

# **STANDARD SPECIFICATIONS FOR CONSTRUCTION**

**City of Claremore  
Oklahoma**

*Prepared by:*

**INCOG**

**CITY OF CLAREMORE  
STANDARD SPECIFICATIONS FOR CONSTRUCTION**

**AMENDMENTS PAGE**

<b>PC</b>	<b>CITY</b>	<b>EFFECTIVE DATE</b>	<b>RESOLUTION OR ORDINANCE #</b>	<b>ACTION/DESCRIPTION</b>
N/A	March 18, 2002	April 18, 2002	Ordinance No. 2002-09	Adopted as an Element of the Claremore Land Development Code

# STANDARD SPECIFICATIONS FOR CONSTRUCTION

## TABLE OF CONTENTS

PURPOSE, INTENT AND INTERPRETATION OF SPECIFICATIONS	3
DIVISION I – GENERAL SPECIFICATIONS	4
DIVISION II – WATER AND SEWER MATERIAL SPECIFICATIONS	12
DIVISION III – WATER AND SEWER CONSTRUCTION SPECIFICATIONS	41
DIVISION IV – STREETS AND DRAINAGE SPECIFICATIONS	68
DIVISION V – STANDARD DRAWINGS AND DETAILS	69
LIFT STATIONS	
Duplex Lift Station	Figure STDLS.01
Duplex Lift Station Valve Vault	Figure STDLS.02
TRAFFIC RIGHT-OF-WAY STANDARDS	
Primary/Major and Secondary/Minor Arterials	Figure RW.01
Commercial/Industrial Collector/Central Business Streets, Residential Collector/Commercial /Industrial (Local) Streets	Figure RW. 02
STORM SEWER	
Storm Sewer Pipe Trenching and Bedding	Figure STDSTM.01
Natural Channel	Figure STDSTM.02
Concrete Lined Channel	Figure STDSTM.03
Grass Lined Channel	Figure STDSTM.04
Ramp for Concrete Lined Channel	Figure STDSTM.05
Concrete Channel Liner and Details	Figure STDSTM.06
Flume and Channel Liner Details	Figure STDSTM.07
Area Inlet	Figure STDSTM.08
Junction Box	Figure STDSTM.09
Slopedwall with Dissipater Detail	Figure STDSTM.10

## SANITARY SEWER

Sanitary Sewer Bedding Detail	Figure STDSS.01
Sanitary Sewer Tap Detail	Figure STDSS.02
Sanitary Sewer Riser Detail – Normal Trench	Figure STDSS.03
Sanitary Sewer Riser Detail – Wide Trench Over 12' Deep	Figure STDSS.04
Sanitary Sewer Riser Detail –Narrow Trench Over 12' Deep	Figure STDSS.05
Sanitary Sewer Manhole Connector Details	Figure STDSS.06
Precast Manhole Detail	Figure STDSS.07
Manhole Cover and Frame	Figure STDSS.08
Lamphole Frame and Cover Detail	Figure STDSS.09
PVC Sewer Deflection Gage	Figure STDSS.10
Water Table Cradle for Flexible Pipe	Figure STDSS.11

## STREET DETAILS

Country Living Street	Figure STDST.01
Residential/Collector Local Pavement Sections	Figure STDST.02
Collector/Industrial Local Pavement Sections	Figure STDST.03
Curb and Gutter Detail	Figure STDST.04
Sidewalk and Wheelchair Ramp Detail	Figure STDST.05
Street Patch Detail	Figure STDST.06
Base Drainage	Figure STDST.07
Barricade Details	Figure STDST.08
Asphaltic Concrete Intersection Layout	Figure STDST.09
Concrete Street Intersection Layout	Figure STDST.10
Standard Concrete Pavement Joints	Figure STDST.11
Dowel Bar Assembly Detail	Figure STDST.12
Manholes, Lampholes, and Valve Boxes in Streets	Figure STDST.13
Residential Concrete Driveway	Figure STDST.14
Residential Driveway on Street w/o Curb	Figure STDST.15
Temporary Turn-around	Figure STDST.16
Concrete Lined Channel	Figure STDST.17
Pavement Cuts Detail	Figure STDST.18

## WATER

Water Pipe Bedding Detail	Figure STD.W01
Air Relief Valve and Vault Detail	Figure STD.W02
Water Valve Vault and Lid Detail	Figure STD.W03
Valve Box Detail	Figure STD.W04
Frame and Lid for Valve Vaults	Figure STD.W05
Thrust Block Details	Figure STD.W06
Concrete Encasement & Cradles/Trench Conditions	Figure STD.W07
Water Service Line Street Crossing Detail	Figure STD.W08
Fire Hydrant Assembly Detail	Figure STD.W09
Blow-off Hydrant Details	Figure STD.W10
¾" Meter Setting	Figure STD.W11
1" Meter Setting	Figure STD.W12
1 ½" Meter Setting	Figure STD.W13
2" Compound Meter Setting	Figure STD.W14

**WATER (CONTINUED)**

**2" Positive Displacement Meter Setting**  
**1 ½" & 2" Turbine Meter Setting**  
**Meter or Valve Vault Detail**  
**Blow-off Valve Assembly Detail**

**Figure STD.W15**  
**Figure STD.W16**  
**Figure STD.W17**  
**Figure STD.W18**

## **PURPOSE, INTENT, AND INTERPRETATION OF SPECIFICATIONS**

The purpose of these Specifications is to establish, as appropriate, target, minimum and/or maximum standards for acceptance and payment for end products furnished by the Contractor. While certain interim requirements may be imposed, it is the intent of these Specifications that the Contractor be fully and exclusively responsible for producing an acceptable end product.

In exercising this responsibility the Contractor will be given control of the production processes to the greatest degree possible. However, delegation of control should not be interpreted as limiting the authority of the City to suspend the Contractor's operations when deemed necessary to prevent an unacceptable product or danger to the general public. City of Claremore personnel, except where specifically provided for herein, will make inspections for the City to document that an acceptable product is being produced.

Interpretation of these Specifications will be done in such a manner as to allow the Contractor to control the project to the greatest degree possible in producing an end result product, which is, in all respects, acceptable. These Specifications should not, however, be interpreted in any manner which allows a Contractor to produce an unacceptable product or endanger the health, safety or welfare of the general public. An acceptable end result product is the essence of the Contract. Only projects in substantial conformance with these Specifications will be accepted by the City of Claremore. Acceptance and determination of adjustment in payment for products deviating from specified standards are entirely the City's responsibilities.

The payment section of these specifications are for projects being funded by the City of Claremore only. Those funded by private funds are not required to use the payment section of these specifications.

## DIVISION I

### GENERAL SPECIFICATIONS

#### 101. SCOPE AND LOCATION

101.1. The location of the project is in or near the City of Claremore, Oklahoma. The character and exact location of the project are shown on the Drawings on file in the office of the City Engineer. Said Drawings clearly show the general work involved, but are not intended to show all details of the work.

101.2. The site and/or rights-of-way upon which the work is to be performed are shown on the Drawings. The Contractor agrees that the site or rights-of-way provided, are adequate for the performance of the work. If any additional working area is required, the Contractor shall, at his expense, make arrangements for such working area. The City will not be liable for additional compensation as a result of any delay in obtaining rights-of-way.

#### 102. SCOPE, NATURE, AND INTENT OF SPECIFICATIONS AND DRAWINGS

102.1. The Drawings are not intended to be scaled for dimensions, and if dimensions not shown on the Drawings are required, the Contractor shall request them from the Engineer. Where existing utility lines or other sub-surface obstructions are shown on the Drawings, the same have been located as nearly as practicable from information furnished by the owners of such, and from such surface indications as may exist at the work site. Such obstructions are shown for the purpose of advising the Contractor that they may interfere with the work to be done hereunder, but not for the purpose of indicating that the work can be performed without such interference.

102.2. Where exploratory drilling is indicated on the plans to have been performed, boring logs will be available for review at the office of the Engineer. The logs will be furnished for information purposes only, and are not to be construed as a true representation of actual subsurface conditions.

102.3. Should anything be omitted from the Specifications and Drawings which is necessary for a clear understanding of the work, or should instructions appear to be in conflict, the Contractor shall request written instructions from the Engineer before proceeding with the construction affected by such omissions, discrepancies or conflicts.

103. LINES AND GRADES

103.1. All work under this Contract shall be completed to the lines, grades, and elevations shown on the Drawings. Vertical and horizontal controls shall be furnished by the Engineer. The Contractor shall provide detailed construction staking, forms, straight edges, and other materials for lines, levels, and measurements.

104. PROTECTION OF PROPERTY

104.1. The protection of City, State and Government monuments, street signs, and other City property is of prime importance, and if the same be damaged, destroyed, or removed, they shall be repaired, replaced or paid for by the Contractor. Disturbance of such property must first be approved by the appropriate agency.

104.2. No valve or other control on any utility main or building service line shall be operated for any purpose by the Contractor.

104.3. At places where the Contractor's operations are adjacent to, or crossing railway, telecommunications, electric, gas companies, water, sanitary sewers, and storm sewers; damage to which might result in expense, loss or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made. Contractor shall notify the Notification Center of Oklahoma One-Call System, Inc. of any excavation or demolition prior to the commencement of such work. Notification shall be made no sooner than ten (10) days nor later than forty-eight (48) hours excluding Saturdays, Sundays, and legal holidays, prior to start of work.

104.4. The City has attempted to locate all storm sewers, culverts, buried telephone or electrical conduits, sanitary sewers, water mains, and gas mains that might interfere with the construction of this project. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal or relocation so that these operations may progress in a reasonable manner and duplication or relocation work may be reduced to a minimum, and services provided by these facilities will not be unnecessarily interrupted. The adjustments and crossings of the various types of lines shall be made as follows:

104.4.1. Storm sewers and culverts may be removed at the time of crossing or may be adequately braced and held in position while the pipe is placed beneath them. If the storm sewer or culvert is removed, it shall be replaced with pipe of the same type and size as that removed, and it shall be re-joined to the undisturbed line with a joint satisfactory to the Engineer. Backfill over the main, up to and around the storm sewer, shall be thoroughly compacted so that no settlement will occur. The revision and crossing shown on the Drawing shall be at the expense of the Contractor. In the event lines, other than those shown on the Drawing, are encountered and fall within the standard trench limit and, in the opinion of the Engineer, revision adjustment of the line is necessary for the construction of the project, the Contractor will be reimbursed for the extra cost of the crossing or adjustment under the "Extra Work" clause of the Contract.

104.4.2. All overhead and buried telephone and electrical conduits, and gas mains to be adjusted or crossed by the construction of this project shall be protected in accordance with the directions of the utility company owning the conduits and/or mains. The Contractor shall notify the companies and obtain their permission before making any crossing or adjustment. The adjustment and crossing shown on the Drawing shall be at the expense of the Contractor. In the event lines other than those shown on the Drawing are encountered and fall within the standard trench limit and, in the opinion of the Engineer, adjustment of the line is necessary for the construction of the project, the Contractor will be reimbursed for the extra cost of the crossing or adjustment under the "Extra Work" clause of the Contract. Any overhead or buried cables, conduits or gas mains damaged by the Contractor shall be repaired at his expense to the satisfaction of the Engineer and of the Owner.

104.4.3 The Contractor shall not remove any water or sanitary sewer lines except as directed by the Engineer or as required by the Drawings and Specifications, and shall adequately brace and protect them from any damage during construction. Any existing water main, sewer main, or lateral damaged by the Contractor's operation shall be repaired by the Contractor's forces. The Contractor shall notify the City immediately after damaging any pipe. The repairs will be made at the Contractor's expense.

104.5. The location of utility service lines serving individual properties may or may not be shown on the Drawings, but the Contractor shall assume that such service lines exist whether or not they are shown on the Drawings, and it shall be the responsibility of the Contractor to make any necessary changes in the line and/or grade of such services, or to secure the necessary changes therein by the particular utility company involved, or owner thereof. In the event of interruption of a utility service as a result of accidental breakage, Contractor shall promptly notify the Engineer and the owner of the utility, and shall repair or cause the same to be repaired, and the Contractor shall take all steps necessary to assure to the restoration of services as promptly as may be reasonably possible. All sanitary sewer service lines damaged shall be replaced with ductile iron pipe, as directed by the Engineer, regardless of type or kind damaged.

104.6. In the event the Contractor in any way fails to comply with the requirements of protecting, repairing, and restoring of any utility or utility service, the Engineer may, upon forty-eight (48) hours' written notice, proceed to protect, repair, rebuild or otherwise restore such utility or utility service as may be deemed necessary, and the cost thereof will be deducted from any money due or which may become due the Contractor pursuant to the terms of his contract.

## 105. CONNECTIONS

105.1. All connections to existing water mains shall be made by the Contractor, unless noted otherwise. The Contractor shall schedule and perform his work so that these connections may be accomplished in an expeditious manner. All transfer of building service line connections from the existing to the new main shall be made by the

Contractor after the main has been backfilled, tested, and chlorinated, but before any sidewalks, driveways, curbs, and/or paved roadways, are replaced.

105.2. The Contractor shall not make any unauthorized connections to a sewer, nor shall he permit any such connections to be made. If the Contractor is properly authorized by the Engineer to make connections by installing wyes in the sewer under construction, such installation shall conform to local ordinances and codes.

#### 106. REFERENCES TO OTHER SPECIFICATIONS

106.1. Where a standard American Society for Testing Materials, American Concrete Institute, American Standards Association, American Water Works Association, or other agency designation is specified for a material, that designation shall be the current edition, either tentative or adopted. If a referenced specification is in disagreement with these specifications, the City of Claremore specifications shall govern.

#### 107. PROTECTION OF MATERIALS

107.1. All materials delivered to the site of the work shall be adequately housed and protected against deterioration according to the standard accepted procedures. The Contractor shall keep his storage yards in good order, pile his materials neatly, and protect them from damage.

#### 108. TESTING

108.1 General: Unless otherwise specified, testing of projects constructed using these specification will be tested in accordance with this section. Unless otherwise specified, the contractor shall provide the equipment, materials, and labor necessary to conduct the required tests. The contractor will coordinate with the Project Inspector for appropriate test dates and the Inspector will observe tests as required. When tests are conducted off site or by a testing laboratory, the Contractor will provide certified copies of the test results. If a project or portion of a project fails to meet the required test results, the Contractor will take appropriate corrective action and the test shall be conducted again on the corrected work. Corrections to work and additional testing shall be at the Contractor expense.

108.2 Test Specimens: The Contractor shall furnish evidence to the City/Authority that the quality of the materials and workmanship entering in to the work complies with the plans and specifications. The minimum schedule of satisfactory tests listed herein shall be performed by a certified testing laboratory licensed to practice by the Oklahoma State Board of Registration for Professional Engineers and Land Surveyors. When tests reveal that the quality of materials or workmanship does not meet the requirements of the specifications, additional tests shall be made as directed by the Engineer/Inspector until the number of satisfactory tests called for in the schedule have been made. The Contractor will pay for of all testing of work. The Developer of a subdivision which requires public improvements shall pay the cost of all testing, including,

but not limited to, subgrade densities, paving densities, concrete strength tests, paving thickness cores.

108.3 Pavement Testing

108.3.1 Concrete:

108.3.1.1 Cylinders: One test for concrete cylinders shall be construed to mean that at least Four test specimens shall be taken in accordance with the above schedule. Two (2) shall be tested at an age of seven (7) days, and two (2) shall be tested at an age of twenty-eight (28) days, and the strength determined from the average of these pairs of test specimens. A minimum of one test (four specimens) shall be taken for each day of work. Beam and cylinder specimens taken in the field shall be made and cured in accordance with AASHTO T-23. One test for entrained air content shall be made for each set of four concrete cylinder specimens taken.

<u>Description</u>	<u>Test Method</u>	<u>One Test for Each</u>
Concrete Cylinder	AASHTO T-23	50 CY Concrete
Entrained Air Content	AASHTO T-152	50 CY Concrete

108.3.1.2 Job-Mix Design: The Contractor shall provide the City with a complete job-mix design performed by an Oklahoma Department Of Transportation (ODOT) approved laboratory. A design need not be performed for each project, but the design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor will be responsible for the cost of this testing, unless otherwise stated in the Special Conditions. A new job-mix design will be performed if materials sources are changed during the project.

108.3.2 Asphalt Testing

108.3.2.1 General: The testing described herein will be required on asphalt mixes produced under these specifications.

108.3.2.2 Job-Mix Design: The Contractor shall provide the City/Authority with a complete job-mix design performed by an ODOT approved laboratory. A design is not needed for each project, but the design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor shall be responsible for the cost of this testing, unless otherwise stated in the Special Conditions. A new job-mix design shall be performed if materials sources are changed during the project.

108.3.2.3 Aggregates: The Contractor shall provide the City/Authority with copies of the tests required by ODOT specification 708.06 for each aggregate to be used on this project.

108.3.2.4 Asphalt: The Contractor shall obtain from this asphalt supplier, and furnish the City/Authority with a Certificate of Analysis of each different type and grade of asphalt used on the project. All asphalt products will be required to meet the provisions of Section 708 of the latest edition of Standard Specifications for Highway Construction of the Oklahoma Department of Transportation (ODOT).

108.3.2.5 Schedule:

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Field Density	ASTM D1556 or ASTM D2922	1 test every 1,000 SY or 250 Tons
Extraction & Gradation	ASTM D2177 and ASTM D5445	1 test every 1,000 SY or 250 Tons
HVEEM Stability Test	ASTM D150	1 test minimum each day or 200 Tons

108.4 Compaction Tests

108.4.1 Test Schedules

108.4.1.1 Subgrade Test Schedule:

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Standard Proctor Density	AASHTO T-99	As required by differing soil conditions
Field Density: Subgrade and/or sand bedding	AASHTO T-191 AASHTO T-204 AASHTO T-205	600 SY of subgrade or 200LF for 26LF of street

108.4.1.2 Trench Backfill Test Schedule

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Std Proctor Density	AASHTO T-99	As required by differing soil conditions
Field Density	AASHTO T-191 AASHTO T-204 AASHTO T-205	1 test every 300 lf trench for each 4 lf lift 1 test every 200 lf of Bedding Material

108.4.1.3 Surface Coring

108.4.1.3.1 Schedule:

<u>Classification</u>	<u>Interval</u>
Residential	300 lf
Collector	230lf
Arterial:	
- Full Width	150lf
- Half Width	300lf

108.4.1.3.2 Patching: Core hole shall be patched immediately with material as follows:

Concrete Paving: PCC grout, Class A Asphalt Paving: Hot mix, cold laid asphalt per ODOT 708.04, Table 3b, or approved equal.

108.4.2 Compaction Under Structures

108.4.2.1 Cohesionless Soils:

108.4.2.1.1 Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 75 percent relative density.

108.4.2.1.2 Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.

108.4.2.1.3 Well graded gravels (GW) shall be placed at the optimum moisture content.

108.4.2.2 Other Soils:

108.4.2.2.1 Each lift of fills, embankment and backfills and the top six (6) inches of soil in cuts supporting equipment slabs, building slabs-on-grade, and other structures shall be compacted to not less than 100 percent standard proctor at optimum moisture.

108.4.2.2.2 Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.

108.4.3 Trench Compaction

108.4.3.1 Cohesionless Soils:

108.4.3.1.1 Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 75 percent relative density.

108.4.3.1.2 Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.

108.4.3.1.3 Well graded gravels (GW) shall be placed at the optimum moisture content.

108.4.3.2 Other Soils:

108.4.3.2.1 Each lift of fills, embankment and backfills and the top six (6) inches of soil in cuts supporting equipment slabs, building slabs-on-grade, and other structures shall be compacted to not less than 100 percent standard proctor at optimum moisture.

108.4.3.2.2 Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.

108.4.3.2.3 Under pavements, driveways, curbs, gutters, steps, sidewalks, and similar use areas (including adjacent shoulder areas): Each lift shall be compacted to not less than 95 percent standard proctor at optimum moisture up to the elevations at which the requirements for pavement subgrade compaction control.

108.4.3.2.4 Under grassed or landscaped areas: Each lift shall be compacted to not less than 95 percent standard proctor at optimum moisture.

108.4.3.2.5 Each lift shall be compacted at a moisture content One (1) percent to four (4) percent above optimum moisture.

108.4.4 Over-All Compaction

108.4.4.1 Cohesionless Soils:

108.4.4.1.1 Each lift of fills, embankments and backfills supporting equipment slabs, building slabs-on-grade and other structures shall be compacted to not less than 75 percent relative density

108.4.4.1.2.1. Poorly graded gravel (GP) and sands (SW or SP) shall be placed fully saturated to prevent bulking.

108.4.4.1.2.2. Well graded gravels (GW) shall be placed at the optimum moisture content.

108.4.4.2 Other Soils:

108.4.4.2.1 Under pavements, driveways, curbs, gutters, steps, sidewalks, and similar use areas (including adjacent shoulder areas): Each lift shall be compacted to

not less than 95 percent standard proctor at optimum moisture up to the elevations at which the requirements for pavement subgrade compaction control.

108.4.4.2.2 Under grassed or landscaped areas: Each lift (except topsoil) shall be compacted to not less than 90 percent standard proctor at optimum moisture.

108.4.4.2.3 Each lift shall be compacted at a moisture content one (1) percent below to four (4) percent above optimum moisture.

108.4.5 Pavement Subgrade Compaction

108.4.5.1 Cohesionless Soils:

108.4.5.1.1 Poorly graded gravel (GP) and sands (SW or SP) shall be placed full saturated to prevent bulking.

108.4.5.1.2 Well graded gravels (GW) shall be placed at the optimum moisture content.

108.4.5.2 Other Soils:

108.4.5.2.1 The top twelve (12) inches of subgrade in fill areas and the top six (6) inches of subgrade in cut areas under pavements, driveways, curbs, gutters, steps and similar use areas (including adjacent shoulder areas): Each lift shall be compacted to not less than 100 percent of maximum dry density.

108.4.5.2.2 The top six (6) inches of subgrade under sidewalks and similar use areas: Each lift shall be compacted to not less than 95 percent of maximum dry density.

108.4.5.2.3 Each lift shall be compacted at a moisture content one (1) percent to three (3) percent above optimum moisture.

108.4.6 Compaction Deficiencies

108.4.6.1 The Owner's Representative shall be the final judge of suitability of all compaction.

108.4.6.2.1 Apparent negligence or carelessness during any portion of the earthwork operations will require that additional tests be performed on that portion of the work.

108.4.6.3 Fills, embankments, backfills or subgrades which do not meet the specification requirements shall be removed or recompacted until the requirements are satisfied.

108.5 Water Line Pressure, Leakage, And Bacteriological Testing.

108.5.1 Preparation: The Contractor shall pressure test the distribution line without the taps installed. Prior to starting the test, the Contractor will flush the line of all dirt and air and disinfect by chlorination. This procedure will be coordinated with the City Project Inspector and/or a Water Division representative of the Public Works Department. In no case is the Contractor authorized to operate city water valves. Pressure tests shall conform to AWWA C605 latest revision.

108.5.2 Pressure Testing:

108.5.2.1 Flushing: The Contractor shall fill the lines slowly with potable water at a maximum velocity of one (1) foot per second while venting the air so that the air will not be entrapped. Lines shall be flushed with a minimum of three changes of treated water. Valves on the new lines shall be closed slowly to prevent excessive surges while maintaining positive pressure at all times. Flushing water shall be discharged without causing erosion damage, nuisance or interruption of traffic.

108.5.2.2 Damage Prevention: The Contractor shall backfill the line as necessary to prevent pipe movement. Thrust blocking shall be installed to prevent damage while filling the line.

108.5.2.3 Contamination: Existing water mains used to supply water for testing shall

be protected from backflow contamination by temporarily installing a double check valve assembly between the test and supply main. Prior to testing, the back flow prevention device shall be removed so the supply main is isolated from the supply main.

108.5.2.4 Pressure Test: After flushing, fill and bring the line up to the test pressure of 150 psi, all fittings, pipe, valves and hydrants shall be inspected for leaks and repaired accordingly. All defective elements shall be replaced until the allowable leakage requirement are met. The line must maintain that pressure for a two (2) hour period with less than 5 psi pressure drop.

108.5.3 Leakage Testing: Leakage is the quantity of water that must be supplied into the pipe section being tested to maintain a pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. It is also defined as the water needed to fill the full pipeline after the line is tested with air pressure for the same duration above. No installation will be accepted if the leakage in gallons per hour is greater than that determined by the following formula and table:

$$L = \frac{SD(P)^{\frac{1}{2}}}{133,200}$$

L = leakage in gallons per hour

S = length of pipe in feet

D = nominal diameter of pipe in inches

P = average test pressure maintained during the leakage test in pounds per square inch (psi)

Avg. Test Press.	Nominal Pipe Diameter, in.									
	4	6	8	10	12	14	16	18	20	24
psi										
150	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99
125	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81
100	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62
75	0.23	0.35	0.47	0.59	0.70	0.82	0.94	1.05	1.17	1.40
50	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.96	1.15

108.5.4 Disinfection:

108.5.4.1 Following completion of the pressure and leakage tests, the Contractor shall disinfect the water line by adding chlorine to elevate the concentration to at least 50 mg/l but no more than 200 mg/l. The chlorine shall be allowed to stand in the pipe for 24 hours, as per AWWA specification C651, latest revision. The following table lists the amounts of 65 percent calcium hypochlorite (H.T.H.) powder needed for various lengths of pipe at various diameters to achieve the 50 mg/l concentration needed:

Ounces of H.T.H.

	Length of Pipe, feet									
Pipe Dia	100	200	300	400	500	600	700	800	900	1000
Inches										
2	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10
4	0.04	0.08	0.13	0.17	0.21	0.25	0.29	0.34	0.38	0.43
6	0.10	0.19	0.28	0.38	0.47	0.57	0.66	0.75	0.85	0.94
8	0.17	0.34	0.50	0.67	0.84	1.00	1.17	1.34	1.51	1.68
10	0.26	0.52	0.79	1.05	1.31	1.57	1.83	2.09	2.36	2.62
12	0.38	0.75	1.13	1.51	1.89	2.26	2.64	3.02	3.39	3.77
16	0.67	1.34	2.01	2.68	3.35	4.02	4.69	5.36	6.03	6.70
18	0.85	1.70	2.55	3.39	4.24	5.09	5.94	6.79	7.63	8.48
20	1.05	2.09	3.13	4.19	5.24	6.28	7.33	8.38	9.42	10.47
24	1.45	2.90	4.35	5.80	7.25	8.70	10.15	11.60	13.05	14.50

108.5.4.1.1 Disinfection shall be by adding H.T.H. granules. This process consists of placing calcium hypochlorite granules in the pipe sections as they are constructed. The pipe shall be filled with water to remove all air, flushed to remove particulates

108.5.4.1.2 After 24 hours, the residual chlorine shall be at least 10 mg/l or the Contractor shall re-chlorinate the line. Once the test passes, the Contractor shall flush the chlorine out of the line at a rate not less than 2.5 feet per second. Once the line is flushed, the City will check the chlorine residual to insure that it is in the range from 1.0 to 2.0 mg/l.

108.5.4.1.3 The Contractor shall allow the line to set for a period of 48 hours without adding additional chlorine or flushing water through the system.

108.5.4.1.4 The City shall take water samples after the 48 hour period for two (2) consecutive days and test for bacteriological quality in conformance with Oklahoma Department of Environmental Quality (ODEQ) criteria.

108.5.4.1.5 If the samples from the line do not pass, the Contractor will flush the line and add additional chlorine. Once this is done, the process of checking the line will start again.

108.5.4.1.6 If the samples in the line pass then the Contractor will flush the line completely and make sure that all valves are open. Once opened, the Contractor shall not operate any valve without authorization of the Engineer.

108.5.4.1.7 Inspection Requirements: The City Project Inspector shall be given sufficient notification in order to be on-site to observe all pressure testing. The Project Inspector or Water Division representative will take samples for testing. Any cost testing will be paid by the Contractor or Developer.

## 108.6 Sanitary Sewer Force Main Pressure Testing

108.6.1 Preparation: Prior to starting the test the Contractor will flush the line of all dirt and air. This shall be coordinated with the Project Inspector and/or a Wastewater Division representative of the Public Works Department.

### 108.6.2 Procedure:

108.6.2.1 The Contractor shall bring the line up to test pressure of 100 psi and the line must maintain that pressure for a period of 30 minutes with not more than a 5 psi drop.

108.6.2.2 If the line does not pass the pressure test, then the Contractor shall repair the lines so that it will meet the test requirements.

108.6.3 Required Results: Hold 100 psi pressure of the line for 30 minutes with a drop of 5 psi or less.

108.6.4 Inspection Requirements: The Project Inspector shall be given sufficient notification in order to be on-site to observe all pressure testing.

108.7 Sanitary Sewer Gravity Lines Testing

108.7.1 Preparation: The Contractor will ensure that the line is clean and all debris has been removed from manholes. Debris removal shall be by using a sewer cleaning ball or high velocity jet. The Contractor will coordinate with the Project Inspector to have the lines deflection tested with a mandrel prior to pressure testing.

108.7.2 Deflection Test: Deflection tests shall be performed on all PVC Sewer Lines. After the sewer line has been in place and the backfill has settled for 30 days, the Contractor shall hand pull the appropriate sized mandrel through the line while the Project Inspector observes. Sewer line sections not passing the mandrel shall be considered deflected and shall be excavated and repaired. The mandrel exterior diameter shall be 92.5% of the interior pipe diameter. The sizes of mandrels needed for PVC sewer line 6 inches through 24 inches are listed in the table below:

ASTM D 3034 PIPE			ASTM F 679 PIPE		
Nominal Size (inches)	Inside Dia. (Inches)	7.5% Deflection	Nominal Size (inches)	Inside Dia. (Inches)	7.5% Deflection
6	5.742	5.31	18	16.976	15.70
8	7.665	7.09	21	20.004	18.50
10	9.563	8.84	24	22.480	20.80
12	11.361	10.51	27	25.327	23.44
15	13.898	12.86			

108.7.3 Pressure Test:

108.7.3.1 The Contractor shall plug both ends of the line and pressure the line to 4psi.

108.7.3.2 When the line is at pressure the Project Inspector shall observe the pressure gage for the time required in the table below:

Pipe Dia. (in)	Min. Time (min:sec)	Length For Min. Time (ft)	Time for Longer Length (sec)	100 ft.	200 ft.	300 ft.	400 ft.	500 ft.
4	3:46	597	0.380L	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854L	5:40	5:40	5:40	5:42	7:07
8	7:34	298	1.520L	7:34	7:34	7:36	10:08	12:40
10	9:26	239	2.374L	9:26	9:26	11:52	15:49	19:47
12	11:20	199	3.418L	11:20	11:24	17:05	22:47	28:29
15	14:10	159	5.342L	14:10	17:48	26:42	35:36	44:31
18	17:00	133	7.692L	17:00	25:38	38:27	51:16	64:06
21	19:50	114	10.470L	19:50	34:54	52:21	69:48	87:15
24	22:40	99	13.674L	22:47	45:34	68:22	91:10	113:57
27	25:30	88	17.306L	28:51	57:41	86:32		

108.7.3.3 If the line does not meet test requirements, the Contractor shall make necessary repairs and retest.

108.7.3.4 When the test is completed, the Contractor shall remove all plugs and ensure the line is clear.

108.7.4 Required Results: The Mandrel must pass through the line. The City may test or contract for test of pipe alignment by use of a video camera.

108.7.5 Inspection Requirements: The Project Inspector shall be given sufficient notification in order to be on-site to observe all mandrel testing.

108.7.6 Alternative Inspections: In special circumstances and with approval by the City Engineer, the following alternative tests may be substituted for the pressure test detailed above.

108.7.6.1 Joint Testing: Only 24" and larger diameter lines.

108.7.6.2 Exfiltration Test: In the event a section of line is in dry ground conditions above the water table, an exfiltration test may be used. The line shall be filled with water and pressurized so that the maximum pressure at the lowest end does not exceed 10 psi. The allowable exfiltration is 50 gal per inch diameter of pipe per mile per day.

108.7.6.3 Infiltration Test: In the event a section of line is below the groundwater table, an infiltration test may be required. The allowable infiltration of a sewer line is 4.6 liters per millimeter of pipe diameter per kilometer of pipe per day (50 gal/inch/mile/day), including manholes.

108.7.6.4 Sanitary Sewer Lines Dye Testing:

108.7.6.4.1 Requirements: In specific cases determined by the Engineer, this test is used for gravity sanitary sewer line projects.

108.7.6.4.2 Preparation: The Contractor shall ensure that the line is clean and all debris has been removed from manholes. The contractor will prepare the water source with sufficient sewer line marking dye to give the water a highly visible color.

108.7.6.4.3 Procedure:

108.7.6.4.3.1 A rigid pipe connected to a water source shall be used to inject dye colored water, under pressure, into the material surrounding the gravity sewer.

108.7.6.4.3.2 The dye injection shall start 3 m (10 feet) upstream of the lowest manhole and will proceed upstream in 3 m (10 feet) increments. The dye will be injected until, in the opinion of the Inspector, the area is saturated.

108.7.6.4.3.3 Dye shall be injected in the vicinity of all service taps.

108.7.6.4.3.4 The Inspector will observe the down stream manhole and if dye appears in the manhole, the line has failed the test. If the line fails the test, the contractor shall make necessary repairs and retest.

108.7.6.4.4 Required Results: Absence of dye entering the line.

108.7.6.4.5 Inspection Requirements: The Project Inspector will be on site to observe all dye testing.

108.8 Manhole Inspection/Testing

108.8.1 Preparation: The Contractor shall ensure that the manholes to be inspected are clean, properly grouted, and that the appropriate rings and lids have been installed.

108.8.2 Procedure:

108.8.2.1 The Inspector shall visually inspect each manhole for compliance with the Specifications.

108.8.2.2 A vacuum test shall be performed by introducing a vacuum of 10 inches Hg after the holes have been plugged. The vacuum pressure drop shall not exceed 1 inch Hg in one minute or the manhole has failed the test and shall be re-tested after the corrections made.

108.8.2.3 If a dye test is required it shall be prepared in the same manner as a line test except:

108.8.2.3.1 The dye injection shall be at 4 equally spaced locations around the manhole.

108.8.2.3.2 Dye shall be injected until, in the opinion of the Inspector, the area is saturated.

108.8.2.3.3 The Project Inspector shall observe the manhole for 30 minutes and if dye appears on the walls of the manhole, the manhole has failed the test. If the manhole fails the test, the contractor shall make necessary repairs and retest.

109. "OR EQUAL" CLAUSE

109.1. When a material is specified or shown on the Drawings by brand or manufacturer's name, any other material that will adequately perform the same function, in the opinion of the Engineer and/or the City, may be accepted for use.

110. DEWATERING

110.1. The Contractor shall provide all necessary pumps, drains, dams, well points, and other means for removing water from, or preventing water from entering the trench or other excavation until the project is completed. Sufficient pumps or other works shall be made available at all times to hold the water at a safe level. Water from the excavation shall be properly disposed of so that no damage or interference results to public health, public or private property, completed or uncompleted work, other projects, or streets.

111. SAFETY

111.1. Excavations: The Contractor shall adequately shore, or sheet, and brace the excavation, or shall slope the sides of the trench in accordance with State of Oklahoma Department of Labor requirements.

111.2. Explosives: In handling explosives used during the construction of the project, the Contractor shall adhere to all Federal and State Laws and City Ordinances regulating the purchase, transportation, storage, handling, and use of such explosives. Blasting shall not be undertaken without the approval of the City Engineer and in the presence of the Inspector. All equipment, tools, and materials used shall be of the correct type and in good condition for the operation. The Contractor shall take all necessary precautions to avoid damage to property resulting from the transportation, storage, handling and use of explosives.

111.3. Work Zone Traffic Control: When the Contractor is performing any type of construction or excavation work, or is stockpiling or storing any materials or equipment upon or adjacent to any street, alley, sidewalk, public ground, or other location that is likely to be subject to pedestrian or vehicular traffic; he shall furnish, erect, and maintain substantial guard rails, barriers, signs and lights around the project to protect pedestrians, animals, and vehicles from injury or damage. The Contractor shall provide sufficient proper signage and flagman for warning during blasting operations. All signs and traffic control devices shall be fabricated and installed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), current edition.

111.4. Power Lines: Contractor shall take reasonable precautions for the protection of personnel and equipment when working.

111.5. Fire Prevention and Protection: The Contractor shall take all necessary measures to prevent fire, and shall provide satisfactory fire fighting means at the work site.

111.6. Interference with Traffic: The Contractor shall construct and maintain adequate and safe bridges or crosswalks over excavations, where required. When a roadway or sidewalk is not closed, the Contractor shall provide a safe substitute route for any portion obstructed by his operations. If a roadway or sidewalk is closed to traffic, the Contractor shall provide and mark detours.

111.7. Condition of Equipment and Materials: All equipment, tools, appliances, and materials used in connection with the project shall be handled and operated only when they are in safe operating condition and in accordance with a standard safety procedure.

## 112. REMOVAL OF CONDEMNED MATERIALS AND STRUCTURES

112.1. The Contractor shall remove from the site of the work, without delay, all rejected and condemned materials or structures brought to or incorporated in the work, and upon failure to do so, or to make satisfactory

progress in so doing, within forty-eight (48) hours after the service of a written notice from the Engineer ordering such removal, the condemned material or structures may be removed by the City and the cost of such removal shall be taken out of the money that may be due or may become due the Contractor on account of or by virtue of this Contract. No such rejected or condemned material shall again be offered for use in this project by the Contractor under this or any other Contract.

### 113. TRAFFIC CONTROL DEVICES

113.1 The Contractor shall furnish and place traffic control devices in accordance with the standard drawings and as directed by the Engineer. All traffic control devices shall be fabricated in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

### 114. CLEAN-UP

114.1. Immediately upon installation of any portion of the work, the Contractor shall restore all fills, topsoil, and utilities to their location and condition prior to construction.

114.2. Immediately upon installation of 600 feet of water or sanitary sewer line, the Contractor shall remove all materials, tools, debris, excess excavated material, and equipment; and restore the distributed area to the condition prior to construction, as directed by the Inspector.

114.3. Clean-up and restoration of service line transfers shall be made immediately following each transfer.

### 115. STREET WASH DOWN

115.1 The Contractor shall wash down streets to control dust in the area of construction and before final acceptance of the street, as directed by the Inspector. Contractor shall obtain a hydrant meter from the Customer Service Department and shall pay all required fees for the use of the meter.

### 116. PLACING WORK IN SERVICE

116.1. If desired by the City, portions of the work may be placed in service when completed and the Contractor shall give prior access to the work for this purpose, but such use and operation shall not constitute an acceptance of the work.

117. DUTIES OF THE CITY ENGINEER

It is the duty of the City Engineer or his designee to inspect all construction, reconstruction, laying, relaying and replacement of water mains, sanitary sewer lines, and street and drainage facilities, and any appurtenances relating thereto on any parcel or tract of land located within the corporate limits of the City and which are considered privately financed public improvements. The City Engineer or his designee may, as necessary in the performance of this duty, enter in the daytime onto any parcel or tract of land located inside the corporate limits of the city. The City Engineer or his designee shall review and approve or disapprove all plans, drawings and specifications for any construction of water mains, sanitary sewer lines, street and drainage facilities, and appurtenances related thereto, proposed in the city and he shall enforce compliance of codes as provided in this chapter.

118. ADMINISTRATION AND ENFORCEMENT

The provisions of this chapter shall be administered and enforced by the engineering department of the city. The engineering department is hereby empowered to cause any parcel or tract of land to be inspected and examined and to order in writing the remedying of any condition found to exist in violation of any provision of this part as a result of the construction, or related activity, of water mains, sanitary sewer lines, and street and drainage facilities, and appurtenances related thereto. After such order has been delivered to the violator or posted on the premises where such violation exists, no work shall proceed on any parcel or tract of land covered by such order, except to correct any such violation or to comply with an order of the engineering department.

119. PENALTIES

Any person, firm, or corporation violating any provision of this part shall be deemed guilty of an offense, and upon conviction thereof, shall be fined as provided in the Code of Ordinances of the City of Claremore, Section 1-108. The owner or owners of any parcel or tract of land or part thereof, where anything in violation of this part shall be constructed or shall exist, and any engineer, builder, contractor, agent, person, firm, or corporation employed in connection therewith, and who may have participated or aided in such violation shall be guilty of a separate offense and upon conviction thereof, shall be fined as provided in the Code of Ordinances of the City of Claremore, Section 1-108.

120. FINAL ACCEPTANCE

Before final acceptance of any project, whether owned or to be eventually maintained by the City of Claremore, the following items shall be completed, as a minimum, for the project.

120.1 Water Lines

120.1.1 All water lines shall have an approved pressure test by the City Engineering Department and an approved bacteriological test from ODEQ.

120.1.2 All valves and fire hydrants shall be installed correctly and in working order.

120.1.3 All trenches shall be graded and not showing signs of settlement.

120.2 Sanitary Sewer Lines

120.2.1 All sewer lines shall be cleaned and have an approved pressure test; mandrel test and video inspection.

120.2.2 All manholes shall have an approved vacuum test.

120.2.3 All trenches shall be graded and not showing signs of settlement.

120.3 Streets

120.3.1 All concrete streets shall be cured to a minimum of 4000 psi and sealed with an approved sealant.

120.3.2 All streets shall be cleaned with water and a power broom.

120.3.3 All curb inlets and grates shall be cleaned

120.3.4 All street signs shall be installed and approved

120.4 Storm Sewers

120.4.1 All storm sewer lines shall be cleaned and have an approved video inspection.

120.5 Detention

120.5.1 All detention ponds shall be erosion free and have an adequate grass growth established.

120.6 As-Built Plans – A complete set of as-built plans shall be submitted in 22" x 34" paper format and in DWF digital format.

120.7 Bonds – Maintenance bonds or irrevocable letters of credit shall be in place before final acceptance.

## DIVISION II

### WATER & SEWER MATERIAL SPECIFICATION

#### 200. SUBMITTALS

200.1. The Contractor shall submit to the Engineer, six (6) copies of material information or data sheets for all material he proposes to use. Construction shall not begin until the submittals have been approved by the Engineer.

200.2. Submittals for pipe shall consist of notarized certifications that the pipe was manufactured and tested in accordance with the applicable specifications. The certifications shall indicate the pipe diameter, the pressure rating, and the batch number from which the pipe was manufactured. For pipelines 16-inches in diameter and larger and for restrained joint pipe, a detailed laying schedule prepared by the manufacturer shall be submitted, along with the detailed design calculations.

200.3. Submittals for material other than pipe shall consist of manufacturer's product literature or shop drawings, indicating dimensions and material specifications. Submittals shall include reference to compliance with AWWA, ASTM, NSF, and other applicable standards.

#### 201. CONCRETE

##### 201.1 Cement

201.1. All cement used in the work shall be a well-known brand of true Portland Cement and shall conform to the Standard Specifications for Portland Cement, ANSI/A.S.T.M. Designation C150. Unless otherwise permitted, the Contractor shall use only one brand of cement in the work and under no condition shall he use more than one brand of cement in the same structure. Cement, which for any reason has become partially set or contains lumps or cakes, will be rejected and shall be removed from the site of the work.

201.1.2. The acceptance or rejection of cement shall rest with the Engineer and any cement failing to meet the requirements specified herein may be rejected at his direction. All rejected cement shall be plainly marked for identification, shall be immediately removed from the work, and shall not again be offered for inspection. Cement kept in storage for several months may be subject to repeated tests, if required.

201.1.3. The cement shall be delivered in strong cloth or paper bags. Not cement shall be used and not cement shall be inspected unless delivered in

the original package with the brand and name of the manufacturer plainly marked thereon. Each bag of cement shall contain approximately ninety-four pounds of cement, net weight, and four bags shall be the equivalent of one barrel. Packages received in broken or damaged condition will be rejected or accepted only as fractional packages.

201.1.4. The Contractor shall provide, at the site of the work, a suitable weathertight building, or buildings, having a tight floor properly blocked or raised from the ground, for the storage of cement. The building shall be large enough to permit keeping on hand a supply of cement in quantity sufficient to prevent delays or interruptions to the work which might be due to the lack of cement. The cement shall be stored in such manner to permit easy access for the proper inspection and identification of each shipment. Cement in bags shall not be piled to a height in excess of seven feet. Suitable accurate scales shall be provided by the Contractor for weighing the cement. After the cement has been delivered to the job, the Contractor will not be permitted to remove any of the cement to any other jobs or dispose of any of this cement in any way without the consent of the Engineer.

201.1.5. At the beginning of operations and at all other times while cement is required, the Contractor shall have, at the site of the work, an ample supply of acceptable cement and shall carefully guard against possible shortage on account of rejection, irregular deliveries, or any other cause.

## 201.2 Water

201.2.1. All water used in mixing mortar or concrete shall be free from acid, alkali, oil, salt, vegetable, or other matter in sufficient quantity to be injurious to the finished product, and shall be from an approved source.

## 201.3 Aggregate

201.3.1. Fine aggregate for concrete shall be clean, hard, durable, uncoated grains of Arkansas River sand or other sand acceptable to the Engineer. It shall be free from injurious amounts of dust, clay balls, soft or flaky particles, shale, alkali, organic matter, loam, or other deleterious substances. It shall not contain more than three per cent, by weight, or material which can be removed by standard decantation tests. If the color of the supernatant liquid is darker than that of the reference standard color solution when subjected to the Standard Test for Organic Impurities in Sands for Concrete ANSI/ASTM C40, the fine aggregate shall be rejected unless it passes the Standard Test for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar ANSI/ASTM C87.

201.3.2. Fine aggregate shall be graded approximately within the limits shown in the following table. If not enough fines are available in the natural sand, limestone dust, or other approved fines shall be added:

Percent Passing Standard Square Mesh Screens

<u>No. 4</u>	<u>No. 20</u>	<u>No. 50</u>	<u>No. 100</u>
95-100	45-80	10-30	5-10

201.3.3. Coarse aggregate shall consist of the best available crushed limestone or other approved material. River gravel or other material with smooth surfaces shall not be used without specific written approval of the Engineer. Coarse aggregate shall be clean, tough, sound, durable rock and shall not contain harmful quantities of foreign materials and must be satisfactory to the Engineer.

201.3.4 Coarse aggregate shall be graded approximately within the limits shown in the following table:

Percent Passing Standard Square Mesh Screens

Aggregate Max Size	2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	No. 4
2"	100	95-100	60-95	50-83	40-70	20-40		0-5
1 1/2"		100	95-100		40-70		10-30	0-5
3/4"				100	95-100		40-75	0-5

201.3.5. Coarse aggregate shall conform to Standard Specifications for Concrete Aggregates, ANSI/ASTM C33, except as to gradation. The maximum size aggregate to be used in structures six inches thick and under shall be three-quarters inch; in structures from six inches to ten inches thick, the maximum size of aggregate shall be one and one-half inches. If required, the Contractor shall furnish test certificates showing the aggregates meet the above requirements.

