.1.2 Pipe shall be suitable for use in the conveyance of water for human consumption. The pipe shall be marked with two seals of the testing agency that certified the pipe material is suitable for potable water use.

#### Delete "and PVCO" from 121.5.1.3.

121.5.1.3 PVC pipe shall be approved by the Underwriters Laboratories (UL) and be furnished in cast iron pipe-equivalent outside diameters. Joints shall be push-on flexible elastomeric gasketed.

#### Delete (DR 18) from 121.5.1.4.

121.5.1.4 Pressure pipe shall have a minimum working pressure of 150 psi or as specified on the plans or in the Supplemental Technical Specifications.

121.5.1.5 Pipe lengths shall contain one bellend or couple with an elastomeric gasket. Gasket shall meet the requirements of ASTM F477. The bell shall be an integral part of the pipe length and have the same strength and DR as the pipe. The spigot pipe end shall be beveled.

Delete "PVCO pressure pipe in sizes 4-inch through 12 inch shall meet the requirements of AWWA C909" from 121.5.1.6.

121.5.1.6 PVC pressure pipe in sizes 4-inch through 12-inch shall meet the requirements of AWWA C900.

121.5.1.7 PVC pressure pipe in sizes 14-inch through 24-inch shall meet the requirements of AWWA C905.

121.5.2 POLYVINYL CHLORIDE (PVC) GRAVITY FLOW PIPE:

121.5.2.1 The material in PVC pipe shall be in accordance with ASTM D1784.

121.5.2.2 PVC gravity flow pipe may be used for sanitary sewer and storm drainage applications for sizes 8-inch and greater, except for installation resulting in a depth of cover (to subgrade elevation) less than 3.1 feet or when the Contract documents specifically prohibit its use. 121.5.2.3 Lateral line connections shall be made at manholes or at factory manufactured saddles or tees only, unless specifically authorized by the ENGINEER.

121.5.2.4 PVC gravity flow pipe in sizes 8inches through 15-inches shall meet the requirements of ASTM D3034. Only solid wall pipe shall be used. Minimum wall classification shall be SDR 35.

121.5.2.5 PVC gravity flow pipe in sizes 18inch and larger shall meet the requirements of ASTM F679 or ASTM F794. Minimum pipe stiffness shall be 46 psi.

121.5.2.5.1 Sewer service line connections to this pipe will not be permitted, unless specifically authorized in the plans and/or Supplemental Technical Specifications and/or by the ENGINEER.

Delete Section 121.5.3 in its entirety and substitute the following:

# 121.5.3 POLYETHYLENE (PE) PIPE FOR GRAVITY SERVICE ONLY:

121.5.3.1 The material in PE pipe shall be in accordance with ASTM D1248.

121.5.3.2 HIGH DENSITY POLYETHYLENE (HDPE) PROFILE WALL GRAVITY FLOW PIPE:

121.5.3.2.1 High-density polyethylene (HDPE), large diameter, profile wall, gravity flow pipe shall meet all general requirements for plastic pipe and shall conform to requirements in ASTM F894 for diameters of 30-inch and larger.

121.5.3.2.2 Minimum wall thickness in pipe waterway shall be RSC 63. When using ASTM D2412 for determining the strength value of pipe, the E' number (E = modulus of soil reaction) shall not exceed 1500 psi. The pipe manufacturer shall provide certification to the CONTRACTOR and ENGINEER that the class of pipe used is adequate for the specific pipe laying conditions, including, but not limited to, depth of bury, soil characteristics and groundwater conditions.

121.5.3.2.3 Sewer service line connections to this pipe will not be permitted, unless specifically authorized in the plans and/or Supplemental Technical Specifications and/or by the ENGINEER.

121.5.3.2.4 Lateral line connections shall be made at manholes or at factory manufactured tees or saddles only, unless specifically authorized by the Engineer.

121.5.3.3 All water service lines shall be copper per these specifications.

#### Add the following:

#### 121.5.4 HIGH-DENSITY POLYETHYLENE (HDPE) PIPE FOR GRAVITY AND PRESSURE SERVICE:

MATERIALS: Black PE materials 121.5.4.1 used for the manufacture of high-density polyethylene pipe, tube and fittings shall be PE 4710 high density polyethylene meeting ASTM D3350 cell classification 445574C (formerly PE 3408 meeting 345464C per ASTM D3350-02) and shall be listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F. The material shall be listed and approved for potable water in accordance with NSF/ANSI 61. Gray PE material, when used, shall be the same except for meeting ASTM D3350 cell classification 445574E. When requested on the order, the Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

121.5.4.2 HIGH DENSITY POLYETHYLENE PIPE: Polyethylene pipe shall be manufactured in accordance with AWWA C901 for sizes 1 1/4" through 3" IPS diameters and to the requirements of ASTM D3035. Pipe 4" IPS and DIPS sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906. 2" and smaller water service pipe and tubing shall be manufactured in accordance with ASTM D2239 for inside diameter control IPS size or ASTM D2737 for outside diameter control CTS size.

121.5.4.2.1 SERVICE IDENTIFICATION STRIPES FOR IPS SIZED PIPE: IPS pipes shall be black. When requested as an option, IPS pipes shall have four, equally spaced, blue color stripes coextruded into the pipe outside surface. Stripes printed on the pipe outside surface shall not be acceptable.

121.5.4.2.2 SERVICE IDENTIFICATION STRIPES FOR DIPS SIZED PIPE: DIPS sized pipes shall have three equally spaced pairs of longitudinal blue color stripes co-extruded into the pipe outside surface. Stripes printed on the outside surface shall not be acceptable.

121.5.4.2.3 MARKING: Pipe shall be marked in accordance with ASTM F714 and/or AWWA C906. Marking shall indicate the pipe's Pressure Rating (PR) and/or Pressure Class (PC).

121.5.4.2.4 HIGH-DENSITY POLYETHYLENE FITTINGS AND CUSTOM FABRICATIONS: Polyethylene fittings and custom fabrications shall be molded or fabricated by an Approved Manufacturer. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe.

121.5.4.2.5 MOLDED FITTINGS: Molded fittings shall be manufactured and tested in accordance with ASTM D3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

121.5.4.2.6 X-RAY INSPECTION: The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection per project specifications. X-ray inspection procedures shall be used to inspect molded fittings for voids.

121.5.4.2.7 FABRICATED FITTINGS: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.

121.5.4.2.8 HIGH-DENSITY POLYETHYLENE FLANGE ADAPTERS: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations).

121.5.4.2.9 BACK-UP RINGS AND FLANGE BOLTS: Flange adapters shall be fitted with backup rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 3 or higher.

121.5.4.2.10 MJ ADAPTERS: MJ Adapters 4" through 16" may be provided with optional Stainless Steel Stiffener upon request. MJ Adapters 14" and above shall be provided with Heavy Duty Back-up Ring Kits. All MJ adapters 18" and above must be provided with Stainless Steel stiffeners.

121.5.4.2.11 COMPLIANCE TESTS: MANUFACTURER'S INSPECTION AND TESTING OF THE MATERIALS: In case of conflict with Manufacturer's certifications, the Contractor, Project Engineer, or Owner may request retesting by the Manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense, and shall be performed in accordance with these Specifications.

#### 121.5.4.3 JOINING:

121.5.4.3.1 HEAT FUSION JOINING: Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

121.5.4.3.2 BUTT FUSION OF UNLIKE WALL THICKNESS: Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 13.5 to SDR 17, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. SDRs for polyethylene pipe are 7.3, 9, 11, 13.5, 17, 21, 26, 32.5 and 41.

121.5.4.3.3 HEAT FUSION TRAINING: The City will require that the Contractor provide proof of certification for all personnel involved in the heat fusion process. The certification shall be for the type of heat fusion equipment being used for the specific project. The certification shall be provided by the equipment manufacturer for the equipment used for the specific project.

121.5.4.3.4 JOINING BY OTHER MEANS: Highdensity Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining highdensity polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

121.5.4.3.5 ID STIFFENER AND RESTRAINT: A stiffener shall be installed in the bore of the highdensity polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

121.5.4.4 TESTING:

121.5.4.4.1 FUSION QUALITY: The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. The City will require the Contractor to verify field fusion quality by making and testing a trial fusion for pipe sizes 12" and smaller. The trial fusion shall be allowed to cool completely before conducting a Bent Strap Test. The bent test straps shall be cut out and tested in accordance with ASTM F2620. If the bent strap test of the trial fusion fails at the joint, the field fusions

represented by the trial fusion shall be rejected. For pipe sizes greater than 12" the Contractor shall provide field tensile testing of the joint to verify joint integrity. Contractor's personnel shall be certified in the use of all equipment used for performing the field tensile test. Certification shall be by the equipment manufacturer for the specific equipment used for the project. The Contractor, at his expense, shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall remake the rejected fusions.

121.6 MEASUREMENT AND PAYMENT: Plastic pipe used for both pressure and gravity flow shall be measured and paid for at the contract unit pipe as specified in Section 800 and 900 and/or as defined in the Bid Proposal.

## SECTION 205: SUBGRADE PREPARATION

#### 205.1 DESCRIPTION

This work shall consist of preparing and maintaining the upper portion of the embankment, identified as the Subgrade Preparation Area, for subsequent placement of aggregate base materials as per the contract or, if not included in the contract, as per City of Rio Rancho Standard Details.

The following definition is provided for clarity:

1. Subgrade Preparation includes the upper one (1) foot of the subgrade measured from the top of finished subgrade down. Embankment materials placed in this area shall meet the Design R-Value requirements of the contract.

#### 205.2 MATERIALS

#### 205.2.1 Suitable, Unsuitable, Unstable and Borrow Materials

See Section 202.2.1 of these specifications for Material Classifications for suitable, unsuitable, unstable subgrade, and borrow materials in the subgrade preparation area.

#### 205.2.2 Particle Sizes

No materials larger than two and one-half (2-1/2) inches in greatest dimension shall be placed in the subgrade preparation area.

#### 205.2.3 Design R-Value

The top one (1) foot of the finished subgrade shall have a minimum Resistance Value (R-Value), as determined by ASTM D-2844, equal to or greater than the design R-Value for the pavement section as indicated in the contract. On small projects, in areas that involve replacement of existing roadway items or when no design R-Value has been established, this design R-Valve requirement may be waived if authorized by the City Engineer or designee.

#### 205.3 CONSTRUCTION REQUIREMENTS

#### 205.3.1 General

Subgrade preparation shall be performed after completion of earthwork construction, subsurface utility installation, and trenching backfill within the limits specified in the contract, as directed by the City Engineer or designee. The subgrade preparation area shall be loosened by plowing or scarifying so the material is broken and uniformly blended to a depth indicated in the contract or as specified in City of Rio Rancho Standard Details.

Areas on which roadway pavement items are to be placed shall be compacted uniformly to the required subgrade density at the same time. Obtaining the required subgrade density in trench areas at a different time than obtaining the required subgrade density in the adjacent pavement areas shall not be permitted.

Prior to placement of aggregate base course materials, the subgrade shall be proof-rolled with either a pneumatic roller weighing a minimum of 25 tons or a 4000-gallon water tank filled to capacity, and shall exhibit no displacement when proof-rolled. Areas that exhibit displacement are considered unstable subgrade areas.

The Contractor shall protect utilities and structures during construction operations and repair any damage caused by their operations at the Contractor's expense. This may require the Contractor to install temporary protection features. Should any damage occur to these existing features due to the Contractor's operations, the City Engineer or designee may withhold payment until the damage is remediated or require the damaged items to be replaced at the Contractor's expense.

#### 205.3.2 Preparation Extents

Subgrade preparation shall extend to one (1) foot beyond the limits of the improvement to be placed on the subgrade except when that improvement abuts an existing structure and/or the limits of the right-of-way. Where an improvement abuts an existing structure and/or the limits of right-of-way, the subgrade preparation shall extend to the edge of the existing structure and/or the limits of right-of-way, as specified in the plans, specifications, supplemental technical specifications, or as directed by the City Engineer or designee.

Where existing structures are in the right-of-way or construction easements, subgrade preparation shall extend to the face of the structure, as specified above. Subgrade preparation shall not extend below the bottom of the foundation of an existing structure without specific authorization by the City Engineer or designee.

Subgrade preparation for roadway improvements shall extend the full width of the roadway to either one (1) foot beyond new curb and gutter, and/or to the face of existing structures, and or the limits of right-of-way, as specified in the plans and specifications, as directed by the City Engineer or designee.

Subgrade preparation for sidewalks, multi-use trails, and drive pads shall extend a minimum of one (1) foot beyond the free edge of the improvement, and/or to the limits of right-of-way, and/or to the face of existing structures.

Subgrade preparation for roadway construction without curb and gutter, shall extend one (1) foot beyond the edge of the pavement, and/or to the face of existing structures, and/or to the limits of right of way, as specified in the plans and specifications, as authorized by the City Engineer or designee.