201.3.6. In case the concrete resulting from the mixture of the aggregates is not of a workable character or does not make the proper finished surface, the Engineer may require a different grading in order to secure the desired results, or they may allow the use of inert admixtures to correct deficiencies, upon proper showing that such use will not materially lower the strength or increase the permeability of the concrete.

201.4. Steel Reinforcement

201.4.1. All reinforcing steel shall be deformed bars and shall conform to the requirements of the Standard Specifications for Billet Steel Bars for Concrete

Reinforcement, ANSI/ASTM A615, for intermediate or hard grades. All steel shall be manufactured in the United States.

201.4.2. The Engineer reserves the right to require a test of three specimens of each size of bar from each carload received on the work. These tests shall be made by a laboratory or testing firm approved by the Engineer and the cost of such testing shall be included in the price bid for steel reinforcement.

#### 201.5. Strength and Proportion

201.5.1 The concrete shall have a compressive strength of not less than three thousand 3,000 pounds per square inch, unless otherwise specified in the plans, as determined from test cylinders at 28 days, made, cured, and broken, as hereinafter specified.

201.5.2 The concrete shall be mixed in the approximate proportion of: 1 : 2-1/2 : 4-1/4 and shall contain not less than 5 sacks of cement per cubic yard of finished concrete. With the approval of the Engineer, admixtures may be added to increase workability.

#### 201.6. Testing of Misc. Concrete Structures

201.6.1. During the progress of the work, a reasonable number of compression tests shall be made when and if required by the Engineer. Each test shall consist of not less than three test cylinders. At least one test shall be made for each one hundred cubic yards of concrete placed. The test cylinders shall be made and stored in accordance with the Standard Method of Making and Curing Concrete Test Specimens in the Field, ANSI/ASTM C31, and shall be tested in accordance with the requirements relating to making compression tests on concrete test specimens as given in the Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, ANSI/ASTM C39.

201.6.2. All test specimens shall be kept as near to the point of sampling as possible and yet receive the same protection from the elements as is given to the portions of the structure being built. Specimens shall be protected from damage. They shall be sent to a testing laboratory approved by the Engineer not more than seven days prior to the time of the test, and while in the laboratory shall be kept in the ordinary air at a temperature of approximately 70 degrees Fahrenheit until tested.

201.6.3. The Contractor shall furnish the Engineer certified reports on these test and shall pay all expenses of making the tests and of furnishing the concrete for preparing and testing the cylinders.

## 201.7. Responsibility of Contractor for Strength

201.7.1. It is the intent of these specifications that the Contractor shall guarantee that concrete of the specified compressive strength is incorporated in the structures and that the responsibility for producing the required grades of concrete is assumed by the Contractor.

201.7.2. Should the average strengths shown by test cylinders fall below the strengths required, the Engineer will require any of all of the following changes: amount of cement, grading of aggregate, or ratio of the water to the cement used. If the tests disclose that the strength of the concrete is insufficient for the structure as built, the Engineer may condemn the part of any structure in which concrete of insufficient strength has been placed and the Contractor, at his cost, shall remove and replace such concrete with concrete meeting these specifications.

## 201.8. Experimental Concrete Mixes

201.8.1. The Contractor shall make experimental mixes prior to the placing of the concrete and at any time during the progress of the work when necessary to demonstrate that the concrete will meet these specifications. Materials for making experimental mixes shall be furnished by the Contractor and these materials shall be identical with those intended for use in the work. The cost of the materials, as well as the costs of crushing test specimens made from the experimental mix, shall be borne by the Contractor and shall be included in the price bid for concrete.

## 201.9. Mixing

201.9.1. The concrete shall be mixed in an approved batch machine or mixer. The ingredients shall be accurately measured by weight, unless measurement by volume is permitted by the Engineer, before being placed in the mixer. Measuring boxes or other approved measuring apparatus shall be such that the proportions can be accurately determined. The quantity of water to be added, which will vary with the degree of dryness of the material and with the weather conditions, shall be accurately measured for each batch of concrete. Means shall be provided by which a measured quantity of water can be introduced at any stage of the process. The mixing shall be done in a thorough and satisfactory manner and shall continue until every particle of aggregate is completely covered with mortar. The mixing time for each batch shall not be less than one minute after the materials are in the mixer. The entire contents of the drum shall be discharged before recharging. Retempering of concrete which has partly hardened will not be permitted.

## 201.10. Consistency

201.10.1. All reinforced concrete which is required to be spaded or puddled in forms or around reinforcing steel shall be of such consistency that: all aggregate will float uniformly throughout the mass without settling or segregation; when dropped directly from the discharge chute of the mixer, it will flatten out at the center of the pile but will stand up at the edges, the pile spreading from internal expansion and not by flowing; it will flow sluggishly when tamped or spaded; it can be readily puddled into corners and angles of forms and around reinforcing steel, it can be readily spaded to the bottom of the pour or to a depth of several feet any time within thirty minutes after placing.

201.10.2. A desirable consistency is one which results in a very slight accumulation of water at the top of a layer several feet in thickness, but not with segregation or accumulation of laitance.

201.10.3. If, through accident, intention, or error in mixing, any concrete shall, in the opinion of the Engineer, vary materially from the consistency specified, such concrete shall not be incorporated in the work but shall be discharged as waste material.

## 201.11. Placing Concrete

201.11.1. Before beginning a run of concrete, surfaces of the forms, reinforcing steel, and concrete previously placed, shall be thoroughly cleaned of hardened concrete or foreign materials. Forms shall be thoroughly wetted or oiled.

201.11.2. Concrete shall be placed in the forms immediately after mixing. It shall be deposited so that the aggregates are not separated. Dropping the concrete any considerable distance, generally in excess of five feet, depositing large quantities at the point and running or working it along the forms, or any other practice tending to cause segregation of the ingredients, will not be allowed. It shall be compacted by vibration or continuous tamping, spading, or slicing. Care shall be taken to fill every part of the forms, to work the coarser aggregate back from the face, and to force the concrete under and around the reinforcement without displacing it. All concrete shall be thoroughly vibrated, except where specifically excepted in the specifications. The concrete shall be deposited in continuous horizontal layers and, whenever practicable, concrete in structure shall be deposited continuously for each monolithic section of the work. Chutes and tremies used for conveying concrete shall be mortar-tight.

201.11.3. Work shall be arranged in order that each part of the work shall be poured as a unit, if this is possible. Where necessary to stop pouring concrete, the work shall be brought up in level courses and against a vertical stop board.

201.11.4. The placing of concrete under water, where permitted, must be done by special approved methods.

201.12. Placing In Cold/Hot Weather

201.12.1. Cold Weather Placement

210.12.1.1 No concrete shall be placed without the specific permission of the Engineer when the air temperature is at or below thirty-five degrees Fahrenheit.

201.12.1.2 If placing concrete in freezing weather is permitted by the Engineer, care shall be taken to prevent the use of any frozen material. In addition to adequate provision for protecting the concrete against chilling or freezing, the Contractor shall be required to heat the water and aggregate so that when deposited in the forms, the concrete will have a temperature of not less than 50 degrees Fahrenheit, and not more than 80 degrees Fahrenheit. The concrete shall be adequately protected to maintain this temperature for a minimum of 72 hours after it has been placed and a temperature above 32 degrees Fahrenheit for a period of two additional days. The work shall be done entirely at the Contractor's risk and expense.

201.12.1.3 No chemicals or other foreign matter shall be added to the concrete for the purpose of preventing freezing.

201.12.2. Hot Weather Placement

210.12.2.1 Concrete shall not be placed when the temperature of the concrete exceeds 90 degrees F. Mixing water may be chilled or chopped ice may be used to control the concrete temperature provided that the water equivalent of the ice is calculated to the total amount of mixing water.

210.12.2.2 Cover reinforcing steel with water soaked burlap if the temperature of the steel exceeds the ambient air temperature immediately before embedment in concrete.

210.12.2.3 Use set control admixtures when required and accepted in mix designs

210.12.2.4 Subgrade and forms shall be dampened

210.12.2.5 Construct/erect wind breaks and sunshades to reduce surface temperature

210.12.2.6 Utilize fogging to cool and moisten the surrounding air with specialized fogging nozzles. Garden hose nozzles shall not be accepted due to the excessive washing tendency.

201.13. Ready-Mixed Concrete

201.13.1. Ready-mixed concrete may be used, with the approval of the Engineer, when the Contractor can demonstrate that the concrete can be furnished in accordance with the specifications herein and that delivery can be made at such a rate that will insure the continuity of any pour. Standard Specifications for Ready-Mixed Concrete, ANSI/ASTM C94, when not in conflict with the specifications herein, shall control the furnishing of ready-mix concrete.

201.13.2. All mixer trucks shall be equipped with water meters. Additional water shall be added at the job site only with the specific approval of the Engineer.

201.14. Construction Joints

201.14.1. Construction joints shall be located as shown on the drawings and at other points as may be necessary during the construction, provided that the location and nature of additional joints shall be approved by the Engineer. In general, joints shall be located at points of minimum shear, shall be perpendicular to the principal lines of stress, and shall have suitable keys having areas of approximately one-third of the area of the joints.

201.14.2. In resuming work, the surface of the concrete previously placed shall be thoroughly cleaned of dirt, scum, laitance, or other soft material, and shall be roughened. The surface shall then be thoroughly washed with clean water and covered with at least one-half inch of cement mortar, after which concreting may proceed. Mortar shall be placed so as not to splatter forms and reinforcing steel.

201.15. Finish of Concrete Surfaces

201.15.1. All surfaces exposed to view shall be free from conspicuous lines, defects, or other irregularities caused by defects in the forms. If for any reason this requirement is not met, or if there are any conspicuous honeycombs, the Engineer may require the correction of the defects by rubbing with carborundum bricks and water until a satisfactory finish is obtained.

201.15.2. Immediately after removing the forms, all wires or other exposed metal shall be cut back flush with the concrete surface, and the depressions thus made and all honeycombs and other defects shall be pointed with mortar and then rubbed smooth. If the Engineer deems any honeycomb or other defect to require such treatment, the defective concrete shall be cut out to a depth

sufficient to expose the reinforcement and to afford a key for the concrete replacing that cut out.

#### 201.16. Curing Concrete

201.16.1. Exposed surfaces of concrete shall be protected by approved methods from premature drying for a period of at least seven days. Curing compounds, when approved by the Engineer, shall be applied according to the manufacturer's recommendations. In dry, hot weather, forms shall be removed as early as practicable and curing started immediately. The Engineer may require the frequent wetting of the concrete and the use of means to protect it from the direct rays of the sun.

#### 201.17. Placing Reinforcement

201.17.1. All reinforcement, when placed, shall be free from mill scale, loose or thick rust, dirt, paint, oil or grease, and shall present a clean surface. Bends and splices shall be accurately and neatly done, and shall conform to American Concrete Institute Manual of Standard Practice for Detailing Reinforced Concrete Structures.

201.17.2. All reinforcing shall be placed in the exact position shown on the drawings and shall be held firmly in position by means of approved metal spacers and supports, by wiring to the forms, and by wiring the bars together at intersections with approved wire ties so that the reinforcement will not be displaced during the depositing and compacting of the concrete. The placing and fastening of reinforcement in each section of the work shall be approved by the Engineers before any concrete is deposited in the section. Care shall be taken not to disturb the reinforcement after the concrete has taken its initial set.

#### 201.18. Forms

201.18.1. Forms shall be so designed and constructed that they may be removed without damaging the concrete. The material to be used in the form for exposed surfaces shall be sized and dressed lumber or metal in which all bolt and rivet heads are countersunk. In either case, a plain, smooth surface of the desired contour must be obtained. Undressed lumber may be used for backing or other unexposed surfaces, except inside faces of conduit.

201.18.2. The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar-tight, and if necessary to close cracks due to shrinkage, shall be thoroughly soaked in water. Forms for re-entrant angles shall be thoroughly soaked in water. Forms for re-entrant angles shall be filleted, and for corners shall be chamfered. Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed. The interior surfaces of

the forms shall be adequately oiled with a non-staining mineral oil to insure the non-adhesion of mortar.

201.18.3. Form lumber which is to be used a second time shall be free from bulge or warp and shall be thoroughly cleaned. The forms shall be inspected immediately preceding the placing of concrete. Any bulging or warping shall be remedied, and all dirt, sawdust, shavings, or other debris within the forms shall be removed. No wood device of any kind used to separate form will be permitted to remain in the finished work.

201.18.4. Temporary openings shall be placed at the bottom of the column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

#### 201.19. Removal of Forms

201.19.1. Forms shall be removed so as to ensure the integrity of the structure. No forms shall be removed except with the express approval of the Engineer. In general, this approval will be based on the following:

201.19.1.1 Forms on ornamental work, railings, parapets, and vertical surfaces which do not carry loads and which will be exposed in the finished work shall be removed within 24 to 48 hours after placing, depending upon weather conditions.

201.19.1.2 Girder, beam, and joist sides only, column, pier, abutment, and wall forms may be removed within 24 to 48 hours after placing, depending upon weather conditions. No backfill shall be placed against walls, piers, or abutments, unless they are adequately supported for have reached the required strength.

201.19.1.3 Girder, beam, and joist soffit forms shall remain in place with adequate shoring underneath, and no construction load shall be supported upon, nor shall any shoring be removed from any part of the structure under construction until that portion of the structure has attained sufficient strength to support safely its weight and the loads placed thereon.

#### 202. DUCTILE IRON PIPE, DUCTILE AND CAST IRON FITTINGS AND VALVES

##### 202.1. Pipe and Fittings

202.1.1. Where ductile iron pipe (DIP) three (3) inches in diameter and larger is specified or required, it shall conform to, and be tested in accordance with, the current American National Standard Specification for Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids, ANSI/AWWA C151/A21.51.

The ductile iron (nodular cast iron) shall conform to the Standard Specification for Ductile Iron Castings, ANSI/ASTM A536, with physical properties of Grade 60-42-10.

Length of joints shall be either eighteen or twenty feet. The minimum standard thickness of each size pipe shall be as follows:

Pipe Diameter	Thickness Class	Pressure Class
8" and less	51	350
10" and greater	50	250

For Ductile Iron Pipe, 16-inch diameter and larger, all bell and spigot joints shall be electrically bonded, using a #4 AWG bare copper wire of adequate length to braze the copper wire to the bare metal at the bell and spigot using a #15 cadweld cartridge. Cost shall be included in the unit price bid per lineal foot of Ductile Iron Pipe.

For Ductile Iron Pipe, 16-inch diameter and larger, junction box test stations shall be furnished and installed, EXCEPT, no magnesium anode banks shall be furnished or installed. Junction box test stations shall be installed in accordance with the stationing shown on the Schedule of Anode Spacing. Cost shall be included in the unit price bid per lineal foot of Ductile Iron Pipe.

202.1.2. Fittings for ductile iron pipe shall be cast or ductile iron. Cast iron and ductile iron fittings shall conform to the American National Standard for Gray-Iron and Ductile Iron Fittings, 3-inch through 48-inch, ANSI/AWWA C100/A21.10; or the American National Standard for Ductile-Iron Compact Fittings, 3-inch through 12-inch, ANSI/AWWA C153/A21.53, with the exception of solid sleeves. All solid sleeves shall conform to ANSI/AWWA C110/A21.10 and shall be the longest length listed in the AWWA specification (12-inch length for 3-inch through 12-inch sleeves, 15-inch length for 14-inch through 24-inch sleeves, and 24-inch length for 30-inch through 48-inch sleeves).

## 202.2. Joints

202.2.1. Cast iron and ductile iron pipe and fittings shall be jointed with any of the end types as specified below, unless a particular end type is specified. Fittings shall have mechanical joints, unless otherwise specified. Flanged ends shall be used only where specifically noted on the Drawings except that the valve connection end of all tapping sleeves shall be flanged.

202.2.2. Mechanical joints and push-on joints shall conform to, and be tested in accordance with, the American National Standard for Rubber Gasket

Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings, ANSI/AWWA C111A21.11.

202.2.3. Flange joints shall conform to the American National Standard for Cast Iron Pipe Flanges and Flanged Fittings, ANSI B16.1.

202.2.4. Where ductile iron pipe is to be tapped, a split cast or ductile iron tapping sleeve of 150 psi working pressure shall be used. The sleeve body shall be cast iron conforming to ANSI/AWWA C110. The sleeve shall have mechanical joints forming to ANSI/AWWA C111 on the run and a flange branch conforming to ANSI B16.1, Class 125. The end gaskets shall be natural rubber or neoprene material conforming to ANSI/AWWA C111.

202.2.5. Stainless Steel tapping sleeves manufactured by Mueller, Clow, and American, or equal are permitted.

202.2.6. Openings of the sizes shown on the drawings shall be furnished with steel blind flanges of proper strength to withstand the working pressure of the line where no other provision is made for closing the openings. Blind flanges shall be fabricated from material as specified under ANSI/AWWA C200. All bolts shall be carbon steel ANSI/ASTM A307, Grade A only, in accordance with ANSI/AWWA C207.

202.2.7. Where restrained joints are specified or required, they shall be a wedge action type mechanical restrained joint assembly equal to the Megalug Series 1100, manufactured by Ebaa Iron, Inc. Set screw type retainer glands will not be permitted.

202.3. Coating, Lining and Polyethylene Wrap

202.3.1. Ductile iron pipe and cast or ductile iron fittings shall be bituminous coated outside and cement-mortar lined inside with seal coat in accordance with American National Standard for Cement Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water, ANSI/AWWA C104/A21.4.

202.3.2. All ductile iron pipe and cast or ductile iron fittings shall be encased with polyethylene tube in accordance with AWWA C105, American National Standard for Polyethylene Encasement for Ductile Iron Piping for water and other liquids. Polyethylene film shall be manufactured of virgin polyethylene material conforming to ANSI/ASTM Specification D-1248, Type 1, Class A or C, Grade E. Thickness shall not be less than 8 mils (.008 inch). Tensile strength shall be 1200 psi, minimum. Elongation shall be 300 percent, minimum. Tube length shall provide a least one (1) foot of overlap at each joint of pipe. Tape shall be a 2" width, plastic backed adhesive tape, Polykan #900, Scotch #50, or equal. Tube width for each pipe diameter shall be as follows:

NOMINAL PIPE DIAMETER (inches)	FLAT TUBE WIDTH (inches)
3	14
4	16
6	20
8	24
10	27
12	30
14	34
16	37
18	41
20	45
24	54
30	67
36	81
42	95
48	108
54	121

#### 202.4. Gate Valves

202.4.1. Where gate valves are specified or required, they shall conform to and be tested in accordance with, the AWWA Standard for Gate Valves, 3-inch through 48-inch, Nominal Pipe Size, for Water and Sewer Systems, ANSI/AWWA C500. Valves shall have double disc parallel seats, non-rising stem, vertical mounting "O" ring stem seal, counter-clockwise opening, and ends to fit the pipe or fitting to which attached (push-on, mechanical, bell and spigot, or flanged).

202.4.2. Where resilient seated gate valves are specified or required, they shall conform to and be tested in accordance with the AWWA Standard for Resilient Seated Gate Valves, 3-inch through 12-inch, Nominal Pipe Size, for Water and Sewer Systems, ANSI/AWWA C509. Valves shall be resilient seated, bubble type from either direction at a rated design working pressure of 200 psi. The valve shall have a single disc gate with synthetic rubber seat bonded or mechanically attached to the disc; non-rising stem with 2-inch AWWA operating nut, counter-clockwise opening, "O" ring stem seals, corrosion resistant interior coating acceptable for potable water; and end to fit the pipe or fitting to which it is attached (mechanical, bell-and-spigot, or flanged).

202.4.3 Only the following makes will be permitted: American, Mueller, U.S. Pipe. Clow and Kennedy.

202.4.4. Certified test reports in accordance with Section 6, AWWA C509 shall be submitted to the Engineer prior to installation.

202.4.5 Where flanges are specified they shall be ANSI B16.1, Class 125, cast iron flanges.

202.4.6 Where gate valves are specified for fire hydrant installations, they shall have a flanged end on the influent side of the valve facing the tee and a mechanical joint on the discharge side.

## 202.5. Ball Valves

202.5.1 Ball valves shall conform to and be tested in accordance with the AWWA Standard for Ball Valves, ANSI/AWWA C507. Where ball valves are specified or required, they shall be: doubled-seated with natural or synthetic rubber, bronze, or monel metal seats; designed for 150 psi working pressure; flanged end; "O" ring rotor bearing seals; constructed of high-tensile strength cast iron; equipped with totally enclosed manual operators, with open-closed indicator and hand wheel with standard AWWA 2-inch operating nut for one-man operation at 150 psi unbalance across the valve. Where manual worm gear operators are specified or furnished, they shall be furnished with an AWWA Input Shaft Stop, designed and tested to withstand, without damage, all torques and forces in accordance with AWWA C507. Valves shall be tested by, and shall withstand without leak, a hydrostatic pressure of: (1) 250 psi on the valve body with rotor in the open position; and (2) 150 psi on the side of the valve with the opposite side open to atmosphere. Four (4) copies of the test results and manufacturer's drawings shall be submitted for approval prior to delivery of the valve.

202.5.2 Where flanges are specified they shall be ANSI B16.1, Class 125, cast iron flanges.

202.5.3 Only the following makes will be permitted: McNally, Henry Pratt, or Williamette Iron & Steele.

## 202.6. Butterfly Valves

202.6.1 Butterfly valves shall be of the tight-closing, rubber-seat type, shall have a rated pressure of 150 psi, and shall be bubble-tight at this pressure with flow in either direction. The valves shall conform to and be tested in accordance with the AWWA Standard for Rubber-Seated Butterfly Valves, ANSI/AWWA C504, Class 150B. The valve body shall be of the short-body flange type, constructed of cast iron conforming to either ASTM A126, Class B, or ANSI/ASTM A48, Class 40 or ductile iron ANSI/ASTM A536, Grade 65-45-12. Flanges shall be ANSI B 16.1, Class 125, cast iron flanges. Valve discs shall be constructed of alloy cast iron conforming to ANSI/ASTM A436, Type 1, or cast iron conforming to ANSI/ASTM A48, Class 40, or ductile iron, ANSI/ASTM A536 Grade 65-45-12. Valve shafts shall be constructed of 18-8, Type 304 or 316 stainless steel, ANSI/ASTM A296, Grade CF8, or monel. Valve seats shall be

body or disc mounted and shall be of natural or synthetic rubber compound with mating seat surfaces of 18-8, Type 304 or 316 stainless steel, or alloy cast iron conforming to ANSI/ASTM A436, Type 1, or bronze Grade A, D, or E. Valve bearings shall be corrosion resistant and self lubricating.

202.6.2. Manual valve operators shall be totally enclosed, permanently lubricated, suitable for buried service, and equipped with an opened-closed indicator, handwheel, and standard AWWA 2-inch operating nut for one-man operation at 150 psi, unbalanced across the valve. The handwheel shall be mounted in the horizontal position.

202.6.3. Interior surfaces of the valve, except seating surfaces, shall be epoxy coated in accordance with AWWA Standard for Protective Interior Coatings for Valves and Hydrants, AWWA C550. Exterior surfaces of the valve shall be thoroughly cleaned and painted with two (2) coats of asphalt varnish conforming to Federal Specification TT-V-51C. For non-buried service, exterior surfaces shall be coated with two (2) coats of zinc chromate.

202.6.4. Performance, hydrostatic, and leakage tests shall be conducted in strict accordance with ANSI/AWWA C504, except that the leakage tests as outlined herewithin are to be conducted on both faces of the disc. Four (4) certified copies of test results and manufacturers drawings shall be submitted for approval prior to delivery of the valve.

#### 202.6.5. Manual Operators for Ball Valves and Butterfly Valves

202.6.5.1. Manual operators for ball and butterfly valves shall be totally enclosed, permanently lubricated, counter-clockwise opening, and designed for buried or submerged service. Manual operators shall be equipped with a 2-inch square AWWA operating nut with a removable handwheel complete with spinner and an operating open-closed indicator, suitable for one-man operation at 150 psi unbalanced across the valve. Manual operators shall be either worm gear or traveling-nut type, and shall conform to AWWA C507 for ball valves or AWWA C504 for butterfly valves.

202.6.5.2. Manual operators for ball and butterfly valves 16" and larger shall be equipped with a torque limiting control device. The device shall be mounted directly on the operating nut for valves in vaults and on top of the extension shaft for buried valves. The device shall be secured to the operating nut with two set screws. The device shall declutch at 200 ft. lbs. Of input torque in either direction of rotation. The device shall be designed for permanent buried or submerged service. Declutch and reset shall be automatic. Repeatability shall be within five percent (5%) of original rating for a minimum of 1000 cycles. Certified proof-of-design test reports shall be furnished for the device.

202.7. Air Relief Valves

202.7.1. Where air relief valves are specified or required, the valves shall be: heavy-duty combination air release and vacuum type for 150 psi working pressure, tested to 300 psi, and the size shown on plans. The valve body, cover, and baffle shall be cast iron. All internal parts shall be either highest quality stainless steel or bronze, and the inside of the valve shall be coated with rust inhibitor.

202.7.2. Only the following makes will be permitted: American, Apco, Crispin and Val-Matic.

202.8. Check Valves

202.8.1. Where check valves are specified or required, they shall conform to, and be tested in accordance with the AWWA Standard for Swing-Check Valves for Ordinary Water Works Service, AWWA C508. They shall be horizontally mounted, single disc, swing type with a full diameter passage providing minimum pressure loss. Valves shall be of the non-slamming type designed for the future installation of outside lever and weight. Disc faces and seat rings shall be bronze. Ends shall fit the pipe or fitting to which attached (mechanical, bell and spigot, or flanged).

202.8.2. Only the following makes will permitted; American, Dresser, Mueller, U.S. Pipe, Clow, and Kennedy.

202.9. Fire Hydrants

202.9.1. Where fire hydrants are specified, they shall conform to, and be tested in accordance with the AWWA Standard for Dry-Barrel Fire Hydrants, ANSI/AWWA C502. All hydrants shall have: breakable connection features and a breakable coupling on the stem immediately above the bury line which has a lower breaking point than the rest of the unit; 5-1/4-inch compression main valve; 6-inch inlet connection; or mechanical joint hub; four-foot six-inch bury length, or as specified on drawings; two 2-1/2-inch hose nozzles with National Standard threads; one 4-inch pumper nozzle with City of Claremore Standard threads (refer to standard detail for Fire Hydrants included on the drawings); "O" ring seal; drain valve; left (counter-clockwise) opening); Federal yellow finish paint above ground line; and National Standard pentagon operating nut.

202.9.2. Where fire hydrant extensions are specified or required, they shall be of proper design to accommodate the make of fire hydrant installed.

202.9.3. Only the following makes will be permitted: Mueller Centurion, Kennedy Guardian K81A, American-Darling B62B or B84B. (NOTE: in the Rural

Service Area, only the Mueller Centurion with tamper resistant operating mechanism will be permitted.)

202.10. Five-Way Fire Hydrants

202.10.1. Where five-way fire hydrants are specified or required, they shall conform to, and be tested in accordance with the AWWA Standard for Dry-Barrel Fire Hydrants, ANSI/AWWA C502. All hydrants shall have; breakable connection features and a breakable coupling on the stem immediately above the bury line which has a lower breaking point than the rest of the unit; 5-1/4-inch compression main valve; 8-inch inlet connection; bell, flange, or mechanical joint inlet; four-foot six-inch bury length; three 2-1/2-inch nozzles with National Standard threads; two 4-inch pumper nozzles with City Standard threads (refer to Standard Details as shown on the Drawings); "O" ring seal; drain valve; left (counter-clockwise) opening; Federal yellow finish paint above ground line; and National Standard pentagon operating nut.

202.10.2 Where fire hydrant extensions are specified or required, they shall be of the proper design to accommodate the make of fire hydrant installed.

202.10.3. Only the following makes will be permitted: American Darling; and Mueller Improved.

202.11. Blow Off Hydrant

202.11.1. Where blow off hydrants are specified or required, they shall be an Eclipse Model 85 TU or equal. Blow off hydrants shall have; 2-1/2-inch main valve; one 2-1/2-inch brass hose nozzle with National Standard Threads; cast iron yoke and base; drain valve; left (counter-clockwise) opening; and 7/8-inch brass pentagon operating nut.

202.11.2. Where blow off hydrant extensions are specified or required, they shall be of proper design to accommodate the make of hydrant installed.

203. STEEL PIPE AND FITTINGS (NOT USED)

204. REINFORCED CONCRETE PIPE AND FITTINGS (NOT USED)

205. POLYETHYLENE PROFILE WALL PIPE FOR SANITARY SEWERS

205.1 Where polyethylene profile wall sewer pipe, 18-inch diameter through 36-inch diameter, is specified or required, it shall conform to the Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe, ASTM F894.

205.2 The Ring Stiffness Constant (RSC) shall be as directed by the Engineer. Minimum RSC Classifications shall be RSC 100 for 18-inch through 24-inch diameters, and RSC 160 for 27-inch through 36-inch diameters. Maximum depths for each class and diameter shall be as follows:

MAXIMUM DEPTH TO PIPE INVERT

Diameter (inches)	RSC 100 (feet)	RSC 160 (feet)	RSC 250 (feet)
18	24	32	---
21	22	31	---
24	20	28	---
27	---	26	33
30	---	25	32
33	---	24	31
36	---	23	31

205.3 Pipe joints shall be a bell and spigot type gasketed joint. The bell and spigot ends shall be integrally formed and shall, when assembled, form a water tight seal by radial compression of the gasket. The gasket shall be contained within a machined groove on the spigot end. The joint shall be designed to avoid displacement of the gasket when it is assembled in accordance with the manufacturer's recommendations. Gaskets shall comply with the physical requirements of ASTM F-477. The lubricant shall have no detrimental effect on the gasket or the pipe. Laying lengths shall be 20 feet except for specials.

205.4 The manufacturer shall maintain quality control through regularly scheduled testing in accordance with all referenced ASTM standards. Testing for flattening and the Ring Stiffness Constant shall be performed on one test specimen for each size and class of pipe produced for the project. Certifications shall be furnished to the City that the material was manufactured, sampled, tested, and inspected in accordance with all specifications. The certifications shall indicate the manufacturer's production code, from which the plant location, machine, and date of manufacture can be identified.

206. POLYVINYL CHLORIDE (PVC) PIPE, WATER SERVICE

206.1 Where polyvinyl chloride (PVC) pipe four (4) inches in diameter through twelve (12) inches in diameter is specified or required, it shall conform to and be tested in accordance with AWWA C900, "AWWA STANDARD for POLYVINYL CHLORIDE (PVC) PRESSURE PIPE, 4 IN. THROUGH 12 IN., FOR WATER" as herein modified. PVC water pipe shall be approved by the Underwriters Laboratory and bear the seal of approval ("NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.

Polyvinyl chloride water pipe shall be restricted from use under or adjacent to arterial streets.

206.2 PVC pipe shall conform to pressure Class 200 (equivalent to Standard Dimension Ratio 14) and shall have an outside diameter (OD) equal to the OD of equivalent size ductile iron pipe.

206.3 PVC pipe shall have integral wall-thickened bell ends and shall be jointed using one piece elastomeric gaskets. Solvent cement jointing shall not be permitted.

206.4 Fittings for PVC pipe shall be polyethylene wrapped ductile or cast iron conforming to these specifications. The use of PVC fittings shall not be permitted.

206.5 Contractor shall submit certifications from the manufacturer that PVC pipe has been manufactured in accordance with AWWA C900, and that it meets the approval of the "NSF".

## 207. POLYVINYL CHLORIDE (PVC) PIPE, SEWER SERVICE

207.1 Where polyvinyl chloride (PVC) pipe eight (8) inches in diameter through fifteen (15) inches in diameter, fittings and in-line tees or wyes are specified or required for sewer service, it shall conform to and be tested in accordance with ASTM D3034 "Type PSM Polyvinyl Chloride Sewer Pipe and Fittings" for Standard Dimension Ratio (SDR) of 35.

207.2 Where PVC pipe 18-inch in diameter through 36-inch in diameter is specified or required for sewer service, it shall conform to and be tested in accordance with ASTM F679, Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings; or ASTM F794, PVC Profile Gravity Sewer Pipe and Fittings Based on controlled inside diameter. Minimum pipe stiffness shall be 46 psi.

207.3. The PVC sewer pipe shall be supplied in 12.5 foot, or 20 foot laying lengths as specified.

207.4. Where it is necessary to connect PVC sewer pipe to ductile iron pipe an AWWA C110 long body solid sleeve shall be used with a special gasket for the PVC pipe. Flexible couplings will not be permitted.

207.5. Where PVC sewer pipe is being installed, the fittings for the service line and the in-line tees or wyes for future service connections shall be manufactured and specifically designed for Schedule 40 PVC service lines.

207.6. The manufacturer shall maintain quality control through regularly scheduled testing in accordance with all referenced ASTM standards. Testing for flattening and the pipe stiffness shall be performed on one test specimen for each size and class of pipe produced for the project. Certifications shall be furnished to the City that the material was manufactured, sampled, tested, and inspected in accordance with all specifications. The certifications shall indicate the manufacturer's production code, from which the plant location, machine, and date of manufacture can be identified.

## 207. CASTINGS

207.1. Domestic gray iron castings shall conform to and be tested in accordance with the Standard Specification for Gray Iron Casting ASTM A48. Casting for manhole steps, lamphole covers, valve boxes, and water meter lids shall be Class 30A or 30B iron. Castings for frames and lids for valve vaults, meter vaults, and manholes shall be Class 35B.

207.2. Dimensions shall not vary by more than +/- 1/16 inch per foot. Frames and lids for all manholes and valves vaults, and for meter vaults and other castings located within dedicated public right-of-way or other locations subject to vehicular traffic shall be rated for h-20 loading and shall have all bearing surfaces machined to prevent rocking and rattling.

207.3. Frames and lids for manholes, valve vaults, and traffic location meter vaults shall be certified by the manufacturer for H-20 loading. Only those makes which have been certified by the manufacturer and approved by the City shall be permitted. Certification shall consist of submittal of shop drawings, design calculations, laboratory test reports, and a written statement certifying the casting for H-20 loading. All submittal items shall be signed and sealed by the responsible registered professional engineer.

207.4. Where sealed lids are specified or required for sanitary sewer manholes, they shall be Neenah R1755-E, or equal.

## 208. CONDUITS

208.1. Where conduit (also know as tunnel liner or pipe sleeve) is specified or required, it shall conform to, and be tested in accordance with one of the following:

TYPE OF CONDUIT  
PVC Pipe, 1inch to 4 inches  
Steel Pipe, 6-inches and larger thickness

SPECIFICATION  
AWWA, C-900, DR-14  
AWWA C200; 3/8-inch  
minimum wall thickness

209. VAULTS, PITS, AND MANHOLES

209.1. Concrete masonry units shall conform to, and be tested in accordance with the specifications for concrete Masonry, Hollow Load Bearing Concrete Masonry Units, ANSI/ASTM C90, or Concrete Building Brick C55, Grade A.

209.2. Storm Sewer manhole units shall conform to, and be tested in accordance with, one of the following: Sewer Brick (made from clay or Shale), ANSI/ASTM C32 Grade 3M; Concrete Building Brick, ANSI/ASTM C55, Grade N; or Concrete Masonry Units for Construction of Catch Basins and Manholes, ANSI/ASTM C139.

209.3. Precast manholes shall conform to, and be tested in accordance with, the specifications for Precast Reinforced Concrete Manhole Sections, ANSI/ASTM C478, flat slab top type.

210. SAND FOR CUSHION OR BACKFILL

210.1 Sand shall be graded from fine to coarse, free from objectionable material, and contain not more than ten percent (10%) clay or loam by weight. One hundred per cent shall pass a three-quarter inch screen, and ninety-five per cent shall pass a number four screen.

211. CRUSHED STONE FOR SURFACING, BASE, COURSE, AND STABILIZATION

211.1. Crushed stone shall consist of clean, tough, durable fragments, free from an excess of soft or disintegrated particles. Sampling shall be in accordance with the Standard Method of Sampling Aggregates, ANSI/ASTM D75.

211.2. Sieve analysis shall be performed in accordance with the method of Sieve Analysis, ANSI/ASTM C136. Gradation to be used at each location will be specified by the Engineer.

## SURFACING AND BASE COURSE

<u>SIEVE SIZE</u>	<u>PER CENT PASSING</u>	
	<u>TYPE A</u>	<u>TYPE B</u>
3"		100
1-1/2"	100	40-100
3/4"	40-100	30-75
3/8"	30-75	25-60
No. 4	25-60	20-50
No. 10	20-43	15-35
No. 40	8-26	7-22
No. 200	4-12	3-10

211.3. Crushed stone aggregate for stabilization and bedding shall conform to the ASTM D448 and C33 gradations.

### 212. RIP-RAP

212.1. Quality of Materials: All stone for Rip Rap shall be either sandstone, fractured limestone, or other hard stone of good quality that will not materially disintegrate under action of air or water. It shall weigh not less than 140 pounds per cubic foot as determined from the bulk specific gravity (saturated surface dry) of the sample in accordance with procedure in ANSI/ASTM Specifications C127-68, "Test for Specific Gravity and Absorption of Coarse Aggregate". Slabs or slivers shall not be used. Rocks shall be of angular shape. Gypsum, anhydrite, chert, shale, soft or weathered rock shall not be used. All stone material furnished shall yield hard, massive, heavy, durable stone, and shall be free from cracks, seams and other defects that would tend to unduly increase its destruction by natural causes. The contractor shall furnish for the work, and approved stone of good quality. The contractor shall, within fifteen (15) days after receipt of notice to proceed, submit to the City for approval, three (3) samples weighing not less than 150 pounds each, of the stone he proposes to furnish. The samples shall be fairly representative of the whole quarry. If it is proposed to furnish stone from more than one quarry, samples as stated above shall be furnished from each quarry. The City will notify the contractor of acceptance or rejection of the stone samples within ten (10) days after their submittal for approval. The submission of samples will not be required if the material is to be obtained from a source previously approved by the City from test and service records.

212.2. Type "B" rip rap material shall be quarry-run rock free from over burden spoil, and no piece shall weigh more than 500 pounds. At least forty percent (40%) of any shipment shall consist of rocks weighing 100 pounds or more. Rock shall be graded so as to produce a reasonably well-graded mass with the minimum practicable percentage of voids. Rock carrying dirt and fines less than 1/2-inch in maximum cross section, accumulated from interledge layers

or from blasting or loading operations, will be accepted if such material does not exceed ten percent (10%) by weight.

212.3. Type "C" rip rap material shall be quarry-run rock free from overburden spoil, and no piece shall weigh more than 1,000 pounds. At least forty percent (40%) of any shipment shall consist of rocks weighing 200 pounds or more. Rock shall be graded so as to produce a reasonably well-graded mass with the minimum practicable percentage of voids.

### DIVISION III

## **WATER & SEWER CONSTRUCTION SPECIFICATIONS**

### **301. RIGHT-OF-WAY CLEARING AND RESTORING**

301.1. Work under this item shall include the removal and reconstruction or replacement of all obstructions affected by the construction of the project, including, but not limited to fences, retaining walls, patios, trash burners, signs, mail boxes, out-buildings, landscaping, etc. Any such obstructions which are not to be reconstructed are so designated on the drawing and shall be removed and disposed of by the Contractor. All obstructions to be replaced or reconstructed shall be restored to substantially the same condition as existed prior to the construction except as otherwise noted. The Contractor shall remove and dispose of all debris, restore the ground surface to, as reasonably as possible, to the grade existing prior to construction. Upon completion of the work, the Contractor shall leave the site in as neat, clean and orderly a condition as existed prior to construction. Prior to construction, the Contractor shall photograph all concrete and asphalt driveway crossings with a still camera or video camera, in the presence of an inspector, marking the location by street address on each photo. Photographs shall be filed with the City prior to commencing work. All costs of photography shall be included in Bid Item 301: Right-Of-Way Clearing and Restoring.

301.2. Passable surfaces across or along the construction vicinity shall be maintained at all times with gravel, steel mat or plate, or temporary bituminous surfacing material where a sidewalk, driveway, parking lot, street or alley previously existed. Pavement damaged by the contractor shall be replaced to its original condition or better. Oiled surfaces shall be reoiled. Gravel or macadam surfaces shall be replaced in kind.

301.3. If an obstruction is in public or private utility ownership, the Contractor shall notify the appropriate agency or utility, and obtain any necessary permit or license 48 hours before beginning any operations affecting the obstruction. All work shall conform to the current standards and specifications of that agency or utility, and shall be approved by the agency or utility before completion of the project.

301.4. Payment for this item shall be made at the unit price bid per linear foot. Total footage shall be the total length of pipe, not including bores, fittings, or specials, as included in other items. No additional payment shall be made for alterations of utility mains, service lines, or appurtenances, unless specifically provided for elsewhere in the Contract Documents.

302.0. EXCAVATION AND BACKFILL, UNCLASSIFIED

302.1. The work under this item shall include all earth, shale, gravel, loose rock, solid rock, debris, junk and/or other material excavated or otherwise removed in the preparation of the trench; all work in connection with the excavation, removal and subsequent handling and disposal of such material, regardless of its type, character, or condition; subgrade preparation, all sheeting, piling, shoring, bracing, and dewatering of trenches; protection of adjacent property; backfilling; sand cushion; grade base stabilization; all specified backfill consolidation; and other work necessary or required.

302.2. The trench shall be excavated so that the pipe can be laid to the alignment and grades shown on the drawings, or as directed by the Inspector. In dense or built-up areas or where unstable soils exist, the trench shall be excavated a maximum of one hundred (100) feet in advance of pipe laying. In open areas or where soil conditions permit, the trench excavation may be unlimited in advance of pipe laying, as approved by the Engineer. Opening of trenches in excess of the maximum requires specific approval of the Engineer. The trenches shall be dry when the trench bottom is prepared. The trench bottom shall be shaped so that even bearing is obtained for the barrel of the pipe with the bells unsupported. The standard trench width as shown on the attached Standard Detail, shall not be exceeded at any elevation below a point twelve inches above the top of the pipe. If for any reason this portion of the trench exceeds the permitted width and the Inspector determines that cradling or encasement is required, said concrete cradle or encasement shall be installed. Any part of the bottom of the trench excavated more than four inches below the specified grade shall be corrected with approved material thoroughly compacted as directed by the Inspector. In the event that excavated material is not suitable sand shall be used. When rock is encountered and concrete cradle is required, the trench shall be excavated four inches below the bottom of the pipe and refilled to grade with sand. When quicksand or other unstable earth is encountered, the Contractor shall excavate to sufficient depth to permit backfilling with crushed stone to provide a stable base for the pipe.

302.3. Bedding of pipe shall be as shown on the attached Standard Details. Sand shall be placed in the trench simultaneously on both sides of the pipe to an elevation of six inches above the top of the pipe, and shall be carefully worked and hand-tamped around the pipe to consolidate the sand and assure excellent bedding. Backfill material shall not be placed in the trench covering the sand cushion without prior approval of the Inspector.

302.4. For large diameter flexible pipe, bedding shall be in accordance with the Bedding Detail for Large Diameter Flexible Pipe. The pipe shall be bedded in soil-cement, installed over a 6-inch sand cushion. The bedding shall be installed to the top of the pipe for a full width of the excavated trench. The soil-cement shall consist of a mixture of sand, Portland cement, and water. Each

cubic yard of soil-cement shall contain 1 and ½ sacks of cement and approximately 70 gallons of water. Precautions shall be taken to prevent floatation. Moveable trench supports shall not extend lower than the top of the pipe.

302.5. When the type of backfill material is not indicated on the Drawings or specifications, the backfill may be made with the excavated material, provided that such material, in the opinion of the Inspector is suitable for backfilling. In the event that excavated material is not suitable, sand or other approved material shall be used. From six inches above the pipe to eighteen inches above the pipe, the trench shall be backfilled by hand or by mechanical methods approved by the Inspector. Special care shall be used in placing this portion of the backfill to avoid damaging or moving the pipe. The remainder of the trench may be backfilled by mechanical methods. Backfilling operations shall be completed within one hundred (100) feet of the finished line at all times, or as directed by the Inspector.

302.6. All trenches excavated across any sidewalk, driveway, parking lot or other paved area, across any traveled portion of unpaved streets or alleys, across any proposed roadways or proposed roadway fills, and as shown on the drawings shall be backfilled and compacted to the same density as the existing soil adjacent to the trench, but not less than 95% Standard Proctor Density, provided the excavated material consists of soil that can be readily compacted at the optimum moisture. If the excavated material consists of mostly clay or silt containing an excess of moisture, such excavated material shall be removed from the site of the work and the trench filled with sand or other material that will meet AASHTO M145 soil classification of A02, or better. Trenches excavated across existing street or alley paving shall be backfilled in accordance with the standard detail for Pavement Removal and Replacement. If the backfilling has been completed and the backfill material does not meet the requirements for compaction, all the material shall be removed and hauled from the job site and the trenches refilled with material as specified above. Failure of backfill shall be corrected immediately, as directed by the Engineer.

302.7. Payment for this item shall be made at the unit price bid per cubic yard. Volume computation will be based on the standard trench width as shown in the standard detail included in the drawings as the actual horizontal length along the centerline of the trench and the depth of trench from the original ground surface to the flow line of the pipe as shown in the construction drawings. The average end-area method of computing volume will be used. No payment for excavation will be made for material excavated outside the neat lines of the standard trench width as given in the attached Standard Detail. No additional payment will be made for: sand cushion; backfilling; compaction of backfill; sand used for backfill under existing and/or proposed roadways, roadway fills, streets, alleys, driveways, sidewalks, parking lots or as shown on the Drawings; removing and replacing topsoils and obstructions, tunneling under trees, storm sewers or

other obstructions; blasting; bracing and shoring; dewatering; pumping and draining; grade base stabilization; removal of excess excavated material; or restoration of the site. It is mutually understood that subterranean water, quicksand, or other unstable earth may be encountered and the Contractor has taken such into consideration in making this bid. Where such is encountered, Contractor will be required to excavate to sufficient depth to permit backfilling with crushed stone in order to provide a stable base for the pipe. Extra payment will not be made because of such additional excavation or because it is necessary to excavate wider than the trench width as given in attached Standard Detail; or for crushed stone.

303. (SECTION DELETED)

304. POLYETHYLENE PROFILE WALL PIPE FOR SANITARY SEWERS

304.1 The work under this item shall include furnishing, hauling, and placing and jointing of Polyethylene Profile Wall Pipe in the trench in specific conformity with the line and levels given. Pipe shall be installed in accordance with manufacturer's recommended procedures.

304.2 Pipe shall be protected during unloading and installation against impact shocks and free fall. After unloading and before installation, pipe shall be stored on flat, level ground with no rocks or other objects under the pipe.

304.3 The pipe shall be laid on a firm trench bottom, true to the lines and grades shown on the Drawings and/or as given in the field by the Inspector. The pipe shall be installed so that the larger diameter or major axis of the cross section is oriented vertically. The laying of pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. Pipe shall be laid continuously through new manholes if both inlet and outlet pipes are of the same size and in line. Upon completion of the manhole, the invert shall be shaped. The ends of adjoining pipes shall butt against each other for their entire circumference in such manner that there is no shoulders of unevenness of any kind. The pipe grade shall be established by the Contractor. Any error, discrepancies, or displacement of grade stakes shall be called to the attention of the Inspector, and corrected. Bedding and backfill shall be in accordance with the standard bedding detail for Large Diameter Flexible Pipe.

304.4 Prior to making pipe joints, all surfaces of the portion of the pipe to be jointed shall be cleaned and dried. Jointing shall be done in strict accordance with the manufacturer's recommended procedure

304.5. A manhole water stop gasket and clamp assembly as approved by the Engineer shall be constructed at each point where a line enters or exits a manhole. The fluted gasket shall be placed around the pipe and secured with a

stainless steel retainer ring. A standard o-ring coupling shall be placed around the manhole water stop assembly.

304.6 After all backfill is in place, PVC sewer pipe shall be measured for vertical ring deflection using a deflection testing mandrel. The contractor shall provide the mandrel and all necessary equipment to perform the deflection test. All testing and test conclusions shall be verified by the Engineer or his designated representative. The contractor shall submit detailed dimensional drawings of the mandrel for approval by the Engineer. The mandrel shall be sized to limit the maximum ring deflection of the installed pipe to 5% of the average inside diameter, as defined by ASTM Designation D3034. All pipe exceeding the allowable deflection shall be replaced at no additional cost to the owner.

304.7. Payment for this item shall be made at the unit price bid per linear foot of the pipe specified in the Proposal, and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes.

305. PIPE, REINFORCED CONCRETE (NOT USED)

306. PIPE, DUCTILE IRON

306.1. The work under this item shall include furnishing, hauling, placing, and jointing of Ductile Iron pipe in the trench in specific conformity with the lines and levels given. All Ductile Iron pipe shall be wrapped with a loose fitting, slip-on polyethylene film. The polyethylene film shall be slipped over the end of the pipe length that has been raised above the ground at the trench side. After the joint on the pipe is made up, the one-foot length shall be slipped over the joint to form an over-or-under lap of the adjacent polyethylene tube at this point. The loosely fitting film shall then be neatly folded over the top of the joint and held in place with tape. The loosely fitting tube extending along the pipe shall be drawn up snugly, and folded along the top and held in place by using short pieces of plastic tape at intervals not to exceed four (4) feet. Fittings, valves and corporation stops shall be wrapped with a section of polyethylene material split to form a flat sheet, using plastic tape to hold the material around the appurtenance. For all pipe, the American National Standard for Installation of Gray and Ductile-Cast-Iron Water Mains and Appurtenances, AWWA C-600 shall govern the installation as applicable.

306.2. For water lines, all fittings or specials included as pipe shall be blocked in accordance with the attached Standard Detail, with the size determined by the Engineer.

306.3. Payment for this item shall be made at the unit price bid per linear foot of pipe of the type specified in the Bid form, and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings used with drop manholes, for fittings or specials included as pipe, or for concrete blocking.

307. PIPE, STEEL (NOT USED)

308. POLYVINYL CHLORIDE (PVC) PIPE, WATER SERVICE

308.1. When PVC pipe is delivered to the job site it shall not be exposed to sunlight for more than three (3) weeks. PVC pipe likely to be exposed to sunlight for more than three (3) weeks shall be covered with an opaque protective covering. The pipe shall be left stacked and no more pipe than can be installed in one day shall be strung along the job site.

308.2. When a length of PVC pipe is cut, the plain end shall be beveled to the same configuration as the factory beveled end. The end shall be beveled using a pipe beveling tool, portable sander, or abrasive disc. After beveling, stop marks shall be applied to the plain end at a distance from the end corresponding to the original stop marks.

308.3. Both Bell End and Plain End of PVC pipe shall be thoroughly cleaned before connecting pipes.

308.4. Elastomeric Gaskets shall be placed into bell with colored side of the gasket to the outside.

308.5. Before connecting PVC pipes, the plain end shall be lubricated with an approved lubricant. The bell end of PVC pipe shall not be lubricated.

308.6. When connecting, the plain end pipe shall be inserted into the bell end pipe and then pushed until stop marks on plain end are flush with end of bell.

308.7. Payment for this item shall be made at the unit priced bid per linear foot of pipe of the type specified in the Bid form, and placed as shown on the Drawings. Total footage shall be the actual horizontal measurement along the centerline of the pipe. No additional payment shall be made for vertical pipe or fittings or specials included as pipe, or for concrete blocking.

309. LOCATOR WIRE AND DETECTABLE MARKING TAPE

309.1. A Number 8 bare copper conductor wire for the purpose of locating PVC pipe shall be buried along the top of the pipe, and connected at each end to a fire hydrant by Cadweld Brazing just above the finished grade.

309.2. Detectable Mylar marking tape for location of PVC water pipe shall be buried above PVC water lines at a depth of 10-inches below the finished grade. Detectable Mylar marking tape shall be 2-inches wide, blue in color with a continuous black lettered imprint stating "Caution: Water Line Below". Tape shall be equal to Lineguard Tape III tape as manufactured by Lineguard, Inc. of Wheaton, Illinois.

309.3. Payment for tape shall be included in the unit price bid for PVC pipe. No additional payment will be made.

310. TAPPING OFF PVC PIPE FOR SERVICE CONNECTIONS

310.1. Standard water service connections shall be made by using bronze service clamps as shown on the standard details included in drawings. The couplings shall be provided with factory installed brass bushings which conform to ASTM B62 and AWWA C800 for standard corporation stop threads. Bushings must match the corporation stops. Direct tapping of PVC water pipe will not be allowed.

311. FITTINGS

311.1. The work under this item shall include all of the requirements specified under the item of pipe, in that "pipe" is understood to also mean "bends, tees, crosses, sleeves, and other specified fittings." If ductile iron pipe is used, the outlet shall consist of a tee with the outlet flanged. If a gate valve is shown on the Drawings to be attached to the outlet, the line side end shall be flanged and the opposite end shall be bell or mechanical joint according to the item for valves. All bends, tees, crosses, outlet assemblies, and plugs shall be blocked with concrete as shown on the Standard Detail, except, where the fittings have flanged, welded, or harnessed joints, the Inspector may, under certain conditions, delete the blocking. Concrete blocking shall be placed so that joints are accessible for repair.

311.2. Payment for this item shall be made at the unit price bid per fitting, of the type specified in the Bid form, and placed as shown on the drawings. Only fittings specifically noted in the Bid form are included in this item. No additional payment shall be made for excavation, backfilling, or concrete blocking.

312.

POLYVINYL CHLORIDE (PVC) PIPE, SEWER SERVICE

312.1. The work under this item shall include furnishing, hauling, placing, and jointing PVC sewer pipe in the trench in specific conformity with the line and levels given. Installation of the PVC sewer pipe shall be in accordance with ASTM D2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe", except as modified by these specifications. Backfill materials shall be placed in accordance with Standard Bedding Detail for Polyvinyl (PVC) Chloride flexible sanitary sewer pipe. All crushed stone material shall be one and one-quarter to three-quarter inch class "A" graded stone. Crusher run will not be acceptable. Limestone screenings may be used if compacted to 90 percent density at optimum moisture content. If there is a question regarding moisture content, the contractor may, at his option, provide approved laboratory analyses to establish optimum moisture content. However, the Engineer's decision will be final.

312.2. Pipe shall be protected during unloading and installation against shocks and free fall. After unloading and before installation, pipe shall be stored on flat level ground with no rocks or other objects under the pipe.

312.2.1. The pipe shall be laid on a firm trench bottom, true to the lines and grades shown on the drawings and/or as given in the field by the Inspector. Pipe shall be protected during handling against impact shocks and free fall. The laying of pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. Pipe shall be laid continuously through new manholes if both inlet and outlet pipes are of the same size and in line. Upon completion of the manhole, the invert shall be shaped. The ends of adjoining pipes shall butt against each other for their entire circumference in such manner that there are no shoulders or unevenness of any kind.

312.2.2. The pipe grade shall be established by the Contractor. Any error, discrepancies, or displacement of grade stakes shall be called to the attention of the Inspector, and corrected.

312.2.3. Prior to making pipe joints, all surfaces of the portion of the pipe to be jointed shall be cleaned and dried. Jointing shall be done in accordance with the manufacturer's recommendations.

312.2.4. A manhole water stop gasket and clamp assembly as approved by the Engineer shall be constructed at each point where a line enters or exits a manhole. The fluted gasket shall be placed around the pipe and secured with a stainless steel retainer ring. A standard o-ring coupling shall be placed around the manhole water stop assembly.

### 312.3. Testing

312.3.1. After all backfill is in place, PVC sewer pipe shall be measured for vertical ring deflection using a deflection testing mandrel. The contractor shall provide the mandrel and all necessary equipment to perform the deflection test. All testing and test conclusions shall be verified by the Engineer or his designated representative. The contractor shall submit detailed dimensional drawings of the mandrel for approval by the Engineer. The mandrel shall be sized to limit the maximum ring deflection of the installed pipe to 5% of the average inside diameter, as defined by ASTM Designation D3034. All pipe exceeding the allowable deflection shall be replaced at no additional cost to the owner.

312.3.2.1. Flushing of PVC sewer lines will be performed by the Contractor. Any infiltration of flushing water or other leaks into the sewer shall not be acceptable, and the contractor shall immediately correct the cause of the leak in a manner acceptable to the Engineer.

312.3.3. Where air testing of PVC pipe is specified, it shall be air tested in accordance with the City. The air testing will be performed by the Contractor.

312.3.4. Manholes shall be water tested by plugging all lines entering and exiting the manholes and then flooding the manhole to rim elevation. This test will be performed by the Contractor.

312.3.5. Payment for this item shall be included in the unit price bid per linear foot of the pipe specified in the Bid form, and placed as shown on the Drawings.

### 313. MANHOLES

313.1. The work under this item shall include all excavation for, furnishing all materials required for, construction of, pipe connections to, and finishing and backfilling of new standard or drop manholes. Construction of manholes shall progress as rapidly as installation of the line permits, and as directed by the Inspector.

313.2. Excavation for manholes shall be made with vertical sides and minimum dimensions permitting construction of the manhole in accordance with the attached Standard Details. Manholes are to be built to an elevation not less than that of the existing ground surface, or as shown on the drawings.

313.3. New manholes shall be constructed around existing lines without disturbance to the line. When the manhole is completed, the existing pipe shall be removed from the invert of the manhole. Care shall be taken in removing the pipe to prevent any stoppage. Immediately upon completion of the

manhole, all waste mortar and debris shall be removed from the bottom and invert. When the walls are completed, a standard manhole frame and cover shall be set in place. Above the base, manhole inverts shall be carefully constructed of solid concrete to maintain proper velocities. Changes in pipe grade, alignment or size shall be made by transition sections of the invert, determined by the lower half of the inlet and outlet pipes, but not greater than that of the outlet pipe. All inverts shall be plastered, troweled, and brushed to a smooth, clean surface. Inlet and outlet pipes shall not project beyond the interior wall of the manhole and shall be free from all sharp masonry.

313.4. During the construction of each manhole, cast iron steps shall be set in place on the inside of the manhole, beginning eighteen inches above the bottom and placed not more than fifteen inches apart. No steps shall be placed closer than eighteen inches to the manhole top. If concrete masonry units are used for the walls, special cut step blocks shall be installed to receive the steps. Steps shall be built firmly into the wall, allowing the steps to project five inches inside the manhole. If five-inch concrete masonry units are used, the ends of the steps projecting beyond the outside wall shall be cut off flush with the wall, and plastered over. The centerline of the steps shall be as shown on the Standard Detail for Manholes. Four-and-one-half-inch steps shall be used for brick manholes and twelve-inch steps for precast manholes.

313.5. The use of concrete masonry units shall not be allowed in connection with pipes larger than eight inches in diameter. If concrete masonry units five inches thick are used, the manhole shall not be located within any dedicated street or alley, or any other location subject to vehicular traffic; and shall not exceed twelve feet in depth. The foregoing restrictions as to location and depth shall not apply if eight-inch concrete masonry units, brick, or precast manholes are used.

313.6. For brick manholes, a single rowlock course shall be turned over each pipe. Every unit shall have a full mortar joint on the bottom and sides, which shall be formed in one operation by placing sufficient mortar on the bed and forcing the unit into it. Horizontal joints shall not exceed three-eighths inch and vertical joints on the inside of the manhole shall not exceed one-quarter inch in thickness. All joints on the inside are to be rubbed full and struck as the manholes are built up. Walls shall be constructed in horizontal courses with vertical joints staggered. When the manhole top is above the proposed graded elevation, the taper shall be drawn in the manhole top to twenty-four inches I.D. at a point one foot below said proposed elevation and the remainder constructed with brick as a twenty-four inch cylinder. The inside and outside walls of the manholes are to be plastered with one-quarter inch of mortar to give a smooth and regular finish.

### 313.7. Pre-cast Manholes

313.7.1. Pre-cast manholes with cast-in-place base slabs shall be permitted on a case-by-case basis.

313.7.2. Pre-cast manholes with integral pre-cast floors will be used for standard , shallow and drop manhole installations.

313.7.3. Pre-cast floors shall be placed on a minimum of 18-inches of compacted Class A crushed stone.

313.7.4. Pre-cast manholes shall conform to the specifications for Pre-Cast Reinforced Concrete Manhole Sections, ASTM C478. Joint construction shall be in accordance with the standard specification for Reinforced Concrete Pipe except that no exterior grout band is required. No more than eight (8) inches of concentric rings shall be used to bring the manhole to finished grade. Each concentric ring shall have a full mortar joint, not exceeding three-eighths (3/8) inch in thickness. Inside joints shall be rubbed full and struck.

### 313.8 Cleaning

313.8.1 Thoroughly clean all new manholes of all silt, debris and foreign matter of any kind, prior to final inspections.

313.9. Payment for this item shall be made at the unit price bid per manhole of the type specified in the Bid form, and placed as shown on the drawings. If the manhole depth, measured from the invert to the top of the cover, exceeds six feet, the additional depth shall be paid for at the unit price bid per linear foot of manhole depth over six feet. No additional payment will be made for excavation, backfilling, pipe or concrete bottoms.

### 314. CONNECTIONS

314.1. The work under this item shall include all excavation, furnishing of all materials required, construction, finishing, and backfilling of connections to existing mains, valves, manholes, special connections, service line re-connections, plugs, or in-line tees and wyes for future connections, as indicated on the Drawings or as directed by the Inspector.

314.2. Connections shall be made in accordance with the details on the drawings or as directed by the Engineer. The Contractor shall make the pressure and wet connections to existing *water* mains, as shown on the drawing, unless noted otherwise.

314.3. Connections to existing manholes shall be made by coring into the manhole at the specified grade, inserting the pipe, and sealing the connection

with a flexible seal, such as Kor-N-Seal. The contractor shall not break into any existing sewer unless the Inspector is present. Inlet and outlet pipes at the invert shall not project beyond the interior walls of the manholes. The manhole base shall be cut and reconstructed in such a manner that a proper invert section is maintained. All waste mortar, debris, and sharp edges shall be removed from the joints, bottom, and invert. Any and all diversion or pumping of water or sewerage in a wet connection is included in this Item.

314.4. Methods of construction shall be the same for house line reconnections as for main sewers. Ductile iron pipe shall be used for all lines in parking areas, across open or sewers, across backfilled ditches, or within public rights-of-way. PVC pipe shall be used in all other locations, unless ductile iron pipe is specifically required by the Engineer. All reconnections shall be constructed in conformance with the Plumbing Code of the City of Claremore, unless modified herein. New pipe used shall be of the same diameter as the existing line.

314.5. Plugs shall be constructed of manhole brick and mortar, extending at least one foot from the manhole into the line plugged. The plug shall be watertight and troweled to a smooth finish on the interior of the manhole.

314.6. In-line tees or wyes shall be installed for future service connections, as shown on the plans, in accordance with the Standard Detail for in-line tees or wyes. The tee or wye shall be capped with a PVC cap or plug, marked by a non-magnetic, Mylar tape, and stapled to both sides of a nominal 2" x 4" marker, 8' long, (4' buried, and 4' exposed), directly above the fitting plug. The Mylar tape shall be a minimum of 2-1/2" in width, green in color, and marked "Caution, Sanitary Sewer Below," as manufactured by Terra Tape or Line Guard.

314.7. After a new water main have been tested and chlorinated, the Contractor shall excavate around the new main for the service transfer. The existing mains and new mains shall remain in service during the transfer of services. The Contractor shall tap the new main and install a new corporation stop, service clamp, bend, copper tubing, and required fittings. The new service shall be connected to the existing meter after the service has been tested for leakage. The excavated area shall be backfilled and restored to original condition. Where galvanized service lines are encountered, they shall be replaced with copper. Where long services are replaced, they shall be bored under existing pavement. Open cutting will not be permitted unless approved by the Engineer. Copper tubing shall be Type K soft annealed conforming to ASTM B88.

314.8. Payment for this item shall be made at the unit price bid for each type of connection constructed, or in-line tee for future connection, as specified on the Bid form, or as directed by the Engineer. Payment for the first drop connection to a new manhole is included in the Manhole Item. No

additional payment will be made for excavation, backfilling, furnishing and placing of concrete, removing and replacing of manhole steps, if necessary, or for the diversion or pumping of water or sewerage necessary to make the connection. Payment for water service transfers shall be made at the unit price bid for pipe and fittings under the appropriate connection bid item and shall include all necessary excavation, backfill, right-of-way clearing and restoring, materials, and labor.

315. LAMPHOLES

315.1. The work under this item shall include all excavation for, furnishing of all materials required, construction, finishing and backfilling of lampholes and pipe connection thereto. Lampholes shall be located and constructed as shown on the Drawings, or as directed by the Inspector. When the concrete lamphole frame base has been completed, a standard lamphole frame shall be set in place and closed with a lamphole cover.

315.2. Payment for this item shall be made at the unit price bids per lamphole constructed as specified on the Bid form. No additional payment will be made for excavation, backfilling, or pipe.

316. VALVES

316.1. The work under this item shall include the furnishing, hauling, and installing of valves at the locations shown on the Drawings, and in accordance with the attached Standard Details. The American National Standard for Installation of Gray and Ductile-Cast-Iron Water Mains and Appurtenances, AWWA C-600 shall govern the installation, as applicable. If the paint is damaged, the valve shall be cleaned by wire brushing and given two coats of black asphalt paint.

316.2. Gate valves shall be set with the stems plumb. Ball valves shall be set with the handwheels horizontal. Air relief valves shall be set so that the square-operating nut on the two-inch valve can be operated from the top. Check valves shall be set horizontally. Construction standards for air relief and check valve vaults shall be the same as for manholes.

316.3. Fire hydrants shall be set so that the bottom of the steamer nozzle is not less than 18 inches nor more than 21 inches above the finish grade of the ground. Breakable bolts damaged in the installation shall be replaced in kind. If the Mueller hydrant is used, the oil reservoirs shall be filled before the hydrant is set. Concrete blocking shall be placed so that the drain and joints are accessible. Fire hydrant and stem extensions shall be provided and installed as necessary, in accordance with the manufacturer's recommendations.

316.4. Payment for this item shall be made at the unit price bid per valve, of the type specified on the Bid form, and placed as shown on the Drawings. If fire hydrant and stem extension are required, they shall be paid for at the unit price bid for each different length of extension used. The unit price bid for air relief and check valves shall include the valve vault. No additional payment shall be made for: excavation; backfilling; concrete blocking; the pipe length between the line and the fire hydrant, except where the pipe is shown on the Drawings in a separate profile; crushed rock for drains; or air relief valve piping vaults.

317. VALVE BOX

317.1. The work under this item shall include furnishing, hauling, and installation of valve boxes and valve box extensions at the locations shown on the Drawings. The American National Standard for Installation of Gray and Ductile-Cast-Iron Water Mains and Appurtenances, AWWA C-600, shall govern the installation, as applicable. Exposed parts of valve boxes shall be given one coat of red lead and one finish coat of yellow paint.

318. ENCASEMENT, CONCRETE

318.1. The work under this item shall include the installation of concrete encasement as shown on the drawings or as directed by the Inspector, in accordance with the Standard Details. Care shall be taken to assure that placing of encasement does not deflect the pipe from the proper grade and alignment.

318.2. Sanitary sewers shall be encased when the depth of cut from the original ground elevation to the flow line of the pipe is four feet (4') or less. Concrete encasement necessitated by trench widths more than the maximum as shown on the Standard Detail for Thrust Blocks and Trench Conditions shall be placed as directed by the Inspector.

318.3. Payment for this item shall be made at the unit price bid per cubic yard of concrete placed as encasement. All concrete encasement required because of excessive trench width shall be placed at the expense of the Contractor. No payment will be made for concrete used as fill or in excess of the theoretical quantity computation based on the Standard Detail for thrust blocks and trench conditions.

319. CRADLE, CONCRETE

319.1. The work under this item shall include the installation of concrete cradle as shown on the Drawings or as directed by the Inspector, in accordance with the Standard Detail for Thrust Blocks and Trench Conditions.

Care shall be taken to assure that placing of cradle does not deflect the pipe from the proper grade and alignment.

319.2. For sanitary sewers, standard concrete cradle is required at any location where the depth of cut to the flow line of the pipe is sixteen feet (16') or more. Concrete cradle necessitated by trench widths greater than the maximum as shown on the Standard Detail shall be placed as directed by the Inspector.

319.3. Payment for this item shall be made at the unit price bid per cubic yard of concrete placed as cradle. All concrete cradle required because of excessive trench width shall be placed at the expense of the Contractor. No payment will be made for concrete used as fill or in excess of the theoretical quantity computation based on the Standard Detail for Thrust Blocks and Trench Conditions.

### 320. PIERS, REINFORCED CONCRETE

320.1 The work under this item shall include all labor and materials required for forming, construction of, and finishing reinforced concrete piers, and necessary pipe anchorage. Piers shall be located and constructed as shown on the Drawings and Standard Details. Forms shall be made to conform to the shape of the pier and securely braced. Reinforcing steel shall be bent as detailed and securely tied in place. Bearing area for the pipe shall be made to fit the outside diameter of the pipe and shall support the pipe at the proper grade. Steel strapping and bolts shall be installed and painted with one heavy coat of coal tar or asphalt paint after bolting in place. Any honeycomb or other unevenness in the concrete shall be patched with cement mortar immediately after form removal.

320.2. Payment for this item shall be made at the unit price bid per cubic yard of concrete placed as reinforced concrete piers in accordance with the Standard Details, at the location shown on the Drawings, or as directed by the Engineer. No additional payment will be made for excavation, reinforcing, forming, bracing, dewatering, backfilling, or pipe anchorage.

### 321. CONDUIT

321.1. The work under this item shall include the installation of railroad, street, or other crossings by boring or tunneling as shown on the drawings. The conduit pipe shall be installed to the line and grades given. Voids between the outside of the conduit and the surrounding earth shall be filled with cement grout or other material approved by the Engineer. The space between the outside of the carrier pipe and conduit shall be filled with sand if required by the Inspector. The Engineer shall approve the following optional methods: tunneling or boring; conduit material; construction method details, carrier supports, sand fill.

321.2. Payment for this item shall be made at the unit price bid per linear foot of conduit, of the size specified in the Bid form, and placed as shown on the Drawings. All carrier pipes shall be paid for under other items. No additional payment shall be made for excavation, backfilling, boring, tunneling, dewatering or sand fill.

322. STRUCTURE, SPECIAL

322.1. The work under this item shall include the furnishing of all materials and performing all work necessary to complete any special structures shown on the Drawings.

322.2. Payment for this item shall be made at the unit price bid for each structure as specified in the Bid form, and constructed as shown on the Drawings. Pipe, fittings, valves and other appurtenances will be paid for under other items. No additional payment will be made for excavation, reinforcing, backfill, foundations, or any particular element of construction.

323. Materials Furnished by the Contractor and Installed by the City

323.1. The work under this item shall include furnishing and hauling of materials to the site of work. All necessary clearing, excavation, other site preparation, backfill and restoration, shall be performed by the Contractor so that the City may install the materials in place with a minimum amount of delay. The Contractor shall furnish assistance to the City in installing the materials so that they may be readily installed. The City's responsibility shall be only for the actual installation of the materials. All other work shall be performed by the Contractor.

323.2. Payment for this item shall be made at the unit price bid per material item of the type specified in the Bid form and actually installed per Drawings. Only materials specifically noted in the Bid form are included in this item. The cost of all necessary clearing, excavation, other site preparation, backfill and restoration will be paid for under other bid items.

324. SODDING AND SEEDING

324.1. Only the turf in one residential block may be removed at any time. Where residential blocks are not delineated the turf along no more than 1,000 linear feet of trench excavation may be removed at any given time. Where the installation of a water or sanitary sewer main traverses developed residential or commercial areas, the Contractor shall restore all turf damaged by the construction. The restoration of turf shall be by Sod Replacement or Hydromulch Seeding, as directed by the Engineer.

324.2. Sod Replacement: The Contractor shall remove the turf with approved cutting equipment. Store the turf in an area where construction

operations will not damage it and apply sufficient water to preserve the root system. The Contractor shall replace the turf after the trench has been backfilled and compacted. As an alternate to this method, the Contractor may furnish and install new solid slab grass sod of the same type as that which was removed. The new sod shall be moist when excavated from the source and kept moist until planted. Sod shall consist of vegetative parts (rhizomes, stolons, and roots) with an appreciable quantity of adhering soil. Sod which becomes dry shall be discarded. Sodded areas shall be thoroughly watered after placement.

324.3. Hydromulching: The Contractor shall remove, store, and replace topsoil. Apply seed, fertilizer, and mulch together in a homogenous slurry. Fertilizer shall be 10-20-10 and shall be applied at a rate of 10 lbs. per 1,000 sq. ft. Mulch shall be wood fibers and applied at a rate of 46 lbs. per 1,000 sq. ft. Grass seed shall be either hulled Bermuda applied at a rate of 2 lbs. per 1,000 sq. ft. or Rebel Fescue applied at a rate of 8 lbs. per 1,000 sq. ft. as directed by the Engineer. Mulch shall be kept moist for a minimum of 10 days or until seeds have germinated and rooted. The Contractor as required maintaining the grass shall provide watering.

324.4. The Contractor shall obtain a hydrant meter from the City and pay all required fees for any watering. The Contractor shall maintain all sodded or seeded areas until acceptance of the work.

324.5. Payment for Sod Replacement or Hydromulch Seeding will be made at the unit price bid per linear foot and shall include all necessary top soil replacement, fertilizing, watering, and maintenance. The linear foot pay quantity will be measured parallel to the pipe through the area being restored. The Contractor shall consider the width of turf restoration required for each area. No additional payment will be made for extra sodding or seeding required due to valve vaults, fire hydrants, tie-ins, service transfers, leak repairs, plugging, manholes, lampholes, or other appurtenances.

### 325. DRIVEWAY CROSSING BY BORING

325.1.1. Waterline installed under existing concrete or asphalt driveways shall be bored. The diameter of the bore shall be a maximum of 4-inches larger than the outside diameter of the pipe bell. The annular space between the carrier pipe and the surrounding undisturbed earth shall be filled with sand. If the carrier pipe is ductile iron it shall be polyethylene wrapped and taped at one (1) foot intervals through the entire length of the bore. If the Engineer determines that boring is not possible, the driveway shall be open cut and the pavement replaced as directed by the Engineer.

325.2. Payment for driveway crossings by boring shall be at the unit price bid per linear foot as measured from edge to edge of the driveway. Removal and replacement of driveway pavement will be paid for under other

items. No payment will be made for additional bore required due to obstructions on either side of the driveway.

## 326. PAVEMENT, REMOVAL AND REPLACEMENT

326.1. Work under this item includes removal and replacement of concrete or asphalt pavement for sidewalks, driveways, parking areas, curbs, roads, streets, and alleys, etc. Pavement crossed at right angles shall be saw cut, removed, and replaced as shown on the standard drawings or as directed by the Engineer for the type of pavement indicated on the Bid form. Pavement crossed diagonally shall be squared by saw cutting at right angles to the paved area. If a construction joint is within three (3) feet of a proposed saw line, the pavement shall be replaced to the joint as directed by the Engineer. New concrete pavement shall extend one (1) foot on either side of the trench. All paving shall conform to the City and ODOT standards and specifications. Concrete shall be high early strength. All asphalt shall be hot mix, hot laid.

326.2. Payment for removal and replacement of concrete or asphalt pavement shall be at the unit price bid per square yard. The pay quantity will be computed using the standard pay width for the type of pavement replaced and the length of the pavement cut along the centerline of the pipe. The pay quantity will include pavement replaced due to the proximity of a construction joint if the specified criteria is met. For diagonal crossings, the pay quantity will include the areas replaced due to squaring. Payment for saw cut shall be at the unit price bid per linear foot. Payment for curb and gutter shall be at the unit price bid per linear foot. No payment will be made for preparation of subgrade, forms, or reinforcing. No payment will be made for removal or replacement of gravel, macadam, or oiled surfaces.

## 327. EROSION CONTROL MEASURES

327.1. The Contractor shall be responsible for ensuring that measures are taken to minimize erosion and sedimentation problems, during construction. The measures include but are not limited to the following:

327.1.1. Straw bale dikes in bar ditches at 500 ft. intervals on relatively flat grades and 200 ft. intervals on grades over 5 percent.

327.1.2. Sediment shall be removed from sumps upstream of straw bales on a regular basis.

327.1.3. Removal of silt from streets.

327.1.4. In areas where construction is adjacent to improved streets, measures shall be taken which will minimize accumulation of silt in existing storm

sewers. Straw bales should be placed around inlets. Precautions should be taken during heavy rains to assure that a flooding condition is not created.

327.1.5 Straw mulch can be used as an effective means of erosion control.

327.1.6 Erosion control measures shall be placed at the toe of all cut and fill slopes.

327.2. Straw bales shall be standard rectangular size, approximately 18" x 20" x 36", and shall be securely bound with wire. Bales shall be firmly anchored with wood or metal stakes approximately 3 feet long. A sediment sump shall be excavated immediately upstream of each bale. The Contractor shall clean and maintain sediment sumps throughout the maintenance period.

327.3. The Contractor shall furnish and install straw mulch as directed. Mulch shall be applied at a rate of 1-1/2 tons per acre. Mulch shall be securely anchored in place.

327.4. Payment for straw bales will be at the unit price bid and shall include the cost of sediment sumps and anchoring. Payment for straw mulch will be at the unit price bid per square yard and shall include the cost of anchoring.

## DIVISION IV

### **STREETS & DRAINAGE SPECIFICATIONS**

#### **401. ADOPTION OF STATE STANDARDS**

Except as otherwise provided herein, the latest edition of the Oklahoma Standard Specifications for Highway construction, as published by the Oklahoma Department of Transportation, - as shall be the standard specifications for grading, street, road and drainage construction for the City. In the event of any conflict between any of the provisions of the Oklahoma Standard Specifications for Highway Construction and the specific provisions set forth herein, the specific provisions set forth herein shall govern.

#### **402. DEFINITIONS**

Certain terms in the Oklahoma Standard specifications for Highway Construction referenced in Section 401 shall have the meanings or definitions indicated below when incorporated in the Standard Specifications of the City of Claremore.

402.1. Commission: The duly authorized officers or agents of the City of Claremore, Oklahoma as constituted by law to administer the affairs of the City.

402.2. Department: The City of Claremore, Oklahoma, a municipal corporation, acting through its duly authorized officers or agents.

402.3. Director: The Claremore City Manager or his duly authorized representative.

402.4. Engineer: The City Engineer of the City of Claremore or his duly authorized representative.

402.5. Materials Division: The Public Works Department of the City of Claremore.

## DIVISION V

### STANDARD DETAILS AND DRAWINGS

#### LIFT STATIONS

Duplex Lift Station Figure STDLS.01  
Duplex Lift Station Valve Vault Figure STDLS.02

#### TRAFFIC RIGHT-OF-WAY STANDARDS

Primary/Major and Secondary/Minor Arterials Figure RW.01  
Commercial/Industrial Collector/Central Business  
Streets, Residential Collector/Commercial  
/Industrial (Local) Streets Figure RW.02

#### STORM SEWER

Storm Sewer Pipe Trenching and Bedding Figure STDSTM.01  
Natural Channel Figure STDSTM.02  
Concrete Lined Channel Figure STDSTM.03  
Grass Lined Channel Figure STDSTM.04  
Ramp for Concrete Lined Channel Figure STDSTM.05  
Concrete Channel Liner and Details Figure STDSTM.06  
Flume and Channel Liner Details Figure STDSTM.07  
Area Inlet Figure STDSTM.08  
Junction Box Figure STDSTM.09  
Slopewall with Dissipater Detail Figure STDSTM.10

#### SANITARY SEWER

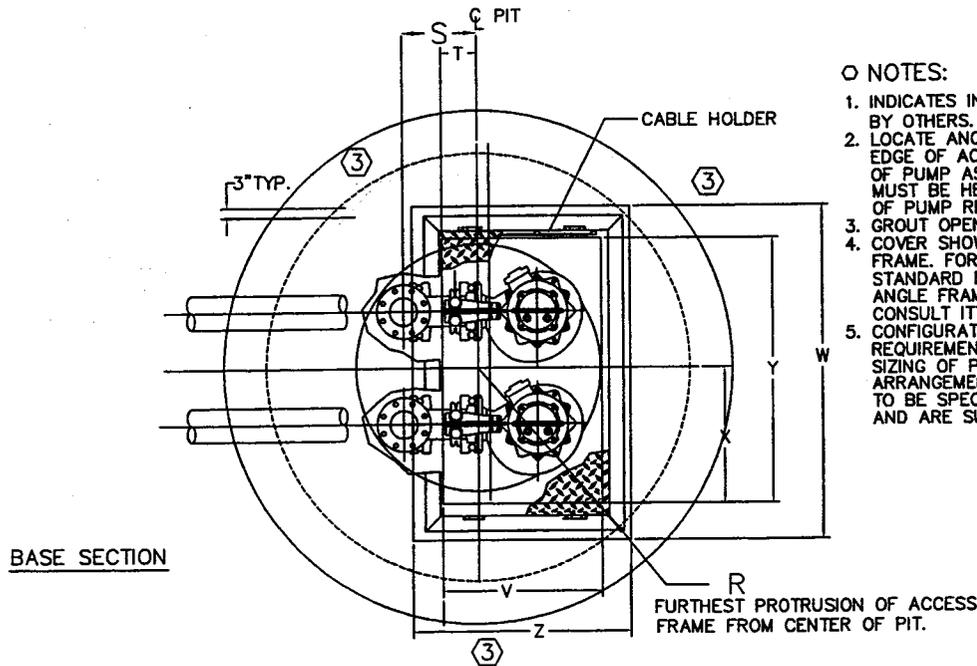
Sanitary Sewer Bedding Detail Figure STDSS.01  
Sanitary Sewer Tap Detail Figure STDSS.02  
Sanitary Sewer Riser Detail – Normal Trench Figure STDSS.03  
Sanitary Sewer Riser Detail – Wide Trench  
Over 12' Deep Figure STDSS.04  
Sanitary Sewer Riser Detail –Narrow Trench  
Over 12' Deep Figure STDSS.05  
Sanitary Sewer Manhole Connector Details Figure STDSS.06  
Precast Manhole Detail Figure STDSS.07  
Manhole Cover and Frame Figure STDSS.08  
Manhole Frame and Cover Detail Figure STDSS.09  
PVC Sewer Deflection Gage Figure STDSS.10  
Water Table Cradle for Flexible Pipe Figure STDSS.11

## STREET DETAILS

Country Living Street	Figure STDST.01
Residential/Collector Local Pavement Sections	Figure STDST.02
Collector/Industrial Local Pavement Sections	Figure STDST.03
Curb and Gutter Detail	Figure STDST.04
Sidewalk and Wheelchair Ramp Detail	Figure STDST.05
Street Patch Detail	Figure STDST.06
Base Drainage	Figure STDST.07
Barricade Details	Figure STDST.08
Asphaltic Concrete Intersection Layout	Figure STDST.09
Concrete Street Intersection Layout	Figure STDST.10
Standard Concrete Pavement Joints	Figure STDST.11
Dowel Bar Assembly Detail	Figure STDST.12
Manholes, Lampholes, and Valve Boxes in Streets	Figure STDST.13
Residential Concrete Driveway	Figure STDST.14
Residential Driveway on Street w/o Curb	Figure STDST.15
Temporary Turn-around	Figure STDST.16
Concrete Lined Channel	Figure STDST.17
Pavement Cuts Detail	Figure STDST.18

## WATER

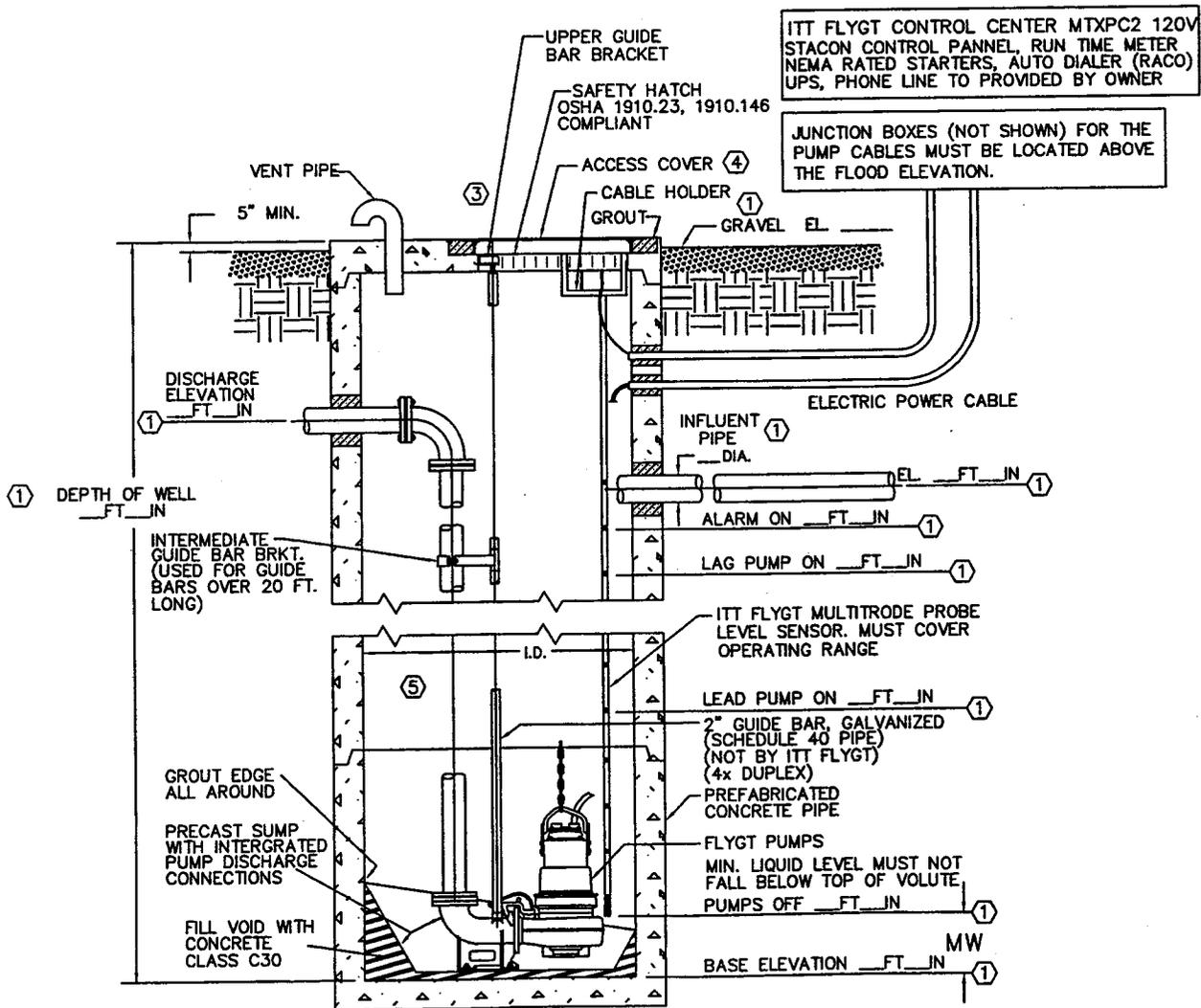
Water Pipe Bedding Detail	Figure STD.W01
Air Relief Valve and Vault Detail	Figure STD.W02
Water Valve Vault and Lid Detail	Figure STD.W03
Valve Box Detail	Figure STD.W04
Frame and Lid for Valve Vaults	Figure STD.W05
Thrust Block Details	Figure STD.W06
Concrete Encasement & Cradles/Trench Conditions	Figure STD.W07
Water Service Line Street Crossing Detail	Figure STD.W08
Fire Hydrant Assembly Detail	Figure STD.W09
Blow-off Hydrant Details	Figure STD.W10
¾" Meter Setting	Figure STD.W11
1" Meter Setting	Figure STD.W12
1 ½" Meter Setting	Figure STD.W13
2" Compound Meter Setting	Figure STD.W14
2" Positive Displacement Meter Setting	Figure STD.W15
1 ½" & 2" Turbine Meter Setting	Figure STD.W16
Meter or Valve Vault Detail	Figure STD.W17
Blow-off Valve Assembly Detail	Figure STD.W18



○ NOTES:

1. INDICATES INFORMATION TO BE DETERMINED BY OTHERS.
2. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND CENTER LINE OF PUMP AS REF. POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP RELATIVE TO ACCESS FRAME.
3. GROUT OPENING FOR ACCESS FRAME.
4. COVER SHOWN IS FOR STANDARD DUTY ANGLE FRAME. FOR ADDITIONAL DIMENSIONS ON STANDARD DUTY TROUGH FRAME, HEAVY DUTY ANGLE FRAME AND HEAVY DUTY TROUGH FRAME, CONSULT ITT FLYGT CORP. ENGINEERING DEPT.
5. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO HIS APPROVAL.

BASE SECTION



ITT FLYGT CONTROL CENTER MTXPC2 120V  
 STACON CONTROL PANNEL, RUN TIME METER  
 NEMA RATED STARTERS, AUTO DIALER (RACO)  
 UPS, PHONE LINE TO PROVIDED BY OWNER

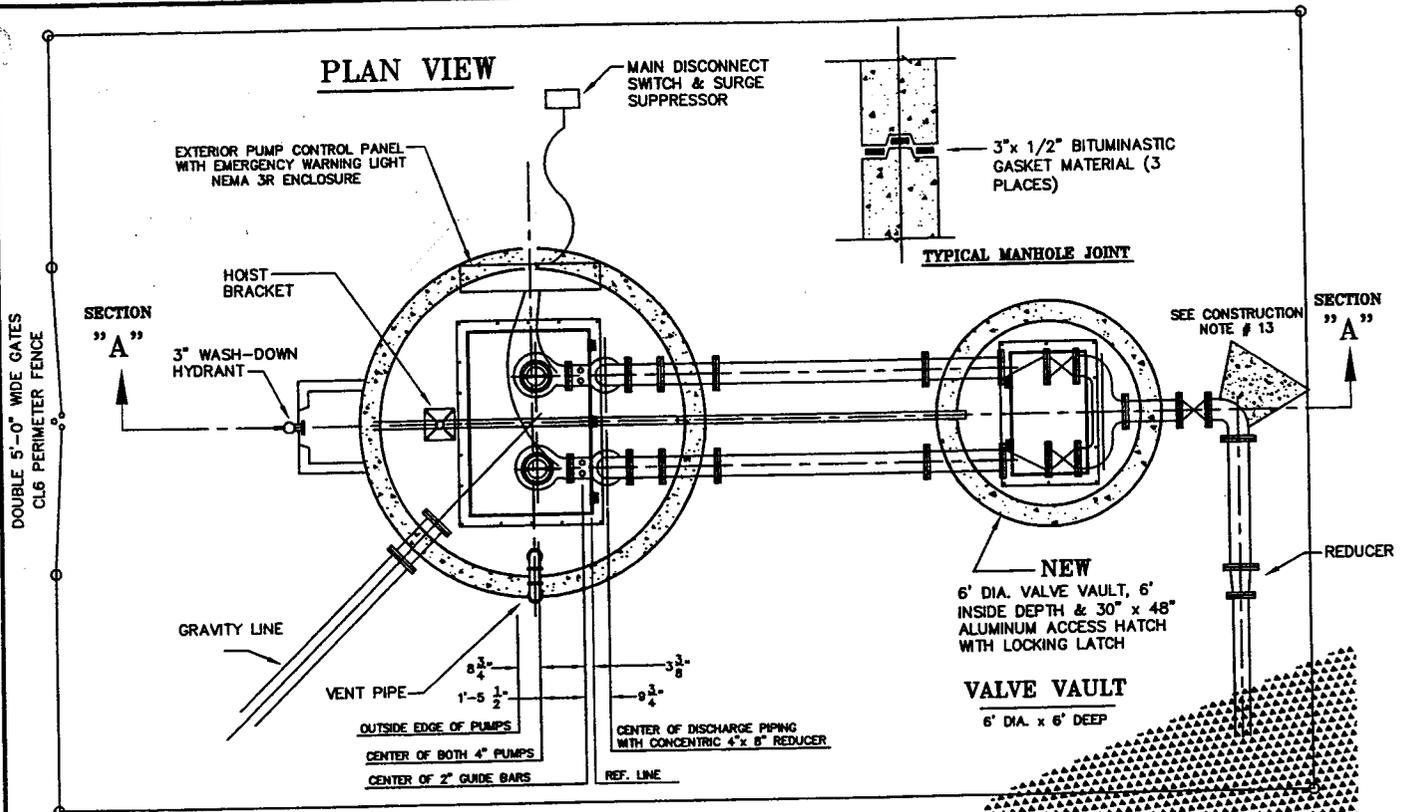
JUNCTION BOXES (NOT SHOWN) FOR THE  
 PUMP CABLES MUST BE LOCATED ABOVE  
 THE FLOOD ELEVATION.