Subgrade preparation shall extend the full width of roadway medians four-feet (4') wide or less. In areas that the medians are wider than four (4) feet, the subgrade compaction shall extend one (1) foot beyond the median edge of the pavement or back of the median curb.

#### 205.3.3 Compaction

#### 205.3.3.1 Lift Thickness

The maximum lift thickness of subgrade preparation area material placed is eight (8) inches in loose condition.

#### 205.3.3.2 Density

The subgrade preparation area shall be compacted to 95% of maximum density based on ASTM Designation D 1557.

#### 205.3.3.3 Moisture Content

The moisture content of the subgrade material, at the time of compaction, shall be optimum moisture content plus or minus two (2) percent. Perform plowing or scarifying as required to obtain the proper moisture content.

#### 205.3.4 Testing

Contractor and Agency testing for subgrade preparation and Design R-Value shall be as per the New Mexico Transportation Department Minimum Testing Requirements at:

http://www.dot.state.nm.us/content/dam/nmdot/Construction/INDEPENDENT\_ASSURANCE\_ PROGRAM\_5-29-13.pdf

A sample of each type of soil encountered shall be classified in accordance with the requirements of ASTM Designation 2487, the moisture density relationship determined in accordance with ASTM Designation D-1557, and an estimated resistance Design R-value assigned based on plasticity index (PI) and percent material passing the No. 200 sieve.

The Contractor is required to submit potential borrow sources to the City Engineer or designee at the preconstruction conference to ensure any necessary testing is performed prior to placement of materials on the project. Refer to Section 202.2.1.4, Borrow Material, of these specifications.

In areas where field testing fails, the area must be re-worked or material replaced and a passing test performed before placement of any subsequent materials.

#### 205.3.5 Tolerances

Finish the subgrade surface at any one location to within 0.25 inches above to 0.25 inches below the subgrade elevations shown on the plans before placing any aggregate base materials.

Subgrades upon which pavement, sidewalk, curb and gutter, drive pads, or other structures are to be placed shall not vary more than  $\pm 0.25$  inches per 10 feet in any direction from the specified grade and cross section. Subgrades upon which base material is to be placed shall not vary more than  $\pm 0.25$  inches per 20 feet in any direction from the specified grade and cross section.

#### 205.3.6 Subgrade Maintenance

Upon completion of subgrade preparation, the Contractor shall maintain the compacted subgrade density and moisture content at the specified levels until aggregate base material is placed. The Contractor shall provide continuous moisture protection of the subgrade by either sprinkling water or by the application of a prime coat, as directed by the City Engineer or designee. For projects with state or federal funding, the only method allowed will be the application of a prime coat.

#### 205.4 METHOD OF MEASUREMENT

Measurement for payment of subgrade preparation will be by the square yard to the limits required, as authorized by the City Engineer or designee.

#### 205.5 BASIS OF PAYMENT

Pay ItemPay UnitSubgrade PreparationSquare Yard

When the contract includes an item for Subgrade Preparation, payment shall be considered allinclusive of costs of the work including: loosening, blending and compacting the material, replacing any unsuitable or unstable material with suitable material, and maintaining the prepared subgrade moisture and density until aggregate base material is placed.

No additional payment will be made for rehandling or reworking material to meet moisture and density requirements.

No additional payment will be made for any excavation or borrow materials associated with subgrade preparation work.

When the contract does not include an item for Subgrade Preparation, all the costs associated with preparing the subgrade shall be considered as included in the price paid for other items of work and no additional compensation will be allowed therefor.

## SECTION 310: BASE COURSE

#### 310.1 DESCRIPTION

This work shall consist of providing, hauling, spreading, compacting and finishing base course in conformance with the Contract, plan set and City Standard Drawings or as directed by the City Engineer or designee.

#### 310.2 MATERIALS

#### 310.2.1 General

Base Course shall consist of crushed stone, crushed or screened gravel, caliche, sand, reclaimed asphalt pavement (RAP), or a combination of such materials. Use of glass aggregate in base course will require written approval by the City Engineer or designee and shall be considered on a case by case basis. Base course shall be free from organic matter or other deleterious materials, including silt and clay balls.

The aggregate materials shall be combined in such proportions that the resulting composite blend meets the requirements of Table 310.2.1:1, "Base Course Gradation" unless otherwise specified.

Table 310.2.1:1			
Base Course Gradation			
Sieve Size	% Passing		
1 in	100		
3/4 in	80 - 100		
No. 4	30 – 60		
No. 10	20 – 45		
No. 200	3.0 - 10.0		

At least 50% of the Materials retained on the No. 4 sieve shall have at least two (2) Fractured Faces (FF) when evaluated by NMDOT Method FF-1, Fractured Face Determination for Course Aggregate. Base course shall have a maximum Aggregate Index (AI) of 35, a maximum Liquid Limit (LL) of 25, and a maximum Plasticity Index (PI) of 6. The aggregate index shall be determined in accordance with Section 910, "Aggregate Index" of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

#### 310.2.2 Aggregate Acceptance

Aggregate source acceptance will be based on certification of material conformance to the requirements of Section 310.2.1 above.

A Base Course Certification Letter shall be submitted by the Contractor to the City Engineer or designee at a minimum of five (5) working days prior to the beginning of base course placement operations. The Base Course Certification Letter shall be signed, dated and stamped by a Professional Engineer licensed in the State of New Mexico certifying conformance to the specifications and shall be dated within one (1) year of material use on the project. The Base Course certification Letter must

reference conformance of the aggregate material source and aggregate combination to the specification requirements as listed in Section 310.2.1 above and shall include a copy of all associated test results. All acceptance testing of materials shall be performed by an AASHTO Materials Reference Laboratory (AMRL) or NMDOT accredited testing laboratory.

Submittal of a current approved base course aggregate material source by the NMDOT may substitute for the above.

Failure to provide a current Base Course Certification Letter dated within one (1) year of material use on the project prior to the Contractor's placement of any base course material on the project may result in removal and replacement of placed material with material conforming to specification requirements at the Contractor's own expense.

#### **310.3 CONSTRUCTION REQUIREMENTS**

#### 310.3.1 Preparation of Subgrade

The subgrade upon which the base course is to be placed shall be prepared in accordance with Section 207, "Subgrade Preparation" of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition, and shall conform to the line, grade, cross section and density requirements of the plans or City Standard Details. The subgrade shall be cleaned of all loose and deleterious material.

Prime Coat shall be applied to the base course surface in conformance with Section 420, "Prime Coat" of these Standard Specifications or as directed by the City Engineer or designee.

#### 310.3.2 Mixing and Placing

Base Course Material shall be mixed to a homogenous mixture. The Contractor shall spread and place base course in lifts not exceeding 6 inches (compacted) unless otherwise directed by the City Engineer or designee. Base course shall not be placed on frozen subgrade. Density requirements shall be determined in accordance with AASHTO T 180 Method D (ASTM D 1557).

Base course shall be compacted to not less than 95% of maximum density or as otherwise specified in the plans, City Standard Drawings or as directed by the City Engineer or designee. Field density tests shall be taken at random locations or at locations shown in the Contractor's quality control plan if required. Densities shall be determined using nuclear testing methods in accordance with AASHTO T 238 and T 239. Moisture content in the base course shall be plus or minus two (2) percent of optimum moisture. Nuclear moisture contents shall be corrected for residual hydrocarbons before computing inplace dry densities when using RAP.

#### 310.3.3 Surface Tolerance

The final surface of base course shall not deviate in excess of ½ inch in ten (10) feet when measured with a ten (10) foot straight edge. All deviations from this tolerance shall be corrected by the Contractor at no additional cost to the City.

#### 310.3.4 Plan Base Course Depths

The Contractor shall monitor and record compacted base course depths during the placement operation. Measurements shall be taken at randomly selected locations. The depth shall be determined

by removing all of the in-place compacted Material, placing a straight edge tool across the hole, measuring the depth to the nearest 1/4 inch using a measuring tape, and then replacing and recompacting the removed material. The depth checks shall be submitted to the City Engineer or designee on a weekly basis. The placement depth of base course shall be in accordance with the plans or City Standard Drawings. There shall be no deviation in depth greater than minus one half (1/2) inch when paid by the square yard. There shall be no deviation in depth greater than plus or minus (+/-) one half (1/2) inch when paid by the ton or cubic yard. If the placement thickness does not meet requirements, the contractor shall correct the thickness deficiency and recompact the surface at no additional cost to the City.

#### 310.3.5 Sampling and Testing

#### 310.3.5.1 Contractor Quality Control

The Contractor is responsible for the quality of materials and construction. The City reserves the right to obtain samples of any portion of any material at any point of the operation for the City's use. The Contractor shall administer a Quality Control Plan to provide and place base course in accordance with the City's Standard Specifications, Standard Details, Plans, and Contract unless otherwise specified by the City Engineer or designee. The Quality Control Plan shall be provided in accordance with Section 423.3.6.1, "Contractor Quality Control" and Section 901.2, "Contractor Quality Control" of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition. Any reference to "Project Manager" or "District Laboratory Supervisor" shall be substituted with the words, "City Engineer or designee."

Quality Control sampling, testing and inspection shall be performed by the Contractor in accordance with Table 310.3.5.1:1, "Minimum Process Control Guidelines for Base Course."

Minimum Process Control Guidelines for Base Course				
Item	Property	<b>Testing Frequency</b>	Test Method	
	Gradation		AASHTO T 11, 27, 146	
Aggregate	Fractured Faces	1 per 1000 Ton	NMDOT Method FF 1	
For	Sand Equivalent		AASHTO T 176	
Base Course	Aggregate Index	1 per source	Per Section 910, NMDOT	
			Std Specs, current	
			Edition	
	Moisture Content	As needed to control	AASHTO T255	
		operations		
	Moisture Content		AASHTO T255	
Base Course	Density	1 per 300 Ton	AASHTO T180	
	Gradation		AASHTO T 11,27	
	Depth	1 per 300 Ton	Section 310.3.4 above	

# Table 310.3.5.1:1
#### 310.3.6 Acceptance

Quality acceptance sampling, testing and inspection of base course shall be performed by the City or a City representative at the direction of the City Engineer or designee unless otherwise specified and shall conform to the requirements of Table 310.3.6:1, "Minimum Acceptance Testing Tolerances for Base Course."

The City may base acceptance of base course on submitted Contractor test results conforming to the acceptance requirements of this Section for development or subdivision work.

The Contractor shall control base course operations such that the tolerances of Table 310.3.6:1 are met.

Table 310.3.6:1

	Minimum Accept	tance Testing Toleran	ces for Base Cours	e		
Property	Point of	<b>Testing Frequency</b>	Tolerance	Test Method		
_	Acceptance	(minimum of)				
Sampling	As Specified			AASHTO T 2, 248		
Gradation	Processed	1 per 300 Ton	Table 310.2.1:1	AASHTO T 11, 27		
	Material from	1 per 1500 SY				
	Roadway	1 per Street or Site				
		2 per Day				
FF, LL*, PI*	Process Material	1 per 300 Ton	Section 310.2.1	NMDOT Method FF1		
	from Roadway	1 per 1500 SY		AASHTO T 176		
Density	Roadway After	1 per 500 Ton	95% of	AASHTO T 180		
	Compaction	1 per 2400 SY	Maximum	AASHTO T 238, 239		
		1 per Street or Site				
		2 per Day				
Depth	Roadway After	3 per 1000LF per	Target Value	Section 310.3.4		
	Compaction	lane	+/- ½ inch			
		3 per 1300 SY				
		3 per Street or Site				
Surface	Roadway After	Continuous over	Target Value	Section 310.3.3		
Tolerance	Compaction	Surface	+/- ½ inch			

\*If the percent passing the No. 10 sieve is less than 10% of AASHTO T-27 test procedure, this test does not need to be performed.

Acceptance Testing shall be performed by an independent Testing Laboratory obtained by the Contractor or as designated by the City Engineer or designee. Test results shall be submitted to the City Engineer or designee and the Contractor within two working days of taking the test or sample.

#### 310.4 METHOD OF MEASUREMENT -

Base course will be measured by the square yard, ton or cubic yard.

When base course is to be measured by the square yard, the average width of base course will be used in computing quantities. The length used in computing the area shall be station to station along the centerline of the roadway. All dimensions shall be as shown on the typical section of the plans or City Standard Drawings.

When base course is to be measured by the ton, the City will deduct the weight of moisture that exceeds the optimum moisture content plus 2%.

Base course testing by the Contractor will be measured by the lump sum.

#### 310.5 BASIS OF PAYMENT

Pay Item Base Course Base Course \_\_\_\_\_in Depth Base Course Testing by the Contractor Lump Sum Pay Unit Ton or Cubic Yard Square Yard

## SECTION 405: HOT-MIX ASPHALT (HMA) MATERIAL

#### 405.1 DESCRIPTION

This work shall consist of providing, mixing, applying, and producing hot-mix asphalt (HMA) and HMA Materials including bituminous materials, hydrated lime or anhydrite based material.

#### 405.2 MATERIALS

#### 405.2.1 General

HMA shall be composed of a mixture of asphalt binder, aggregate, blending sand, mineral filler, and hydrated lime or anhydrated based material. The Contractor shall size, uniformly grade, and combine aggregate fractions in accordance with the Contract. All Materials shall be tested in accordance with applicable AASHTO methods, as modified by the City (if applicable) or other test procedures as directed by the City Engineer or designee. The City Engineer shall decide all questions pertaining to the interpretation of test procedures.

## 405.2.2 Aggregate

The Contract or City Standard Details will specify the type of HMA the Contractor is to use. Aggregate gradation, quality and fractured face requirements shall be based on the HMA type specified.

## 405.2.2.1 Aggregate Gradation Requirements

The aggregate gradation of the HMA mixture shall meet the requirements of Table 405.2.2.1:1, "HMA Aggregate Gradation Requirements." The City Engineer or designee may require, at no additional cost to the City, wet preparation, per AASHTO T 146, Method A, if the City Engineer or designee believes there are Deleterious Materials present in the aggregate stockpiles before aggregate gradation testing. The City will allow the Contractor to combine Materials from two or more sources to produce aggregate only when each individual aggregate source meets all applicable quality requirements.

Aggregate Gr	adation Requi	rements									
	% Passing per HMA Type										
SP	-111	SP-IV									
Min	Max	Min	Max								
100											
90	100	100									
-	90	90	100								
-	-	-	90								
23	49	28	58								
2.0	8.0	2.0	10.0								
	Aggregate Gra SP Min 100 90 - - 23 23 2 0	Aggregate Gradation Require     % Passing per     SP-III     Min   Max     100   100     90   100     -   90     -   -     23   49     20   8.0	Aggregate Gradation Requirements   % Passing per HMA Type   SP-III SP   Min Max Min   100 100 100   90 100 100   - - -   23 49 28   20 8.0 2.0								

## Table 405.2.2.1:1

#### 405.2.2.2

#### **Aggregate Quality and Fractured Faces**

Aggregate Quality and Fractured Faces shall meet the requirements of Section 423.2.2.1.1 Aggregate Quality and Section 423.2.2.1.2 Fractured Faces of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

### 405.2.2.3 Production

When producing aggregates for HMA, natural fines shall be removed by screening and the aggregate shall be stockpiled separately. The Contractor shall use the No. 4 sieve as a minimum or larger screen if needed to properly control the crushing and screening operation. The Material retained on the scalping screen shall be crushed and separated into at least two stockpiles of fine and coarse aggregates. Crushing operations shall be regulated to produce Material within the specified gradation band.

### 405.2.2.4 Stockpiling

Stockpiles shall be constructed upon prepared sites and when completed shall be neat and regular in shape. Stockpiles shall be constructed to prevent segregation of the aggregate.

Sufficient storage space shall be provided for each size of aggregate stockpile. Stockpiles shall be spaced far enough apart, or separated by suitable walls or partitions, to prevent the mixing of the aggregate. The different aggregate sizes shall be kept separated until they have been delivered to the cold feed system feeding the drier.

The Contractor shall prevent foreign matter from contaminating the stockpiles and shall store stockpiles away from vehicular and Equipment traffic. The storage yard shall be maintained neat and orderly and the separate stockpiles shall be readily accessible for sampling.

## 405.2.2.5 Combining

When the crushed materials from the stockpiles are combined, the product of such combination shall meet the gradation requirements. Controlled feeders from each stockpile shall be used to blend the materials.

#### 405.2.3 Asphalt Binder

The Contract or applicable sections of these Standard Specifications will specify the type and grade of asphalt binder.

Asphalt binder shall meet the requirements of Section 402, "Asphalt Materials, Hydrated Lime, and Anhydrite Based Material," of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

The asphalt binder source to be used shall not be changed without the written approval of the City Engineer or designee.

## 405.2.4 Hydrated Lime or Anhydrite Based Material

Hydrated lime or anhydrite based material shall be provided in accordance with Section 402, "Asphalt Materials, Hydrated Lime, and Anhydrite Based Material," of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

#### 405.2.5 Blending Sand

Blending sand shall be provided in accordance with Section 423.2.5, "Blending Sand," of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

#### 405.2.6 Mineral Filler

Mineral filler shall be provided in accordance with Section 423.2.6, "Mineral Filler," of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

The Contractor shall not use fly ash as mineral filler for HMA.

### 405.2.7 Mix Design

An Asphalt Certification Letter shall be provided by the Contractor to the City Engineer or designee at a minimum five (5) working days prior to the beginning of HMA paving operations. The Asphalt Certification Letter must reference an approved and current HMA mix design from the NMDOT. The Asphalt Certification Letter must clearly identify the NMDOT State Materials Laboratory mix design number and NMDOT lab number.

The HMA mix design and mix design adjustment shall be provided in accordance with Section 423.2.8, "Mix Design," of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

City concurrence of a mix design will not relieve the Contractor of full responsibility for producing an acceptable mixture.

The City Engineer will require at least 1.0% hydrated lime or anhydrite based material in all mix designs.

If tests indicate the need for additives or modifiers not specified in the Contract or a change in source of binder to satisfy mix design requirements, the Contractor will perform the required changes at no additional cost to the City.

#### 405.2.8 Job Mix Formula

Job Mix Formula and Job mix Formula Adjustment shall be provided in accordance with Section 423.2.9, "Job Mix Formula," and all associated sub-sections of the NMDOT Standard Specifications for Highway and Bridge Construction, current edition.

#### 405.3 CONSTRUCTION REQUIREMENTS

#### 405.3.1 General

Materials shall be mixed, applied, or incorporated in the work in accordance with the requirements of the Contract, applicable sections of the specifications, or City Standard Details. The Contractor shall submit the name and address of the Material Supplier to the City Engineer or designee.

Representative samples of each grade or classification of asphalt Materials to be furnished shall be submitted for testing, when required by the City Engineer or designee. Asphalt Materials shall be mixed and applied within the approved temperature range.

The Contractor shall not make changes to the asphalt crude stock source, asphalt manufacture method, or the asphalt Supplier without written approval from the City Engineer or designee.

#### 405.4 METHOD OF MEASUREMENT

Aggregate, blending sand, and mineral filler shall be considered incidental to HMA as provided in applicable sections of the specifications and no separate measurement or payment will be made.

Asphalt Materials, hydrated lime, and anhydrite based material will be measured and paid for by the Ton or as described in applicable sections of the specifications.

If asphalt Materials are not stored in tanks for exclusive use on the project, the City will determine the acceptable quantity of *Asphalt Material*, per lot, based on the following equation:

 $Q = T \times X$ 

where

Q = quantity of Asphalt Material (in tons)

T = quantity of placed and accepted asphalt pavement (in tons)

X = the average percent asphalt content in the asphalt pavement (per lot)

#### 405.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Asphalt Material	Ton
Hydrated Lime	Ton
Anhydrite Based Material	Ton

These Standards amend or supplement the American Public Works Association New Mexico Chapter (NMAPWA) Current Edition as indicated below in red. All sections, which are not so amended or supplemented, remain in full force and effect.

801.1 GENERAL: The water facilities and materials, specified herein, are associated with water transmission, collector an1d distribution lines.

- 801.2 REFERENCES:
- 801.2.1 American Water Works Association (AWWA) (Latest Edition):
- C110 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
- C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines -Enamel and Tape-Hot-Applied
- C206 Field Welding of Steel Water Pipe C207 Steel Pipe Flanges for Waterworks Service-Sizes 4 in. through 144 in. C502 Dry Barrel Fire Hydrants
- C207 Steel Pipe Flanges for Waterworks Service - Sizes 4 in. through 144 in.
- C502 Dry Barrel Fire Hydrants
- C504 Rubber-Seated Butterfly Valves
- C509 Resilient-Seated Gate Valves for Water and Sewerage Systems
- C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

C651 Disinfecting Water Mains

C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution C905 Polyvinyl Chloride (PVC) Water Transmission Pipe Nominal Diameter 14 in. through 36 in.

#### Add the following:

- C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.
- C909 Molecular Oriented Polyvinyl Chloride (PVCO), Pressure Pipe 4"-12" for water distribution.
- M9 Concrete Pressure Pipe
- M23 PVC Pipe-Design and Installation
- 801.2.2 THIS PUBLICATION:
- SECTION 121 PLASTIC PIPE
- SECTION 127 STEEL WATER PIPE
- SECTION 128 CONCRETE CYLINDER PIPE
- SECTION 129 DUCTILE IRON PIPE
- SECTION 130 GRAY IRON AND DUCTILE IRON FITTINGS
- SECTION 340 PORTLAND CEMENT CONCRETE CURBS, GUTTERS, WALKS, DRIVEWAYS, ALLEY INTERSECTIONS, SLOPE PAVING, AND MEDIAN PAVING
- SECTION 343 REMOVAL AND DISPOSAL OF EXISTING PAVEMENT, CURBS, GUTTERS, SIDEWALKS, AND DRIVEPADS
- SECTION 701 TRENCHING, EXCAVATION AND BACKFILL
- SECTION 1502 SUBMITTALS
- 801.3 MATERIALS:

### 801.3.1 GENERAL:

801.3.1.1 The CONTRACTOR shall submit certification from the manufacturer of the pipe as specified in Section 1502 as to the pipe material and that the pipe meets or exceeds the required testing. Only pipe manufactured in the United States of America will be acceptable.

801.3.1.2 Main line pipe and fittings shall be as specified in the Reference Section in this publication as listed above or as specified in the Supplemental Technical Specifications and/or as authorized by the ENGINEER.

801.3.2 PIPE:

Delete size reference 4" thru 20" in table from 801.3.2.2 and substitute the following:

Add the following in the table for 801.3.2.2:

801.3.2.2 Limitations of pipe materials versus pipe sizes will be as follows, unless otherwise specified on the plans or Supplemental Technical Specifications:

Pipe Type	<u>Sizes</u>
Ductile Iron	3" thru 64"
Concrete Cylinder (AWWA C303)	16" and larger
Plastic (PVC)	4" thru 24"
Welded Steel Pipe (AWWA 200)	16" and larger
Fusible PVC	4" thru 24"
Polyethylene (HDPE)	4" thru 24"

801.3.2.3 The type of pipe used shall be approved by the ENGINEER. Steel pipe will be used only where specified on the drawings. All pipe shall be of domestic manufacture and origin. Unless otherwise approved by the ENGINEER, all pipe installed shall be identical from valve to valve.

## Add the following:

801.3.2.4 Fusible PVC and fusible HDPE may be used when approved by the City of Rio Rancho Project Manager or City of Rio Rancho Utility Department. The Design Engineer shall be responsible for providing appropriate details and specifications when these materials are used.

801.3.3 GATE VALVES:

801.3.3.1 Gate valves shall only be used for pipe sizes of 12 inches and smaller, unless otherwise noted on the plans or in the Supplemental Technical Specifications.

801.3.3.2 Resilient seat gate valve shall be used f and shall conform to AWWA C509. The gate valve shall be a non-rising stem type with inside screw and "O" ring seals. The valve shall have a standard hub which opens counterclockwise. Type valve ends shall be mechanical joints, unless otherwise specified on the plans. "O" ring retainer shall be secured with nuts and bolts.

801.3.3.3 The resilient seat shall be mechanically retained or bonded on the valve gate (wedge disc).

All brass or bronze parts used on gate valves shall comply with AWWA C509.

801.3.3.5 The outside of the valve body shall be painted with coal tar enamel or corrosion-resistant coating. The inside shall be protected with corrosion resistant coating, approved for potable water.

801.3.3.6 The valve stem shall comply with AWWA C509. The material for the valve stem shall be brass or bronze, and shall have a minimum yield strength of 20,000 psi and minimum tensile strength of 60,000 psi.

801.3.3.7 Gate valves shall have a 2 inch square operating hub nut. Gate valves in vaults with valve covers at ground level shall have a hand wheel with the 2" nut welded to the center.

801.3.3.8 Maximum input torque to open and/or close the valve shall be 200 foot pounds for a 4-inch valve and 300 foot pounds for 6-inch under a working pressure of 200 psi.

801.3.3.9 No Project will be accepted by the OWNER until all valves are operational and accessible.

Delete ", as shown on pages 801-5 and 8/01-6" from 801.3.3.10 and substitute the following:

801.3.3.10 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card" as provided by the City of Rio Rancho Project Manager or City of Rio Rancho Utility Department. The ENGINEER shall forward the card to OWNER.

801.3.4 RUBBER SEATED BUTTERFLY VALVES:

801.3.4.1 Butterfly valves will be used for sizes of 14 inches and larger, and shall comply to AWWA C504.

801.3.4.2 Only short body, Class 150B valves are acceptable. Wafer type valves are not acceptable. Valve ends may be either mechanical joint or flanged.

801.3.4.3 The rubber seat shall be field replaceable on valve sizes 24 inches and larger. The rubber seat may be mechanically retained or bonded on the disc or valve body.