Adopted Date: 3/18/02  
 Effective Date: 4/18/02

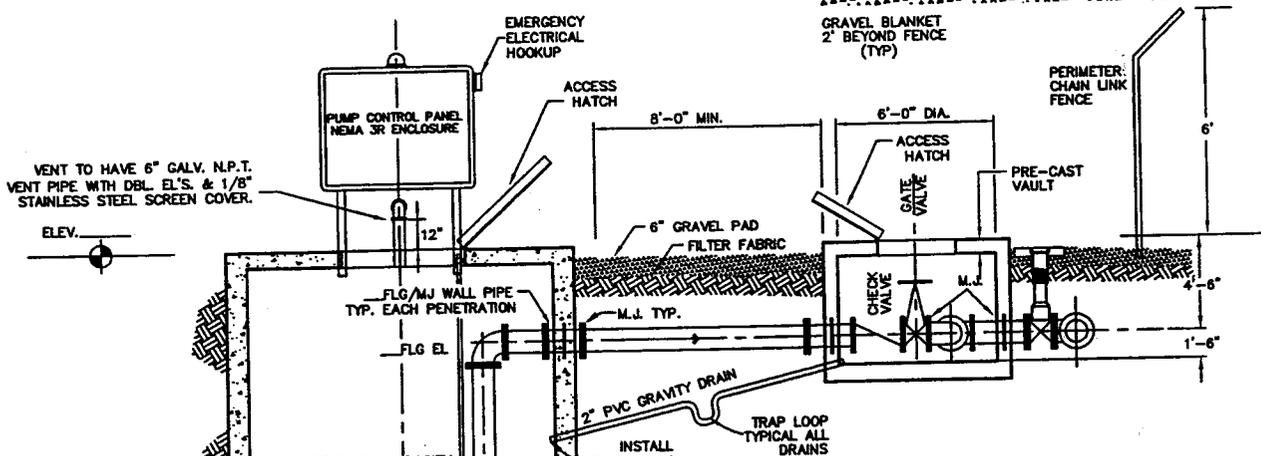
Engineer Approval: HDH

CITY OF CLAREMORE  
 DUPLEX LIFTSTATION VALVE VAULT

FIGURE STDLS.02



DOUBLE 5'-0" WIDE GATES  
 CLG PERIMETER FENCE



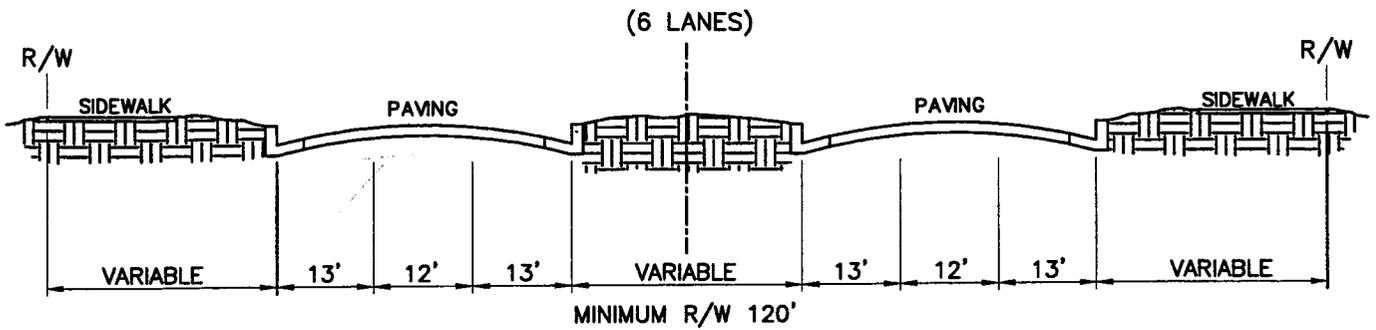
**DESIGN AND CONSTRUCTION NOTES**

1. THE DEVELOPER SHALL VERIFY ALL OPENINGS THROUGH FLOORS, WALLS AND SLABS WITH APPROVED SHOP DRAWINGS.
2. WHERE PIPES AND CONDUITS PENETRATE STRUCTURES, KOR AND SEAL GASKET SHALL BE USED. ALL PENETRATIONS ARE TO BE WATERTIGHT.
3. ALL STRUCTURES SHALL BE WATERTIGHT AND TESTED IN ACCORDANCE WITH MANHOLE TESTING REQUIREMENTS.
4. ALL BACKFILL SHALL BE COMPACTED TO 95% MODIFIED PROCTOR.
5. SUPPORT ALL PIPES AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURE'S RECOMMENDATIONS.
6. PRECAST CONCRETE REINFORCING STEEL CLEARANCE SHALL BE 2", CAST IN PLACE CLEARANCE PER A.C.I.
7. PROVIDE 6" MINIMUM CLEARANCE BETWEEN BOTTOM OF FLANGES AND FLOOR IN VALVE VAULT.
8. LIFT STATION D.I.P. SHALL BE PRESSURE CLASS 350.
9. PRECAST MANHOLE SECTIONS TO RECEIVE BITUMINASTIC GASKET MATERIAL "EZ-STIK" OR EQUAL, AS APPROVED BY THE ENGINEER.
10. ATTACH HOIST BRACKET, HATCH COVER FRAMES, PUMP MOUNTING BRACKETS AND GUIDE RAILS WITH STAINLESS STEEL BOLTS OR AS APPROVED BY THE ENGINEER. FOR PUMP DIMENSION DATA SHEETS, REFER TO PROJECT SPECIFICATION BOOK.
11. MANHOLES SHALL INCLUDE HATCH COVERS, LIDS AND FRAMES. WET WELL SHALL HAVE A SPECIAL DESIGN TOP SLAB.
12. GRAVEL SHALL BE O.D.O.T. STANDARD FILTER BLANKET, SINGLE COURSE, SECTION 713.03, FILTER FABRIC SHALL BE O.D.O.T. STANDARD GEOTEXTILE-FILTER FABRIC, PER SECTION 712.04, GRAVEL AND FILTER FABRIC TO BE 2' BEYOND EXTERIOR OF FENCE.
13. BLOCKING ON FITTINGS EXITING VALVE VAULT IS REQUIRED. IF FORCE MAIN EXITS VAULT STRAIGHT OUT BLOCKING ON TEE INSIDE VAULT MAY BE REQUIRED.

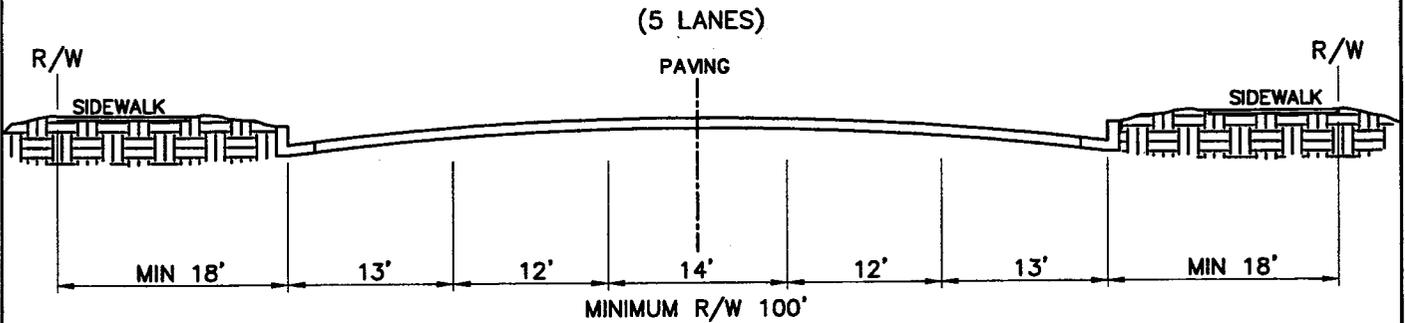
**WET WELL**  
**"A-A" SECTION**  
 NOT TO SCALE

Adopted Date: 3/18/02  
 Effective Date: 4/18/02

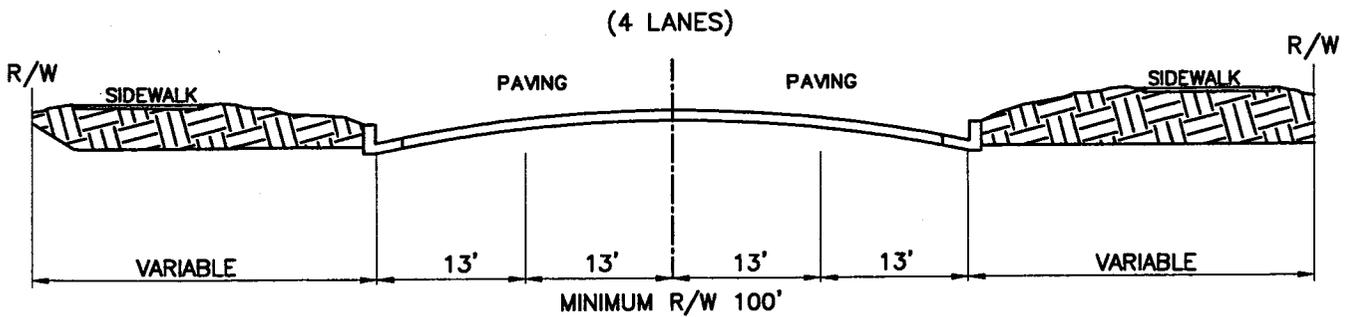
Engineer Approval: HDH



PRIMARY ARTERIAL / MAJOR ARTERIAL  
MINIMUM PAVING AND MATERIAL SPECIFICATIONS FOR CONSTRUCTION  
SHALL BE DETERMINED BY SITE SPECIFIC GEOTECHNICAL REPORT



SECONDARY ARTERIAL (ALTERNATE) / MINOR ARTERIAL (ALTERNATE)



SECONDARY ARTERIAL / MINOR ARTERIAL

MINIMUM PAVING AND MATERIAL SPECIFICATIONS FOR CONSTRUCTION  
SHALL BE DETERMINED BY SITE SPECIFIC GEOTECHNICAL REPORT.

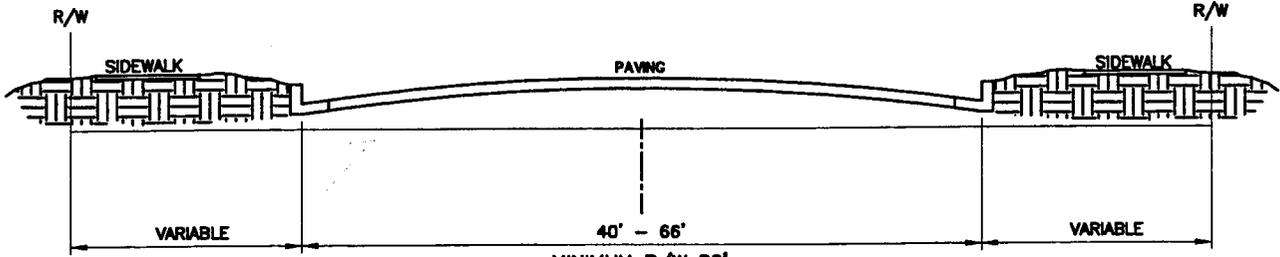
APPENDIX D: MAJOR STREET PLAN - TRAFFIC  
RIGHT-OF-WAY AND PAVING SECTIONS, PAGE D-2  
SOURCE: STANDARD SPECIFICATIONS FOR CONSTRUCTION CITY OF CLAREMORE, OK

Adopted Date: 3/18/02  
Effective Date: 4/18/02

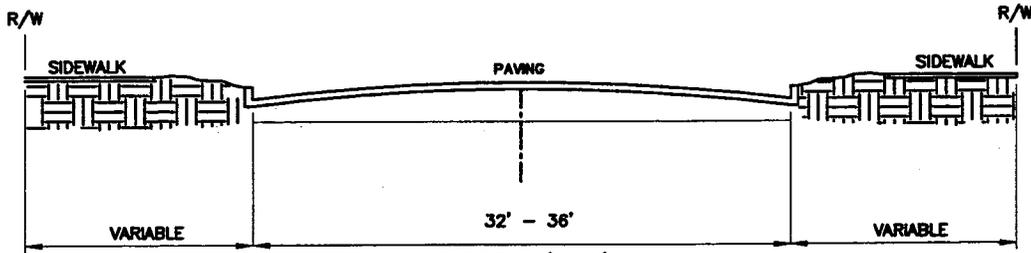
ENGINEER APPROVAL HDH

CITY OF CLAREMORE  
TRAFFICWAY RIGHT-OF-WAY STANDARDS

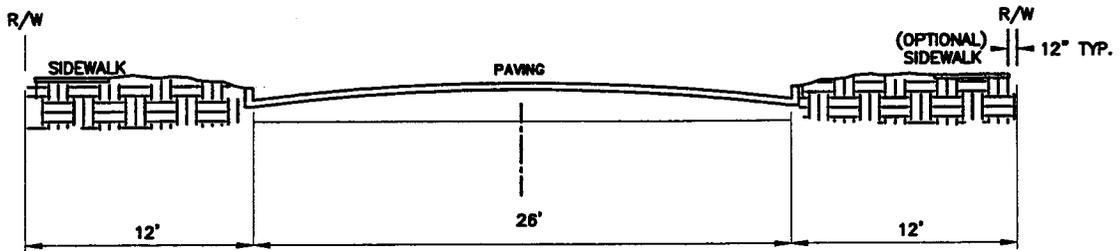
FIGURE RW 02



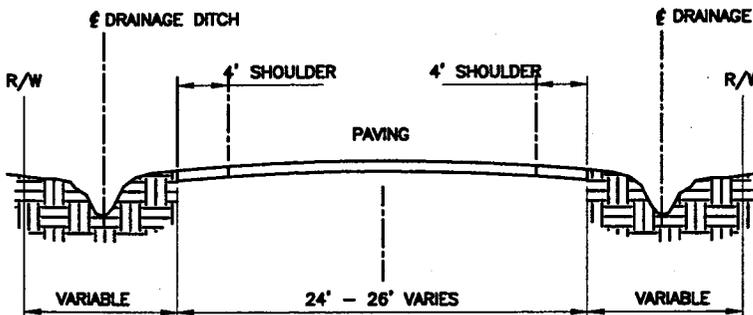
MINIMUM R/W 80'  
COMMERCIAL / INDUSTRIAL COLLECTOR  
CENTRAL BUSINESS DISTRICT STREET WITH SIDEWALKS



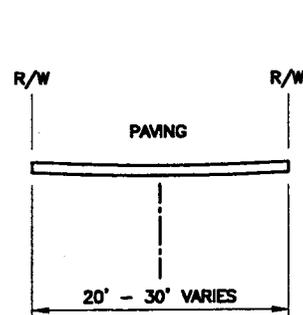
MINIMUM R/W 60'  
RESIDENTIAL COLLECTOR  
COMMERCIAL / INDUSTRIAL (LOCAL)



MINIMUM R/W 50'  
RESIDENTIAL STREET, LOCAL



RURAL RESIDENTIAL STREET with OPEN DRAINAGE  
RS-25CL, RS-40CL, RS-60CL 24ft MIN PVMT / 50' R/W  
(COUNTRY LIVING DEVELOPMENT)  
RS-25, RS-40, RS-60 26ft MIN PVMT / 60' R/W



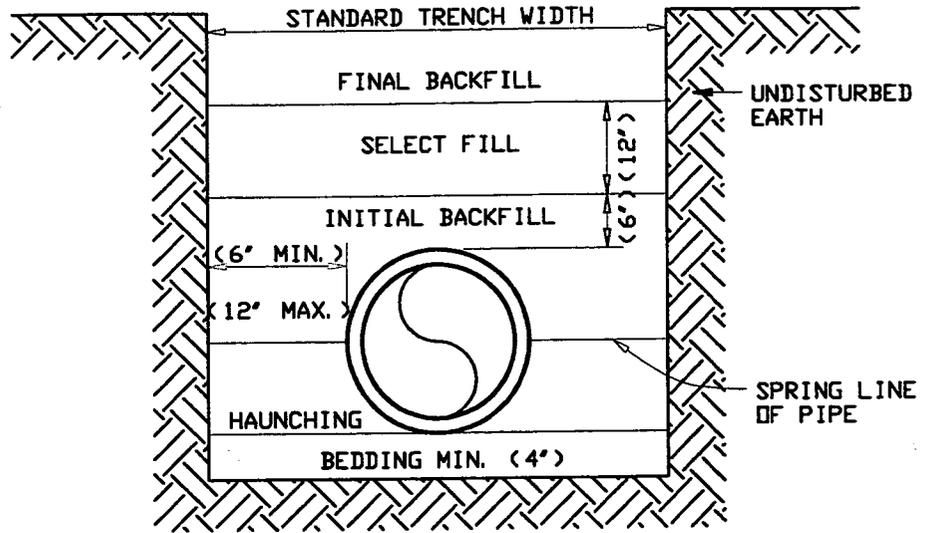
ALLEYWAY  
MINIMUM R/W 20' RESIDENTIAL - PVMT WIDTH 20'  
MINIMUM R/W 30' COMMERCIAL / INDUSTRIAL - PVMT WIDTH 30'

APPENDIX D: MAJOR STREET PLAN - TRAFFIC  
RIGHT-OF-WAY AND PAVING SECTIONS, PAGE D-3  
SOURCE: STANDARD SPECIFICATIONS FOR CONSTRUCTION  
CITY OF CLAREMORE, OKLAHOMA

Adopted Date: 3/18/02  
Effective Date: 4/18/02

ENGINEER APPROVAL HDH

PIPE INSIDE DIAMETER IN.	STANDARD TRENCH WIDTH IN.
15	36
18	36
21	42
24	42
27	48
30	48
36	54
42	60
48	66
54	72
60	78
66	84

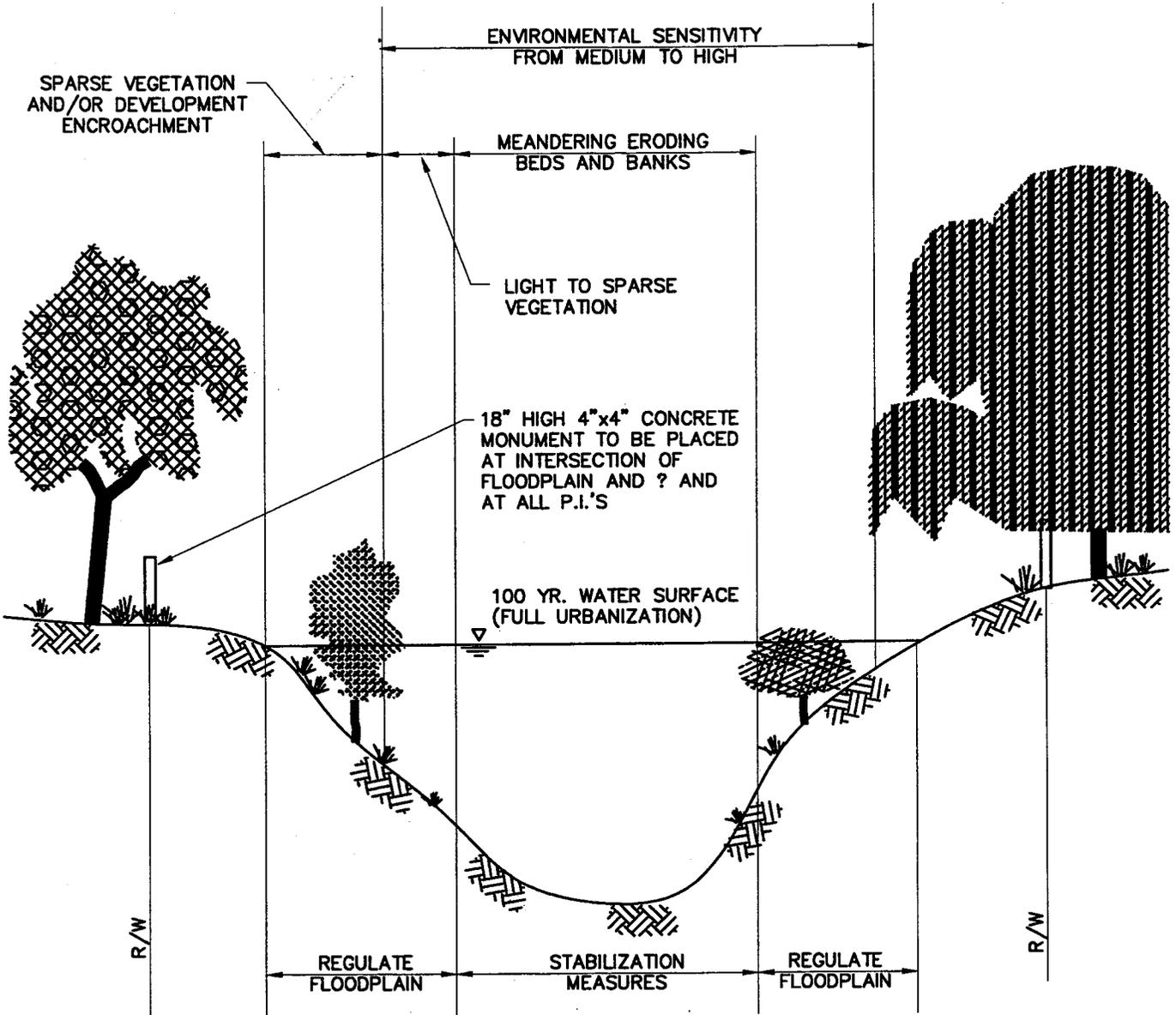


BEDDING MATERIALS						
BACKFILL DESCRIPTION	NON-PAVED AREAS			PAVED AREAS		
	CORRUGATED		CONCRETE	CORRUGATED		CONCRETE
	ALUMINUM	STEEL		ALUMINUM	STEEL	
FINAL BACKFILL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	SBM	SBM	SBM
SELECT BACKFILL	SELECT FILL	SELECT FILL	SELECT FILL	SBM	SBM	SBM
INITIAL BACKFILL	SELECT FILL	SELECT FILL	SELECT FILL	SBM	SBM	SBM
HAUNCHING	COVER <10' SF >10' SBM	COVER <10' SF >10' SBM	COVER <10' SF >10' SBM	SBM	SBM	SBM
BEDDING	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5

NOTES:

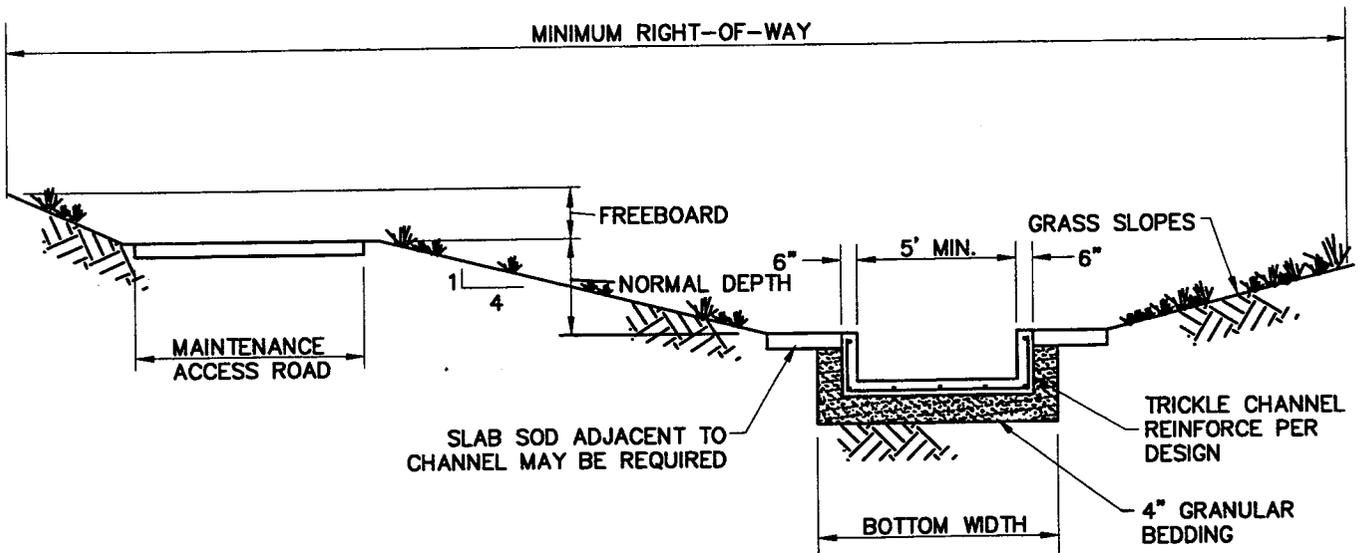
1. INSTALLATION AND BACK FILLING SHALL MEET MANUFACTURERS RECOMMENDATIONS.
2. SELECT FILL CONSISTS OF EXCAVATED MATERIALS CONTAINING NO ROCKS LARGER THAN (2').
3. STANDARD BEDDING MATERIAL (SBM) SHALL CONFORM TO ODOT 703.01, TYPE A AGGREGATE BASE OR FLOWABLE FILL PER SECTION 501.02(B).
4. COMPACTION REQUIREMENTS:
  - a. NON-PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY.
  - b. PAVED AREAS: 95% MAXIMUM STANDARD PROCTOR DENSITY.
5. IF TRENCH IS DRY BEDDING SHALL BE (4') SAND OR TYPE A AGGREGATE BASE, AND IF WET SHALL BE NO. 57 OR NO. 67 ROCK PER SECTION 701.06(C).
6. NO WATER JETTING ALLOWED.

STORM SEWER PIPE TRENCHING AND BEDDING



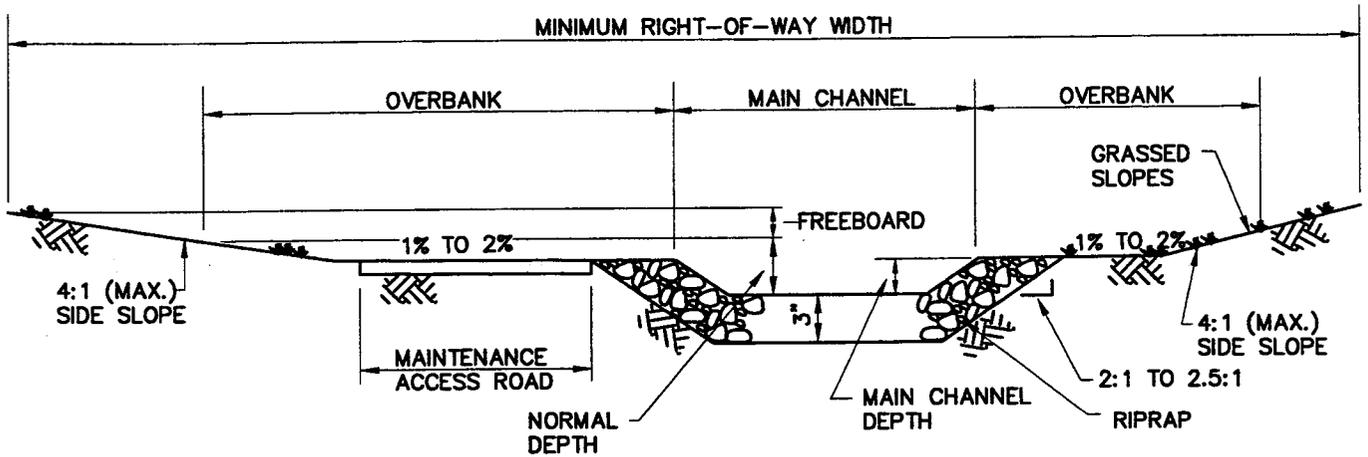
NOTES:

1. STABILIZATION MEASURES INCLUDE CHECK STRUCTURES, RIPRAP, MINOR GRADING, SHORT SECTIONS OF RETAINING WALLS.
2. GENERALLY LITTLE OR NO CAPACITY IMPROVEMENTS ARE INCLUDED - ONLY STABILIZATION AND FLOODPLAIN REGULATIONS.
3. ALL BRUSH AND TREES UNDER 4" DIAMETER MAY BE REMOVED.
4. WHERE FLOODPLAIN IS LESS THAN 150' THE R.O.W. REQUIRED SHALL BE THE FLOODPLAIN WIDTH PLUS 15' (MIN.) EACH SIDE OF FLOODPLAIN FOR MAINTENANCE ACCESS.



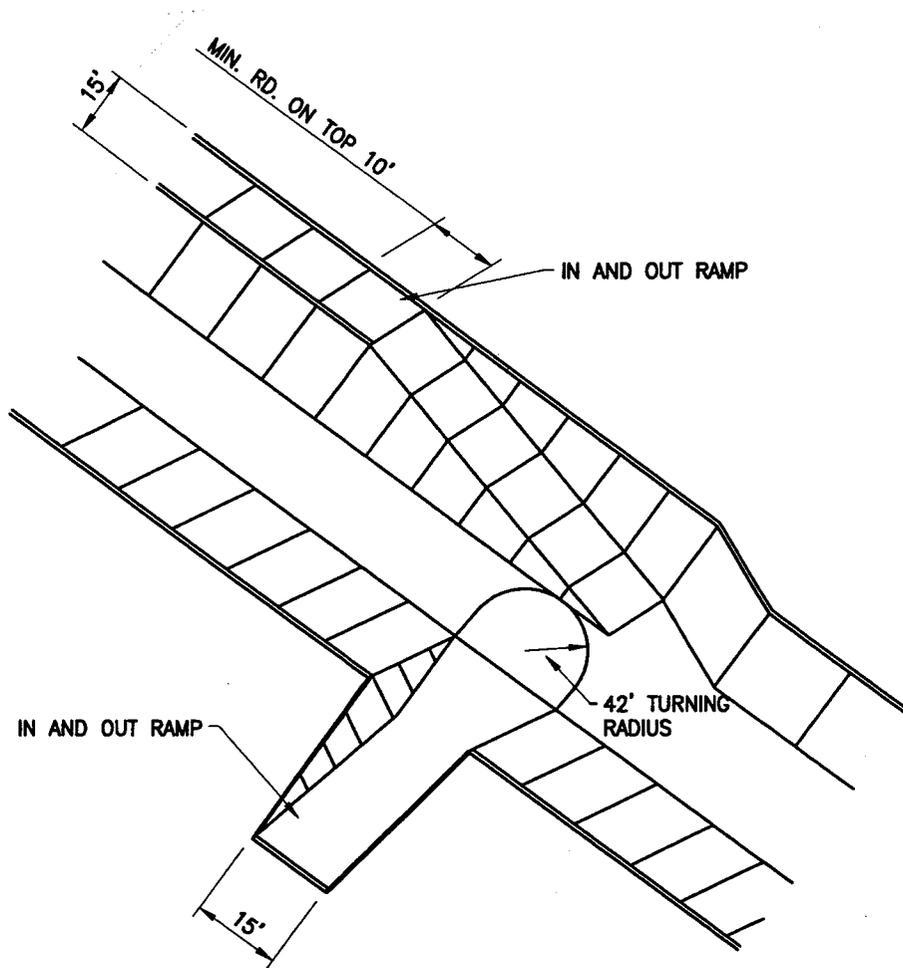
NOTES:

1. BOTTOM WIDTH: CONSISTENT WITH MAXIMUM ALLOWABLE DEPTH AND VELOCITY REQUIREMENTS. SHALL NOT BE LESS THAN TRICKLE CHANNEL WIDTH.
2. TRICKLE CHANNEL: MINIMUM CAPACITY TO BE 1% TO 3% OF 100 YEAR FLOW, BUT NOT LESS THAN 1 cfs. CHANNEL TO BE CONSTRUCTED OF CONCRETE OR OTHER APPROVED MATERIALS.
3. FREEBOARD: FREEBOARD TO BE 1' MINIMUM.
4. MAINTENANCE/ACCESS ROAD: MINIMUM WIDTH TO BE 10'.
5. R/W WIDTH: MINIMUM WIDTH TO INCLUDE FREEBOARD AND MAINTENANCE ACCESS ROAD.
6. CHANNEL SIDE SLOPE: MAXIMUM SIDE SLOPE FOR GRASS-LINED CHANNELS TO BE 4:1.
7. THE MAXIMUM FLOW VELOCITY TO BE 7 fps FOR EROSION RESISTANT SOILS OR 5 fps FOR SANDY SOILS.



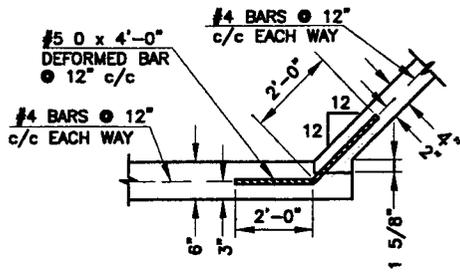
NOTES:

1. THIS SECTION IS REQUIRED FOR CHANNELS WITH SANDY SOILS.
2. MAIN CHANNEL: CAPACITY TO BE FROM 2 YEAR TO THE 5 YEAR. MAXIMUM 100 YEAR FLOW VELOCITY IS 5 fps. PROTECT SLOPES WITH RIPRAP. USE A MANNINGS  $n$  VALUE OF 0.03 FOR HYDRAULIC CALCULATIONS.
3. NORMAL DEPTH: FLOW DEPTH FOR 100 YEAR FLOW SHALL NOT EXCEED 5', NOT INCLUDING THE MAIN CHANNEL DEPTH.
4. FREEBOARD: FREEBOARD TO BE A MINIMUM OF 1'.
5. MAINTENANCE/ACCESS ROADS: MINIMUM WIDTH TO BE 10'. COUNTY MAY REQUIRE ALL OR PART OF THE ROAD TO BE SURFACED.
6. R/W WIDTH: MINIMUM WIDTH TO INCLUDE FREEBOARD AND MAINTENANCE/ACCESS ROAD.
7. OVERBANK: FLOW IN EXCESS OF MAIN CHANNEL TO BE CARRIED IN THIS AREA. AREA MAY BE USED FOR RECREATIONAL PURPOSES.

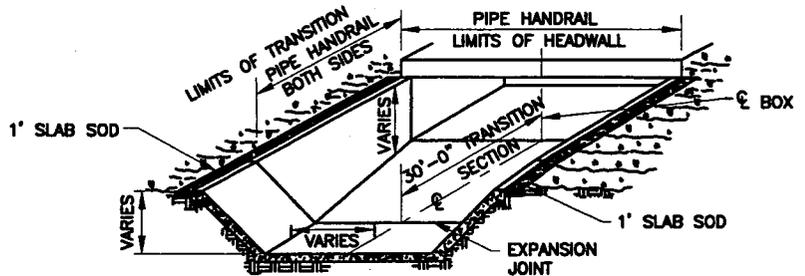


NOTES:

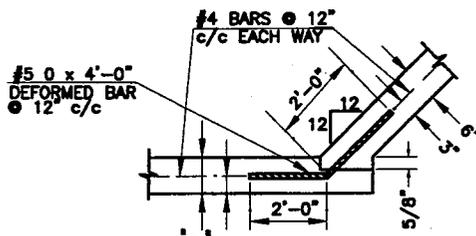
1. ALL RAMPS SHALL HAVE A MAXIMUM SLOPE OF 4:1 WITH 1" CORRUGATIONS IN ROADWAY.
2. MAXIMUM SPACING ON RAMPS SHALL BE 600' WITH A MINIMUM OF 2 RAMPS BETWEEN RESTRICTIVE STRUCTURES.
3. ALL RAMPS ARE TO BE FENCED AND LOCKED. GATE LOCKS TO BE FURNISHED BY THE CITY.
4. MINIMUM TURNING RADIUS AT THE OUTSIDE WHEEL SHALL BE 42' FOR ENTRANCE AND EXIT.



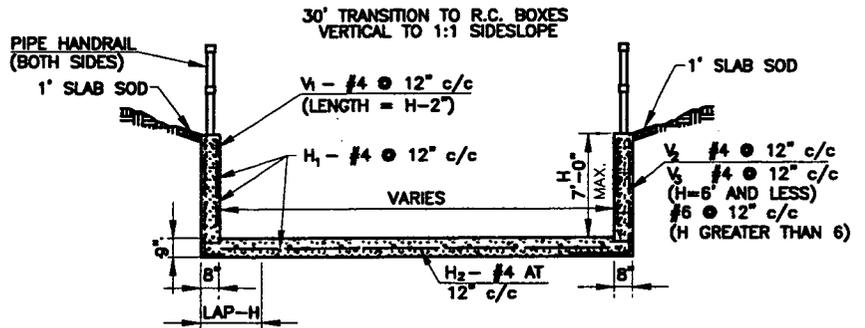
**LONGITUDINAL CONSTRUCTION JOINT**  
FOR 6" BOTTOM & 4" SIDE WALLS  
4" WALLS FOR DEPTHS OF 0' TO 5'



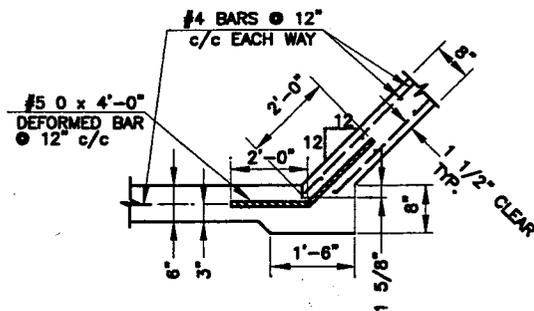
**ELEVATION OF CONCRETE CHANNEL LINER**



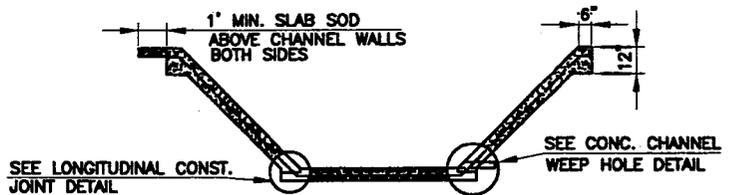
**LONGITUDINAL CONSTRUCTION JOINT**  
FOR 6" BOTTOM & 6" SIDE WALLS  
6" WALLS FOR DEPTHS OF 0' TO 5'



**TYPICAL THROUGH TRANSITION SECTION**  
ODOT TYPE II-C RETAINING WALL SECTION (MODIFIED)

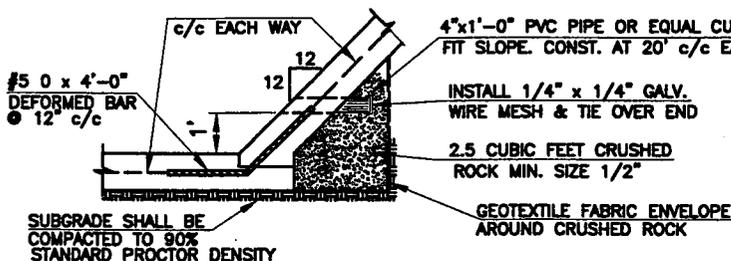


**LONGITUDINAL CONSTRUCTION JOINT**  
FOR 6" BOTTOM & 6" SIDE WALLS  
8" WALLS FOR 2/3 THE WALL HEIGHT FOR CHANNELS ABOVE 5'

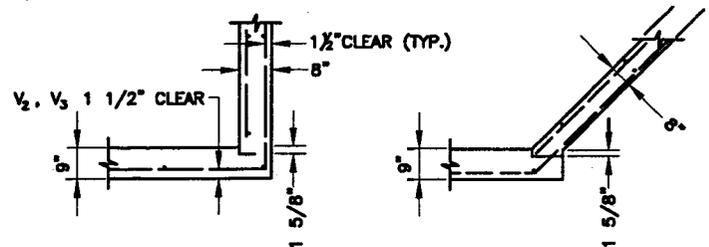


**TYPICAL CONCRETE CHANNEL LINER DETAIL**

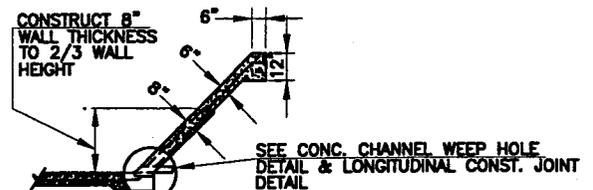
#4 BARS @ 12"



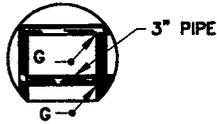
**CONCRETE CHANNEL WEEP HOLE DETAIL**



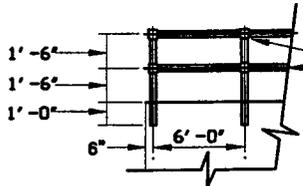
**LONGITUDINAL CONSTRUCTION JOINT**  
THROUGH TRANSITION SECTION



**TYPICAL CONCRETE CHANNEL LINER DETAIL**  
FOR WALL HEIGHT ABOVE 5'



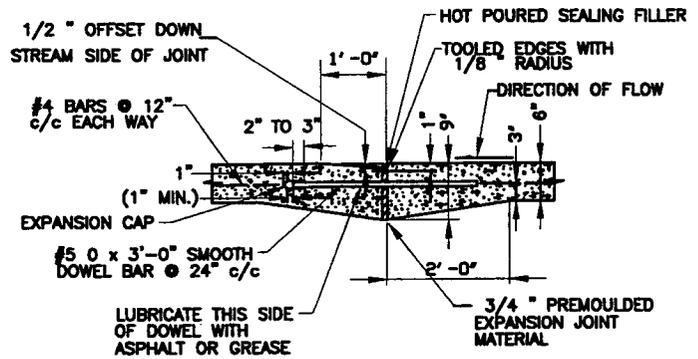
ALTERNATE DETAIL  
(USING WELDED CONNECTIONS ON PIPE HANDRAIL)



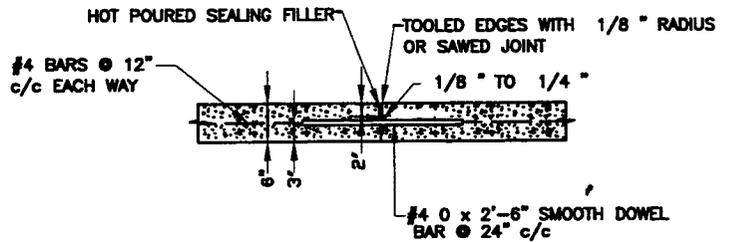
3" I.D. GALV. STEEL PIPE  
WITH PLAIN GALV. FITTINGS.  
USE STANDARD & SPECIAL  
FITTINGS AS NEEDED.

HANDRAIL NOTES:  
WELDED CONNECTIONS MAY BE USED FOR  
PIPE HANDRAIL. WELDED CONNECTIONS SHALL BE  
THOROUGHLY CLEANED OF ALL LOOSE SCALE,  
GROUND SMOOTH & SPOT PAINTED WITH  
TWO COATS OF ALUMINUM PAINT.

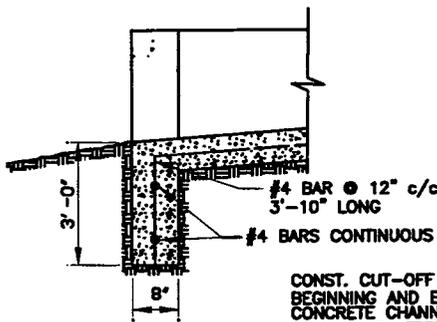
PIPE HANDRAIL DETAIL



TYPICAL TRANSVERSE EXPANSION JOINT  
SPACED AT 100 FOOT C/C MAX.