Delete "3" from 801.3.4.4 and substitute the following:

801.3.4.4 Butterfly valves shall have a 2 inch square operating hub nut. Butterfly valves in vaults with valve covers at ground level shall have a hand wheel with the 3" nut welded to the center.

801.3.4.5 The valve shaft and disc shall be installed horizontally. The valve disc shall pivot and rotate on the horizontal axis.

801.3.4.6 The maximum input torque to open and/or close the valve shall not exceed 150 foot pounds under a minimum working pressure of 150 psi, and the butterfly operator shall be compatible with this pressure. Maximum operating torques shall be in accordance with AWWA C504, Table 1, Class 150B. The manufacturer of the valve shall be responsible for the operator.

801.3.4.7 No project will be accepted by the OWNER until all valves are operational and accessible.

Delete ", as shown on pages 801-5 and 8/01-6" from 801.3.4.8 and substitute the following:

801.3.4.8 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card," as provided by the City of Rio Rancho Project Manager or City of Rio Rancho Utility Department. The ENGINEER shall forward the card to the OWNER.

Delete Section 801.3.5 in its entirety and substitute the following:

801.3.5 VALVE BOXES: Valve boxes shall consist of Polyvinyl Chloride (PVC) C900 and a valve box. No joints shall be allowed in the PVC pipe. The pipe shall be centered and placed true to vertical around the axis of the operating nut. Valve boxes, covers, and lids for potable water shall be as shown in City of Rio Rancho DWG. NO. W-04.

801.3.6 COMBINATION AIR AND VACUUM VALVES: Air and vacuum valves shall be the type and size shown on the plans.

801.3.7 FIRE HYDRANTS:

Fire hydrants and their extensions 801.3.7.1 shall be in accordance with AWWA C502, traffic type. Fire hydrants shall have one 5 1/4 inch diameter valve opening; 6 inch mechanical joint inlet connection; two 2-1/2 inch hose nozzle connections; and one 4 1/2-inch steamer nozzle with National Standard Fire Hose Coupling Screw Threads. Fire hydrants shall have a bronze or cast iron, pentagon, operating nut, be designed for 150 psi working pressure service, and have a normal bury of 4 to 4 1/2 feet unless field conditions require a deeper bury, in which case extensions will be used so as to bring the bottom of the break-off flange 2 to 8 inches above the top of finish grade.

801.3.7.2 The pipe fittings and fire hydrants starting at the street main and ending at the fire hydrant itself shall be lying in a line perpendicular to the street's centerline or radially on a curvilinear installation. Fire hydrants shall have no more than 1/2-inch variation from a vertical line between the breakaway flange and the top of the fire hydrant.

## Delete Section 801.3.7.3 in its entirety

801.3.7.4 Hydrants shall be dry barrel, posttype with compression main valve closing with pressure. They shall have a field lubrication capability. Hydrants shall have a bronze seat ring threaded into a bronze drain ring or bronze or cast iron bushing.

801.3.7.5 Exterior of hydrant, below the ground line, shall be coated with asphalt varnish, and the exterior painted from the top to a point one foot below the ground level flange, consisting of one coat rust inhibitive primer and one coat "chrome yellow" enamel. The bonnet shall then be painted with a reflectorized paint using a color as close to "chrome yellow" as possible.

801.3.7.6 The bottom plate of the main valve shall be epoxy coated. The shoe of the fire hydrant shall have a 6-inch mechanical joint connection and the inside shall be epoxy coated to prevent corrosion. The nozzle shall be threaded in place and retained by stainless steel locks. Hydrant body shall be threaded to receive the threaded nozzle. Nozzle shall be secured by a stainless steel locking device.

801.3.7.7 Fire hydrant shall contain two drain outlets. The drain outlets shall be constructed of bronze. Hydrant shall be provided with a pentagon operating nut to open counter clockwise and shall have an anti-friction washer between the hold-down nut and the operating nut.

801.3.7.8 To prevent loss of brass operating nuts due to theft or vandalism, the following shall be included in or on the fire hydrant:

801.3.7.8.1 Attach OWNER approved anti-theft device to the hydrant; or

801.3.7.8.2 The bonnet must be removed in order to remove the operating nut; or

801.3.7.8.3 Use a cast iron operating nut.

801.3.7.9 Fire hydrants shall be installed at locations as shown on construction plans and in accordance with Standard Detail Drawings.

801.3.7.10 Fire hydrants shall be properly restrained in accordance with Section 130. If mechanical restraint is used, each joint on the hydrant leg shall also be restrained.

801.3.8 PRESSURE REDUCING VALVE (PRV): Pressure reducing valve shall be a globe pattern, flanged end, Pressure Class 125. Submittals for approval shall be made to the ENGINEER and approval must be received before installation. The following items are required in the PRV:

801.3.8.1 MATERIALS:

801.3.8.1.1 Main valve-cast iron with brass trim.

801.3.8.2 PILOT CONTROL SYSTEM:

801.3.8.2.1 Adjustment from 15 psi to 75 psi.

801.3.8.2.2 Shut-off cock on all pilot control system lines.

801.3.8.2.3 Inlet flow strainer.

- 801.3.8.2.4 Closing speed control.
- 801.3.8.2.5 Opening speed control.
- 801.3.8.2.6 Flow stabilizer.

801.3.8.2.7 Tubing shall be copper.

801.3.8.3 Installation shall be as per the construction plans. ENGINEER shall determine final settings on PRV.

801.3.8.4 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a "Water Valve Data Card". The ENGINEER will forward the card to the OWNER.

801.3.9 TAPPING SLEEVES: (For other than Concrete Cylinder Pipe) For either taps greater than 2/3 line size, or size on size taps 12 inches or less, only approved, long body, fully gasketed tapping sleeves shall be allowed. During installation of the tapping sleeve, the pipe shall be fully supported to support the weight of the tapping sleeve and tapping machine.

801.3.9.1 Tapping sleeves of heavy welded steel bodies shall meet the following requirements:

801.3.9.1.1 Epoxy coated.

801.3.9.1.2 Bolts and nuts to be stainless steel.

801.3.9.1.3 Gaskets to be Buna-N rubber.

801.3.9.1.4 Flange to be flat face steel and comply with AWWA C207.

801.3.9.1.5 Class DANSI 150 lbs. drilling.

801.3.9.1.6 Designed to sustain an operating pressure of 150 psi.

801.3.9.1.7 May be used on all water mains, 4" and larger.

801.3.9.2 Tapping sleeves of cast iron bodies shall meet the following requirements:

801.3.9.2.1 Mechanical joint type with a working pressure of 200 psi.

801.3.9.2.2 Outlet flange to be Class 125, ANSI B16.1.

801.3.9.2.3 Sleeves to include side and end gaskets of Buna-N rubber.

801.3.9.2.4 Eight high strength steel bolts and nuts to secure the halves of the sleeve to the pipe.

801.3.9.2.5 May be used on all water mains, 4" and larger.

801.3.9.3 Tapping sleeves of short sleeve cast iron shall meet the following requirements:

801.3.9.3.1 Working pressure of 150 psi.

801.3.9.3.2 Outlet flange to be Class 125, ANSI B16.1.

801.3.9.3.3 Outlet half to have an enclosed gasket in a groove for a pressure seal.

801.3.9.3.4 Four high strength steel bolts to secure halves of tapping sleeve to the pipe.

801.3.9.3.5 May be used on all water mains, 4" and larger.

Delete ", as shown on pages 801-5 and 8/01-6" from 801.4 and substitute the following:

801.4 WATER VALVE DATA CARD: Water Valve Data Card, as provided by the City of Rio Rancho Project Manager or City of Rio Rancho Utility Department shall be prepared for all types of valves (Gate Valves, Butterfly Valves, Pressure Reducing Valves, Air Release Valves, etc.) according to the following instructions.

801.4.1 A Water Valve Data Card will be prepared for each valve installed.

801.4.2 The Valve Number will be assigned by the OWNER at a later date.

801.4.3 Valve Size is the nominal diameter of the valve, i.e., 6-inch, 14-inch or 48-inch. In the case of compound valves give size of main valve and bypass valve, i.e., 24-inch and 4-inch, or 36-inch and 6-inch.

801.4.4 Valve Type is the general description of the valve, such as: Resilient-Seal Gate Valve, Butterfly Valve, Globe Valve, Check Valve, etc.

801.4.5 Make and Model refers to the manufacturer, make and model number to identify the valve for replacement parts. This information should be available from the shop drawings.

801.4.6 Number of Turns and Direction to Open is the number of revolutions of the operating nut to make the valve travel from fully closed to fully open, and the direction is either clockwise or counterclockwise, i.e., 54 turns counterclockwise. All standard valves shall open counterclockwise. Operation, turn count, and direction to open will be verified by the ENGINEER prior to installation.

801.4.7 Under Project Name is the assigned work order number.

801.4.8 Date Warranty Expires is the expiration date, under the contract, for requiring warranty repairs.

801.4.9 STREET LOCATION: Give both Block number and street name. For valves in intersections give both streets, i.e., 5200 San Mateo Blvd. NE and 3000 Candelaria NE.

801.4.10 The section on coordinate location shall be completed with information furnished by the ENGINEER.

801.4.11 All applicable items on the "Water Valve Data Card" should be filled in. However, accuracy is more unknown and cannot be determined, leave the space blank.

801.4.12 Depth to "Operator" is vertical distance from the top of actual valve operating nut to top of valve box cover.

Delete ", as shown on page 801-8" from 801.5 and substitute the following:

801.5 FIRE HYDRANT DATA CARD: Fire Hydrant Data Card, as provided by the City of Rio Rancho Project Manager or City of Rio Rancho Litility Department shall be prepared for

Rancho Utility Department shall be prepared for all installations of fire hydrants, according to the following instructions. 801.5.1 Fire hydrant number will be assigned by the OWNER at a later date.

801.5.2 Fire hydrant type refers to the manufacturer's make and model.

801.5.3 LOCATION: Indicate both block number and street name. At intersections indicate both street names.

801.5.4 DATE INSTALLED: Indicate actual date the hydrant was installed.

801.5.5 DEPTH: Indicate the actual depth in feet of the lower barrel of the fire hydrant. This depth is measured from the shoe to the break-away flanges of the hydrant.

801.5.6 On the reverse side of the card indicate the location of fire hydrant on the sketch.

801.6 WATER LINE CONNECTIONS:

801.6.1 GENERAL: All new water line tie-ins to the existing water system shall be directly inspected and approved by the ENGINEER. This includes non-pressurized or pressurized connections that will result in extension of the existing system.

801.7 LOCATIONS OF WATER MAINS AND SEWER LINES:

801.7.1 Unless otherwise authorized by the ENGINEER, parallel water and sewer lines shall be installed at least 10 feet apart horizontally, and the water line shall be at a higher elevation than the sewer. Separate trenches will be required in all cases (this shall be effective even though one line has been installed prior to the other), and the water line shall be at least 18 inches above the sewer; when water and sewer lines cross each other, the water line shall be at least 18 inches above the sewer; otherwise the sewer shall be of pressure class pipe extending between manholes, or concrete encased for 10 feet on each side of the water line as shown in the Standard Detail Drawings. The crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

801.7.2 Water mains shall not be constructed under walkways, sidewalks, curbs and gutters, drivepads, or similar concrete structures by tunneling underneath them. Trenchless technologies may be allowed with prior approval by the OWNER. The CONTRACTOR will cut these structures by using a concrete saw or, at his option, he may remove and replace the section of the concrete structure to the nearest full expansion joint or edge.

## 801.8 TRENCHING AND BACKFILLING:

## Delete Subsection 801.8.1 in its entirety and substitute the following:

801.8.1 All trenching and backfilling shall be in full accordance with Section 701. The minimum cover over distribution lines shall be 4 feet, and 5 feet of cover over transmission and collector lines.

801.9 GENERAL INSTALLATION ITEMS:

801.9.1 Trenching, bedding, and backfilling shall comply with the requirements set forth in Section 701.

801.9.2 Pipe and accessories shall be new and unused and shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. No other pipe or material of any kind shall be placed inside of a pipe or fitting after the coating has been applied.

801.9.3 The interior of the pipe shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during operations by plugging or other approved methods. When work is not in progress, open ends of pipes and fittings shall be securely closed so that no other substances will enter the pipes or fittings. Any section of the pipe found to be defective before or after laying shall be replaced with sound pipe without additional expense to the OWNER. 801.9.4 All nuts and bolts utilized in underground pipe connections shall be stainless steel, high strength cast iron or high grade, high strength steel. The full length of each section of pipe shall rest solidly upon the bed, with recesses excavated to accommodate bells and joints. Any pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipes shall not be laid in water or when trench or weather conditions are unsuitable for the work except by as authorized by the ENGINEER. All unconnected ends of pipes shall have a valve, plug, or cap installed on it.

801.9.5 Pipe shall be laid to line and/or grade shown on the plans or as staked in the field. Changes in horizontal or vertical alignment of the pipe at a joint shall not exceed the manufacturer's recommended deflection for the type and size pipe being laid. When the change required is more than the recommended deflection, a fitting or several short joints of pipe shall be used. PVC pipe may not be deflected at the joints.

801.9.6 When new pipe is to be connected to an existing pipe or when crossing an existing pipe line, the CONTRACTOR shall excavate the existing lines well in advance of the laying of the new pipe line to enable the ENGINEER to verify their elevation and placement and to make any changes in grade and/or alignment of the new pipe line that may be required.

801.9.7 On all push-on-joints (bell and spigot, fluid-tite, and ring-tite) the rubber gasket shall be removed, cleaned, the groove cleaned, the gasket replaced, and the bell or plain end cleaned before jointing. The gasket and the bell or plain end of the pipe to be jointed shall both be lubricated with a suitable soft vegetable soap compound to facilitate jointing. Care shall be taken to insure that neither the bell or collar, or the pipe being jointed is damaged as it is being pushed home.

801.9.8 Flanged and mechanical joints shall be made with machine bolts and nuts of the proper size only. All components of these types of joints shall be cleaned before jointing. Only one (1) gasket will be permitted in a flange joint. In a

mechanical joint the plain end pipe shall be fully seated before the gasket and gland is slipped up to the bell. Nuts on both types of joints shall be tightened by alternating nuts 180 degrees apart. The CONTRACTOR shall be responsible for assuring that proper torque is achieved and shall have a torque wrench available for verification by the ENGINEER.

Delete Section 801.9.9 in its entirety and substitute the following:

801.9.9 When laying new metallic and nonmetallic pipe, the pipe shall be marked with nondetect utility marking tape and tracer wire. When laying ductile iron pipe, the pipe shall be marked with non-detect utility marking tape, tracer wire, and encased in polyethylene wrap.

801.9.9.1 NON-DETECT UTILITY MARKING TAPE:

801.9.9.1.1 Warning tape shall be installed 3 feet below the finished ground level directly above the pipe longitudinally and shall be centered on the pipe. The warning tape shall be installed continuous for the entire length of the pipe. The tape shall be a 4 mil thick, linear low density polyethylene, specially formulated for extended uses underground. The legend/message associated with the pipe usage shall continually repeat a minimum of every three feet. The tape tensile strength shall be in accordance with ASTM D882 and not be less than 4100 MD (longitudinal directiona0 and 3650 TD (transverse direction). Elongation properties shall be in accordance with ASTM D882 and will be greater than 550% + the breaking point. Tape flexibility shall be in accordance with ASTM D671 and remain pliable. The tape composition shall be of virgin LDPE/LDPE. Tape width shall be 6 inches. The following color and legend/message shall be on the wrap based on the applicable use required by the project:

<u>Color</u>	<u>Use</u>	Legend/Message
Blue	Potable Water	Caution Potable Water Line Buried Below

Blue	Raw/Untreated Well Water	Caution Raw Water Line Buried Below
Purple	Recycled Water	Caution Recycled Water Line Buried Below

### 801.9.9.2 TRACER WIRE:

801.9.9.2.1 All trace wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked. Trace wire shall be #12 AWG copper clad steel, high strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.

801.9.9.2.2 All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At crosses, the four wires shall be joined using a 4-way connector. Use of two 3way connectors with a short jumper wire between them is an acceptable alternative. Direct bury wire connectors shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure. Non locking friction fit, twist on or taped connectors are prohibited.

801.9.9.2.3 All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/inground access box as applicable), specifically manufactured for this purpose. All grade level/in-ground access boxes shall be appropriately identified with "sewer", "water", or "recycle" cast into the cap and be color coded. A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation. All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the

terminal for the grounding anode wire connection. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

801.9.9.2.4 Trace wire must be properly grounded at all dead ends/stubs. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) specifically manufactured for this purpose, and buried at the same elevation as the utility. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and inline with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector. Where the anode wire will be connected to a trace wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

801.9.9.2.5 Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another. Trace wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.

801.9.9.2.6 Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed. Trace wire shall be

installed at the top centerline of the pipe and secured (taped/tied) at 5' intervals. Trace wire must be properly grounded as specified. Trace wire on all service laterals must terminate at an approved trace wire access box located directly above the utility, at the edge of the road right-ofway, but out of the roadway. At all mainline dead-ends, trace wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the trace wire. Mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead-end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the trace wire. All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire. In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.

801.9.9.3 The following products and methods shall not be allowed or acceptable

801.9.9.3.1 Uninsulated trace wire

801.9.9.3.2 Trace wire insulations other than HDPE

801.9.9.3.3 Trace wires not domestically manufactured

801.9.9.3.4 Non locking, friction fit, twist on or taped connectors

801.9.9.3.5 Brass or copper ground rods

801.9.9.3.6 Wire connections utilizing taping or spray-on waterproofing

801.9.9.3.7 Looped wire or continuous wire installations, that has multiple wires laid side-by-side or in close proximity to one another

801.9.9.3.8 Trace wire wrapped around the corresponding utility

801.9.9.3.9 Brass fittings with trace wire connection lugs

801.9.9.3.10 Wire terminations within the roadway, i.e. in valve boxes, cleanouts, manholes, etc.

801.9.9.3.11 Connecting trace wire to existing conductive utilities

801.9.9.4 All new trace wire installations shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, engineer, and facility owner as applicable, prior to acceptance of ownership. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project. Continuity testing in lieu of actual line tracing shall not be accepted. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire at Contractor's expense."

801.9.9.5 POLYETHYLENE WRAP FOR DUCTILE IRON PIPE:

801.9.9.5.1 All ductile iron pipe and fittings shall be wrapped in linear low-density polyethylene wrap. The wrap shall be 8 mil minimum, group 2, linear low density, flat tube, virgin polyethylene film that meets or exceeds ANSI/AWWA C105/A21.5-10 and NT4112-10. The film shall be marked showing trademark, year of manufacture, type of resin, specification, conformance, applicable pipe sizes, and the words "warning corrosion protection-repair any damage". The wrap shall be installed according to latest Ductile Iron Pipe Research Association guidelines. The following wrap color coding shall be used based on the applicable use required by the project.

Color	<u>Use</u>
Blue	Potable Water
Blue	Raw/Untreated Well Water
Purple	Recycled Water

Delete Section 801.9.10 in its entirety and substitute the following:

801.9.10 When laying pipe, Electronic Marker Balls shall be installed in accordance with City of Rio Rancho requirements. Refer to City of Rio Ranch Standard Drawing GU-01. The Engineer of Record will require that marker balls be placed at all fittings, valve locations, and additional locations as described in the City of Rio Rancho's Development Process Manual, Chapter II.7 and/or as designated by the City's Project Manager. Marker balls shall be installed in accordance with Section 170.

801.10 SPECIFIC PIPE LAYING REQUIREMENTS:

801.10.1 Ductile iron pipe shall be installed in accordance with AWWA C600 and as herein specified.

801.10.2 Steel pipe shall be installed in accordance with AWWA C206 for welded joint and as herein specified. All field welded joints shall have one coat of coal-tar enamel of 3/32 inch thickness.

801.10.3 Plastic pressure pipe shall be installed in accordance with AWWA M23 and C900 and/or manufacturer's printed recommendations, whichever is applicable. Where a conflict arises with this Specification, this Specification shall control. Trenching, embedment and backfill shall be specified in Section 701. A reference mark (a distinct circumferential line) is placed on the pipes spigot by the manufacturer to indicate the correct depth of the spigot penetration into the pipes gasket joint. If the pipe is seated too deep or too shallow, the pipe may buckle or separate due to thermal expansion/contraction, therefore particular attention must be exercised when jointing pipe. The reference mark must be showing and not farther than 1/2" from the leading edge of the bell. The CONTRACTOR shall verify that the manufacturer's reference mark is correct per manufacturer's literature.

All welded steel and concrete 801.10.4 cylinder pipe shall have two small bond wires of low resistance, or other approved method, welded across the joint to make the joint electrically continuous. Where rigid joints are specified they shall be provided as specified herein. The outside joint recess shall be completely filled with a rich low shrinkage cement grout. The concrete surface in contact with the joint mortar shall be moistened with water just prior to pouring the joint recess. The mortar shall be poured into the joint recess against a waterproof paper or cloth diaper laid around and lapping the outside field joint. The diaper shall completely and snugly enclose the joint recess, being held in place by metal box strapping or wire. The mortar shall be poured into an opening slightly to one side on the top of the pipe and rodded by a flexible wire rod into place until it appears on the opposite side completely. After the joint recess has been filled with mortar, adjoining pipe sections shall not be disturbed. After the joint has been made, the concrete lining surfaces of the joint shall be moistened and the interior recess tightly jointed and troweled flush and smooth with the inside pipe surface. Grout for painting the interior joints shall be of a stiff consistency and shall have low shrinkage characteristics. In sizes of pipe smaller than 24", the mortar shall be buttered all around the shoulder inside the bell before the spigot is entered. A backing-up tool, such as an inflated rubber ball wrapped with burlap, shall be pulled through the joint to compact the mortar, completely fill the inside annular space and wipe off the excess mortar. Each joint will be inspected by the ENGINEER for proper and complete closure prior to final acceptance. Flanges shall be protected by "cocoon" type protection coating of coal-tar and felt in accordance with AWWA C203. When moving individual pipe sections, the pipe shall be lifted using two web or belt type slings which support the pipe between the third and outside quarter points.

801.10.5 All fittings and valves shall be installed as per the type of joint as stated herein and/or as shown on the plans.

801.10.6 All couplings, clamps, sleeves, etc. shall be installed as per the manufacturer's

printed recommendations and as approved by the ENGINEER. The CONTRACTOR shall properly restrain all appurtenances as necessary.

## Delete "reuse" from 801.10.7 and replace with the following:

801.10.7 All waterlines installed as part of a recycled water system or other non-potable use shall be purple in color or shall be encased in purple PVC wrap.

801.11 CUTTING: The cutting of any type of pipe shall be done as per the manufacturer's printed recommendations, as approved by the ENGINEER. Care shall be taken in cutting any pipe that has an internal and/or external lining or coating.

801.12 BLOCKING AND RESTRAINED JOINTS:

801.12.1 All restrained joints shall be by mechanical means unless directed or approved otherwise by the ENGINEER.

801.12.2 All tees, bends shall be restrained by mechanical means. Valves in runs need not be restrained, except that butterfly valves shall be flanged. Where rigid joints are called for on concrete cylinder pipe, the joints shall be flanged or field welded bell and spigot joints in accordance with the manufacturer's recommendation.

801.12.3 All caps and plugs on dead end lines will be mechanically restrained when feasible. Blocking may also be required when adequate restrain length is not available.

801.12.4 Where restrained joints on ductile iron pipe, or PVC pipe are called for on the plan, the mechanical restraining system employed shall conform to the recommendations of the pipe manufacturer. The restrained joint will be subject to the hydrostatic test specified herein.

801.13 RESTRAINING JOINTS FOR WELDED STEEL AND CONCRETE CYLINDER PIPE:

801.13.1 Restrained joints in welded steel and concrete cylinder pipe for thrust restraint shall be produced by continuous welding the pipe joints and as shown on the plans.

801.13.2 Unless otherwise stated in the supplemental specifications the working pressure (operating plus transient) shall be 150 psi. The value for weight of overburden and the coefficient of friction shall be stated in the supplemental specifications.

801.14 TAPS INTO EXISTING CONCRETE CYLINDER PIPE:

801.14.1 OBJECTIVE: The intent of this Subsection is to establish procedural and design criteria for making taps into existing concrete cylinder pipe for water distribution line extensions, and will be applicable to 4-inch and larger size water taps.

801.14.2 NEW WATER LINES: No nonfactory taps will be allowed on newly-installed concrete cylinder pipes.

801.14.3 EXISTING WATER LINES:

801.14.3.1 Taps to existing concrete cylinder pipe must be approved in writing by the OWNER. The requester shall provide the following information:

801.14.3.1.1 Justification for the tap,

801.14.3.1.2 Project name and number, if applicable,

801.14.3.1.3 Date tap required,

801.14.3.1.4 Name of the CONTRACTOR who will be making the tap.

801.14.3.2 The CONTRACTOR shall coordinate the work with the OWNER before commencing work. The OWNER shall inspect and approve the entire installation of the tap.

801.14.4 INSTALLATION OF FIELD TAP:

801.14.4.1 Installation of field taps on

concrete cylinder pipe shall be no smaller than 4 in. and no larger than 2/3 diameter of pipe to be tapped. No "weld neck" or weld on outlets will be used.