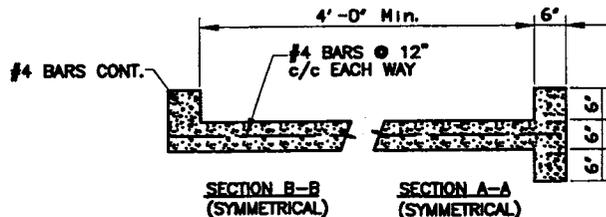


TRANSVERSE DUMMY GROOVE CONTRACTION JOINT  
SPACED AT 20 FOOT C/C



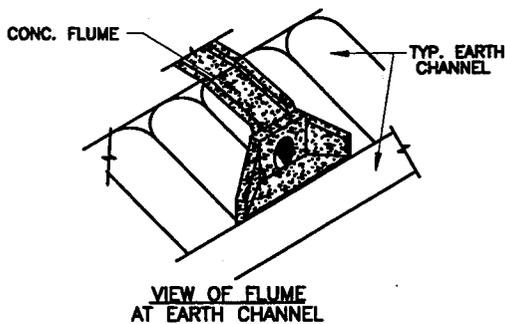
CONST. CUT-OFF WALL AT  
BEGINNING AND END OF  
CONCRETE CHANNEL,  
ENTIRE PERIMETER

CUT-OFF WALL DETAIL

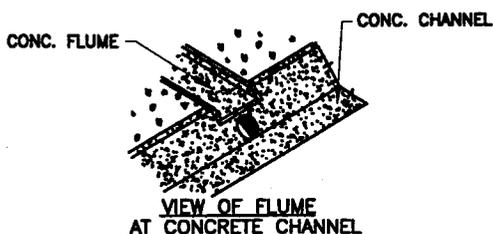


SECTION B-B  
(SYMMETRICAL)

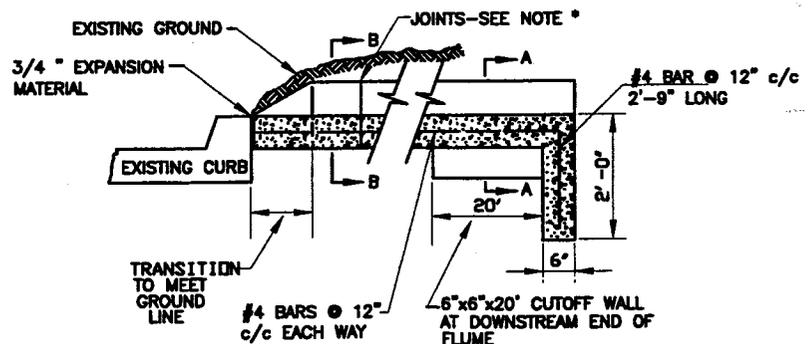
SECTION A-A  
(SYMMETRICAL)



VIEW OF FLUME  
AT EARTH CHANNEL



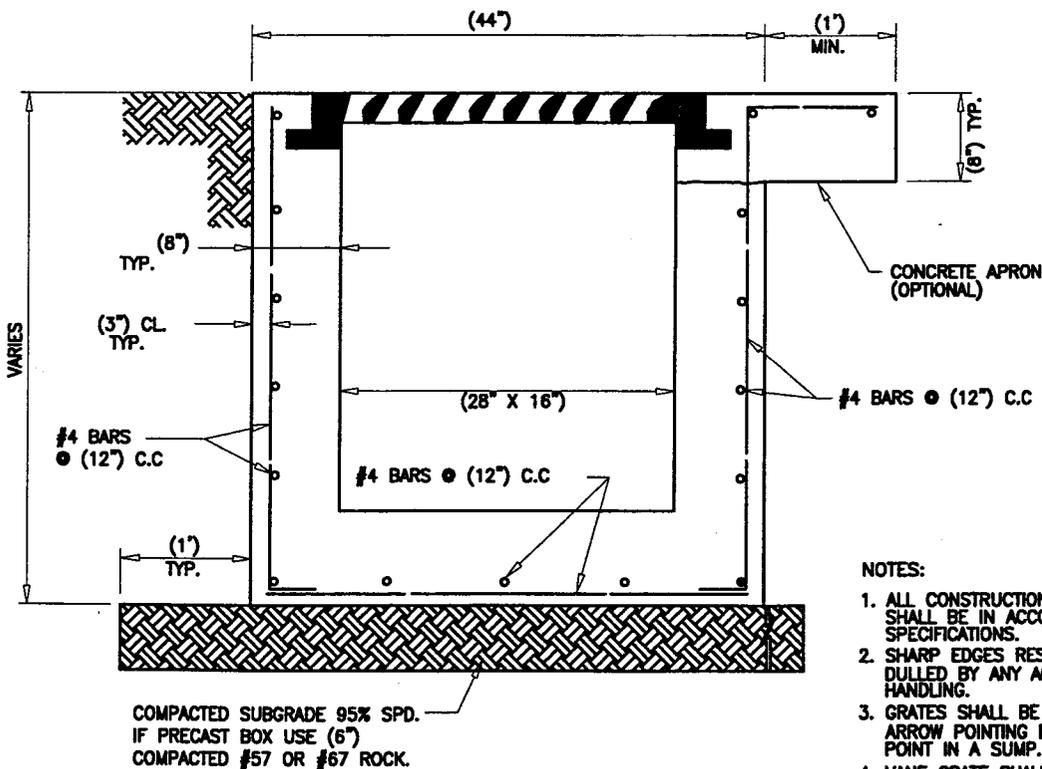
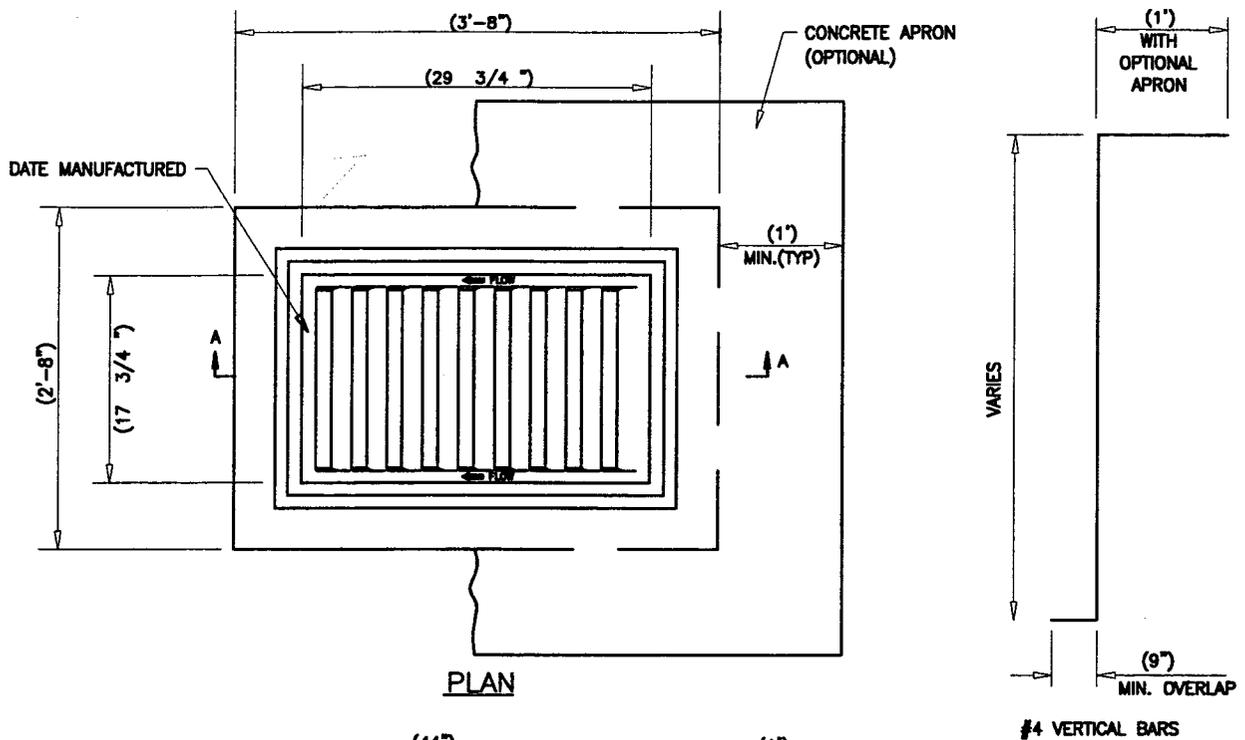
VIEW OF FLUME  
AT CONCRETE CHANNEL



PROFILE

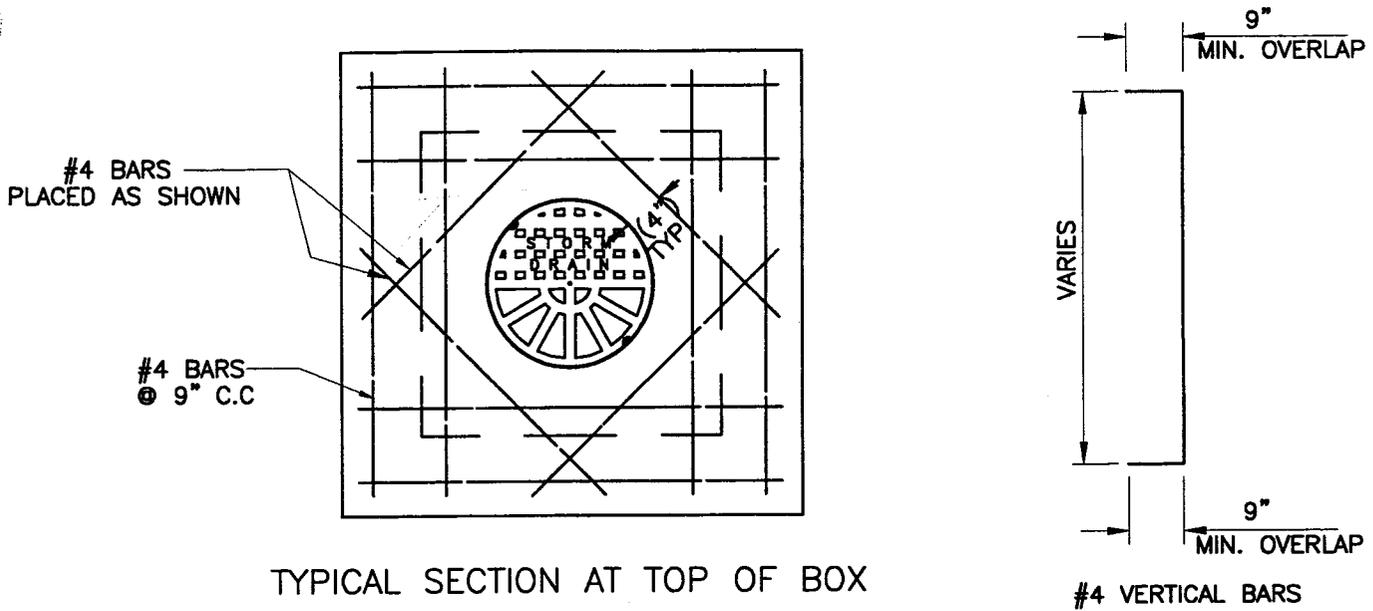
CONCRETE FLUME DETAIL

\* NOTE:  
3/4" EXPANSION JOINT @ 100' MAX.  
SAWED CONT. JOINT @ 20' MAX.

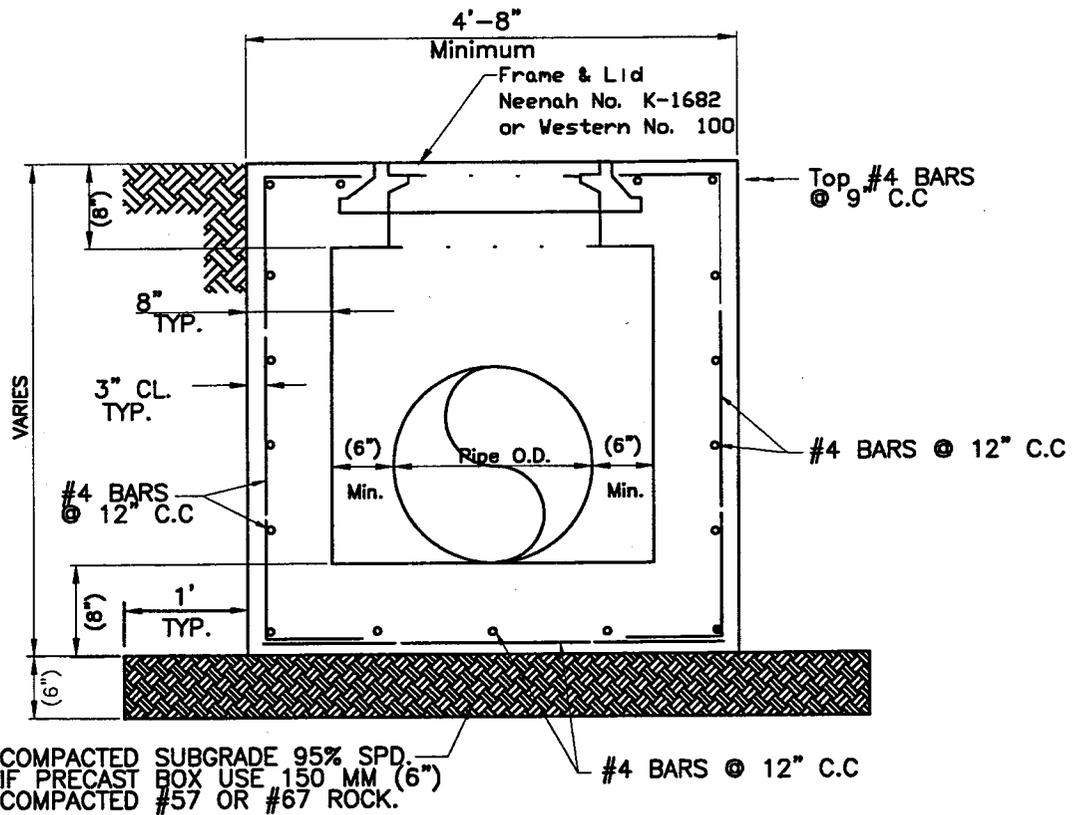


NOTES:

1. ALL CONSTRUCTION METHODS & MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE CURRENT SPECIFICATIONS.
2. SHARP EDGES RESULTING FROM FABRICATION SHALL BE DULLED BY ANY ACCEPTABLE METHOD FOR SAFETY IN HANDLING.
3. GRATES SHALL BE INSTALLED IN FRAME WITH FLOW ARROW POINTING DOWNSTREAM OR TOWARD THE LOW POINT IN A SUMP.
4. VANE GRATE SHALL BE ODOT TYPE VG-F, STANDARD DRAWING CIG-1-2.
5. FRAME SHALL BE ODOT TYPE A FOR INLET DESIGN 1, STANDARD DRAWING SSIF-2-4.
6. CASTINGS SHALL BE SMOOTH AND WELL CLEANED BY SHOT BLASTING OR OTHER APPROVED CLEANING.
7. ALL CASTINGS SHALL BE MANUFACTURED TRUE TO PATTERN; COMPONENT PARTS SHALL FIT TOGETHER IN A SATISFACTORY MANNER.
8. ALL LETTERING SHALL BE RECESSED ( 1/16 ").



TYPICAL SECTION AT TOP OF BOX



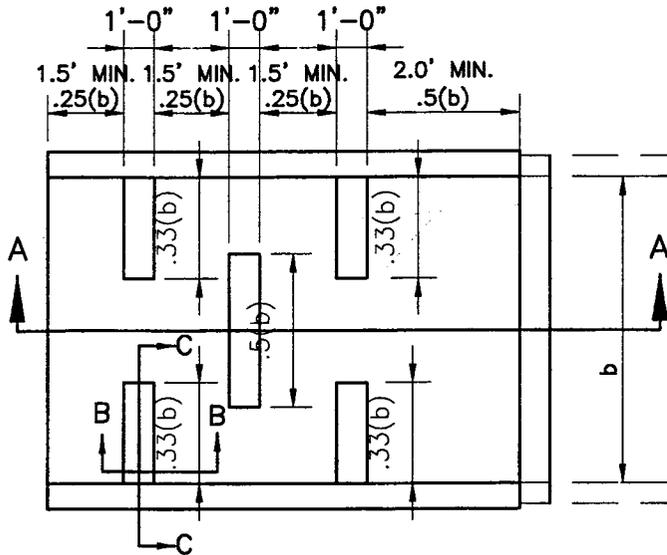
TYPICAL SECTION THRU JUNCTION BOX

NOTES:

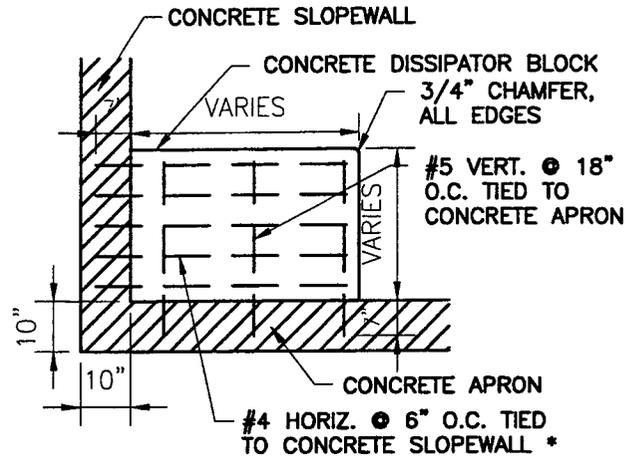
1. ALL CONSTRUCTION METHODS & MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE CURRENT SPECIFICATIONS.
2. ALL LETTERING SHALL BE RECESSED 1/16 \".

CITY OF CLAREMORE  
SLOPEWALL with DISSIPATER DETAIL

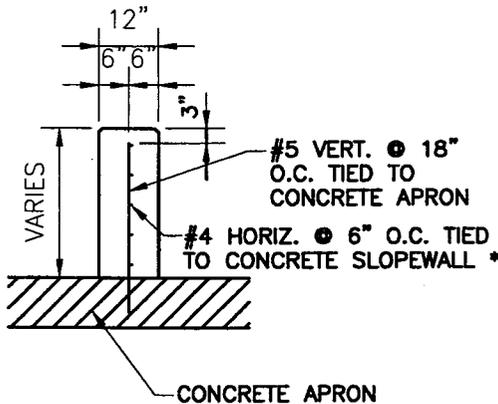
FIGURE STDSTM.10



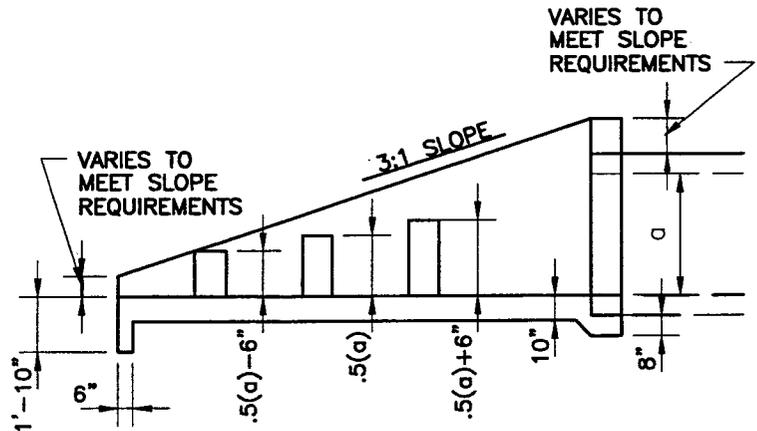
SLOPEWALL



SECTION C-C



SECTION B-B



SECTION A-A

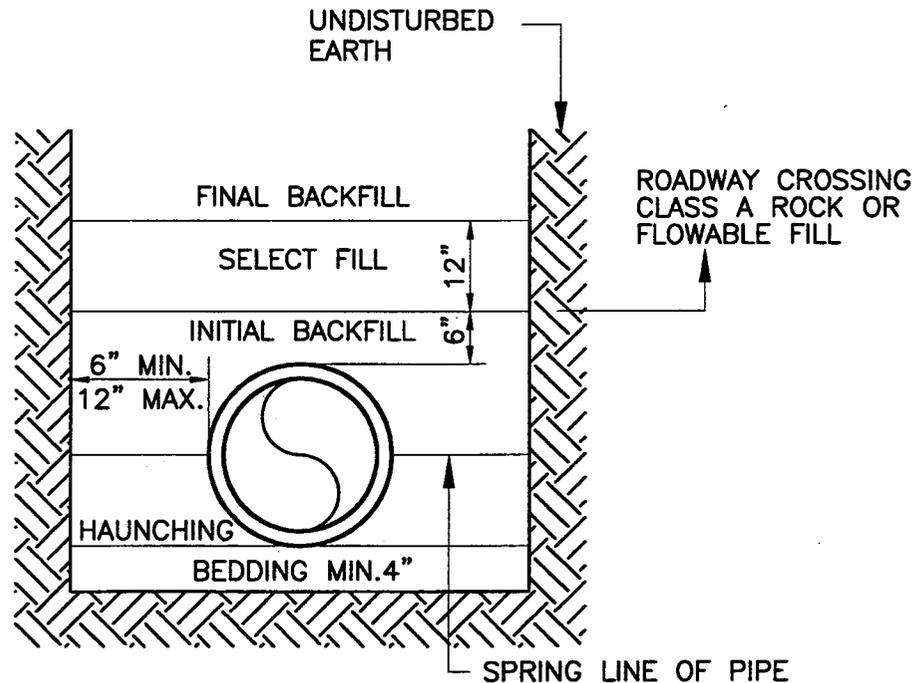
NOTES:

1. CONCRETE FC' = 4000 PSI MINIMUM @ 28 DAYS, WITH 5% + 1% AIR ENTRAINMENT.
  2. REINFORCING STEEL TO MEET ASTM A-615, #4 AND SMALLER GRADE 40, #5 AND LARGER GRADE 60.
  3. FOR DISSIPATER BLOCKS ADDED TO EXISTING SLOPEWALLS ALL REINFORCING STEEL DRILLED INTO EXISTING CONCRETE TO BE ANCHORED WITH HILIT C-100 ADHESIVE OR EQUAL.
  4. SLOPEWALL AND HEADWALL TO BE CONSTRUCTED TO ODOT SPECIFICATIONS,
- \* ON ROW 2, CUT #4 HORIZ. BARS OFF 3" FROM EACH SIDE OF DISSIPATER WALL.

CITY OF CLAREMORE  
SANITARY SEWER BEDDING DETAIL

FIGURE STDSS01

NON-PAVED AREAS				PAVED AREAS		
P V C	DUCTILE IRON	CONCRETE		P V C	DUCTILE IRON	CONCRETE
EXCAVATED MATERIAL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	FINAL BACKFILL	CRUSHED ROCK	CRUSHED ROCK	CRUSHED ROCK
SELECT FILL	SELECT FILL	SELECT FILL	SELECT FILL	CRUSHED ROCK	CRUSHED ROCK	CRUSHED ROCK
SAND	SAND	SAND	INITIAL BACKFILL	CRUSHED ROCK	CRUSHED ROCK	CRUSHED ROCK
SAND	SAND	SAND	SPRINGLINE INITIAL BACKFILL	SAND	SAND	SAND
3/8" CHIPS	3/8" CHIPS	3/8" CHIPS	BEDDING	3/8" CHIPS	3/8" CHIPS	3/8" CHIPS



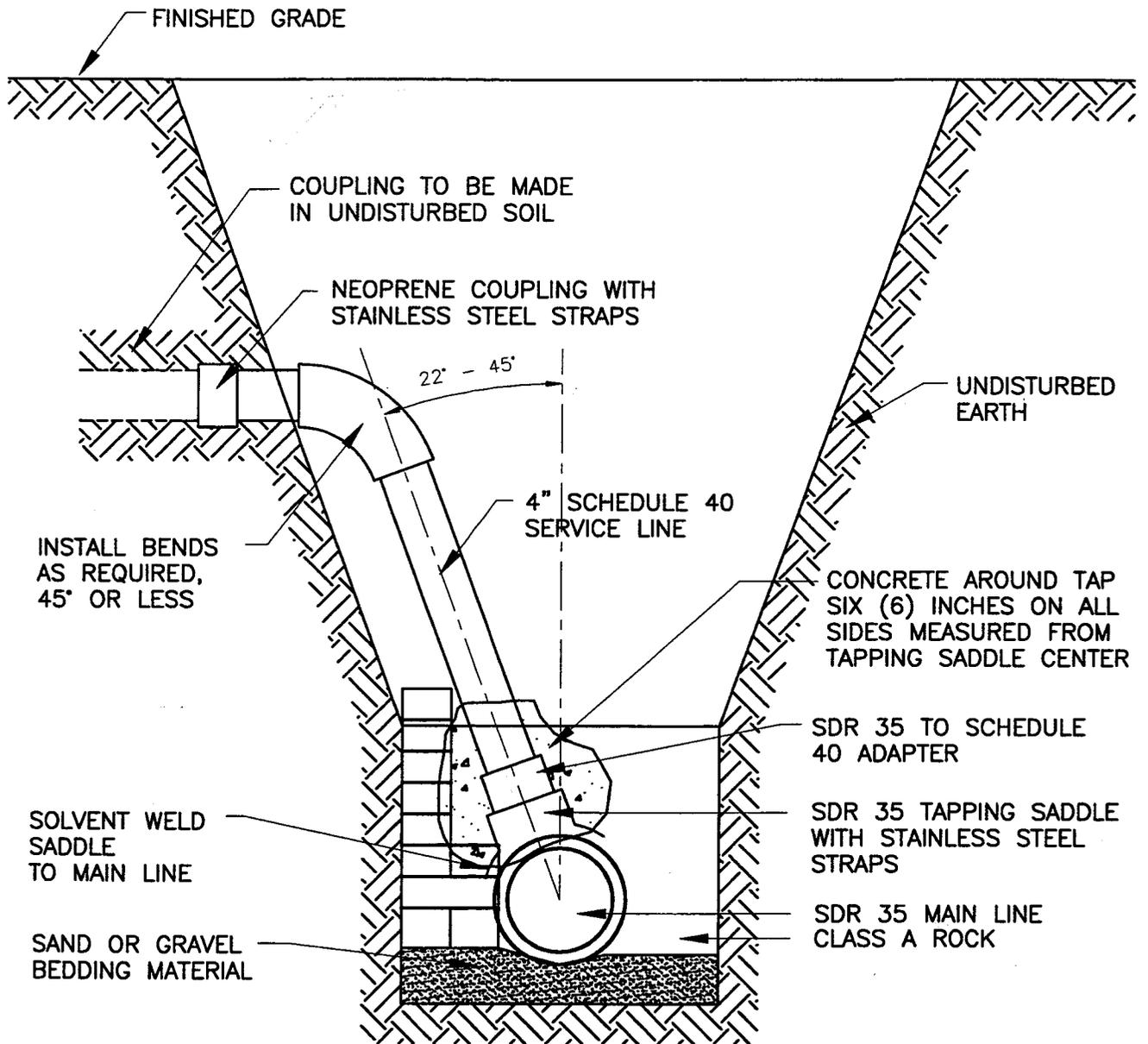
NOTES:

1. SELECT FILL CONSISTS OF EXCAVATED MATERIALS CONTAINING NO ROCKS LARGER THAN 2 INCHES.
2. CRUSHED ROCK SHALL BE ODOT TYPE A ROCK.
3. BEDDING REQUIRED FOR ALL SANITARY SEWER REPLACEMENT PROJECTS IN ROCK EXCAVATION AND FOR LEVELING TRENCH IN NEW INSTALLATION.
4. COMPACTION REQUIREMENTS:
  - a. NON-PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY.
  - b. PAVED AREAS: 95% MAXIMUM STANDARD PROCTOR DENSITY.
5. FILLS OVER 10 FEET DEEP - MATERIAL IN THE AREA FROM SELECT FILL TO BEDDING SHALL BE 3/4" CRUSHER RUN, WELL GRADED.
6. FLOWABLE FILL MAY BE SUBSTITUTED FOR CLASS A ROCK IN ROAD CROSSING.
7. IF TRENCH IS DRY BEDDING SHALL BE 4" SAND OR TYPE A AGGREGATE BASE, AND IF WET SHALL BE NO. 57 OR NO. 67 ROCK PER ODOT SECTION 701.06(C)

Adopted Date: 3/18/02  
Effective Date: 4/18/02

Engineer Approval: HDH

(EXISTING SEWER)



NOTES:

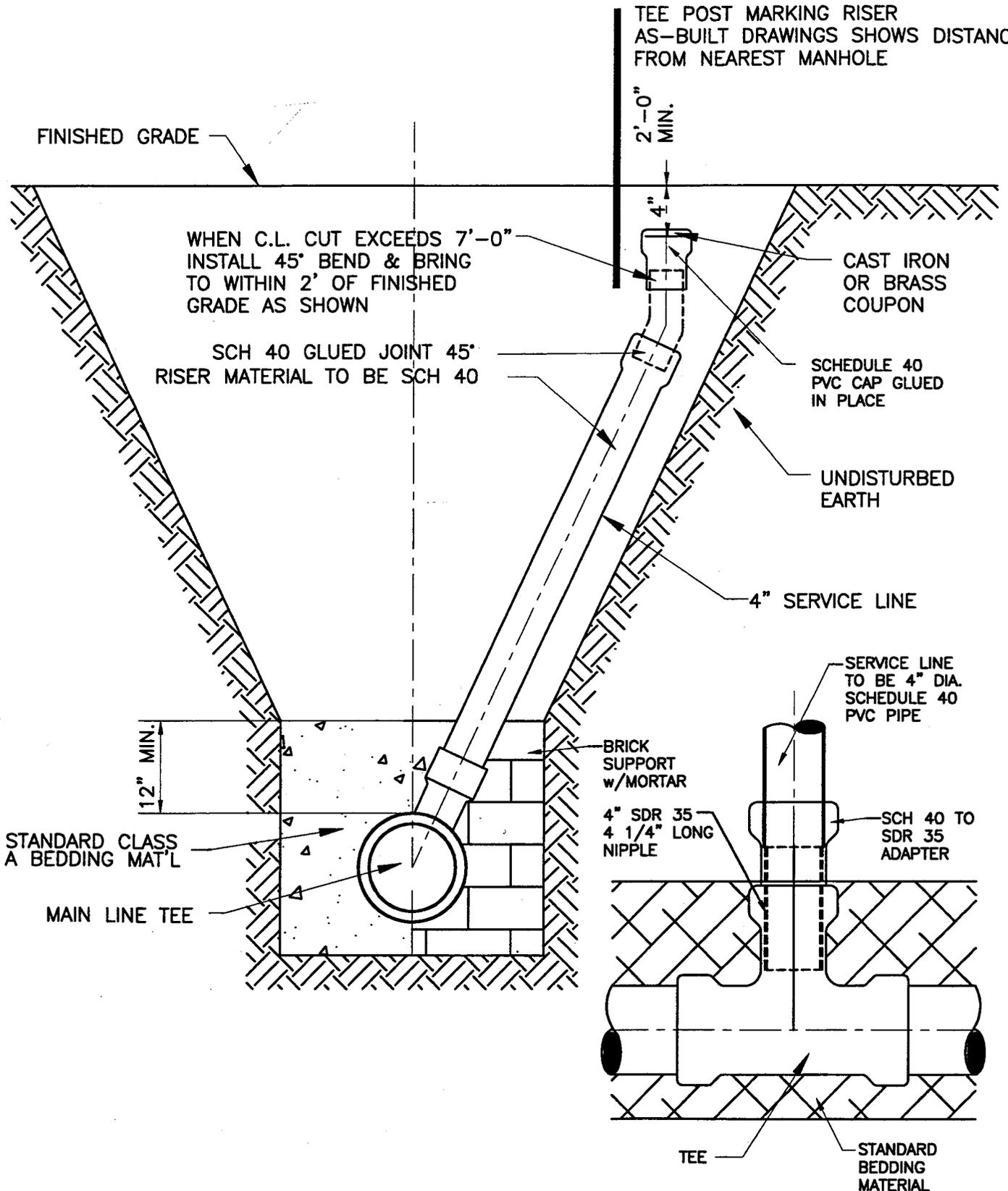
1. PVC SHOWN, HOWEVER, CLAY TILE, CONCRETE, AND DUCTILE IRON SHALL BE TAPPED IN SAME MANNER WITH CHANGE OF TAPPING SADDLE AND EXPANDING POLYURETHANE IN PLACE OF SOLVENT WELDING.
2. ALL MAIN LINE HOLES TO BE SAWED OR DRILLED AND COUPON PRESENTED AT TIME OF INSPECTION.
3. TAPS SHALL BE LEFT UNCOVERED FOR ONE (1) FOOT ON EACH SIDE OF SADDLE, UNTIL TAP IS INSPECTED.
4. FLOWABLE FILL MAY BE SUBSTITUTED FOR CONCRETE AROUND TAP (USE ODOT STD)

CITY OF CLAREMORE  
SANITARY SEWER RISER DETAIL

FIGURE STDSS03

(NORMAL TRENCH)

TEE POST MARKING RISER  
AS-BUILT DRAWINGS SHOWS DISTANCE  
FROM NEAREST MANHOLE



Adopted Date: 3/18/02  
Effective Date: 4/18/02

Engineer Approval: HDH

CITY OF CLAREMORE  
SANITARY SEWER RISER DETAIL

FIGURE STDSS04

(WIDE TRENCH OVER 12ft DEEP)

TEE POST MARKING RISER.  
AS-BUILT DRAWINGS SHOWS DISTANCE  
FROM NEAREST MANHOLE

2'-0"  
MIN.

FINISHED GRADE

WHEN C.L. CUT EXCEEDS 7'-0"  
INSTALL 45° BEND & BRING  
TO WITHIN 4' OF FINISHED  
GRADE AS SHOWN

SCH 40 GLUED JOINT 45°  
RISER MATERIAL TO BE SCH 40

CAST IRON  
OR BRASS  
COUPON

SCHEDULE 40  
PVC CAP GLUED  
IN PLACE

UNDISTURBED  
EARTH

1'-0" x 1'-0" MIN.  
BRICK ENCASEMENT.  
TO BE CONSTRUCTED  
W/ MORTAR USING  
2 PARTS SAND TO  
1 PART CEMENT.  
FLOWABLE FILL  
MAY BE  
SUBSTITUTED.

4" SERVICE LINE

SERVICE LINE  
TO BE 4" DIA.  
SCHEDULE 40  
PVC PIPE

4' SDR 35  
4 1/4' LONG  
NIPPLE

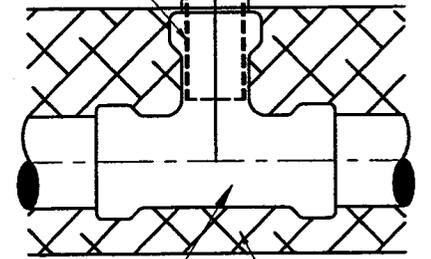
SCH 40 TO  
SDR 35  
ADAPTER

12" MIN

FLOWABLE FILL  
ENCASE TO BEND

MAIN LINE TEE

4' MINIMUM RISER ENCASEMENT



TEE  
STANDARD  
BEDDING  
MATERIAL

4" CONCRETE  
FOUNDATION

NOTE: FLOWABLE FILL MAY BE SUBSTITUTED FOR BRICK ENCASEMENT

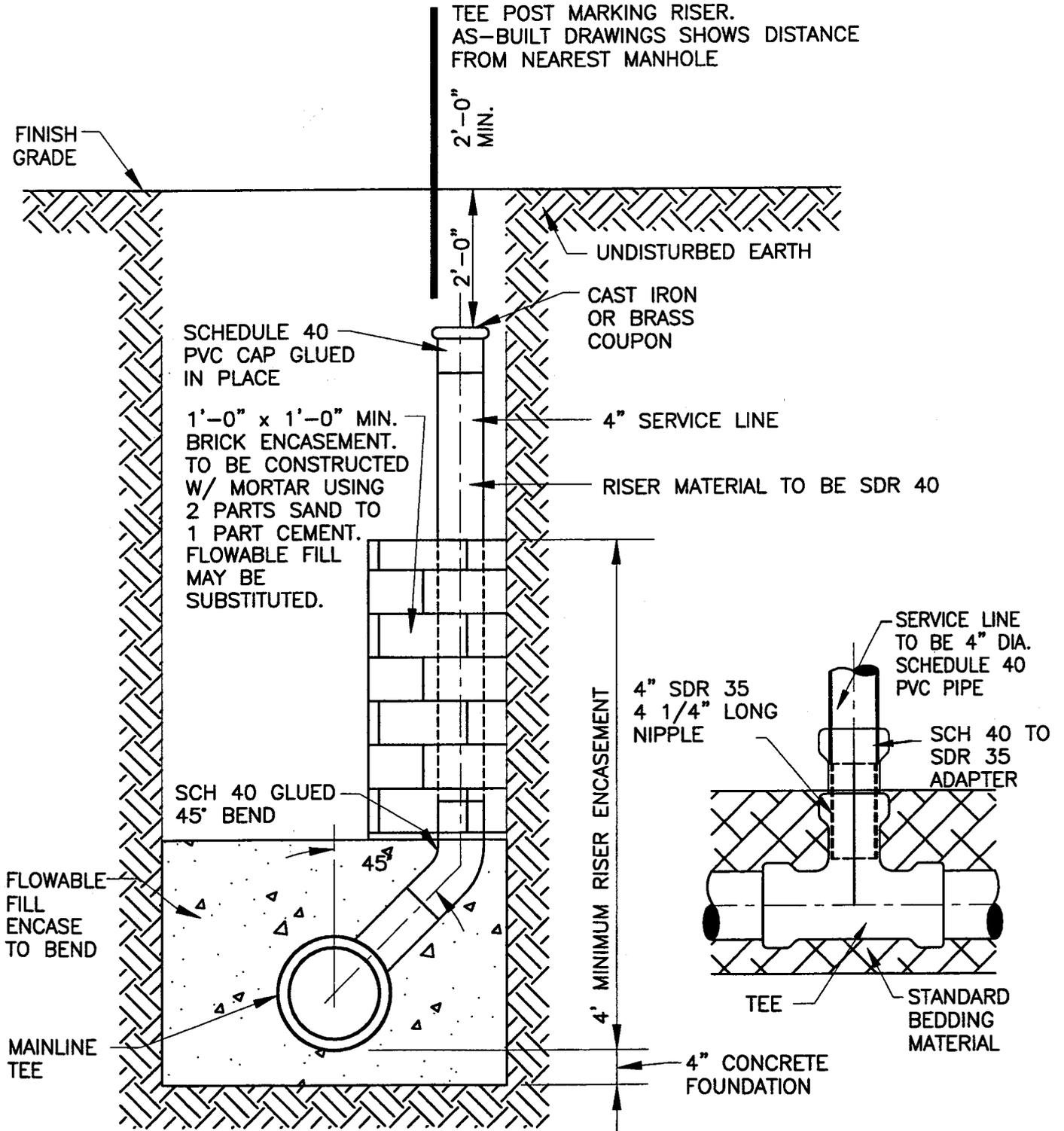
Adopted Date: 3/18/02  
Effective Date: 4/18/02

Engineer Approval: HDH

CITY OF CLAREMORE  
SANITARY SEWER RISER DETAIL

FIGURE STDSS05

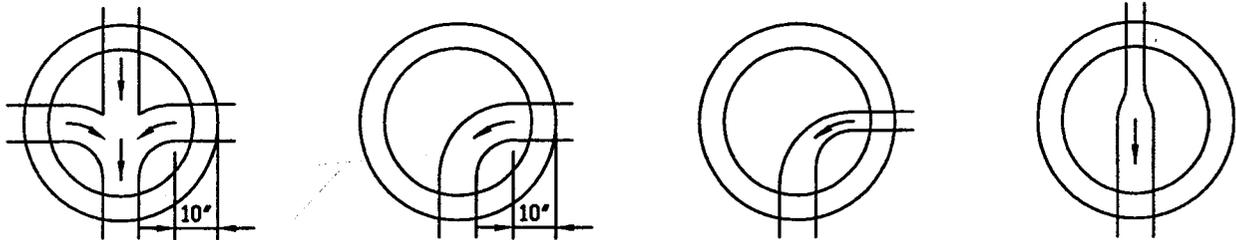
(NARROW TRENCH OVER 12ft DEEP)



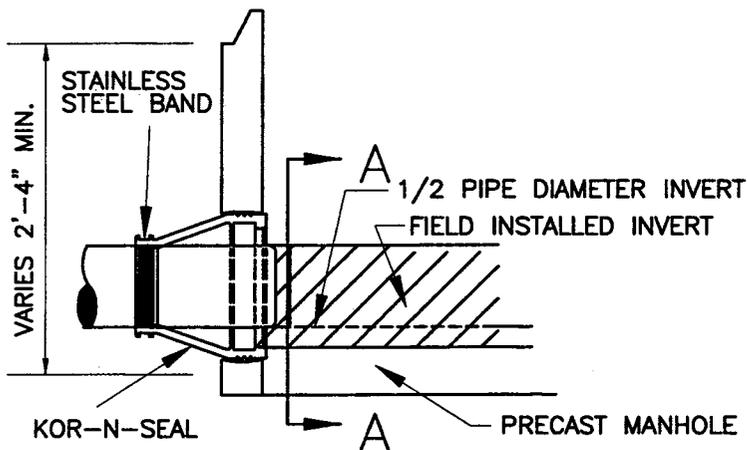
NOTE: FLOWABLE FILL MAY BE SUBSTITUTED FOR BRICK ENCASEMENT.

Adopted Date: 3/18/02  
Effective Date: 4/18/02

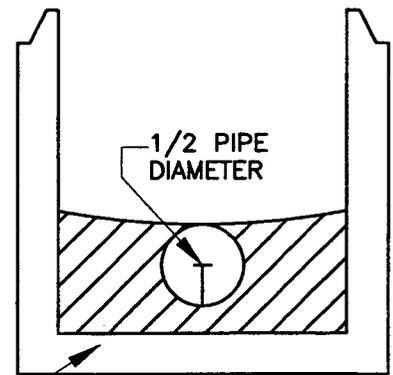
Engineer Approval: HDH



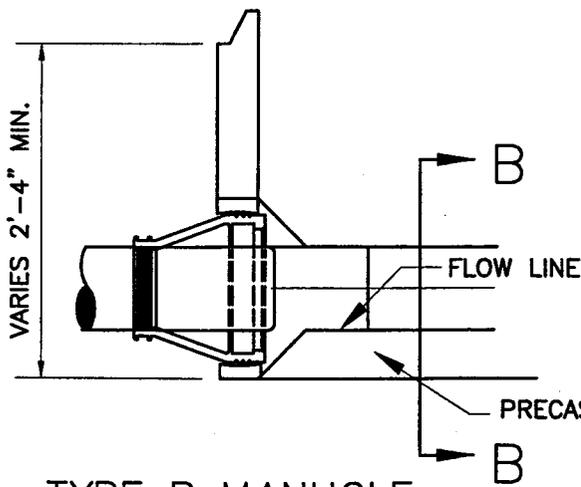
TYPICAL MANHOLE INVERT DETAIL



TYPE A MANHOLE

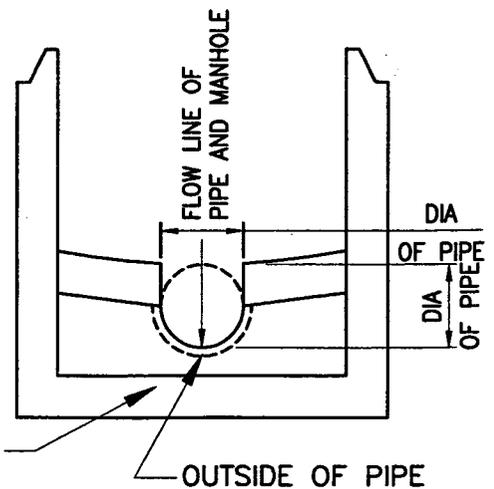


SECTION A-A

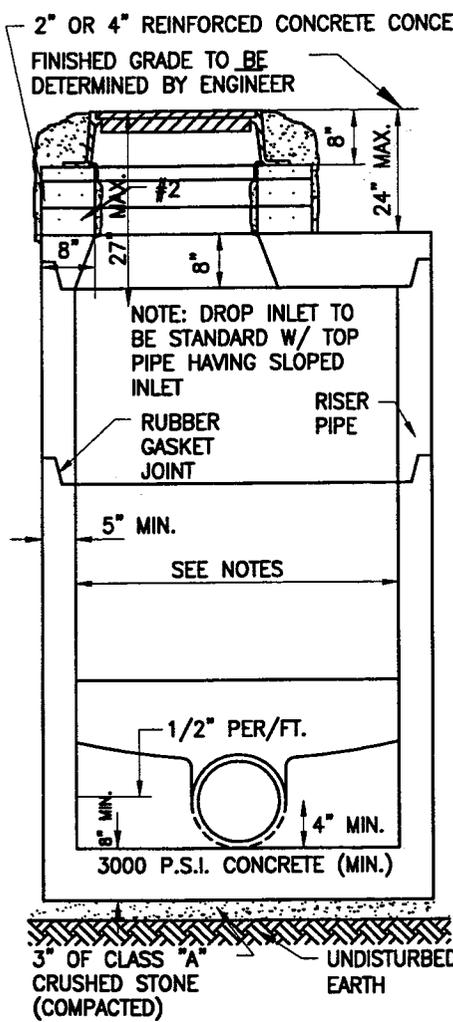


TYPE B MANHOLE

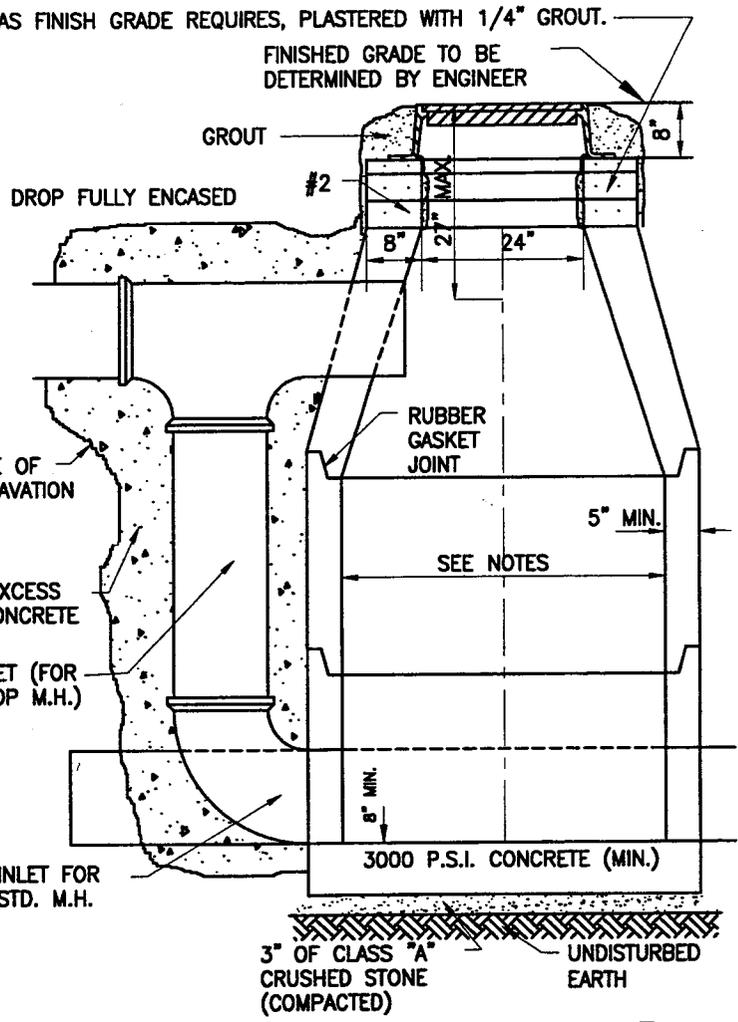
HIGH DENSITY AREA  
 MAY REQUIRE ADDITIONAL  
 HEIGHT OF TROUGH