801.14.4.2 For field taps larger than 2/3 of pipe diameter, a tee will be inserted into the line.

801.14.4.3 For field taps greater than 4 in. and less than 2/3 diameter of pipe to be tapped an approved tapping saddle will be used. Tapping saddles shall be approved by the ENGINEER

801.15 SALVAGED MATERIALS: All salvaged materials (pipe, fittings, valves and other water line appurtenances) shall be stockpiled on-site in a neat manner by the CONTRACTOR. The ENGINEER and a representative of OWNER will inspect the stockpiled materials for salvage fitness and direct the following disposition:

801.15.1 If the material is considered salvageable, the CONTRACTOR will be directed to deliver the material to the OWNER. The CONTRACTOR will be responsible for the loading, transportation and off-loading of the salvageable materials. When the materials are delivered, the CONTRACTOR shall obtain a signed receipt from the OWNER. Before final acceptance of the project, all signed receipts will be submitted to the ENGINEER for accounting purposes.

801.15.2 Materials that do not have salvageable value will be disposed of by the CONTRACTOR at no additional cost to the OWNER.

801.16 HYDROSTATIC TESTS:

801.16.1 The CONTRACTOR shall be required to perform hydrostatic tests in all water mains, laterals, dead ends, and service lines in accordance with AWWA C600. The test shall be conducted in the presence of the ENGINEER or his authorized representative. The testing of the lines shall be done without being connected to existing lines unless approved by the ENGINEER. The CONTRACTOR shall provide all temporary plugs required. If connections to the existing lines are allowed by the ENGINEER, it is

with the understanding that the CONTRACTOR assumes any and all responsibility in case of damage or failure of the existing system. Water used for disinfecting may be used for hydrostatic testing. Leakage through connections to the existing system, leaks in the existing lines, or leaking existing valves under the test pressure will invalidate the test. The lines shall be tested at 150 pounds, or 1.5 times the normal working pressure of the line, whichever is greater, for not less than two hours. All taps, gauges and necessary equipment shall be provided by the CONTRACTOR as approved by the ENGINEER, however, the ENGINEER may utilize gauges provided by himself if he so elects. Each section of the new line, between valves shall be tested to demonstrate that each valve will hold the test pressure. No installed pipe will be accepted if the leakage is greater than that determined by hydrostatic test sheet calculations in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested; D is the nominal diameter of the pipe in inches; and P is the test pressure in pounds per square inch gauge. During the test the test pressure should not lose more than10 psig without being pumped back up to test pressure. The totals of the gallons of water required to hold the test pressure during the two hours and the amount of water required to return the line to the test pressure at the end of the test period is the total leakage. If the total leakage is less than the allowable, the line can be accepted. All visible leaks will be repaired regardless of the amount of leakage.

## Delete "on page 801-12" from 801.16.2 and substitute the following:

801.16.2 CONTRACTOR shall submit a testing plan to the ENGINEER for approval. In cases where a new main is being connected to an existing main without the installation of a new valve, the end of the new main shall be temporarily caped and blocked and a hydrostatic test performed. Hydro-static tests should not be made such that an existing valve or existing main is included in the test section. Test Sheet as provided by the City of Rio Rancho Project Manager or City of Rio Rancho Utility Department is the standard form which must be completed at the time of the test, signed by the ENGINEER and delivered to the OWNER prior to acceptance of the Project.

801.17 DISINFECTING, FLUSHING, AND BACTERIA TESTING OF WATER LINES: New water lines shall be installed in such a manner as to not require cleaning by flushing. This shall require capping of stockpiled line, capping of lines at night and any other time work is not in progress, visual inspection of interior of lines, and cleaning as necessary, prior to placing in the trench. Every effort shall be made to prevent the entry of dirt and debris into pipelines under construction.

801.17.1 Mains shall be disinfected in accordance with AWWA C651 or as required below with chlorine liquid solution, which is added by an approved method at one end of the lines as water is drawn through the lines and service connections. The chlorine solution shall remain in the line for at least 24 hours. The lines shall then be flushed until the chlorine residual is equal to the normal residual in the existing system or at 0.5 parts per million for unchlorinated water. Dry chlorine will not be used for disinfection of water lines. The flushed water will be disposed of by the CONTRACTOR appropriately.

801.17.2 Prior to the line being placed into service, bacteria samples shall be taken by the OWNER. Should results of the bacteriological analysis be unsatisfactory, the disinfection procedure shall be repeated.

801.17.3 The CONTRACTOR will be granted two free volumes of water for testing, disinfecting and flushing the new installation. All water used for testing, disinfecting and flushing shall be metered. If additional water is needed for these purposes, the water will be paid for by the CONTRACTOR at the current water rates. An approved backflow preventer system shall be used when withdrawing water from any waterlines and hydrants. Direct connection to the water system shall not be used for providing water for disinfecting, testing or flushing.

801.17.4 OWNER or the ENGINEER will collect the water sample to test the water in the existing lines at the point of delivery for assurance of clean and potable water. The water in the existing lines will be used for testing and flushing.

801.18 INTERFERENCE WITH SERVICE AND SCHEDULE OR WORK:

## Delete "as per Section 18" from 801.18.1

801.18.1 The CONTRACTOR shall obtain the permission of the ENGINEER before making any connections with existing mains. The required operation of existing valves will be performed by the OWNER.

801.18.2 Work shall be started after authorization of the ENGINEER and shall be completed in a prompt efficient manner in coordination and cooperation with other utilities concerned.

801.18.3 The CONTRACTOR will be required to arrange his construction program with a view of maintaining continuous service to water users, from existing facilities, to the fullest extent possible. He shall, at all times, withhold construction work, where any conflict in the service requirements occur.

801.19 NOTIFICATION OF COMPLETION: The CONTRACTOR shall notify the ENGINEER, in writing, when the CONTRACTOR has completed construction of a water line. This notification should be submitted immediately upon completion; the water line will not be placed in service by the OWNER before the sewer service and the street are in place and until the OWNER has received and accepted all adequate documentation submittals. OWNER shall consider, on a case by case basis, exceptions for fire protection purposes.

801.20 VALVE CAN REHABILITATION:

801.20.1 The rehabilitation of existing valve cans as shown on the plans or as authorized by the ENGINEER shall include the following:

801.20.1.1 Removing the existing valve can and ring and cover and installing the new type can and cover.

801.20.1.2 Install a new concrete collar in paved and unpaved areas. Size and direction of the line should be noted on the collar.

801.20.1.3 The existing ring and cover shall be considered salvaged materials.

801.20.1.4 Removal and replacement of the pavement.

801.20.1.5 Excavation, backfill, and compaction.

801.20.1.6 All materials, labor, and equipment necessary to do the work.

801.20.2 The work under this item shall be constructed per the Standard Detail Drawings.

801.21 DOCUMENTATION SUBMITTALS:

801.21.1 At the time of the final inspection the following documentation will be submitted to the ENGINEER and OWNER:

801.21.1.1 Hydrostatic test data of the new water line system.

801.21.1.2 Microbiological test reports which were taken at representative locations along the system.

801.21.1.3 Fire hydrant and valve cards. All valves at that time shall be in the open position, unless otherwise authorized by the ENGINEER and OWNER.

801.21.1.4 A marked-up set of construction drawings reflecting as-built conditions. This does not supplant the requirements for record or as-built drawings.

801.22 MEASUREMENT AND PAYMENT:

<u>Delete "Pipe locator tape for pipe shall be</u> <u>included in the contract unit price of the pipe"</u> <u>from 801.22.1 and substitute the following:</u>

801.22.1 PIPE: Payment for all sizes and types of pipe shall be made on the basis of measurement per linear foot, including the length of fittings, valves, etc. The contract unit price of pipe shall include all jointing and coupling materials necessary for its installation and connections to other sections of pipe, except for fittings, valves or other appurtenances. The cost of hydrostatic testing, flushing and disinfecting of new water lines shall be included in the contract unit price for the item in place. Pipe locator tape and tracer wire (including all elements described in 801.9.9, above) shall be included in the contract unit price for the pipe. No separate measurement or payment will be made for these items.

801.22.2 DEPTH OF TRENCH:

801.22.2.1 The contract unit price for pipe and appurtenances in all cases shall include the trenching, installation, and compacted backfilling for trench cuts as specified in Section 701.

801.22.2.2 Payment for additional depth, below the specified limits shall be made on the contract unit price per vertical foot per linear foot, and shall include trenching, installation of pipe and appurtenances, and compacted backfilling in the deeper trench.

801.22.3 REMOVAL AND RELAY, RETURN, OR DISPOSAL OF PIPE:

801.22.3.1 The contract unit price for removal and relaying pipe shall include all labor and new gasket material necessary to remove and reinstall pipe in another location.

Delete "Water Utility Division in the City Yard" from 801.22.3.2 and substitute the following:

801.22.3.2 The payment for removing and the delivery 2-1/4 inch to 14 inch pipe to the City of Rio Rancho Utility Department storage area as salvage materials shall be made on the unit price per linear foot. Only cast iron or ductile iron pipe that is undamaged will be considered for salvage. 801.22.3.3 Where there is no salvage value of the pipe, the pipe shall be removed and disposed of by the CONTRACTOR. The payment for removal shall be made on a unit price per linear foot; there will be no additional cost to the OWNER for disposal.

801.22.3.4 The payments for removal and relaying, removal and return, or removal and disposal shall include trenching and compacted backfilling.

801.22.4 CAST IRON AND DUCTILE IRON FITTINGS:

Delete Section 801.22.4.1 in its entirety and substitute the following:

801.22.4.1 All cast iron and ductile iron fittings shall be measured and paid for at the contract unit price per each for the type and size of fitting used. The contract unit price per each shall include all gaskets, glands, bolts and nuts required, no separate payment will be made for these items.

801.22.4.2 When the CONTRACTOR installs an OWNER-furnished fitting and replaces that fitting in the OWNER's inventory, the CONTRACTOR shall be paid the full contract unit price of that fitting as outlined above. If the CONTRACTOR does not replace the fitting in the OWNER's inventory the payment to the CONTRACTOR will be at the contract unit price of the fitting less the cost of the fitting itself.

Delete Section 801.22.4.3 in its entirety and substitute the following:

801.22.4.3 FITTING INSERTION: The insertion of a fitting into an existing pipe line shall be measured and paid for at the contract unit price per each for an all mechanical joint end fitting and if required an all mechanical joint connecting piece (coupling) of the type fitting and size used. This payment shall include all compensation for the excavation, cutting and removal of the existing pipe, installation of the fitting and coupling, if required, the recutting of the existing pipe or new pipe installed between the fitting and coupling, and backfill and

compaction complete in place. In addition to the payment for the fitting insertion, the CONTRACTOR shall be paid for one each nonpressurized (wet) connection and if pavement, curb and gutter, sidewalk, drivepad, etc., are removed, these items will be paid for as part of the appropriate item.

801.22.5 REMOVAL AND RELAY, RETURN OR DISPOSAL OF PIPE APPURTENANCES:

801.22.5.1 The contract unit price for removal and relaying the appurtenances shall include all labor and new gasket material necessary to remove and reinstall the item in another location.

801.22.5.2 The payment for removing and returning 2 1/4 inch to 36 inch appurtenance to the OWNER as salvaged material shall be made on the contact unit price per each or unit price per pound. Only undamaged material will be considered for salvage.

801.22.5.3 Where there is no salvage value of the appurtenance, the item shall be removed and disposed of by the CONTRACTOR. The payment for removal shall be made on the contract unit price per each or contract unit price per pound; there will be no additional cost to the OWNER for disposal.

801.22.5.4 The payment for removal and relaying, removal and return, or removal and disposal shall include trenching and compacted backfilling.

801.22.5.5 Only cast iron or ductile iron appurtenances will be removed and re-laid or removed and returned for salvage.

801.22.5.6 Fire hydrant relocation payment shall be the contract unit price per each for removal and reinstallation and shall include excavation, blocking, aggregate and compacted backfilling, as shown in the Standard Detail Drawings.

801.22.6 CONCRETE CYLINDER OR WELDED STEEL PIPE FITTINGS: Concrete cylinder or welded steel pipe fittings, such as flanged outlets, bends, reducers, etc., shall be considered as incidental to the contract unit price for installation of the pipe, as shown on the construction plans.

801.22.7 COUPLINGS: The measurement for steel or cast iron couplings shall include payment for all gaskets, bolts, and incidental materials as may be needed for its complete installation. Payment shall be made on the contract unit price per each size of coupling required.

Delete Section 801.22.8 in its entirety and substitute the following:

801.22.8 STEEL FITTINGS: Steel fittings shall only be used when authorized by the ENGINEER and when needed to connect to an existing steel water line. Measurement and payment for steel fittings, when authorized, shall be made at the contract unit price per each of the type fitting and size used. This payment shall include all fabrication and welding required on the fitting.

801.22.9 VALVE AND VALVE CANS:

801.22.9.1 Valves shall be measured and paid for at the contract unit price per each size of valve. The contract unit price for valves 24-inch and larger shall include the bypass valve, fittings and piping, complete in place.

801.22.9.2 Valve boxes shall be measured and paid for at the contract unit price per each per type of valve boxes, which payment shall include the concrete pad with stem extension when required, complete in place.

801.22.10 FIRE HYDRANTS: Fire hydrants shall be measured and paid for at the contract unit price per each per depth of bury, which payment shall include excavation, gravel drain pocket, mechanical restraining system or blocking, backfilling, and compaction complete in place.

801.22.11 VALVE BOX ADJUSTMENTS:

801.22.11.1 Valve box adjustment using the adjustment collar and insert shall be measured and paid for per each complete in place including the concrete pad.

801.22.11.2 When the adjustment height required on a valve box exceeds the height of the adjustment collar or the valve box has been previously adjusted, the valve box will have to be rehabilitated. Measurement and payment shall be made as specified under Valve Box Rehabilitation.

801.22.12 WATER LINE CONNECTIONS:

801.22.12.1 NONPRESSURIZED CONNECTIONS: Nonpressurized connections shall be measured and paid for at the contract unit price per each for any size or type of pipe, complete in place, which shall include any extra excavation required, shut-off coordination, the removal of any caps or plugs or the cutting of the existing pipe any number of times required to make the connection, drainage plan (if required), pumping or handling of the water, backfilling and compaction. Fittings shall be measured and paid for per pound as specified herein, including all types of couplings.

801.22.12.2 PRESSURIZED CONNECTION: Pressurized connections shall be measured and paid for at the contract unit price per each per location shown on the plans, complete in place, which shall include excavation, the cleaning or removal of existing pipe coatings and coverings, air testing, the tapping, any grouting required, backfilling and compaction. The installation of the tapping sleeve and gate valve is to be paid under separate item or as indicated on the plans.

Delete Section 801.22.12.3 in its entirety and substitute the following:

801.22.12.3 CONNECTION TO STEEL WATER LINES: All connections to existing steel water lines shall be made by using a transition coupling. The measurement and payment for this type of connection shall be made per each of fitting for a mechanical joint connecting piece of the size used.

801.22.13 THRUST RESTRAINTS:

801.22.13.1 CONCRETE BLOCKING: When concrete blocking is used as a substitute for a

mechanically restrained joint as authorized by the ENGINEER, the blocking shall be measured and paid for at the contract unit price per cubic yard placed to the neat lines shown on the plans or per the Standard Detail Drawings.

801.22.13.2 RESTRAINING JOINTS FOR WELDED STEEL OR CONCRETE CYLINDER PIPE: Measurement and payment for this item shall be at the contract unit price per linear inch of circumferential weld, complete in place, including protective coating of the weld.

801.22.13.3 MECHANICALLY RESTRAINED JOINTS: Mechanically restrained joint assemblies shall be measured and paid for at the contract unit price per each assembly per size of the pipe per each type (pipe to pipe, pipe to mechanical joint, pipe to fitting, etc.) complete in place.

801.22.13.4 VALVE ANCHORAGE: No separate measurement nor payment shall be made for valve anchorage as per Standard Detail Drawing. The cost of this work shall be included with the cost of the valve.

801.22.14 PRESSURE REDUCING VALVE (PRV): Measurement and payment for furnishing and installing a PRV shall be made at the contract unit price per each per size, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and material required for the excavation, the PRV, all by-pass piping, fittings and valves both inside and outside the structure, the structure, backfilling and compaction.

801.22.15 AIR RELEASE VALVE (ARV): Measurement and payment for furnishing and installing an ARV shall be made at the contract unit price per each per size of ARV, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and materials required for the excavation, ARV, piping, fittings, gate valve, can or structure, backfilling, and compaction.

801.22.16 VALVE BOX REHABILITATION: Valve box rehabilitation shall be measured and paid for at the contract unit price per each, complete in place which shall include the removal of the existing valve box, excavation, the new valve box installed, backfilling, compaction and the installation of the concrete collar.

801.22.17 CONCRETE STRUCTURES: The removal and replacement of concrete structures such as sidewalks, drive pads, and curb and gutters etc., required for the installation of water lines shall be measured and paid for as specified in Section 340 and 343.

801.22.18 BEDDING MATERIAL: No separate measurement nor payment shall be made for bedding material required when shown on the plans or when required due to the type of pipe supplied by the CONTRACTOR. The cost of the bedding material shall be included in the unit price of the pipe. If bedding material is not required by the conditions above but is required due to the conditions encountered during construction then the bedding material shall be measured and paid for as specified in Section 701.

801.22.19 SURPLUS MATERIALS: No separate measure nor payment will be made for the removal and disposal of surplus material generated by the pipe, bedding material or the use of lean fill.

# **NMDOT Standard Drawings**

## **GENERAL NOTES:**

- 1. WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE NEW MEXICO DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION CURRENT EDITION.
- 2. CONCRETE SHALL CONFORM TO SECTION 511 CONCRETE STRUCTURES. CONCRETE SHALL BE CLASS A. APPLY PENETRATING WATER REPELLENT PER SECTION 532.
- 3. REINFORCING STEEL (REBAR) SHALL CONFORM TO SECTION 540 STEEL REINFORCEMENT. REINFORCE CONCRETE BLANKETS WITH ONE (1) LAYER OF WELDED WIRE FABRIC. PLACE FABRIC IN THE CENTER OF THE CONCRETE BLANKET AND EXTEND INTO CUT-OFF WALL FULL DEPTH.
- 4. THE CORRUGATED METAL PIPE (CMP) SHALL BE ANCHORED TO THE BLANKET WITH A DOUBLE-NUTTED THREADED ROD. FOR SPACING AND LOCATION, SEE "ANCHOR LOCATION TABLE." BOLTS AND NUTS SHALL BE ZINC COATED.
- 5. INSTALL SWELLABLE HYDROPHILIC WATERSTOP AT THE PIPE TO BLANKET INTERFACE IN ACCORDANCE WITH SECTION 511.
- 6. FOR D, ES AND & SEE ROADWAY DRAWINGS. WHEN EMBANKMENT SLOPE (ES) AT A STRUCTURE DIFFERS FROM THE ORDINARY ROADWAY EMBANKMENT SLOPE, THE CONTRACTOR WILL BE REQUIRED TO TRANSITION SLOPE AS SHOWN ON STANDARD DRAWING 511-13-3/3 "TYPICAL CONCRETE BLANKET DETAILS."

D	Т	L											
(IN.)	(IN.)	0*	5*	10"	15*	20*	25°	30*	35*				
24	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"				
30	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"				
36	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"				
42	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"				
48	8	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-11"	2'-4"	2'-5"				
54	8	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-11"	2'-4"	2'-5"				
60	8	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-11"	2'-4"	2'-5"				

7. FOR T, L, AND E DIMENSIONS SEE TABLES BELOW.

		E				E						
φ (°)	T =	6"	T =	8"	φ(•)	T =	6"	T = 8"				
	ES=4:1	ES=6:1	ES=4:1	ES=6:1		ES=4:1	ES=6:1	ES=4:1	ES=6:1			
0	1'-4"	'-4" 2'-4"		3'-4"	20	1'-6"	2'-7"	2'-3"_	3'-8"			
5	1'-5"	2'-5"	2'-1"	3'-5"	25	1'-7"	2'-8"	2'-4"	3'-9"			
10	1'-5"	2'-5"	2'-1"	3'-5"	30	1'-8"	2'-10"	2'-5"	4'-0"			
15	1'-5"	2-6"	2'-2"	3'-6"	35	1'-10"	3'-0"	2'-8"	4'-3"			

8. FOR VOLUME OF CONCRETE, SEE TABLE BELOW. WEIGHT OF REINFORCING BARS, WELDED WIRE FABRIC, AND ANCHOR BOLTS SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.

		CONCRETE QUANTITIES (CU.YDS.) - V1														
D	0*		5	<sup>*</sup>	1	0*	1	15*		20*		5*	30°		35*	
(IN.)	ES:1		ES:1		ES:1		ES	ES:1		ES:1		ES:1		ES:1		S:1
	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
24	1.5	1.9	1.6	1.9	1.6	2.0	1.7	2.1	1.8	2.2	2.0	2.4	2.2	2.7	2.5	3.1
30	2.0	2.5	2.0	2.5	2.1	2.6	2.2	2.8	2.4	3.0	2.6	3.3	3.0	3.6	3.4	4.1
36	2.5	3.1	2.6	3.2	2.7	3.3	2.8	3.5	3.1	3.8	3.4	4.2	3.8	4.7	4.3	5.3
42	3.0	3.8	3.1	3.9	3.3	4.1	3.5	4.3	3.8	4.7	4.1	5.2	4.6	5.8	5.3	6.6
48	3.8	5.0	3.9	5.1	4.1	5.3	4.4	5.6	4.8	6.1	5.3	6.7	6.0	7.5	6.8	8.6
54	4.5	5.8	4.6	5.9	4.8	6.2	5.2	6.6	5.6	7.1	6.2	7.9	7.0	8.9	8.1	10.2
60	5.0	6.7	5.3	6.9	5.6	7.2	6.0	7.7	6.5	8.3	7.2	9.2	8.2	10.4	9.4	11.9

DESIGNED BY: FDO DRAWN BY: SKL/BEE CHECKED BY: KHC









14

(\*) SEE PLAN VIEW FOR NORMAL INSTALLATIONS AND SKEWED INSTALLATIONS.





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Sheet 511-09

@12" O.C. EAC	H WA	NY .										
_Φ_	THIS PROJI DRAWI DRAWI WILL NOT DESIG THE	STANDAI ECTS. O INGS DO INGS THA BE IDEN BE PHYS NER WHO RESPONSI	rd Ther: Tar Tifie Sical Sical Bilit	DRAWING IS FOR USE ON NM 5 WHO USE THE NMDOT STAND 0 AT THEIR OWN RISK. STAND 7 AT THEIR OWN RISK. STAND 7 AT THEIR OWN RISK. STAND 7 ON THE PROJECT PLANS BUT V 10 ON THE PROJECT PLANS. ECIFIES A STANDARD DRAWING ACCE Y OF DETERMINING THEIR APPLICABIL	DOT ARD ECT VILL THE PTS .ITY.							
	NO.	DATE	BY	DESCRIPTION	_							
	REVISIONS (OR CHANGE NOTICES)											
20 A	DE	PARTI	NEW MEXICO NT OF TRANSPORTATIC NDARD DRAWING	N								
SUITE H		SINGLE METAL PIPE CONCRETE BLANKET WITHOUT SAFETY GRATE (NORMAL & 5° TO 35° SKEW)										
	5	11-11	-2	/2 2 of 2	2							

## **GENERAL NOTES:**

- WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE NEW MEXICO DEPARTMENT OF TRANSPORTATION'S STANDARD 1. SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION CURRENT EDITION.
- SAFETY GRATES WILL NOT BE REQUIRED FOR OPENINGS EQUAL TO OR LESS THAN 30 INCHES IN THE DIRECTION OF 2. TRAVEL. FOR BLANKETS WITHOUT SAFETY GRATES, SEE STANDARD DRAWING 511-12A-1/2 THROUGH 511-12A-2/2.
- CONCRETE SHALL CONFORM TO SECTION 511 CONCRETE STRUCTURES. CONCRETE SHALL BE CLASS A. APPLY PENETRATING WATER REPELLENT PER SECTION 532. 3.
- REINFORCING STEEL (REBAR) SHALL CONFORM TO SECTION 540 STEEL REINFORCEMENT. REINFORCE CONCRETE 4. BLANKETS WITH ONE (1) LAYER OF WELDED WIRE FABRIC. PLACE FABRIC IN THE CENTER OF THE CONCRETE BLANKET AND EXTEND INTO CUT-OFF WALL FULL DEPTH. FOR TYPICAL CONCRETE BLANKETS, REINFORCING BARS, WELDED WIRE MESH, AND ANCHORS SHALL BE CONSIDERED INCIDENTAL TO THE CONCRETE BID ITEM.
- INSTALL SWELLABLE HYDROPHILIC WATERSTOP AT THE PIPE TO BLANKET INTERFACE IN ACCORDANCE WITH SECTION 511. 5.
- PIPE SPACING FOR NEW NORMAL INSTALLATIONS, USE D + 3'-0". FOR EXTENSIONS OR MODIFICATIONS TO EXISTING 6. CULVERT INSTALLATIONS MATCH EXISTING CULVERT PIPE SPACING.
- PIPE SPACING FOR NEW SKEWED CULVERT INSTALLATIONS USE (D + 3'-0")/COS 4. FOR EXTENSIONS OR MODIFICATIONS 7. TO EXISTING CULVERT INSTALLATIONS, MATCH EXISTING CULVERT PIPE SPACING.
- NO JOINT SHALL BE ALLOWED IN THE BEVELED SECTION OF PIPE. 8.
- FOR A, B, C, AND SL DIMENSIONS AND STEEL QUANTITY TABULATIONS SEE TABLES ON STANDARD DRAWINGS 9. 511-16-1/1 THROUGH 511-19-1/1 - CONCRETE BLANKET SAFETY GRATE DETAILS.
- 10. FOR D, ES, AND & SEE ROADWAY DRAWINGS. WHEN EMBANKMENT SLOPE (ES) AT A STRUCTURE DIFFERS FROM THE ORDINARY ROADWAY EMBANKMENT SLOPE, THE CONTRACTOR WILL BE REQUIRED TO TRANSITION SLOPE AS SHOWN ON STANDARD DRAWING 511-14-4/4.