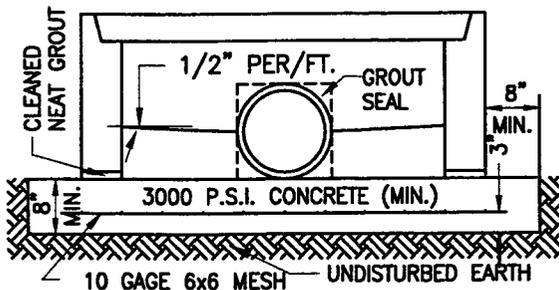
SECTION B-B



PRECAST MANHOLE  
 FLAT TOP



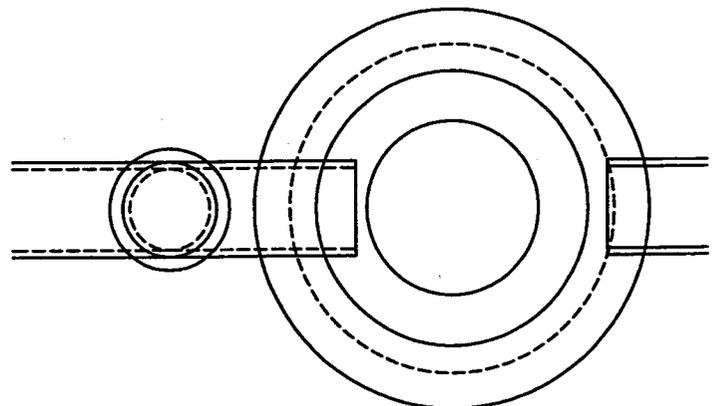
PRECAST MANHOLE  
 TAPERED TOP



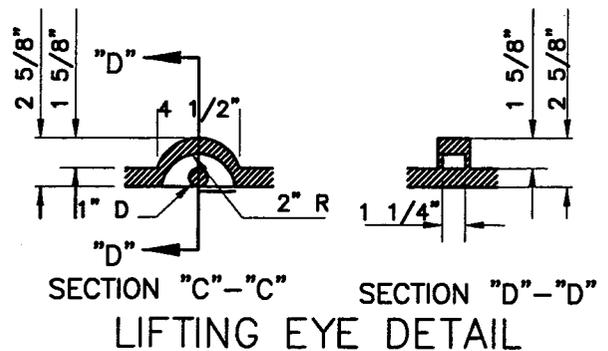
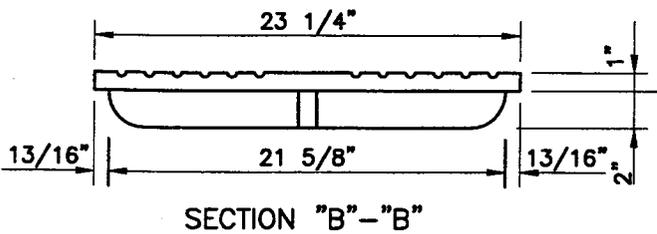
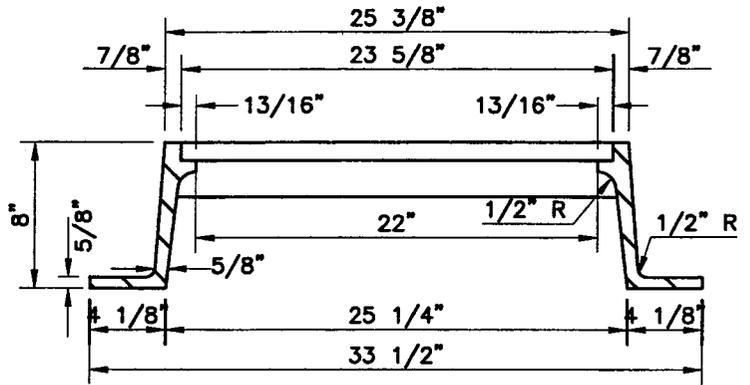
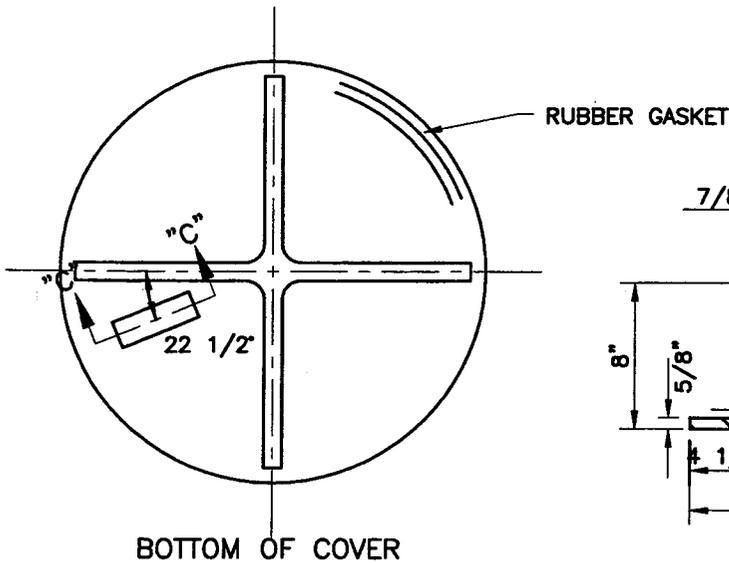
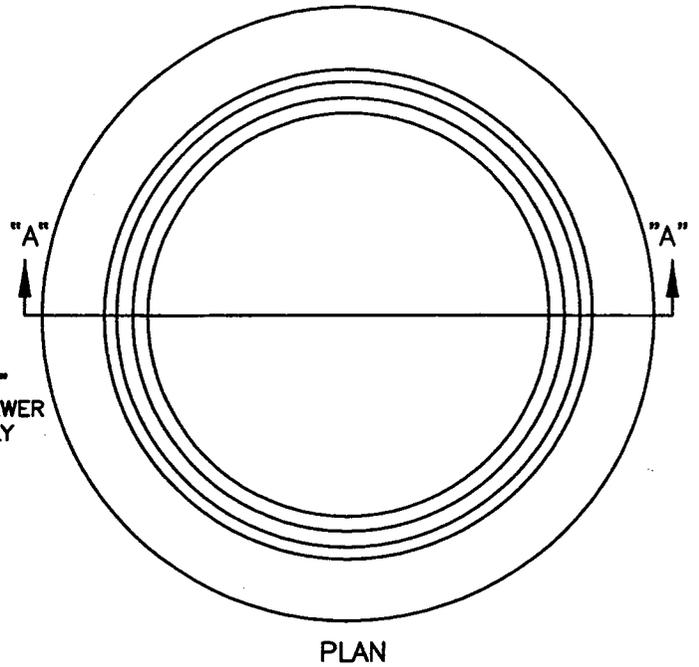
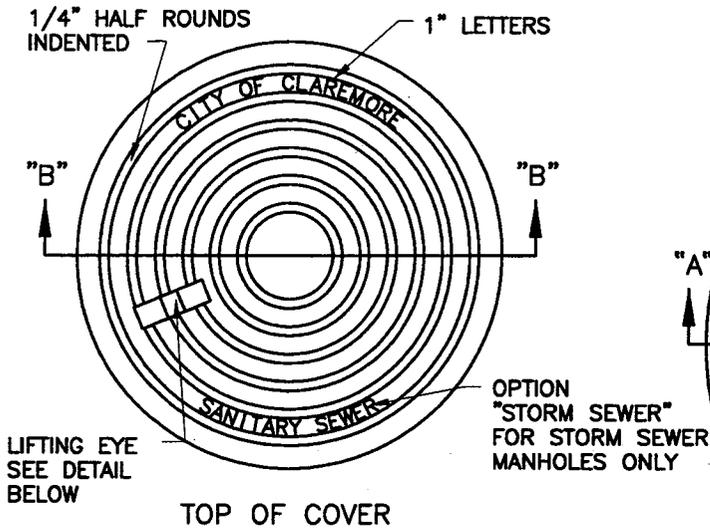
CAST-IN-PLACE BASE

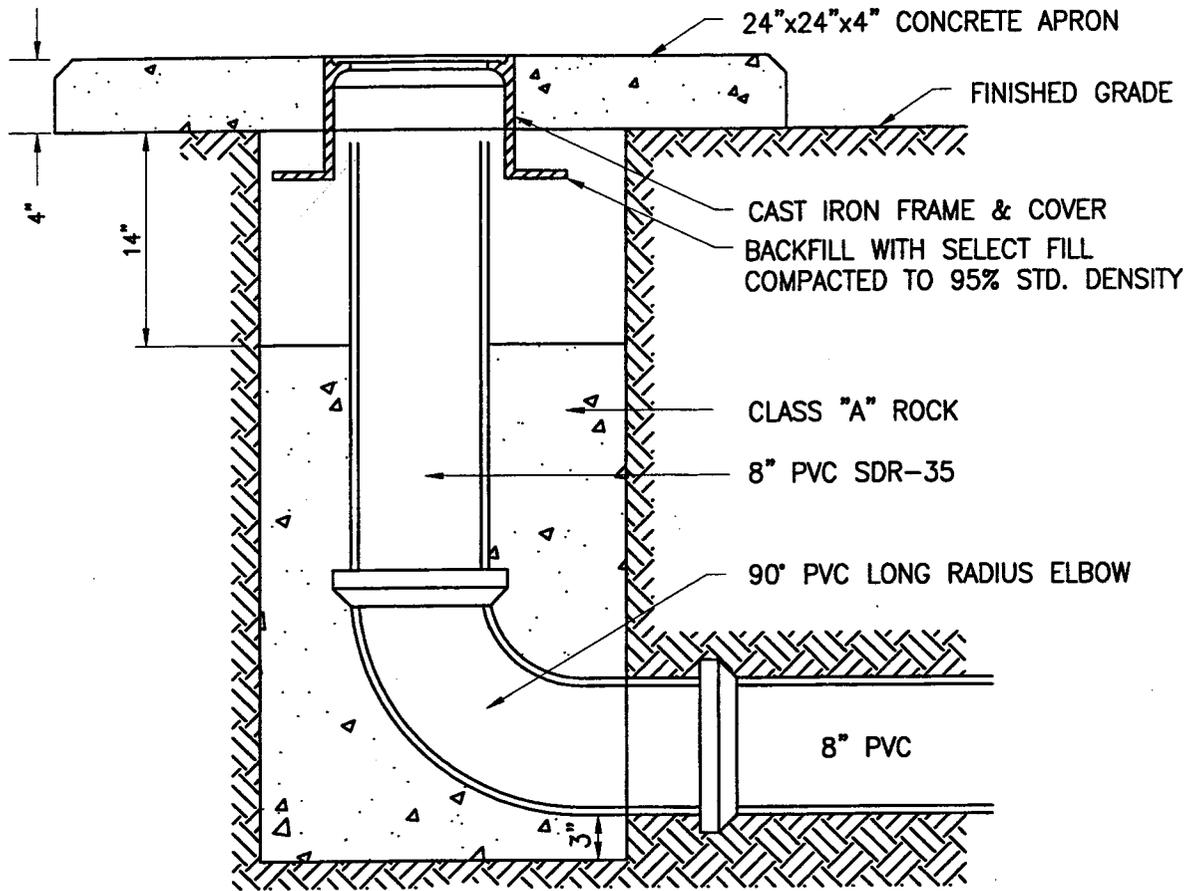
NOTES:

1. SHALL CONFORM TO CURRENT ASTM C478.
2. 8" TO 18" PIPE, 4' ID MANHOLE REQUIRED.
3. 21" TO 27" PIPE, 5' ID MANHOLE REQUIRED.
4. OVER 27" PIPE MANHOLE ID AS SPECIFIED BY ENGINEER.
5. MANHOLES LESS THAN 4'-6" IN HEIGHT SHALL HAVE A FULL 4'-0" ID OR LARGER FROM TOP TO BOTTOM.

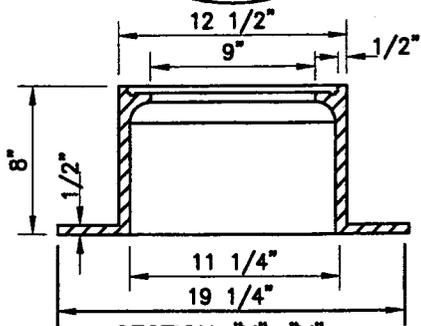
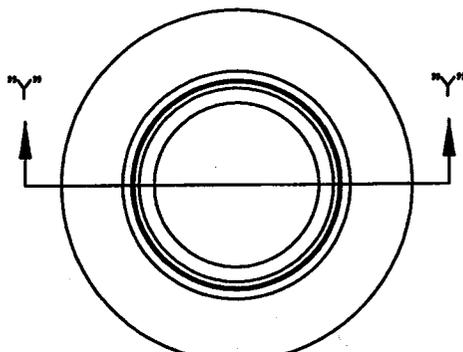


STANDARD & DROP MANHOLE

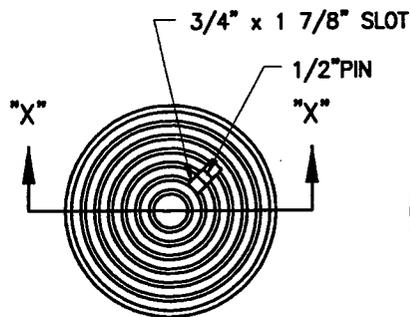




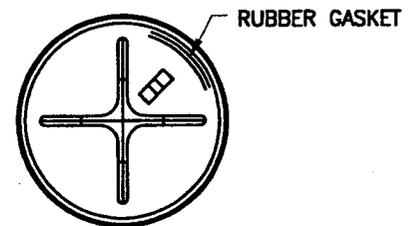
LAMPHOLE DETAIL



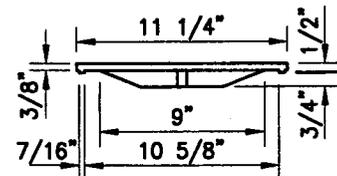
SECTION "Y"- "Y"  
LAMPHOLE FRAME



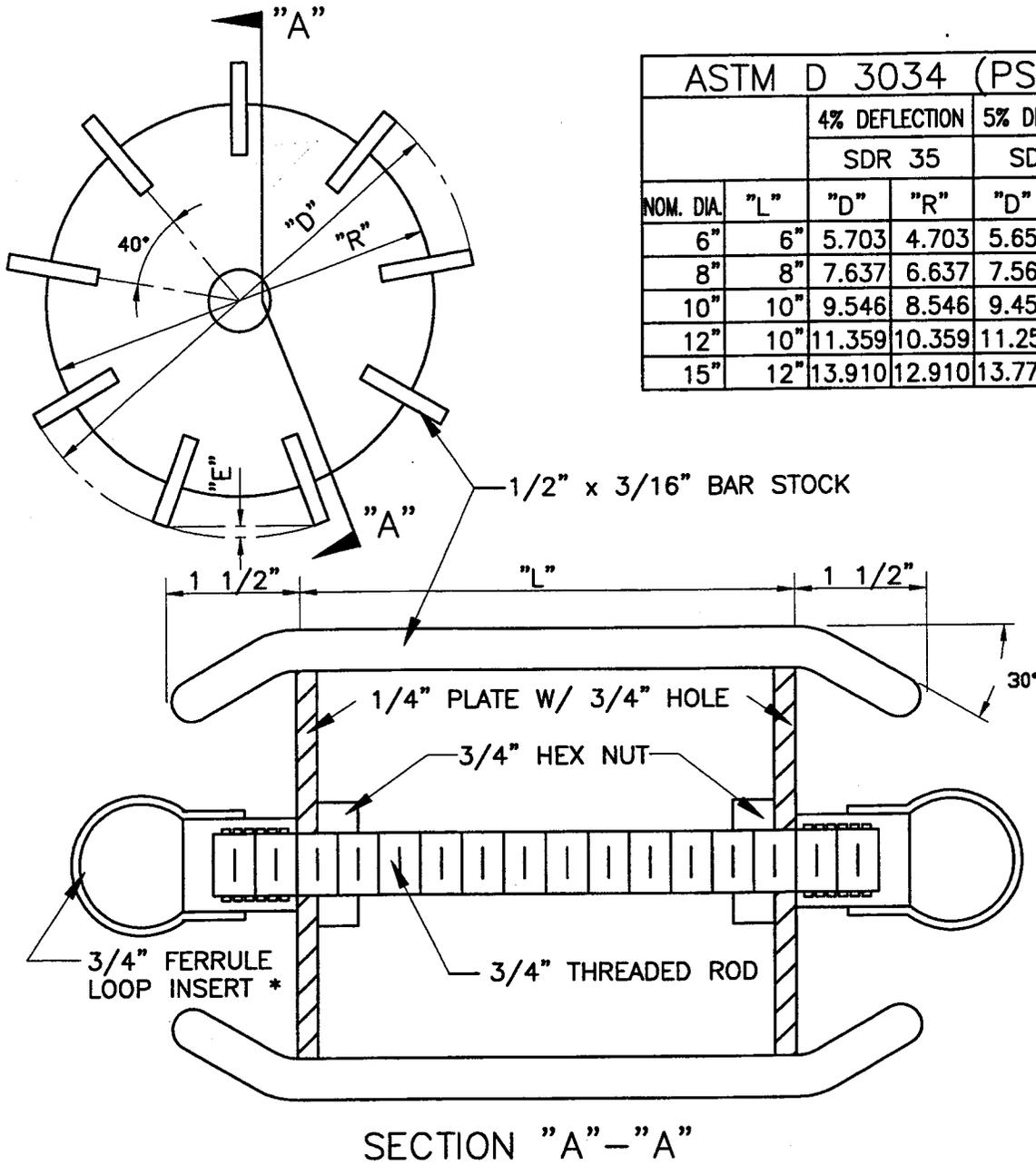
TOP OF COVER



BOTTOM OF COVER



SECTION "X"- "X"  
LAMPHOLE COVER



ASTM D 3034 (PSM)					
		4% DEFLECTION		5% DEFLECTION	
		SDR 35		SDR 35	
NOM. DIA.	"L"	"D"	"R"	"D"	"R"
6"	6"	5.703	4.703	5.650	4.650
8"	8"	7.637	6.637	7.565	6.565
10"	10"	9.546	8.546	9.456	8.456
12"	10"	11.359	10.359	11.251	10.251
15"	12"	13.910	12.910	13.779	12.779

MIN. PLA. DIAMETER  
GAGE DIAMETER HAS BEEN CALCULATED TO CORRECT CHORD LENGTH ERROR "E"

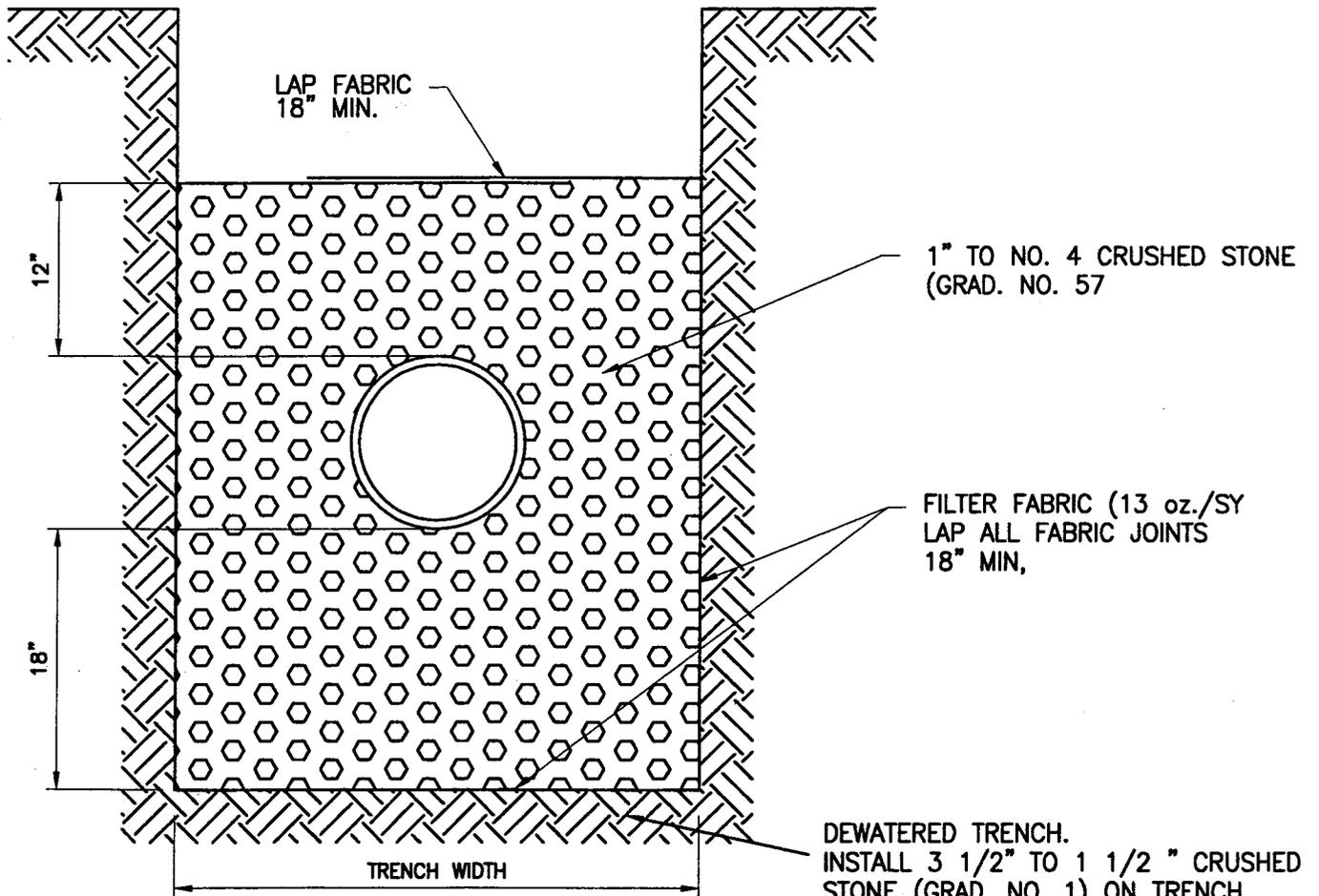
NOTES:

1. USE 4% GAGE IF DEFLECTION TEST IS MADE WITHIN 6 MONTHS OF INSTALLATION.  
USE 5% THEREAFTER
2. MARK ALL GAGES WITH ASTM SPECIFICATION NUMBER, SDR NUMBER AND DEFLECTION.
3. THE 1/2" BAR STOCK ON THE EDGE PROVIDES CLEARANCE TO PASS SMALL AMOUNTS OF SOIL WHICH MAY BE IN PIPE.

\* BURKE CONCRETE ACCESSORIES INC.

NOTES:

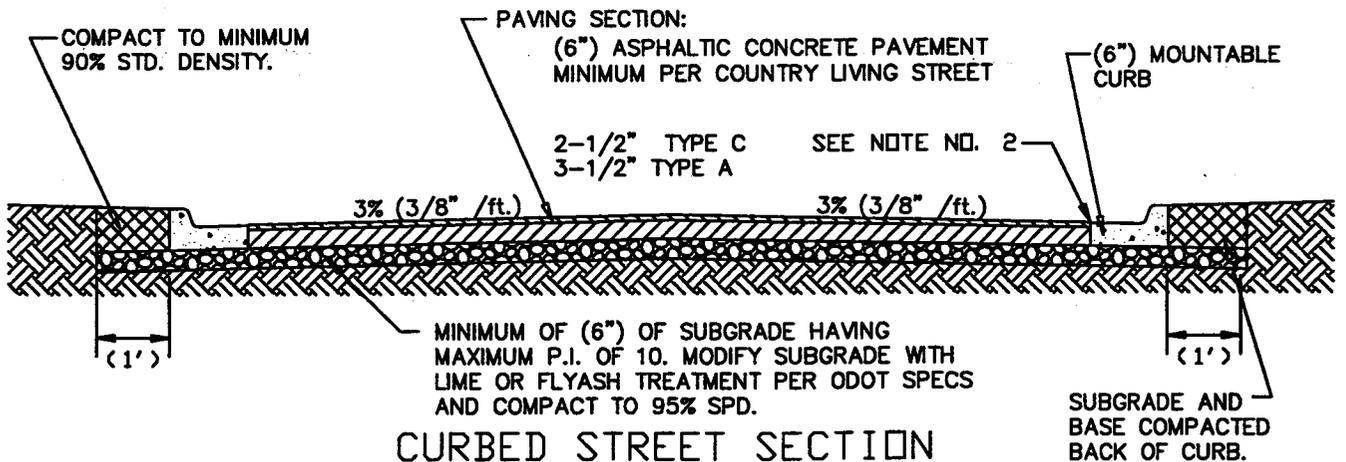
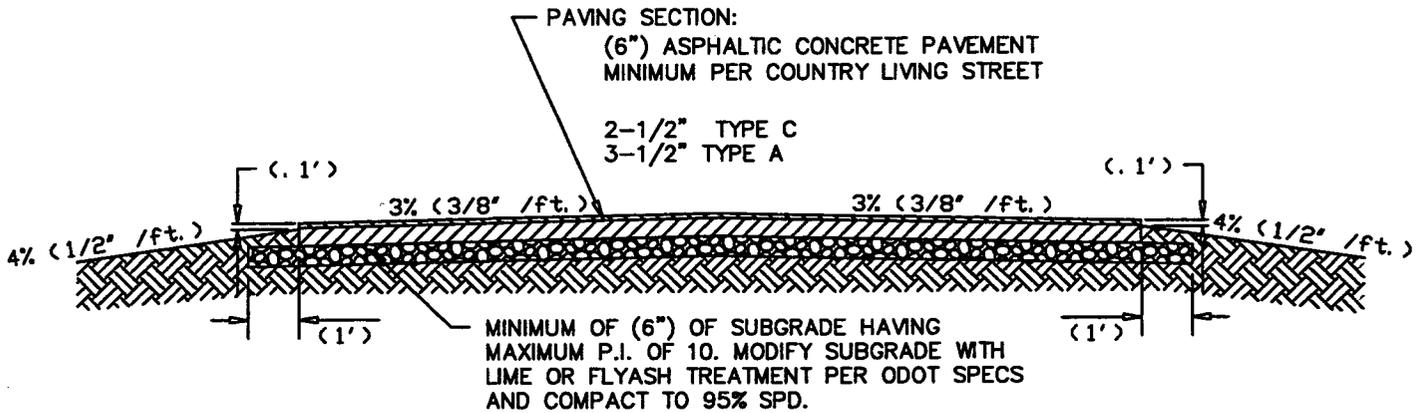
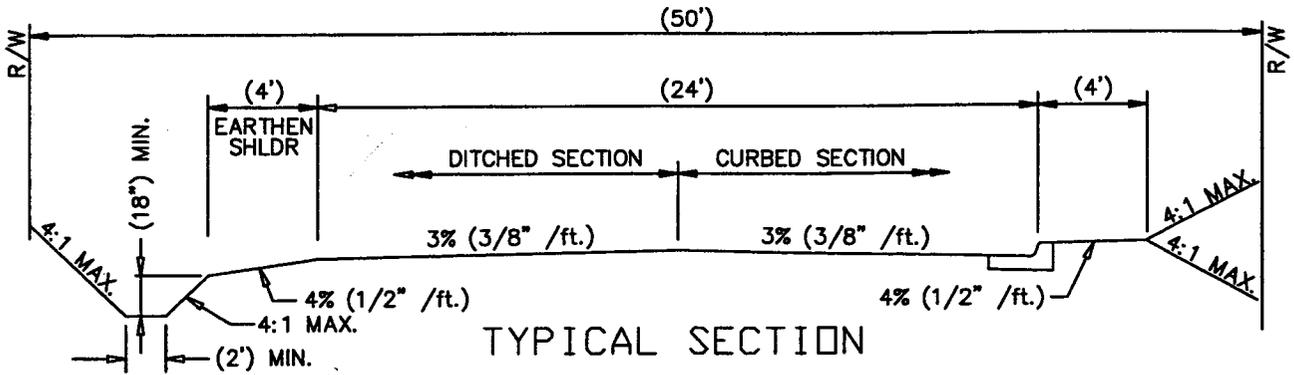
1. SLIDING TRENCH SUPPORTS SHALL NOT BE PLACED BELOW THE TOP OF PIPE.
2. WATER TABLE CRADLE SHALL BE INSTALLED FOR THE FULL WITH OF THE TRENCH LOCATION.
3. FOR RIGID PIPES USE THE STD. TRENCH WIDTH. SEE TABLE FOR FLEXIBLE PIPES.



MINIMUM TRENCH WIDTH FOR FLEXIBLE PIPES	
PIPE I.D.	MIN. TRENCH WIDTH
8" - 12"	3' - 0"
14" - 18"	4' - 6"
20" - 24"	6' - 0"
26" - 30"	7' - 6"
32" - 36"	9' - 0"

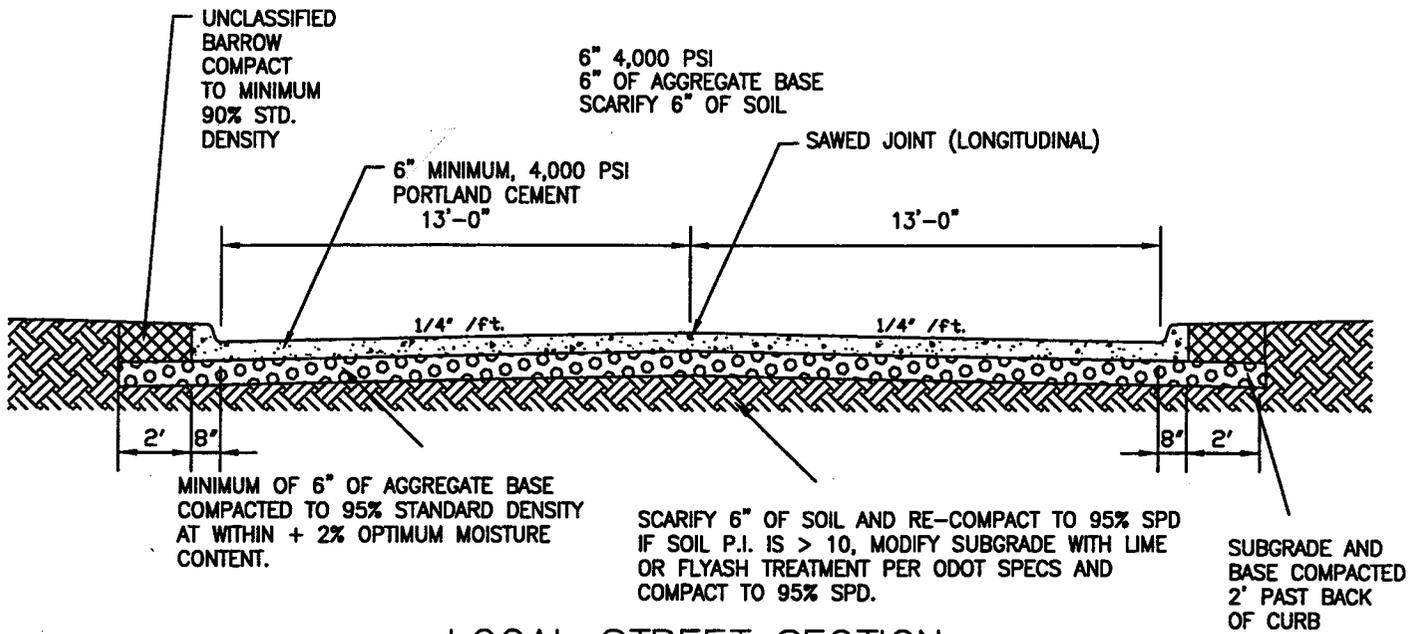
NOTE:

FLEXIBLE PIPES ARE PE. ASTM F894 AND PVC. ASTM D3034 & ASTM F679 & ASTM F794 FOR ALL OTHER PIPES USE THE STANDARD TRENCH WIDTH.

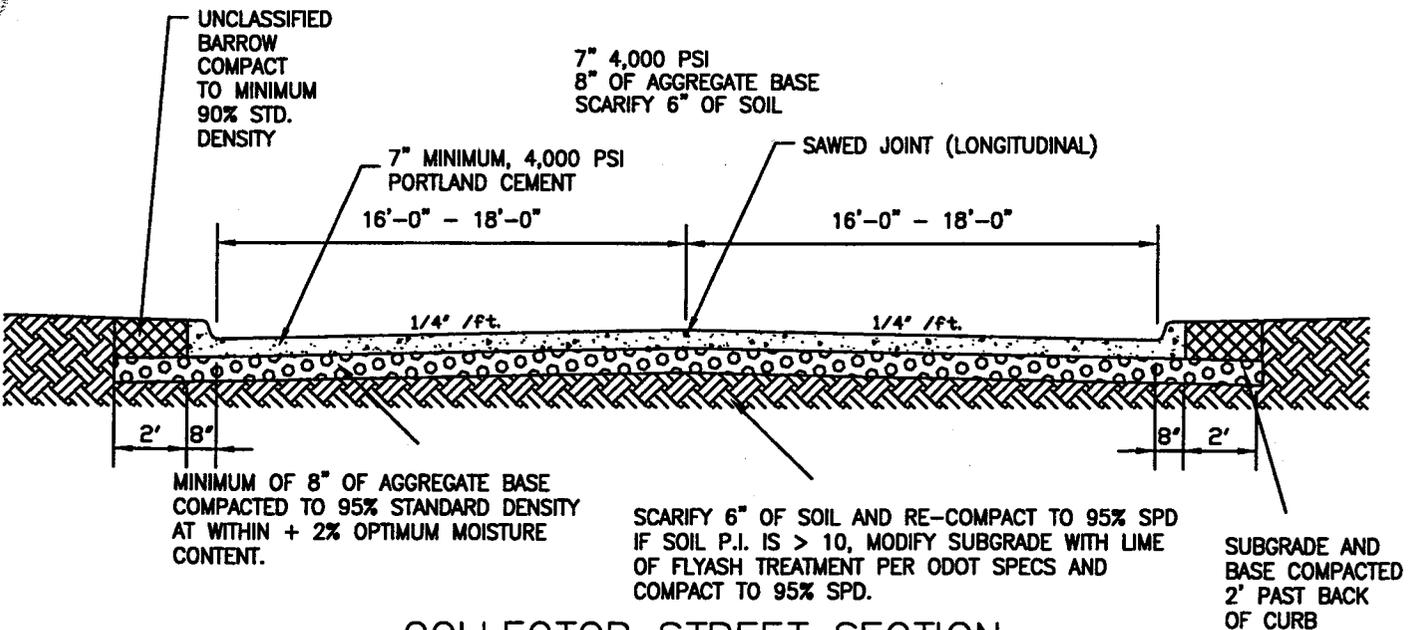


**NOTE:**

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. ASPHALT SURFACE SHALL BE ( 1/4 " ) ABOVE EDGE OF CONCRETE GUTTER. THE GUTTER MAY BE REDUCED TO ( 5 3/4 " ) TO ACCOMMODATE THIS REQUIREMENT.
3. MODIFIED SUBGRADE PER O.D.O.T. SPECIFICATION 307 OR 317.



LOCAL STREET SECTION

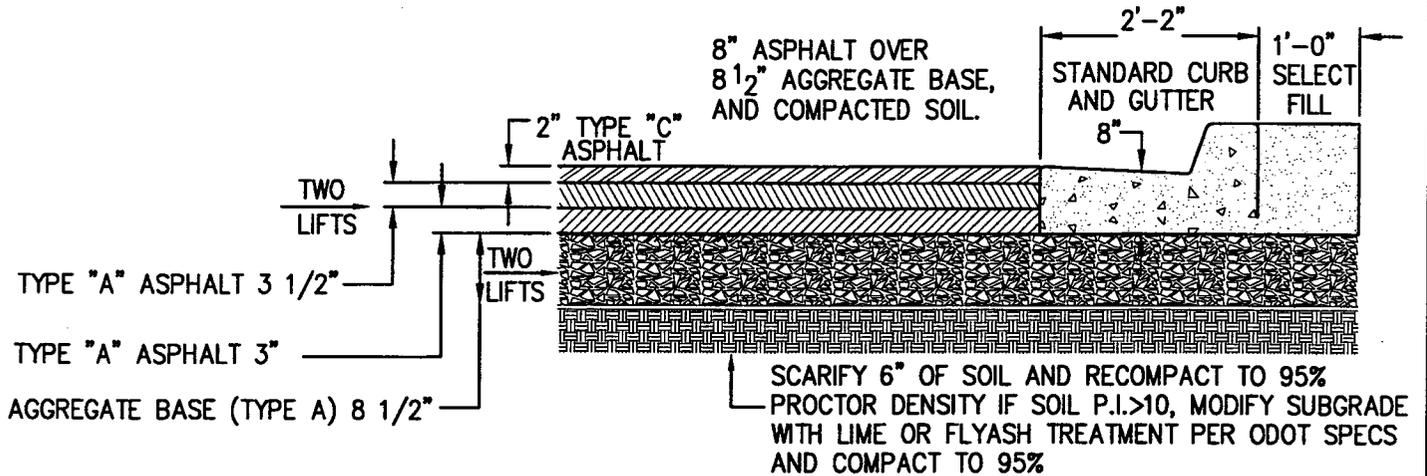


COLLECTOR STREET SECTION

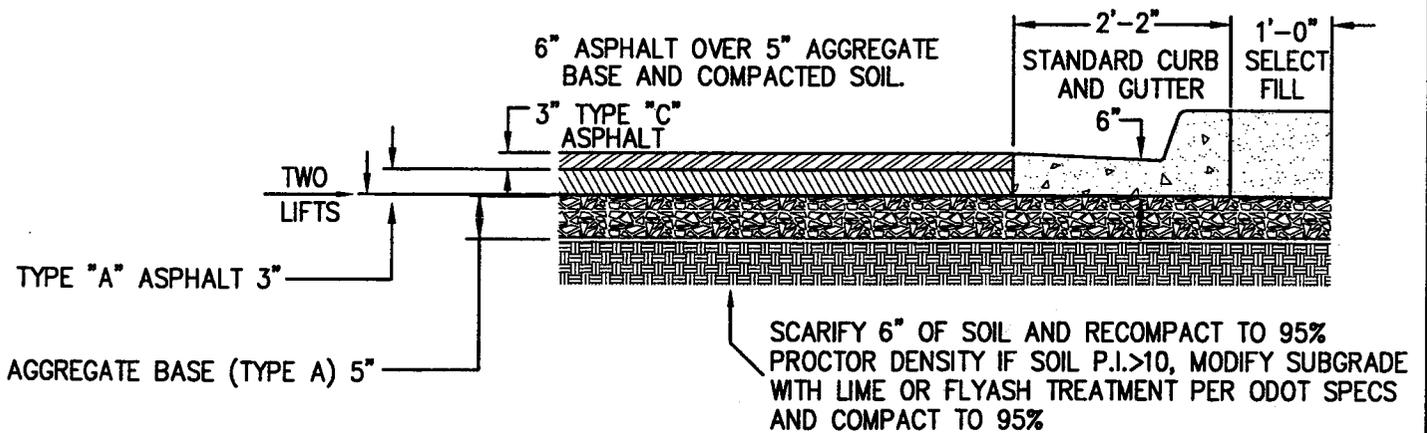
TYPICAL PAVING SECTION CONSTRUCTION NOTES:

1. ALL CONSTRUCTION AND ALL MATERIALS TESTING SHALL BE PER APPLICABLE O.D.O.T. SPECIFICATIONS, 1999.
2. SCARIFY SUBGRADE SOIL TO A DEPTH OF 6" PER O.D.O.T. SPECIFICATION 310 (METHOD B).
3. MODIFIED SUBGRADE (SOIL P.I.>15) PER O.D.O.T. SPECIFICATION 307 OR 317.
4. AGGREGATE BASE (TYPE A) SHALL BE PER O.D.O.T. SPECIFICATION 303.

COLLECTOR / INDUSTRIAL

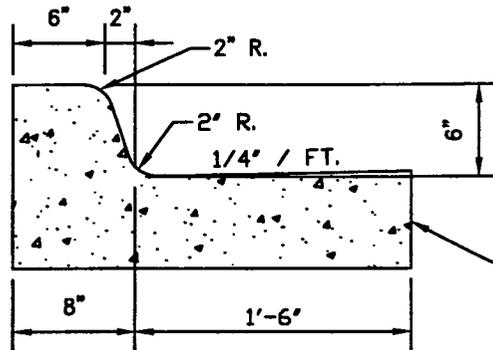


LOCAL



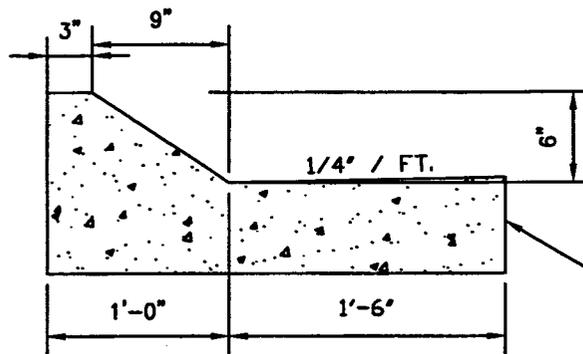
TYPICAL PAVING SECTION CONSTRUCTION NOTES:

1. ALL CONSTRUCTION AND ALL MATERIALS TESTING SHALL BE PER APPLICABLE O.D.O.T. SPECIFICATIONS, LATEST VERSION.
2. SCARIFY SUBGRADE SOIL TO A DEPTH OF 6" MIN. PER O.D.O.T. SPECIFICATION 310 (METHOD B).
3. MODIFIED SUBGRADE (SOIL P.I.>10) PER O.D.O.T. SPECIFICATION 307 OR 317.
4. FILTER FABRIC SHALL BE PER O.D.O.T. SPECIFICATION 325.
5. AGGREGATE BASE (TYPE A) SHALL BE PER O.D.O.T. SPECIFICATION 303.
6. ASPHALT TYPE "A" SHALL BE PLANT MIX ASPHALT CONCRETE PAVEMENT BE PER O.D.O.T. SPECIFICATION 411.
7. PRIOR TO PLACING ASPHALT, ALL ROCK AGGREGATE BASE AND SOIL SHALL RECEIVE A PRIME COAT PER O.D.O.T. SPECIFICATION 408.
8. TACK COAT BETWEEN CONSECUTIVE LIFTS OF ASPHALT WILL BE REQUIRED WHEN THE TEMPERATURE OF THE PREVIOUS LIFT IS LESS THAN 135 DEGREES. APPLICATION SHALL BE PER O.D.O.T. SPECIFICATION 407.



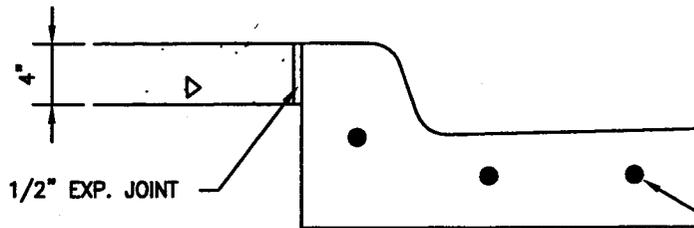
6" MINIMUM  
OR EQUIVALENT  
THICKNESS OF  
STREET BEING  
CONSTRUCTED

6" BARRIER CURB & GUTTER



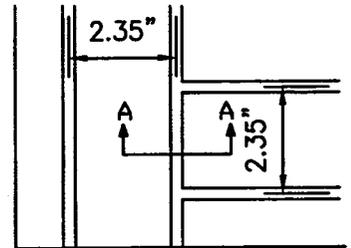
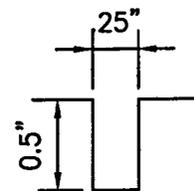
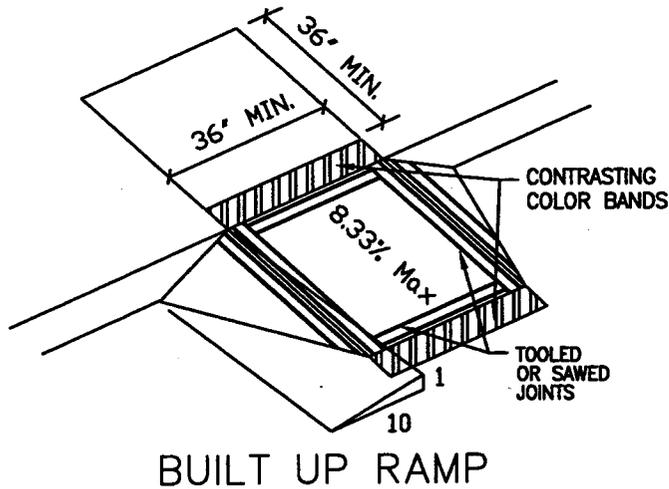
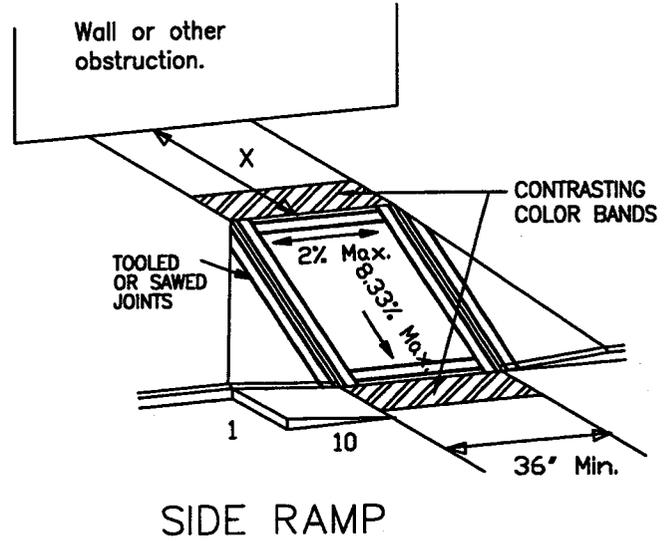
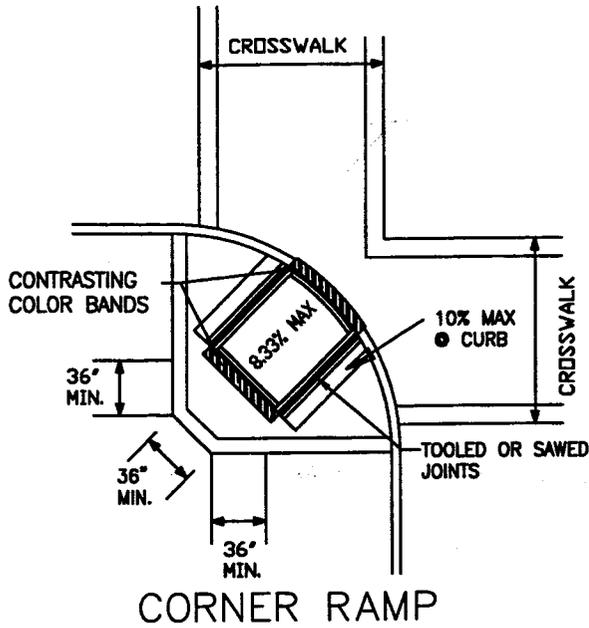
6" MINIMUM  
OR EQUIVALENT  
THICKNESS OF  
STREET BEING  
CONSTRUCTED

6" MOUNTABLE CURB & GUTTER



3 - 3/4" SLICK BARS W/CAPS  
AT EXPANSION JOINTS (ALL CURBS)

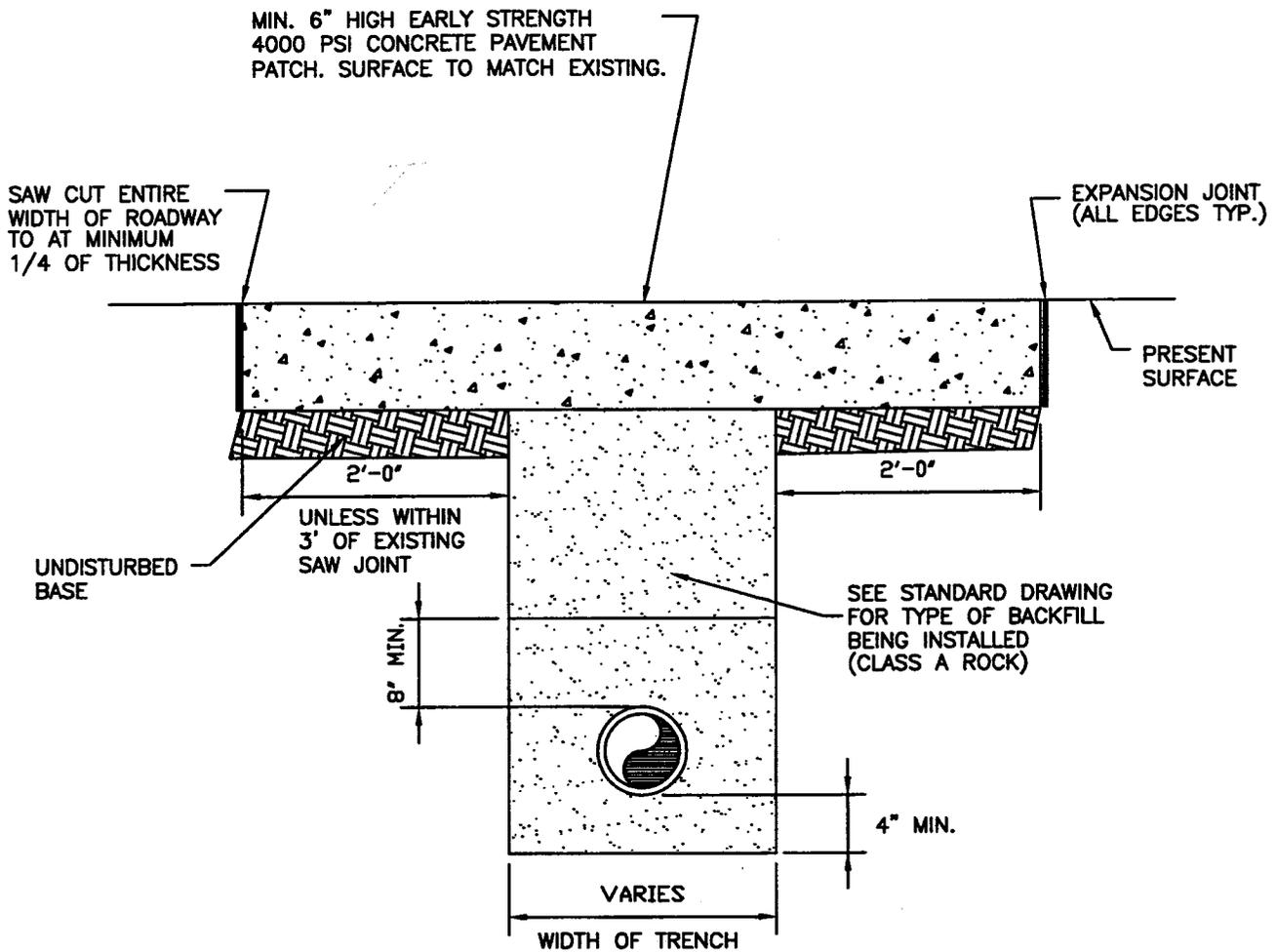
SIDEWALK ADJACENT TO CURB



TOOLED OR SAWED JOINTS

NOTES:

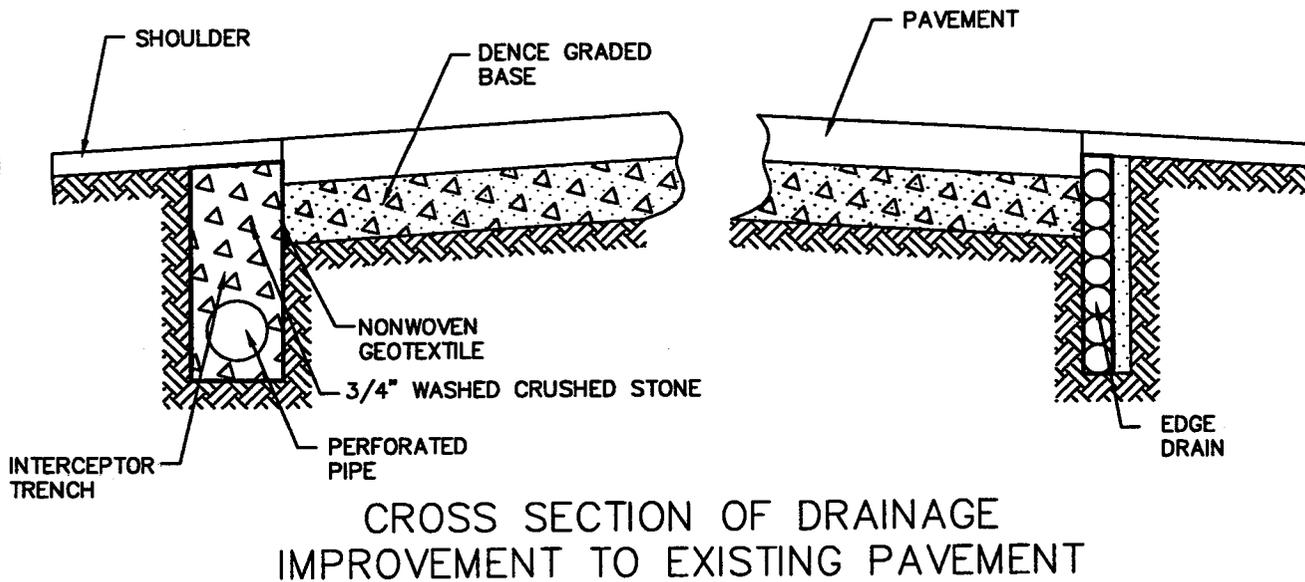
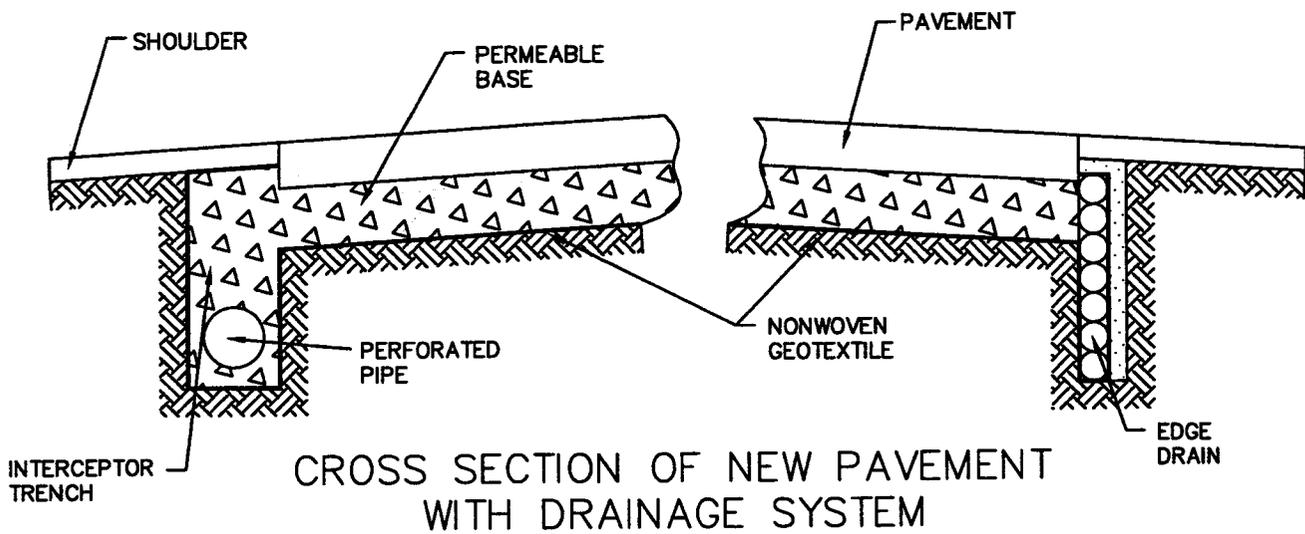
1. DETECTABLE WARNING, CONTRASTING COLOR BANDS, SHALL CONTRAST VISUALLY WITH ADJOINING SURFACE, EITHER LIGHT ON DARK, OR DARK ON LIGHT.
2. THE MATERIAL USED TO PROVIDE CONTRAST SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE.
3. CROSS SLOPE OF LANDING AREA DOES NOT EXCEED 2% IN ANY DIRECTION.
4. WHEN X IS LESS THAN 48", THE SLOPE OF THE FANNED OR FLARED SIDES MUST NOT EXCEED 1:12 (8.33%)
5. BUILT UP RAMPS ARE NOT ALLOWED TO ENCROACH INTO LOADING/UNLOADING ZONES PARKING SPACES OR VEHICULAR TRAFFIC LANES.



USE THIS DETAIL WHERE IT IS NECESSARY TO CUT THE PRESENT SURFACE FOR REMOVAL OR CONSTRUCTION OF AN UNDERGROUND FACILITY

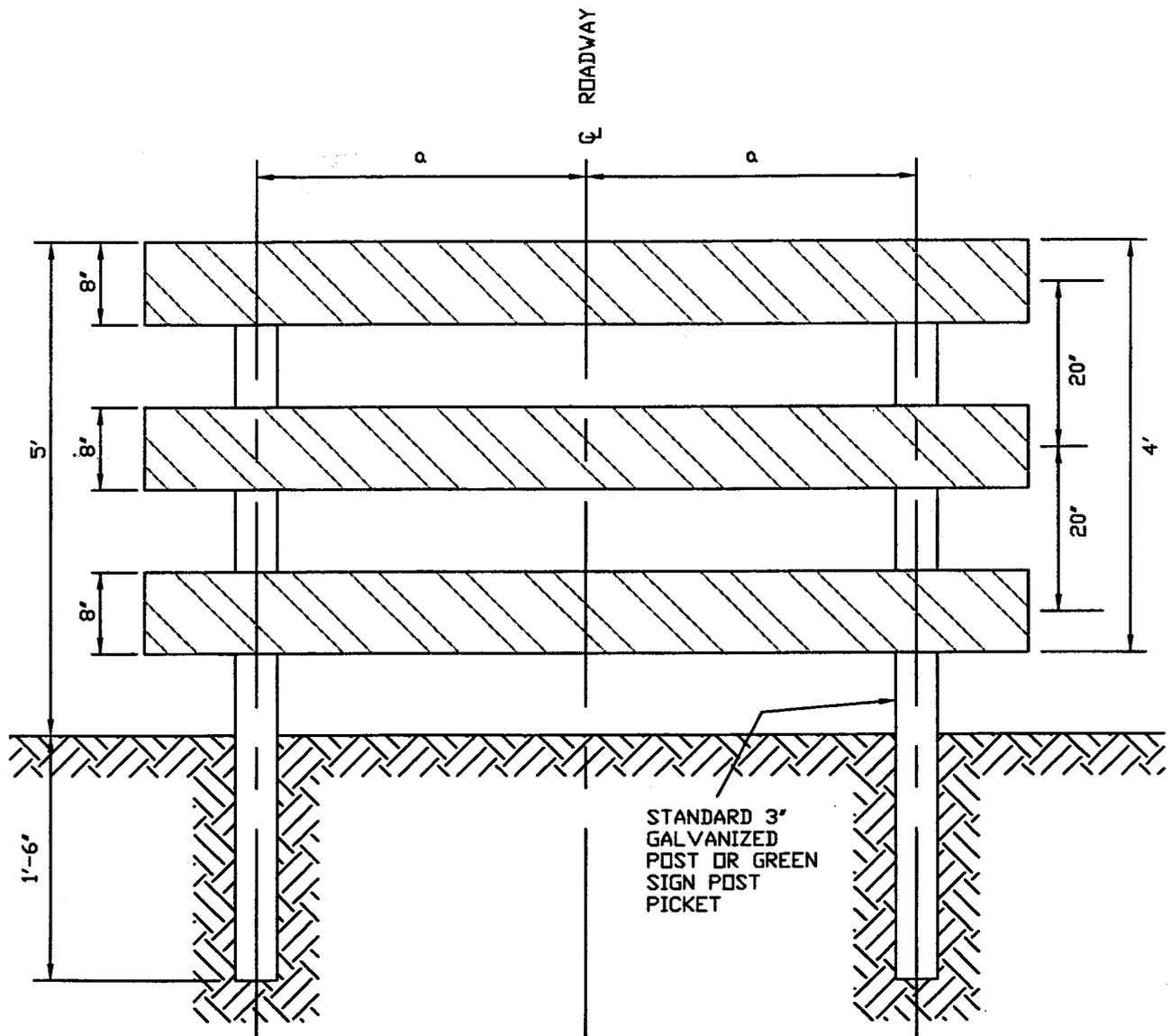
NOTES:

1. CONCRETE TO BE PLACED ONE HALF OF ROADWAY AT A TIME AND CURED FOR THREE (3) DAYS.
2. NEW SURFACE TO TRANSITION SMOOTHLY TO EXISTING PAVEMENT.
3. STRENGTH OF PATCH MUST EQUAL OR EXCEED EXISTING STREET STRENGTH.



NOTES:

1. MINIMUM PERFORATED PIPE SIZE IS 4" DIAMETER.
2. PERFORATED PIPES SHALL BE TIED TO THE STORM SEWER SYSTEM.
3. ON STREETS WITH CURB AND GUTTER, THE DRAIN SHALL BE OUTSIDE BUT ADJACENT TO THE CURB.

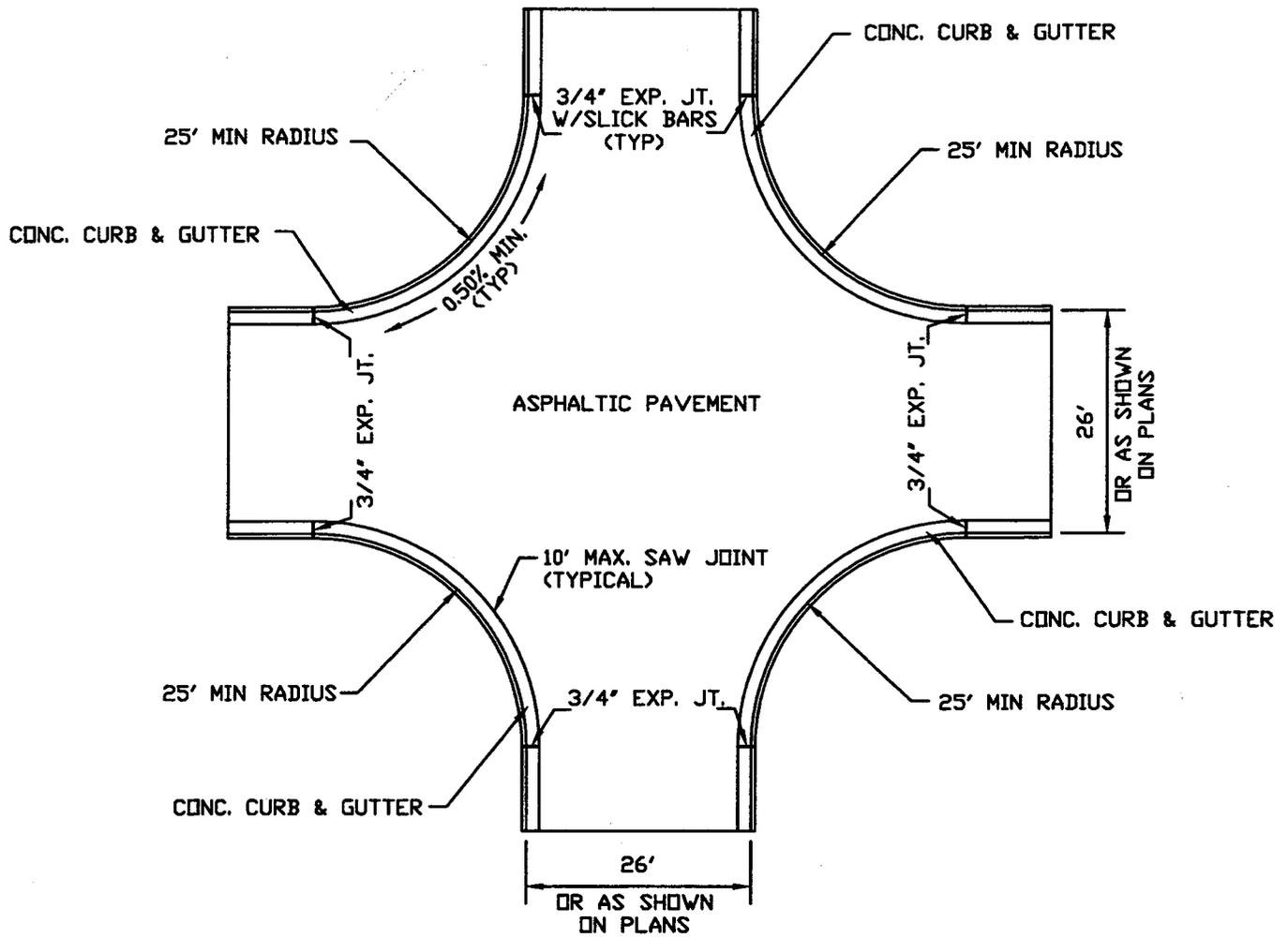


NOTES:

1. FOR ROADWAY 26' WIDE  $a = 6'-6"$
2. FOR ROADWAY 36' WIDE  $a = 9'-0"$
3. FOR ROADWAY 42' WIDE  $a = 10'-6"$

CITY OF CLAREMORE  
ASPHALTIC CONCRETE INTERSECTION LAYOUT

FIGURE STDST.09



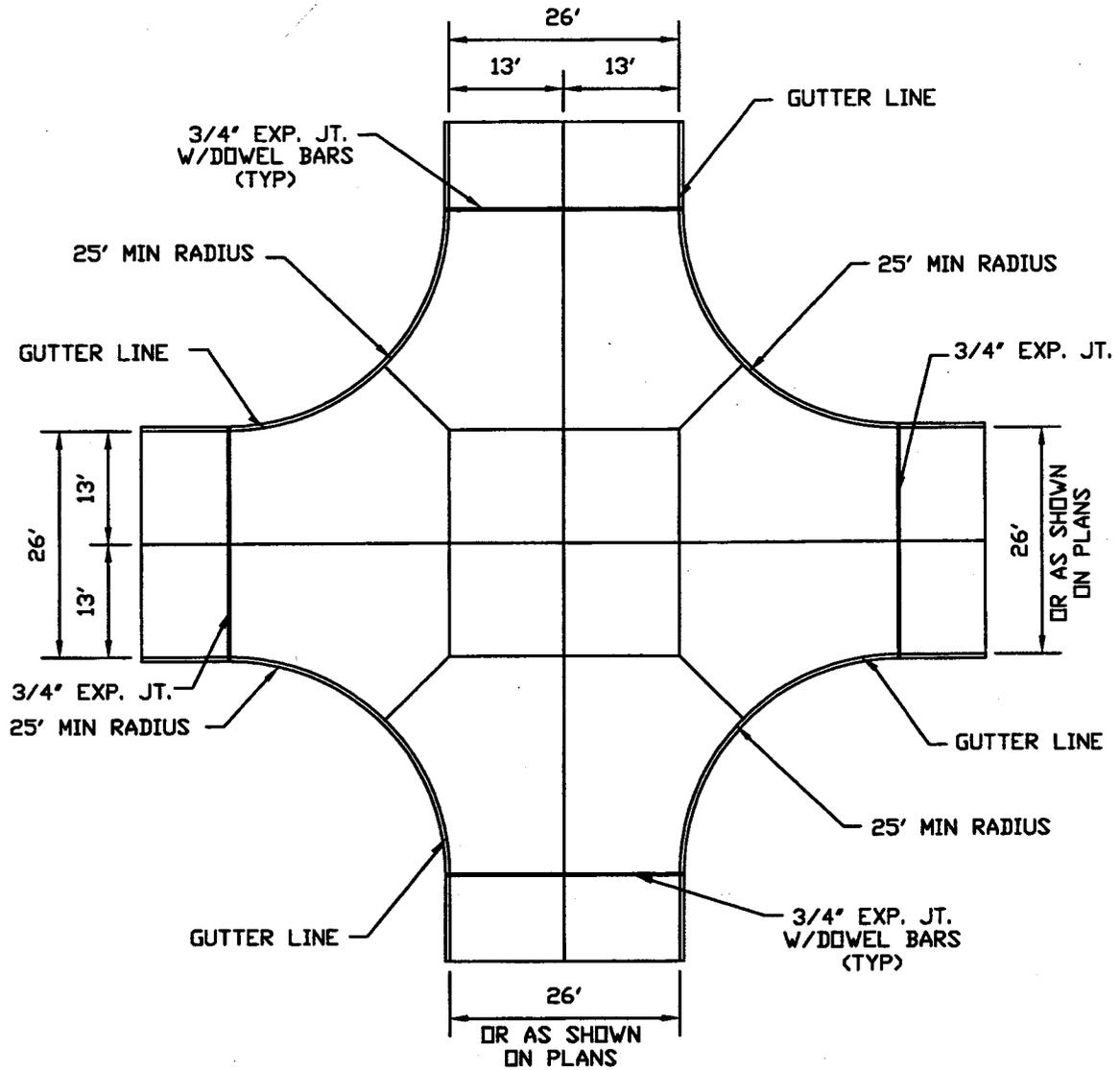
NOTES:

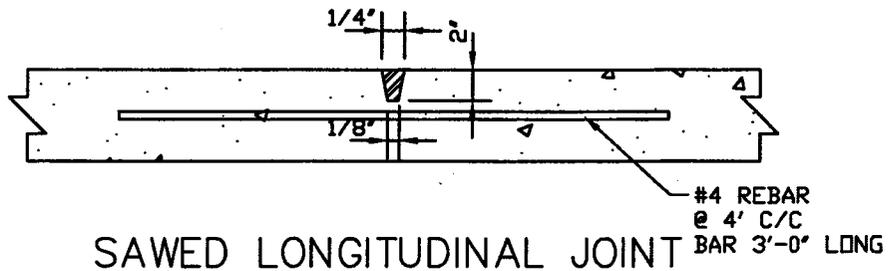
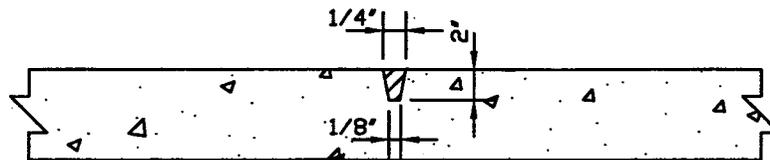
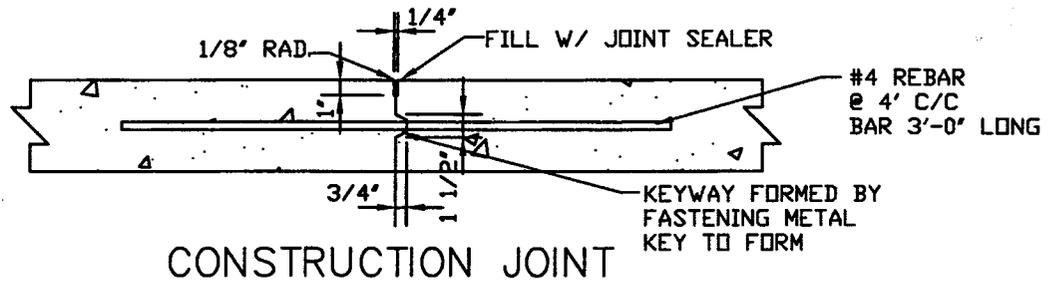
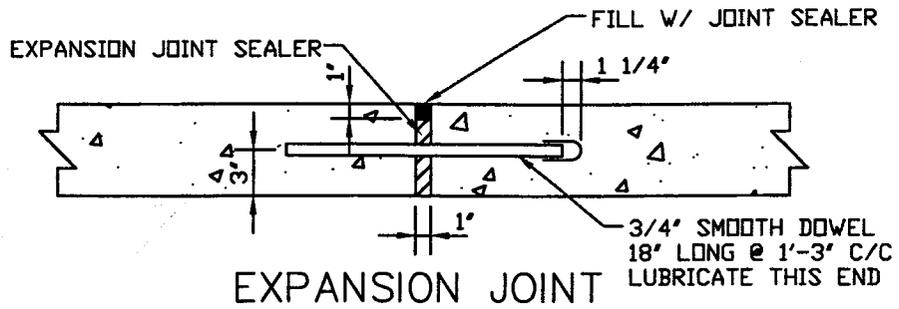
1. SIDEWALKS TO BE LOCATED PER THE LAND SUBDIVISION CODE
2. WHEELCHAIR RAMPS SEE STDST06

Adopted Date: 3/18/02

Effective Date: 4/18/02

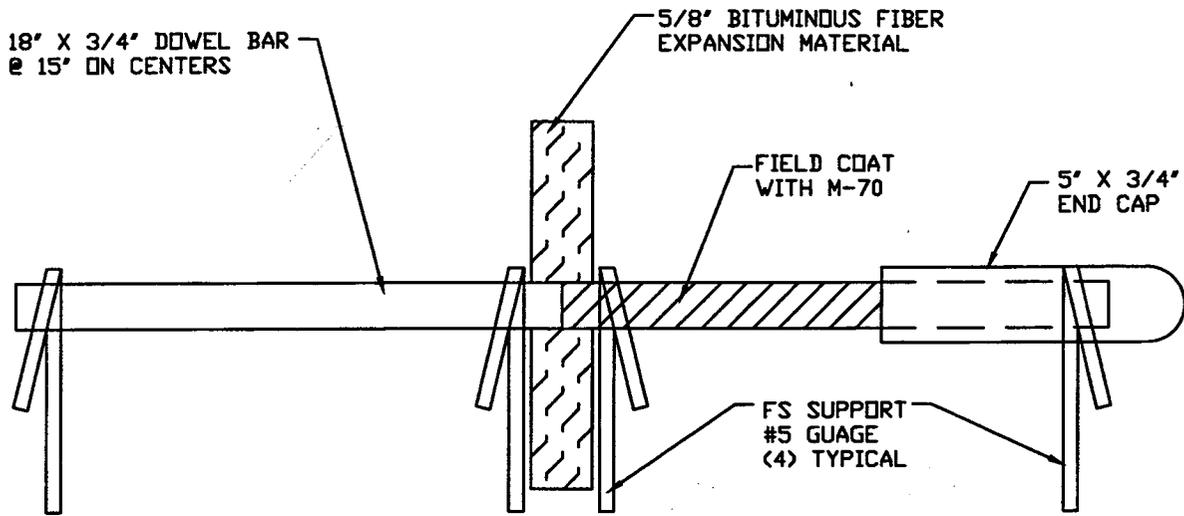
Engineer Approval: HDH



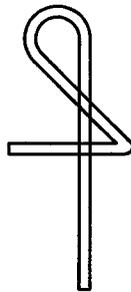


NOTES:

1. SAWED JOINTS SHALL BE SEALED AS REQUIRED.



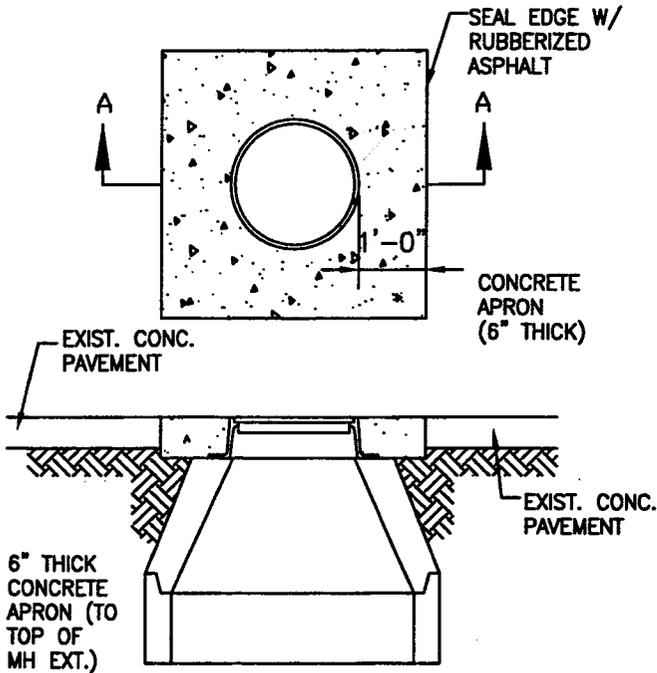
END VIEW



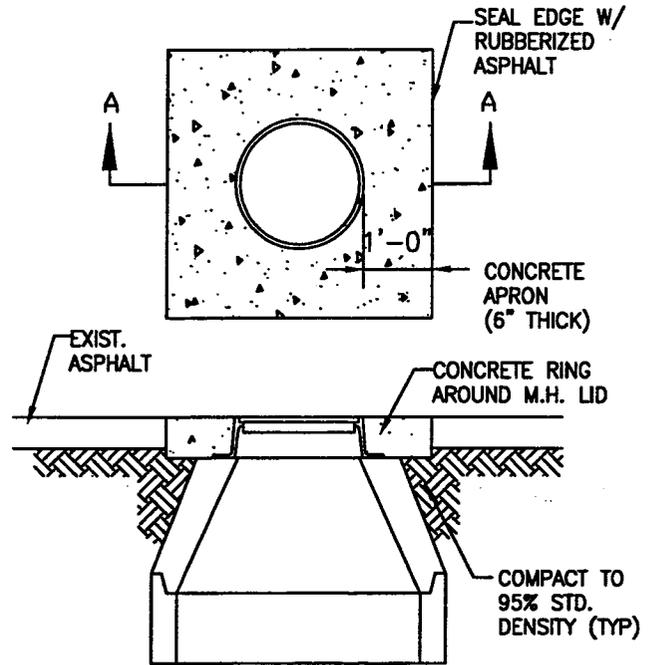
FS SUPPORT DETAIL

NOTES:

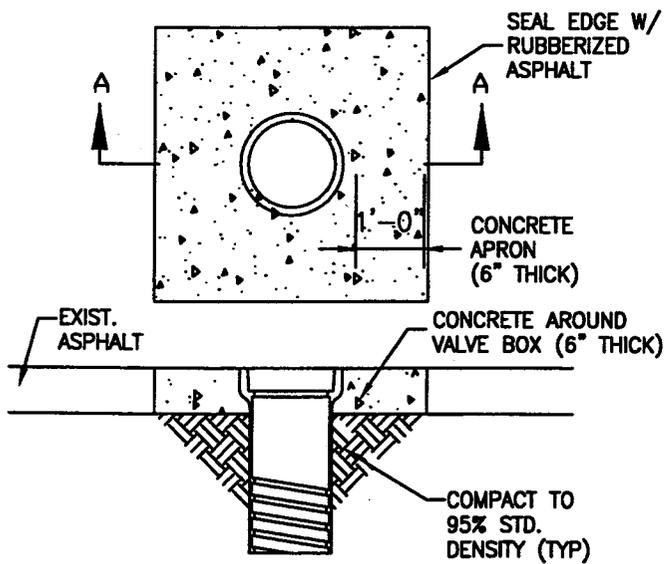
1. ANY DEVICE USED FOR SUPPORTING DOWELS SHALL HAVE SUFFICIENT RIGIDITY AND BE SO HELD IN PLACE DURING CONCRETE PLACEMENT THAT DOWELS WILL BE IN TRUE POSITION IN THE FINISHED PAVEMENT. ANY DEVICE NOT PRODUCING THE DESIRED RESULTS SHALL BE DISCONTINUED.
2. DOWEL BARS SHALL HAVE A SHOP OR FIELD COAT OF RED LEAD OR ZINC CHROMATE FOR FULL LENGTH OF BAR AND SHALL HAVE A FIELD COAT OF M-70 ON THE FREE END (MAXIMUM 1/2 LENGTH OF BAR).
3. EXPANSION JOINT FILLER MATERIAL SHALL BE BITUMINOUS FIBER AND OF NON-EXTRUDING MATERIAL.



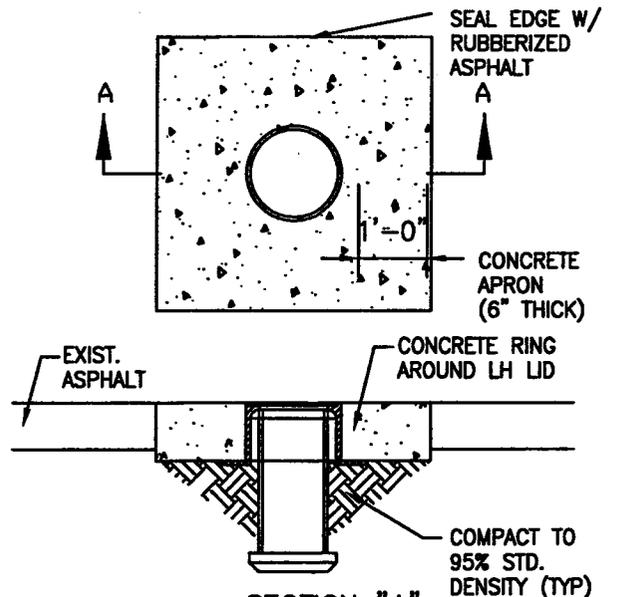
SECTION "A"  
 MANHOLE IN CONCRETE,  
 ADJUST TO GRADE



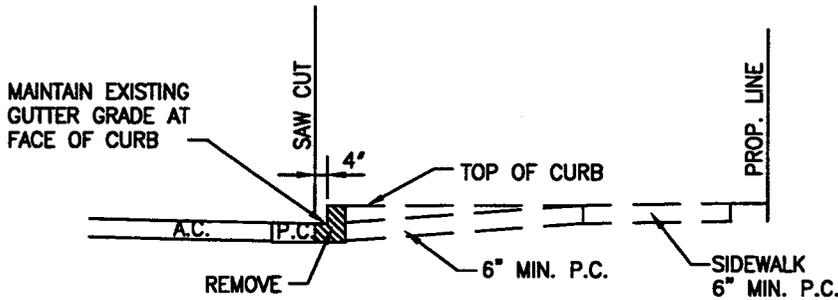
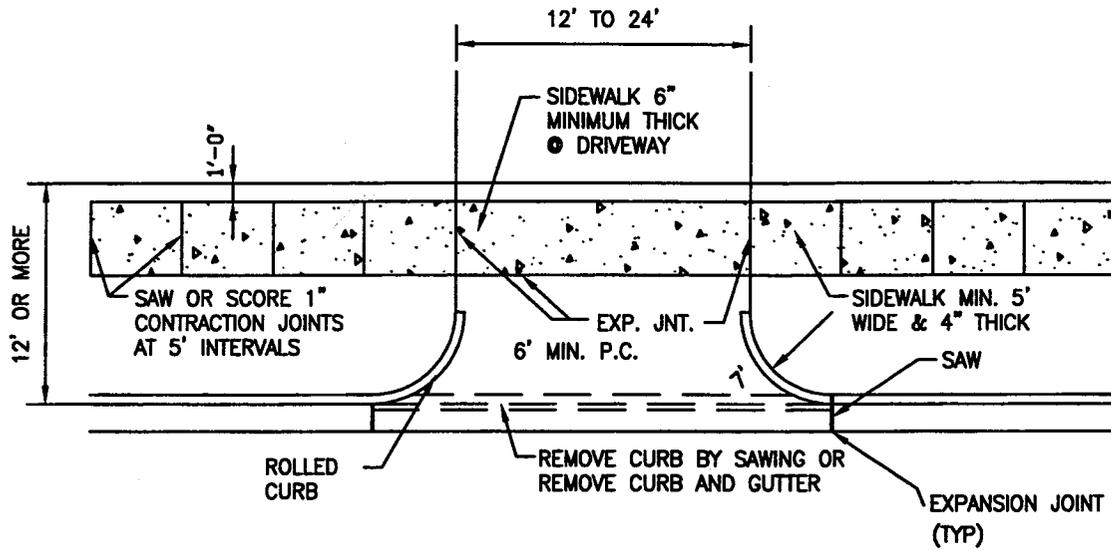
SECTION "A"  
 MANHOLE IN ASPHALT,  
 ADJUST TO GRADE



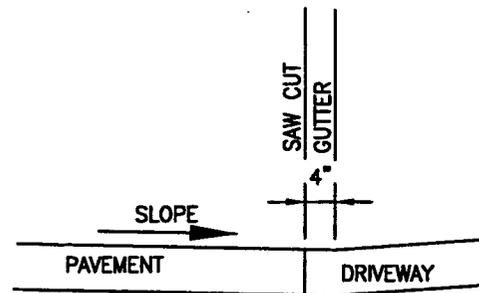
SECTION "A"  
 WATER VALVE TO GRADE  
 IN ASPHALT



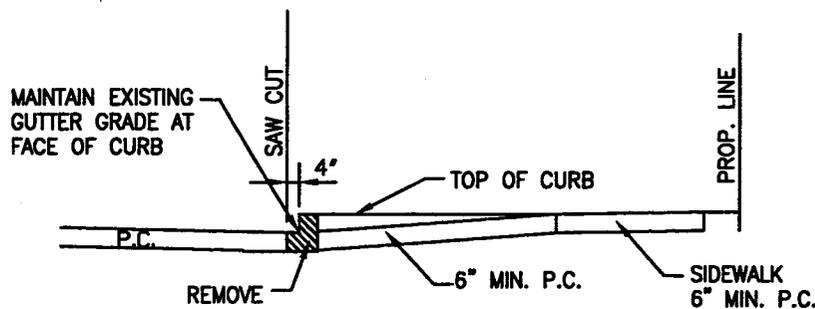
SECTION "A"  
 LAMPHOLE IN ASPHALT  
 ADJUST TO GRADE



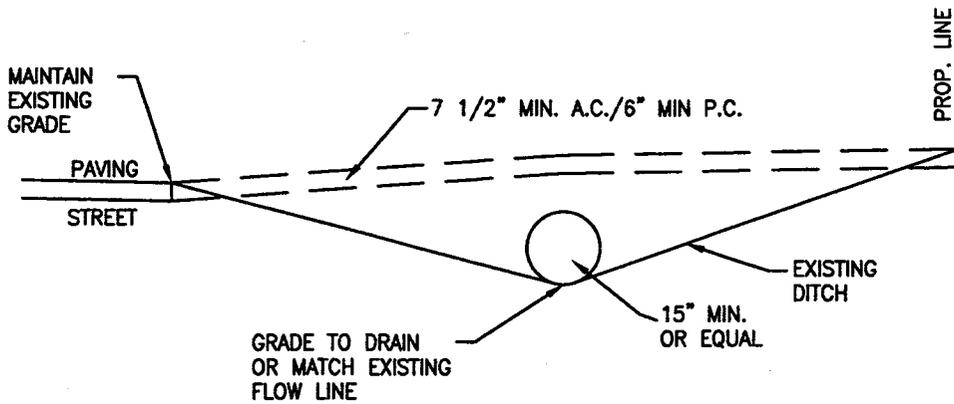
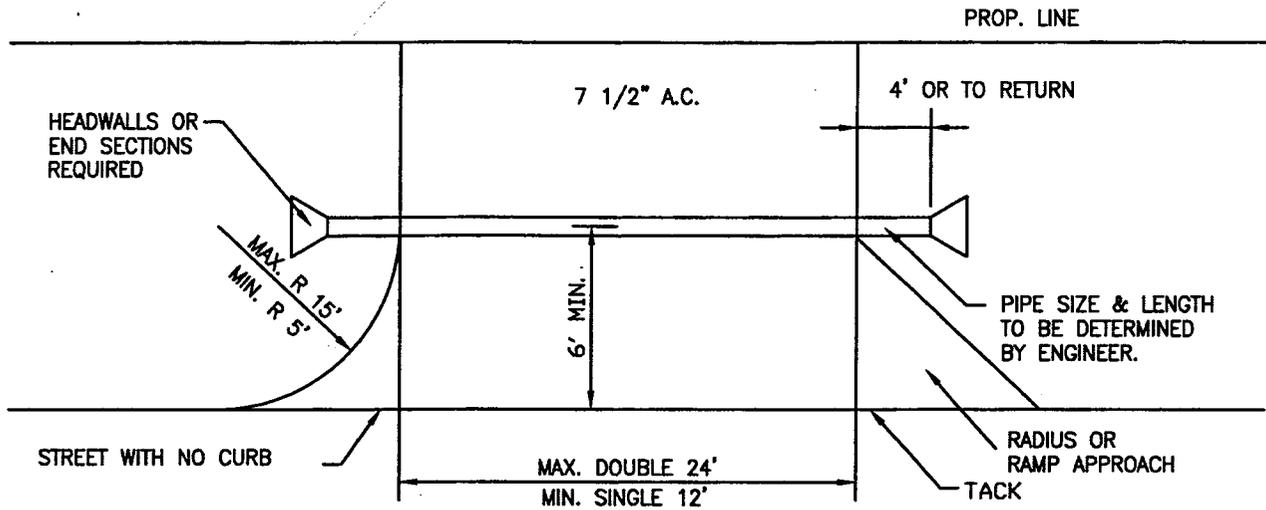
ASPHALT STREET DRIVEWAY SECTION



SECTION AT GUTTER

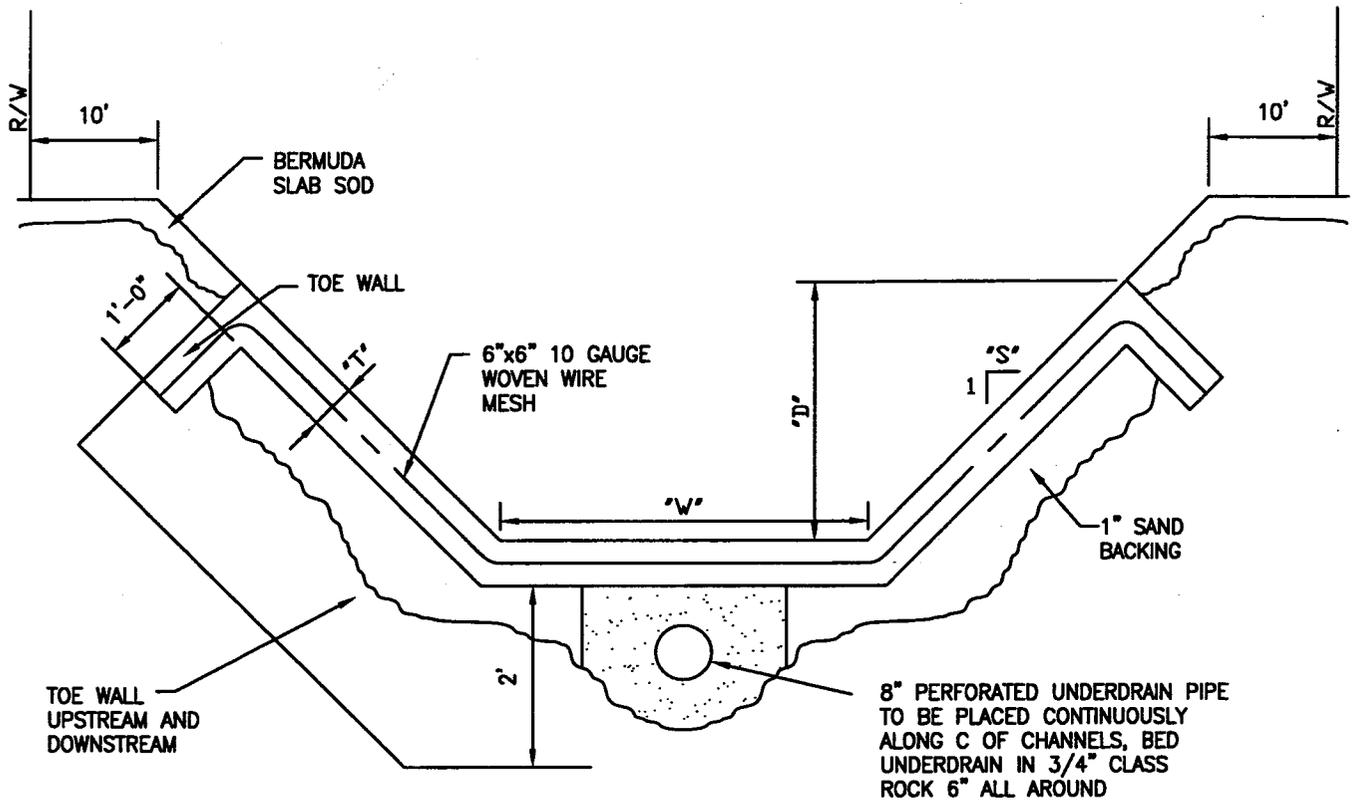


CONCRETE STREET DRIVEWAY SECTION



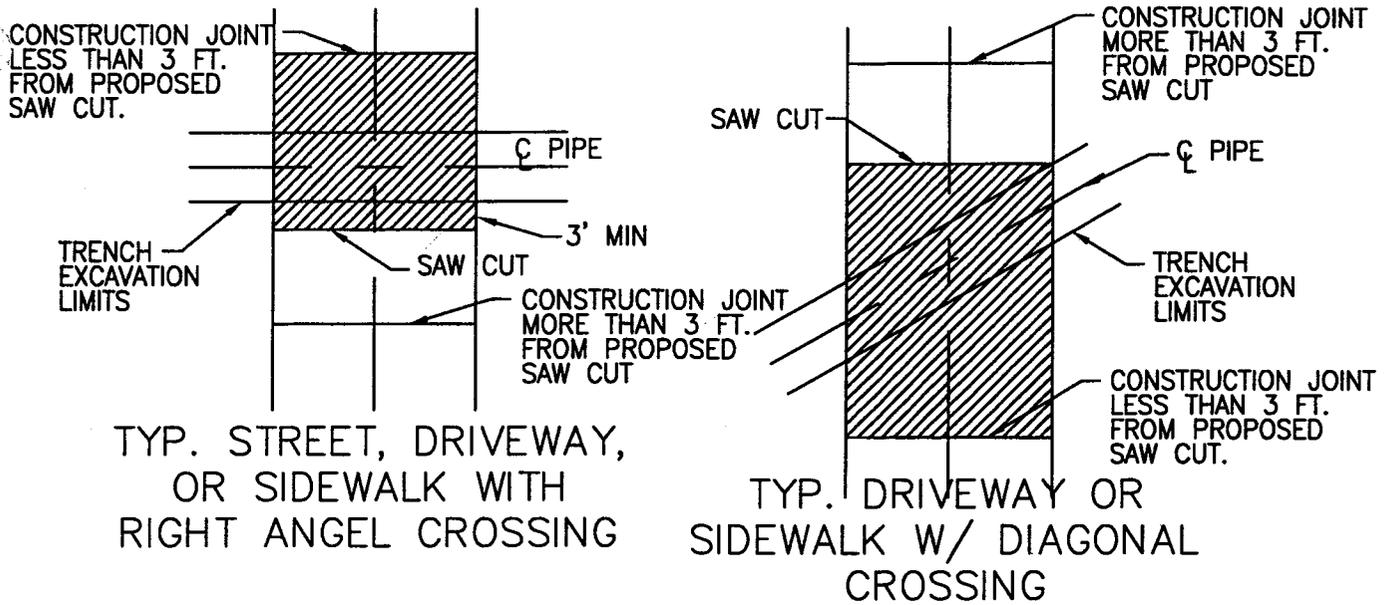
DRIVEWAY SECTION





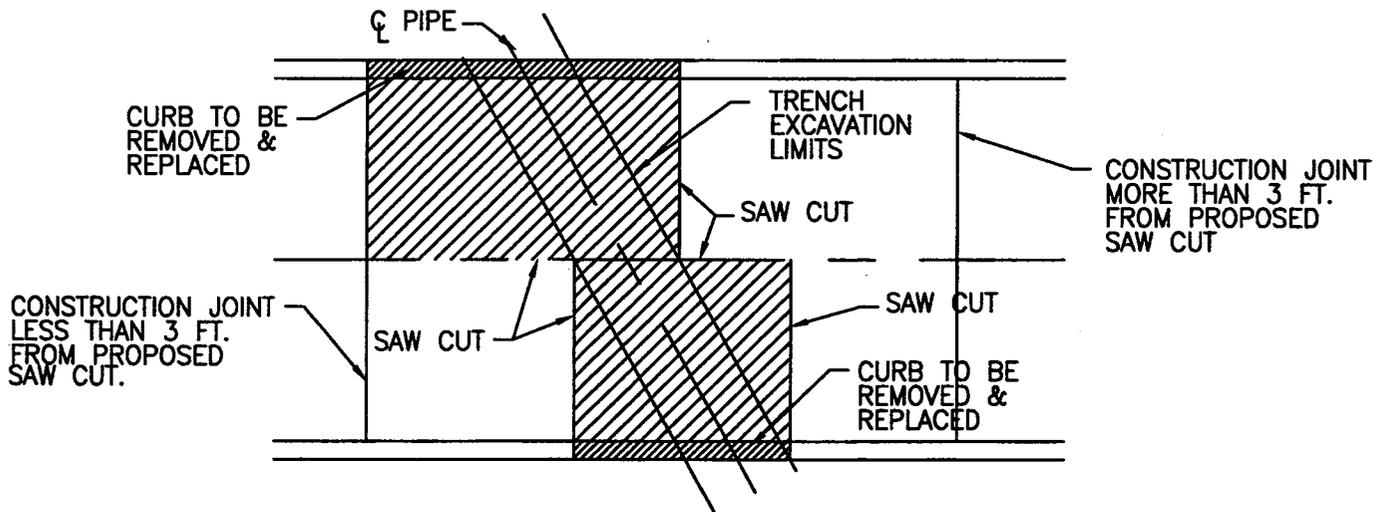
NOTES:

1. 3500 P.S.I. CONCRETE WITH NOT OVER 3" SLUMP.
2. DIMENSIONS FOR "W", "D", "T", AND "S" TO BE SHOWN ON THE PLAN.
3. SEALED SAW CUT JOINTS @ 15' C/C.
4. SEALED 3/4" EXPANSION JOINTS @ 90' C/C.
5. TWO FEET (2') DEEP TOE WALL TO BE CONSTRUCTED AT EACH END.
6. EXTEND REINFORCING STEEL INTO TOP WALL AND TOE WALL.
7. WHERE REQUIRED ENERGY DISSIPATERS WILL BE CONSTRUCTED AS PART OF THE CHANNEL.