11. FOR T. L. AND E DIMENSIONS SEE TABLES BELOW:

Γ	D	т				L					<u>ь</u>		l	E			E			
					1.01	4 5 4	201	0.51	70	7.5.1	0	T =	= 6"	T =	8"	ിന	Т	= 6"	T =	= 8"
4	(INL)	(IN.)	0	5	10	15	20	25	30	35	$\Gamma$	ES=4:1	ES=6:1	ES=4:1	ES=6:1	Ľ	ES=4:1	ES=6:1	ES=4:1	ES=6:
	30	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"	0	1'-6"	2'-6"	2'-2"	3'-6"	20	1'-8"	2'-9"	2'-5"	3'-10
	36	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"	5	1'-7"	2'-7"	2'-3"	3'-7"	25	1'-9"	2'-10"	2'-6"	3'-1
	42	6	1'-0"	1'-2"	1'-4"	1'-6"	1'-6"	1'-9"	1'-11"	2'-2"	10	1'-7"	2'-7"	2'-3"	3'-7"	30	1'-10	3'-0"	2'-7"	4'-2
	48	8	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-11'	2'-4"	2'-5"	15	1'-7"	2'-8"	2'-4"	3'-8"	35	2'-0"	3'-2"	2'-10'	4'-5
	54	8	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-11'	2'-4"_	2'-5"	L	<u>.                                    </u>		r	<i>,</i>	<u> </u>	·	1	1	
ſ	60	8	1'-0"	1'-2"	1'-4"	1'6"	1'-8"	1'-11'	2'-4"	2'-5"										

12. FOR VOLUME OF CONCRETE FOR SINGLE PIPE CON

	CONCRETE QUANTITIES (CU.YDS.)															
	0.		5	5*	10*		15*		20*		25*		30°		35*	
D	ES:1		ES	i:1	ES:1		ES:1		ES:1		ES:1		ES:1		ES	5:1
(IN.)	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
30	2.8	3.7	2.9	3.8	3.0	3.9	3.1	4.1	3.4	4.3	3.7	4.7	4.1	5.2	4.6	5.9
36	3.4	4.5	3.5	4.6	3.6	4.7	3.8	5.0	4.1	5.3	4.5	5.8	5.0	6.5	5.7	7.4
42	4.0	5.3	4.1	5.4	4.3	5.6	4.6	5.9	4.9	6.4	5.4	7.0	6,1	7.8	6.9	8.9
48	5.1	6.7	5.2	6.8	5.4	7.1	5.8	7.5	6.2	8.1	6.9	8.9	7.7	10.0	8.8	11.5
54	5.8	7.6	5.9	7.8	6.2	8.1	6.6	8.6	7.2	9.3	7.9	10.3	8.9	11.6	10.3	13.3
60	6.5	8.6	6.7	8.8	7.0	9.2	7.5	9.7	8.1	10.6	9.0	11.7	10.2	13.2	11.8	15.3

13. FOR VOLUME OF CONCRETE FOR DOUBLE PIPE CONCRETE BLANKETS WITH SAFETY GRATE, SEE TABLE BELOW:

	CONCRETE QUANTITIES (CU.YDS.)															
	0* 5*		5"	10*		15*		20*		25*		30°		35*		
D	D ES:1		ES	ES:1 ES:		:1 ES:1		:1	ES:1		ES:1		ES:1		ES	5:1
(IN.)	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6
30	5.2	6.8	5.3	6.9	5.5	7.1	5.8	7.5	6.2	8.0	6.8	8.8	7.5	9.8	8.5	11.1
36	6.0	7.8	6.1	8.0	6.3	8.3	6.7	8.7	7.2	9.4	7.9	10.3	8.9	11.5	10.1	13.2
42	6.7	8.8	6.9	9.0	7.2	9.3	7.6	9.9	8.3	10.7	9.1	11.8	10.3	13.3	11.8	15.3
48	8.1	10.7	8.3	10.9	8.7	11.4	9.2	12.1	10.0	13.1	11.1	14.5	12.5	16.3	14.5	18.9
54	8.9	11.7	9.1	12.0	9.6	12.5	10.2	13.3	11.2	14.5	12.4	16.1	14.1	18.3	16.4	21.3
60	9.6	12.7	9.9	13.0	10.4	13.6	11.2	14.5	12.3	15.9	13.7	17.8	15.7	20.3	18.3	23.8

14. TO DETERMINE THE VOLUME OF CONCRETE (CU.YDS.) FOR INSTALLATION OF 3 OR MORE PIPES, USE THE FOLLOWING FORMULA: VOL.  $_{(>2)} = V_2 + (V_2 - V_1) \times (N - 2)$ 

WHERE:

 $V_1 = VOL$ , CONCRETE SINGLE PIPE INSTALLATION (CU.YDS.)  $V_2 = VOL$ . CONCRETE DOUBLE PIPE INSTALLATION (CU.YDS.)

(SEE STANDARD DRAWING 511-14-3/4 FOR DIMENSIONS) N = NUMBER OF PIPES WHICH MUST BE GREATER THAN 2



DESIGNED BY: FDO DRAWN BY: SKL/BEE CHECKED BY: KHC

CRETE	BLANKETS	WITH	SAFETY	GRATE,	SEE	TABLE	BELOW:	

	THIS STANDARD DRAWING IS FOR USE ON NMDOT PROJECTS. OTHERS WHO USE THE NMDOT STANDARD DRAWINGS DO SO AT THEIR OWN RISK. STANDARD DRAWINGS THAT ARE APPLICABLE TO A SPECIFIC PROJECT WILL BE IDENTIFIED ON THE PROJECT PLANS BUT WILL NOT BE PHYSICALLY INCLUDED IN THOSE PLANS. THE DESIGNER WHO SPECIFIES A STANDARD DRAWING ACCEPTS THE RESPONSIBILITY OF DETERMINING THEIR APPLICABILITY.										
	NQ.	DATE	BY	DESCRIPTION							
			-								
	MEVISIONS (OR CHANGE NOTICES)										
1	DEPARTMENT OF TRANSPORTATION STANDARD DRAWING										
	MULTIPLE METAL PIPE CONCRETE BLANKET WITH SAFETY GRATE (NORMAL & 5° TO 35°)										
	5	11-14	-1	/4	1 of 4						



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Sneet 511-23

<u>- R</u>				
	THIS	STANDA	RD	DRAWING IS FOR USE ON NMDOT
	DRAW DRAW WILL NOT DESIG THE	INGS DO INGS DO INGS THA BE IDEN BE PHY INER WHO RESPONS	ITIFIE SICAL BILIT	D AT THEIR OWN RISK. STANDARD E APPLICABLE TO A SPECIFIC PROJECT D ON THE PROJECT PLANS BUT WILL LY INCLUDED IN THOSE PLANS. THE ECIFIES A STANDARD DRAWING ACCEPTS Y OF DETERMINING THEIR APPLICABILITY.
	NO.	DATE	BY	DESCRIPTION
	├──			
		Į	REV	ASIONS (OR CHANGE NOTICES)
WEI				NEW MEXICO
	DE	PART	MEI	NT OF TRANSPORTATION
6			STA	NDARD DRAWING
			MUI	TIPLE METAL PIPE
ENGI		(	NOF	TH SAFETY GRATE RMAL & 5° TO 35°)
	5	11-14	-2	/4 2 of 4
				Shoot 511 22



Sheet 511-24 of 142

	THIS STANDARD DRAWING IS FOR USE ON NMDOT PROJECTS. OTHERS WHO USE THE NMDOT STANDARD DRAWINGS DO SO AT THEIR OWN RISK. STANDARD DRAWINGS THAT ARE APPLICABLE TO A SPECIFIC PROJECT WILL BE IDENTIFIED ON THE PROJECT PLANS BUT WILL NOT BE PHYSICALLY INCLUDED IN THOSE PLANS. THE DESIGNER WHO SPECIFIES A STANDARD DRAWING ACCEPTS THE RESPONSIBILITY OF DETERMINING THEIR APPLICABILITY.										
	NO.	DATE	BY	DESCRIPTION							
	REVISIONS (OR CHANGE NOTICES)										
Al	NEW MEXICO DEPARTMENT OF TRANSPORTATION STANDARD DRAWING										
HEIM	MULTIPLE METAL PIPE CONCRETE BLANKET WITH SAFETY GRATE (NORMAL & 5" TO 35")										
	5	1-14	-3	/4 3 of	f 4						



- 1. ALL RODS, NUTS, AND BOLTS SHALL BE ZINC COATED.
- THE CORRUGATED METAL PIPE (CMP) SHALL BE ANCHORED TO THE BLANKET WITH DOUBLE-NUTTED THREADED 2. ROD, FOR SPACING AND LOCATION OF THESE ANCHORS, SEE "ANCHOR LOCATION TABLE."
- ALL THREAD ROD ANCHORS AT THE SAFETY GRATE ELEMENTS SHALL BE PER SECTION 523 -3. CEMENTITIOUS-GROUTED DOWELS AND ANCHORS.
- THE STEEL ROD ANCHORS SHALL BE PER SECTION 541 STEEL STRUCTURES AND SHALL BE EMBEDDED IN THE 4 CONCRETE AT THE TIME OF PLACEMENT.
- AFTER INSTALLATION OF SAFETY PIPE THROUGH STEEL ANCHOR ROD LOOP, PLACE GROUT TO PROVIDE BEARING 5. SURFACE FOR SAFETY PIPE. GROUT TO BE PER SECTION 521.
- TOP OF CONCRETE BLANKET AND TOP OF SAFETY GRATE MUST LIE IN THE SAME PLANE WITHIN ±2". 6.
- FURNISH AND INSTALL ALL ANCHORS SHALL BE INCIDENTAL TO THE CONCRETE PAY ITEM, NO ADDITIONAL PAYMENT 7. WILL BE MADE.



C SAFETY GRATE PIPE

(3"ø STD, W.T. PIPE)

EDGE OF

BLOCKOUT

END OF GRATE

G

PIPE

DESIGNED BY: FOO DRAWN BY:SKL/BEE CHECKED BY: KHC

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Sheet 511-25

# **SSCAFCA Standard Drawings**





Southern Sandoval County Arroyo Flood Control Authority STANDARD DRAWING M101 MAINTENANCE ACCESS GATE

M101.DWG

63 MIL THICK ALUMINUM WITH DIAMOND GRADE

12+ YEAR DURABILITY, MANUFACTURED WITH PREMIUM 3M INKS AND REFLECTIVE MATERIALS DESIGNED FOR MUNICIPAL OUTDOOR TRAFFIC OR

April 8, 2020

# City of Rio Rancho Standard Drawings


EMBEDMENT SOILS CLASSIFICTIONS		
SOILS CLASS	SOIL TYPE	DESCRIPTION
CLASS I SOILS*		MANUFACTURED ANGULAR, GRANULAR MATERIAL, 1/4 TO 1 1/2 INCHES (6 TO 40 MM) SIZE, INCLUDING MATERIALS HAVING A REGIONAL SIGNIFICANCE SUCH AS CRUSHED STONE OR ROCK, BROKEN CORAL, CRUSHED SLAG, CINDERS, OR CRUSHED SHELLS, COMPLYING TO THE REQUIREMENTS OF CLASS II SOILS.
CLASS II SOILS**	GW	WELL-GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES. 50% OR MCRE COARSE FRACTION RETAINED ON NO. 4 SIEVE. MORE THAN 95% RETAINED ON NO. 200 SIEVE. CLEAN.
CLASS II SOILS**	GP	POORLY GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES. 50% OR MORE COARSE FRACTION RETAINED ON NO. 4 SIEVE. MORE THAN 95% RETAINED ON NO. 200 SIEVE. CLEAN.
CLASS II SOILS** 50%	SW	WELL GRADED SANDS AND GRAVELLY SANDS, LITTLE OR NO FINES. MORE THAN OF COARSE FRACTION PASSES NO. 4 SIEVE. MORE THAN 95% RETAINED ON NO. 200 SIEVE. CLEAN.
CLASS II SOILS**	SP	POORLY GRADED SANDS AND GRAVELLY SANDS, LITTLE OR NO FINES. MORE THAN 50% OF COARSE FRACTION PASSES NO. 4 SIEVE. MORE THAN 95% RETAINED ON NO. 200 SIEVE. CLEAN.

\* SOILS ARE AS DEFINED IN ASTM D2487, EXCEPT FOR CLASS I SOILS WHICH ARE DEFINED IN ASTM D2321.

\*\* IN ACCORDANCE WITH ASTM D2487, LESS THAN 5% PASSES NO. 200 SIEVE.

FROM TABLE 701.3.A. NEW MEXICO STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2006 EDITION



## AMAFCA STANDARD DRAWINGS