TYP. STREET, DRIVEWAY,  
OR SIDEWALK WITH  
RIGHT ANGEL CROSSING

TYP. DRIVEWAY OR  
SIDEWALK W/ DIAGONAL  
CROSSING



TYPICAL STREET WITH DIAGONAL CROSSING

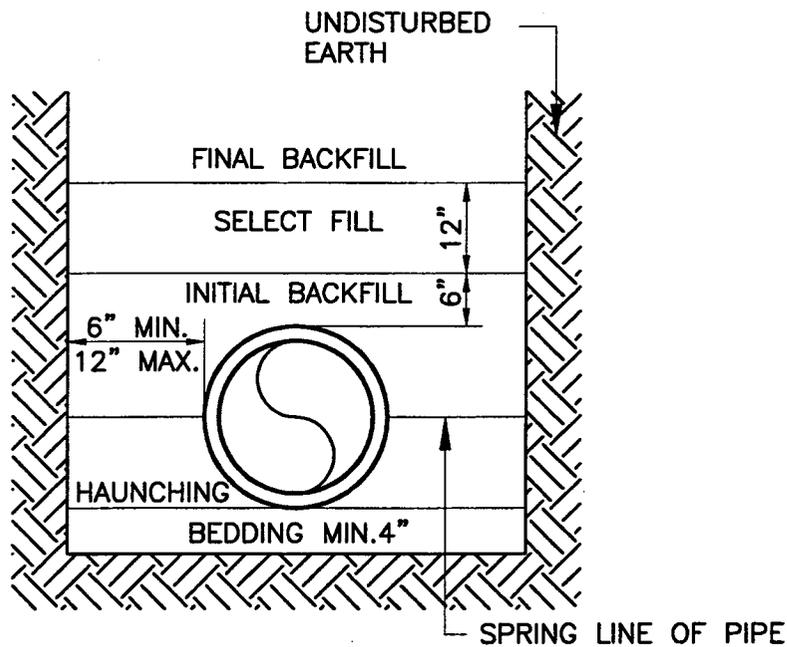
NOTES:

1. REMOVE AND REPLACE PAVEMENT WITHIN SHADED AREAS BOUNDED BY SAW CUTS AND/OR CONSTRUCTION JOINTS.
2. FOR DIAGONAL CROSSING, REPLACE PAVEMENT USING SQUARED CUTS, AS SHOWN. PAY QUANTITY WILL INCLUDED SQUARED AREA.
3. REMOVE AND REPLACE PAVEMENT TO CONSTRUCTION JOINT IF LESS THAN 3 FT. FROM PROPOSED SAW CUT. EXTRA AREA WILL BE INCLUDED IN PAY QUANTITY.
4. FOR LONGITUDINAL INSTALLATIONS: REMOVE AND REPLACE PAVEMENT AND CURB TO EDGE OF STREET, IF THE SAW CUT IS LESS THAN 3 FT. FROM THE OUTSIDE EDGE OF THE PAVEMENT OR CURB. AVOID SAW CUTS IN THE EXISTING WHEEL LINE. TRENCHES EXCEEDING 300 L.F. SHALL BE BACKFILLED AND MADE DRIVEABLE.
5. ALL CONSTRUCTION JOINTS SHALL BE REESTABLISHED IN ACCORDANCE WITH THE CITY OF CLAREMORE STANDARDS FOR PORTLAND CEMENT CONCRETE PAVEMENT. WHEN A PAVEMENT SECTION IS REMOVED ALONG AN EXISTING LONGITUDINAL CONSTRUCTION JOINT, THE NEW PAVEMENT SHALL BE DOWELED TO THE PAVEMENT ADJACENT TO THE JOINT.

CITY OF CLAREMORE  
WATER PIPE BEDDING DETAIL

FIGURE STD.W01

NON-PAVED AREAS				PAVED AREAS		
P V C	DUCTILE IRON	CONCRETE		P V C	DUCTILE IRON	CONCRETE
EXCAVATED MATERIAL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	FINAL BACKFILL	CRUSHED ROCK	CRUSHED ROCK	CRUSHED ROCK
SELECT FILL	SELECT FILL	SELECT FILL	SELECT FILL	CRUSHED ROCK	CRUSHED ROCK	CRUSHED ROCK
SELECT FILL	SELECT FILL	SELECT FILL	INITIAL BACKFILL	CRUSHED ROCK	CRUSHED ROCK	CRUSHED ROCK
SELECT FILL	SELECT FILL	SELECT FILL	SPRINGLINE INITIAL BACKFILL	ROCK	ROCK	ROCK
SAND	SAND	SAND	BEDDING	ROCK	ROCK	ROCK

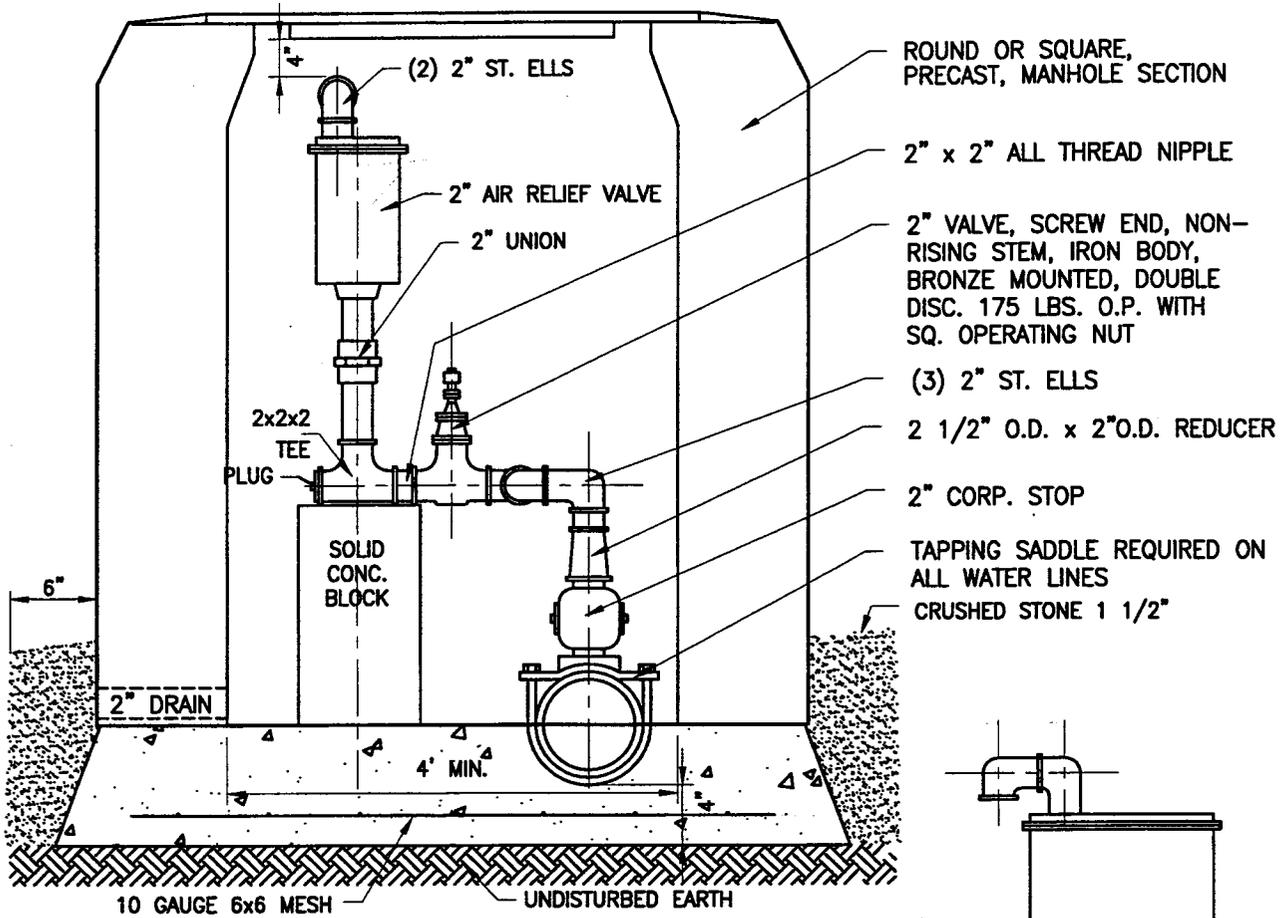


NOTES:

1. SELECT FILL CONSISTS OF EXCAVATED MATERIALS CONTAINING NO ROCKS LARGER THAN 2 INCHES.
2. CRUSHED ROCK SHALL BE ODOT TYPE A BASE
3. BEDDING REQUIRED ONLY FOR ROCK EXCAVATION.
4. COMPACTION REQUIREMENTS:
  - a. NON-PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY.
  - b. PAVED AREAS: 95% MAXIMUM STANDARD PROCTOR DENSITY.
5. FILLS OVER 10 FEET DEEP - MATERIAL IN THE AREA FROM SELECT FILL TO BEDDING SHALL BE 3/4" CRUSHER RUN WELL GRADED.
6. FLOWABLE FILL MAY BE SUBSTITUTED FOR MATERIALS ABOVE SELECT FILL IN ROAD CROSSING.

CITY OF CLAREMORE  
AIR RELIEF VALVE AND VAULT DETAIL

FIGURE STD.W02



ROUND OR SQUARE,  
PRECAST, MANHOLE SECTION

2" x 2" ALL THREAD NIPPLE

2" VALVE, SCREW END, NON-  
RISING STEM, IRON BODY,  
BRONZE MOUNTED, DOUBLE  
DISC. 175 LBS. O.P. WITH  
SQ. OPERATING NUT

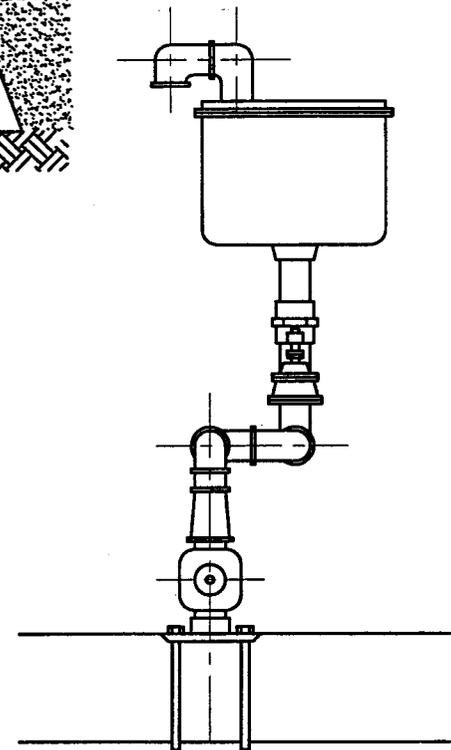
(3) 2" ST. ELLS

2 1/2" O.D. x 2" O.D. REDUCER

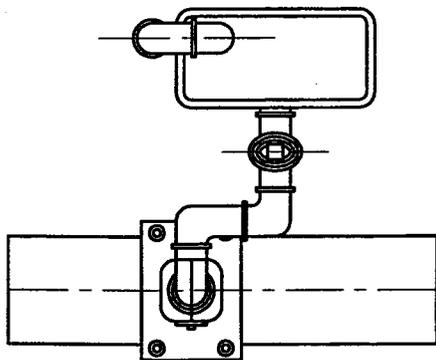
2" CORP. STOP

TAPPING SADDLE REQUIRED ON  
ALL WATER LINES

CRUSHED STONE 1 1/2"



SIDE VIEW



TOP VIEW

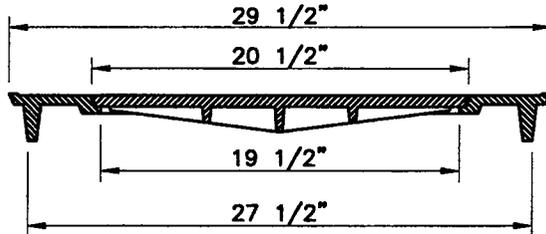
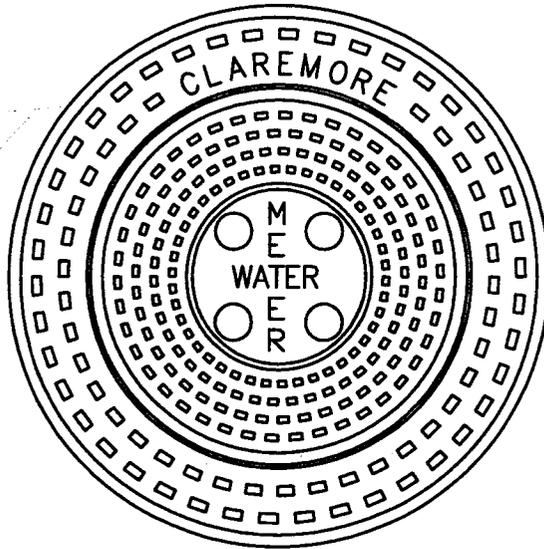
NOTES:

1. ALL PIPING AND CONNECTORS SHALL BE BRONZE, EXCEPT TAPPING SADDLE.
2. STAINLESS STEEL BOLTS WILL BE USED ON TAPPING SADDLES.
3. FRAME AND LID FOR VAULT SHALL BE AS SHOWN ON STANDARD DRAWING W 03.

Adopted Date: 3/18/02

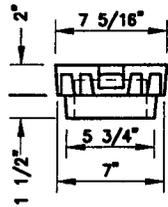
Effective Date: 4/18/02

Engineer Approval: HDH

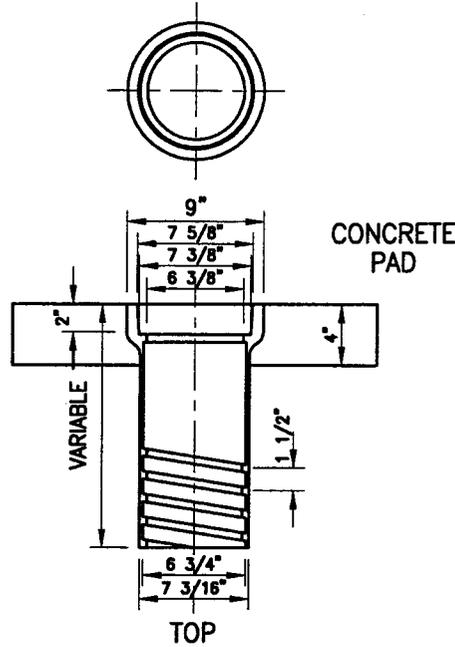


1. METER RING IS CAST WITH SIX BOLT/RIMT HOLES THROUGH THE SKIRT FOR ATTACHMENT TO 28" DIA--METER CORRUGATED STEEL METER CAN. SPECIFY CAN HEIGHT WHEN ORDERING.
2. METER LID TO HAVE KEYED LOCKING MECHANISM.

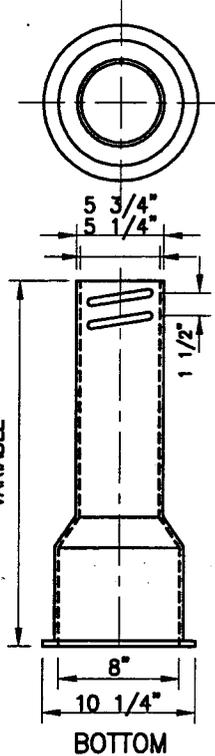
	WEIGHT
LID	46 LBS
RING	61 LBS
SET	107 LBS



LID

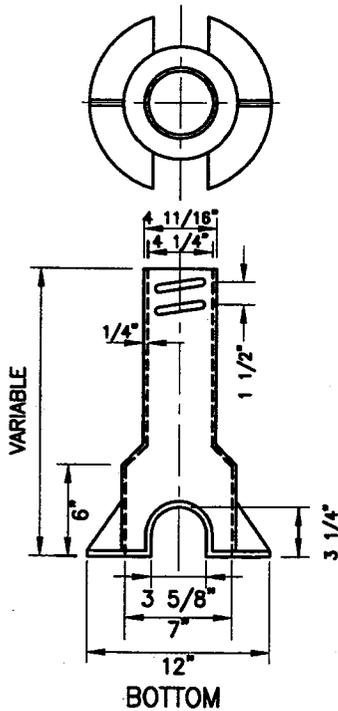


TOP

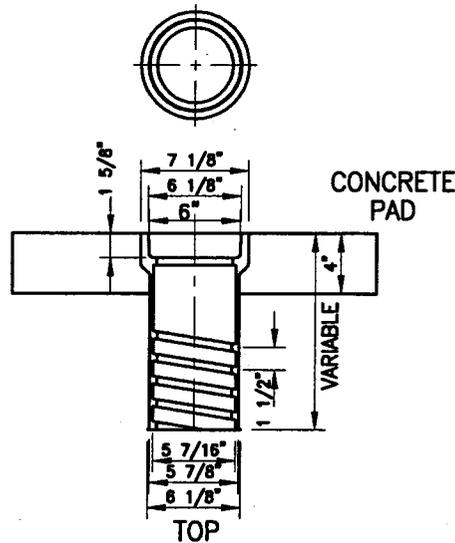


BOTTOM

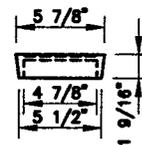
4" - 12" VALVE BOX DETAIL



BOTTOM



TOP



LID

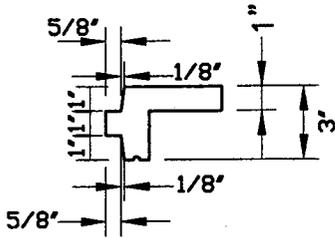
2" - 3" VALVE BOX DETAIL

NOTES:

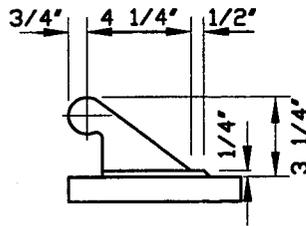
1. WATER LINE CONTRACTOR TO PLACE 2 FOOT SQUARE CONCRETE PAD AROUND EACH WATER VALVE AFTER FINAL GRADING HAS BEEN COMPLETED AND TRENCHES HAVE SETTLED.
2. VALVE BOXES REQUIRING OVER 2 ADDITIONAL BOTTOM SECTIONS SHALL BE EXTENDED USING PVC PIPE WITH A BOTTOM AND TOP SECTION PLACED ON TOP OF THE PVC PIPE.

CITY OF CLAREMORE  
 FRAME AND LID FOR VALVE VAULTS

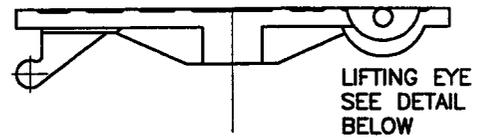
FIGURE STD.W05



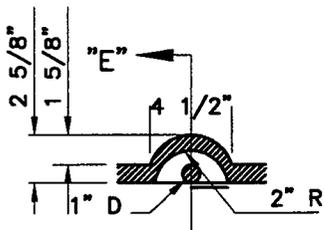
SECTION "A"-"A"



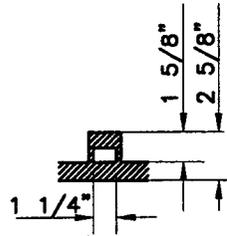
SECTION "B"-"B"



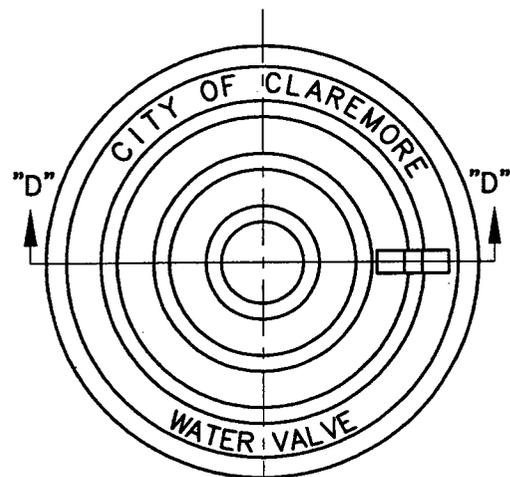
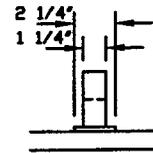
SECTION "D"-"D"



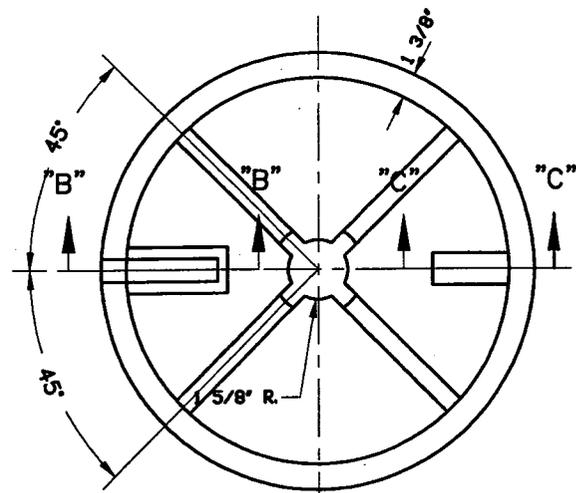
SECTION "C"-"C"



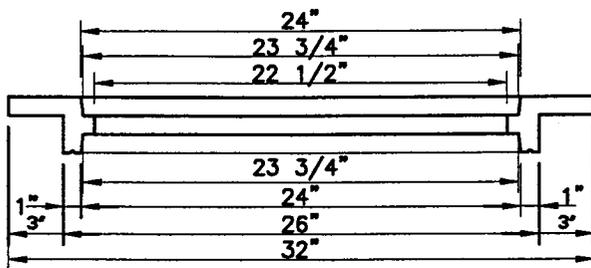
SECTION "E"-"E"



TOP OF LID



BOTTOM OF LID  
 VALVE VAULT LID



VALVE VAULT FRAME

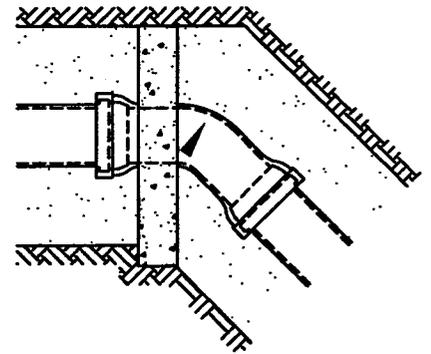
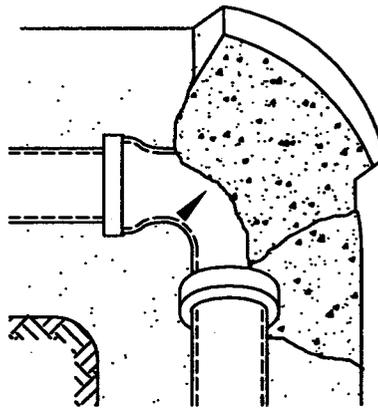
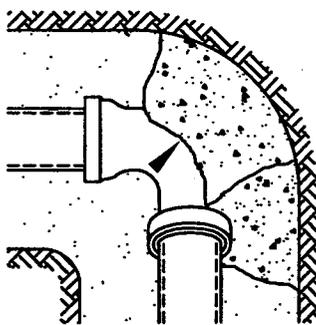
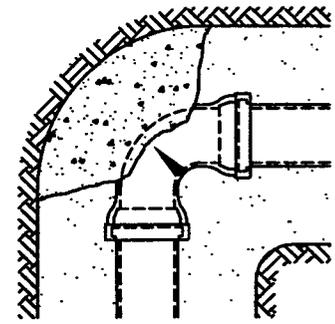
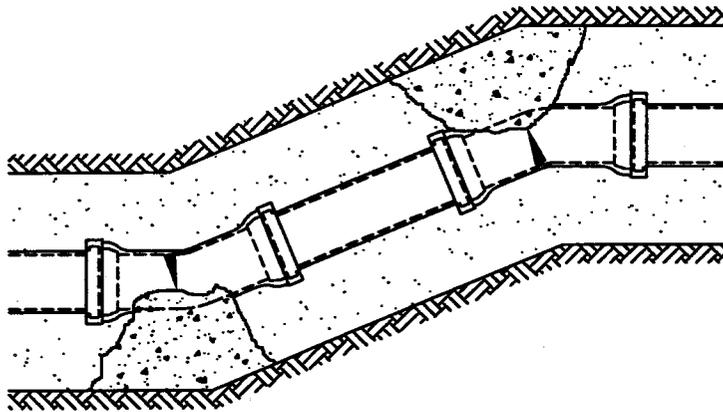
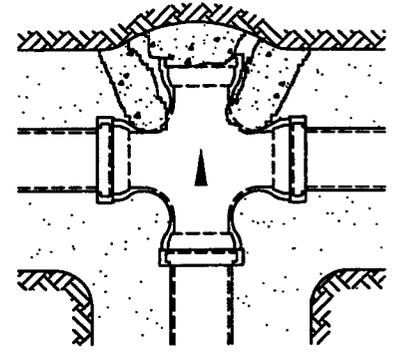
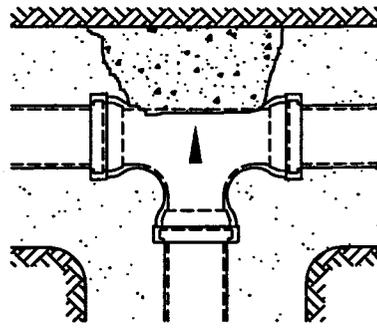
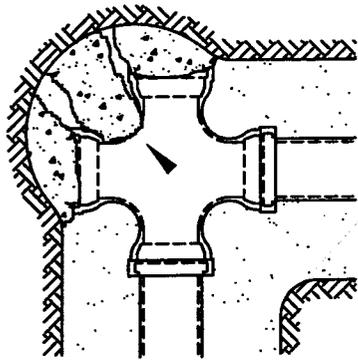
Adopted Date: 3/18/02

Effective Date: 4/18/02

Engineer Approval: HDH

CITY OF CLAREMORE  
THRUST BLOCK DETAILS

FIGURE STD.W06



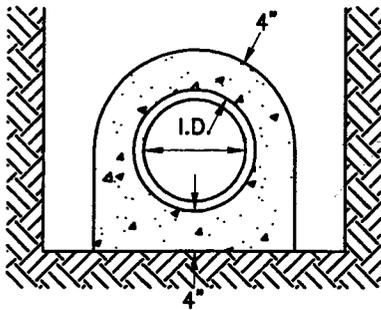
2" - 8" PIPE

LARGER

SURFACE BEARING AREA OF THRUST BLOCK	
DIP METER	THRUST METER
.	.
.	.
.	.
.	.

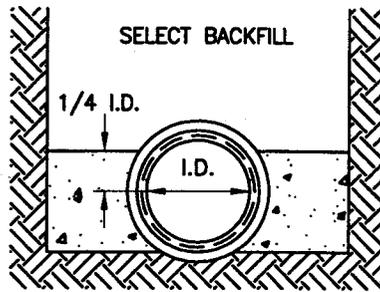
TABLE TO BE COMPLETED  
BY DESIGN ENGINEER

ALL FITTINGS SHALL BE  
MJ x MJ DUCTILE IRON.



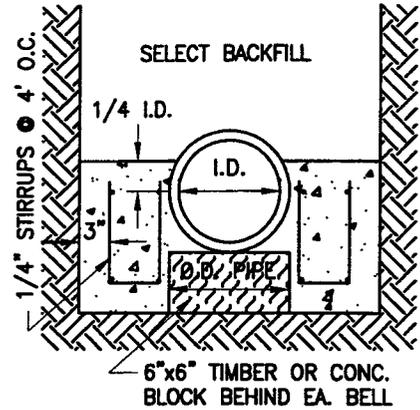
CONCRETE ENCASEMENT  
 CONCRETE PER LF

8" I.D.	DIP, RCP	1.41 CF
10" I.D.	DIP, RCP	1.67 CF
12" I.D.	DIP, RCP	1.93 CF
15" I.D.	DIP, RCP	2.36 CF
18" I.D.	DIP, RCP	2.81 CF
21" I.D.	DIP, RCP	3.27 CF
24" I.D.	DIP, RCP	3.76 CF
27" I.D.	DIP, RCP	4.26 CF
30" I.D.	DIP	4.78 CF
30" I.D.	RCP	5.09 CF
36" I.D.	DIP, RCP	5.80 CF
36" I.D.	RCP	6.20 CF



CONCRETE CRADLE  
 CONCRETE PER LF

8" I.D.	DIP, RCP	1.09 CF
10" I.D.	DIP, RCP	1.23 CF
12" I.D.	DIP, RCP	1.33 CF
15" I.D.	DIP, RCP	1.66 CF
18" I.D.	DIP, RCP	2.00 CF
21" I.D.	DIP, RCP	1.96 CF
24" I.D.	DIP, RCP	2.69 CF
27" I.D.	DIP, RCP	3.52 CF
30" I.D.	DIP	3.38 CF
30" I.D.	RCP	4.40 CF
36" I.D.	DIP, RCP	4.12 CF
36" I.D.	RCP	5.26 CF



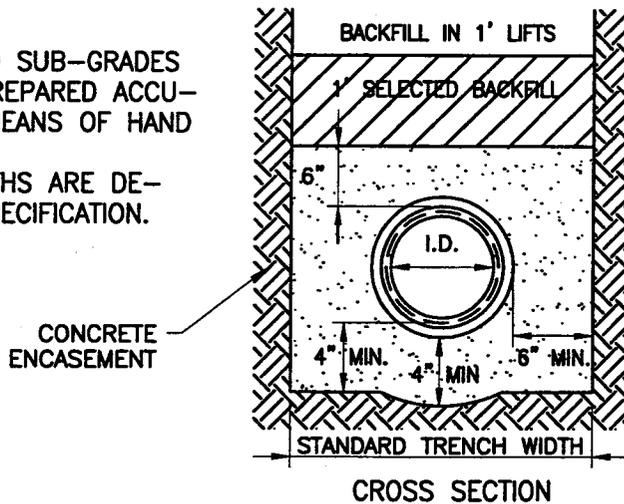
WATER TABLE CRADLE  
 CONCRETE PER LF

8" I.D.	DIP, RCP	2.34 CF
10" I.D.	DIP, RCP	2.48 CF
12" I.D.	DIP, RCP	2.58 CF
15" I.D.	DIP, RCP	3.04 CF
18" I.D.	DIP, RCP	3.50 CF
21" I.D.	DIP, RCP	3.46 CF
24" I.D.	DIP, RCP	4.44 CF
27" I.D.	DIP, RCP	5.52 CF
30" I.D.	DIP	5.38 CF
30" I.D.	RCP	6.65 CF
36" I.D.	DIP, RCP	6.37 CF
36" I.D.	RCP	7.76 CF

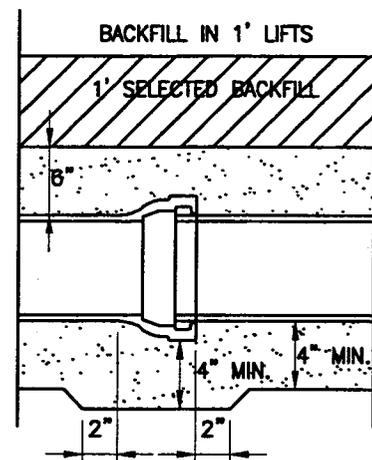
## CONCRETE ENCASEMENT & CRADLES

NOTES:

1. ALL FINISHED SUB-GRADES SHALL BE PREPARED ACCURATELY BY MEANS OF HAND TOOLS.
2. TRENCH WIDTHS ARE DETAILED IN SPECIFICATION.



CROSS SECTION

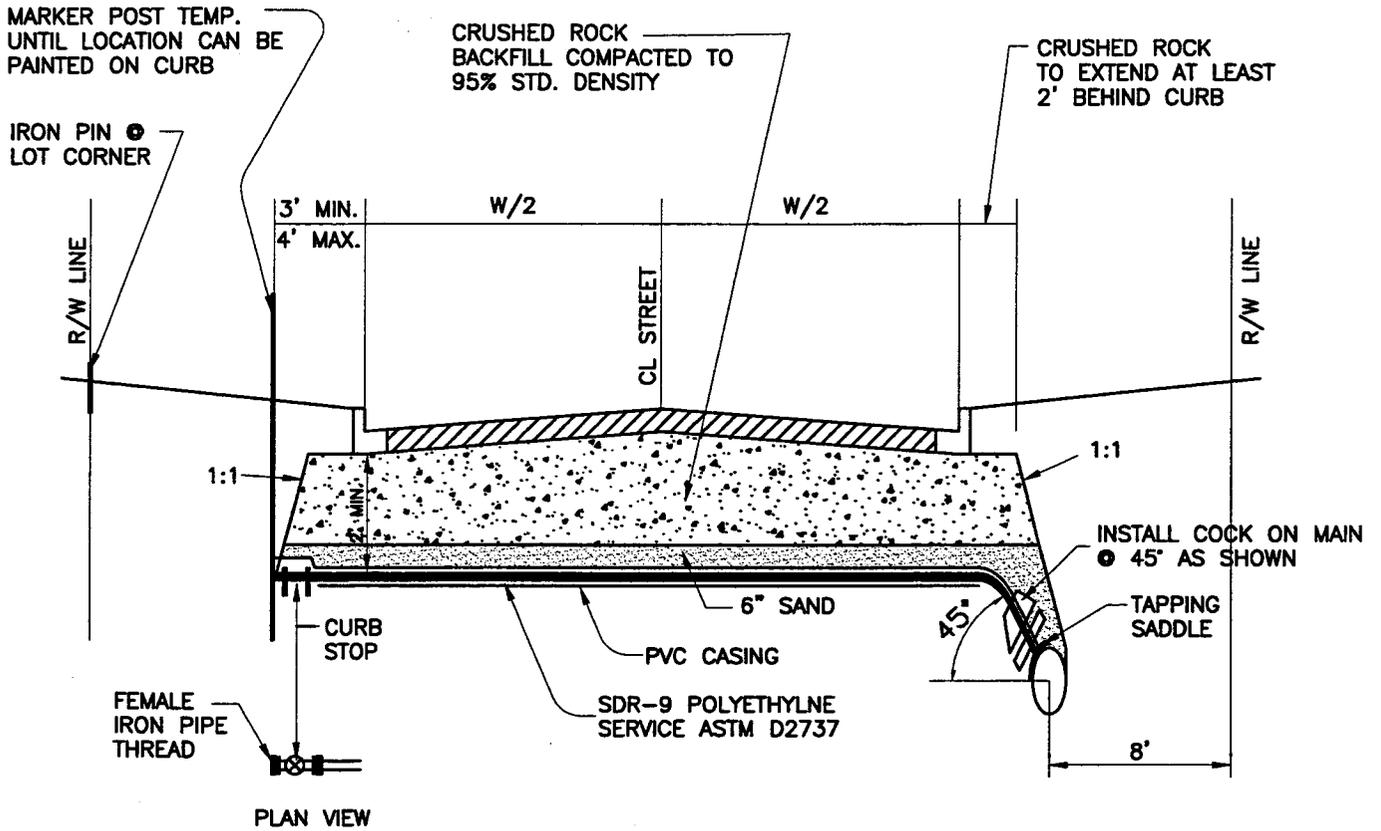


LONGITUDINAL SECTION

## TRENCH CONDITIONS

CITY OF CLAREMORE  
 WATER SERVICE LINE STREET CROSSING DETAIL

FIGURE STD.W08



NOTES:

1. LOT CORNERS SHALL BE STAKED PRIOR TO CONSTRUCTION OF SERVICE LINES, CROSSING TO BE ON LOT LINE.
2. DETECTABLE MYLAR MARKING TAPE (LIFEGUARD TYPE II OR EQUAL) TO BE INSTALLED OVER COPPER SERVICE AS SHOWN.
3. CROSSING NOT REQUIRED IN LOOPED CUL-DE-SAC.
4. COPPER SHALL NOT BE SPLICED.
5. CROSSING TO BE INSPECTED BEFORE TRENCH IS BACKFILLED.
6. IF ROCK IS USED IN BACKFILL, COPPER SHALL BE PLACED IN SCHEDULE 40 PVC SLEEVE.

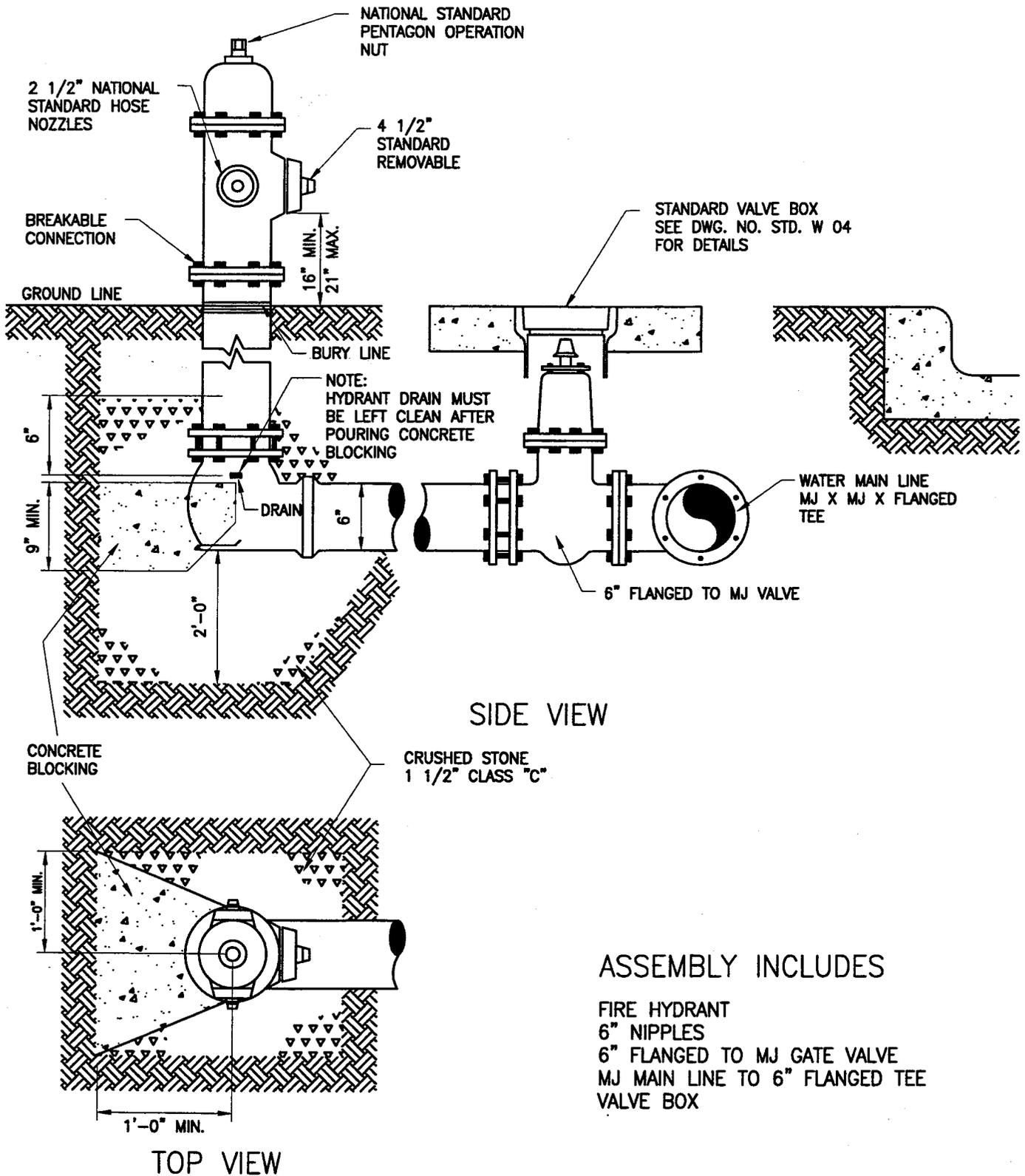
Adopted Date: 3/18/02

Effective Date: 4/18/02

Engineer Approval: HDH

CITY OF CLAREMORE  
FIRE HYDRANT ASSEMBLY DETAIL

FIGURE STD.W09

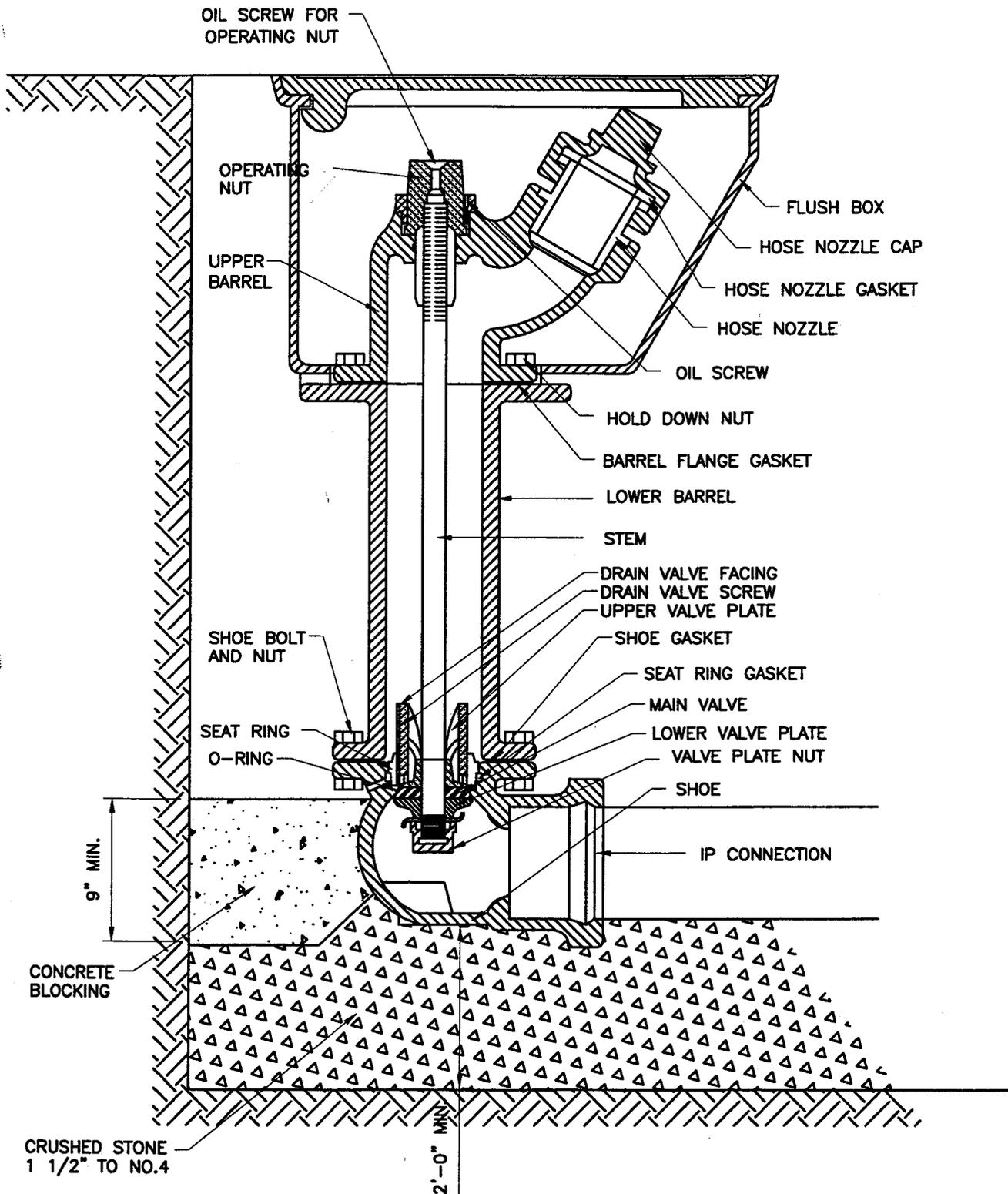


ASSEMBLY INCLUDES

- FIRE HYDRANT
- 6" NIPPLES
- 6" FLANGED TO MJ GATE VALVE
- MJ MAIN LINE TO 6" FLANGED TEE
- VALVE BOX

CITY OF CLAREMORE  
BLOW-OFF HYDRANT DETAILS

FIGURE STD.W10



NOTE:  
PAYMENT OF BLOW OFF HYDRANT ASSEMBLY SHALL INCLUDE  
EXCAVATION, BACKFILL, BLOW OFF HYDRANT, FLUSH BOX, NIPPLE,  
FITTINGS, CONCRETE BLOCKING, AND CRUSHED STONE BASE.

BLOW-OFF HYDRANT TO BE USED INSIDE SUBDIVISION ONLY

Adopted Date: 3/18/02

Effective Date: 4/18/02

Engineer Approval: HDH

COPPER SETTER

Ground Level

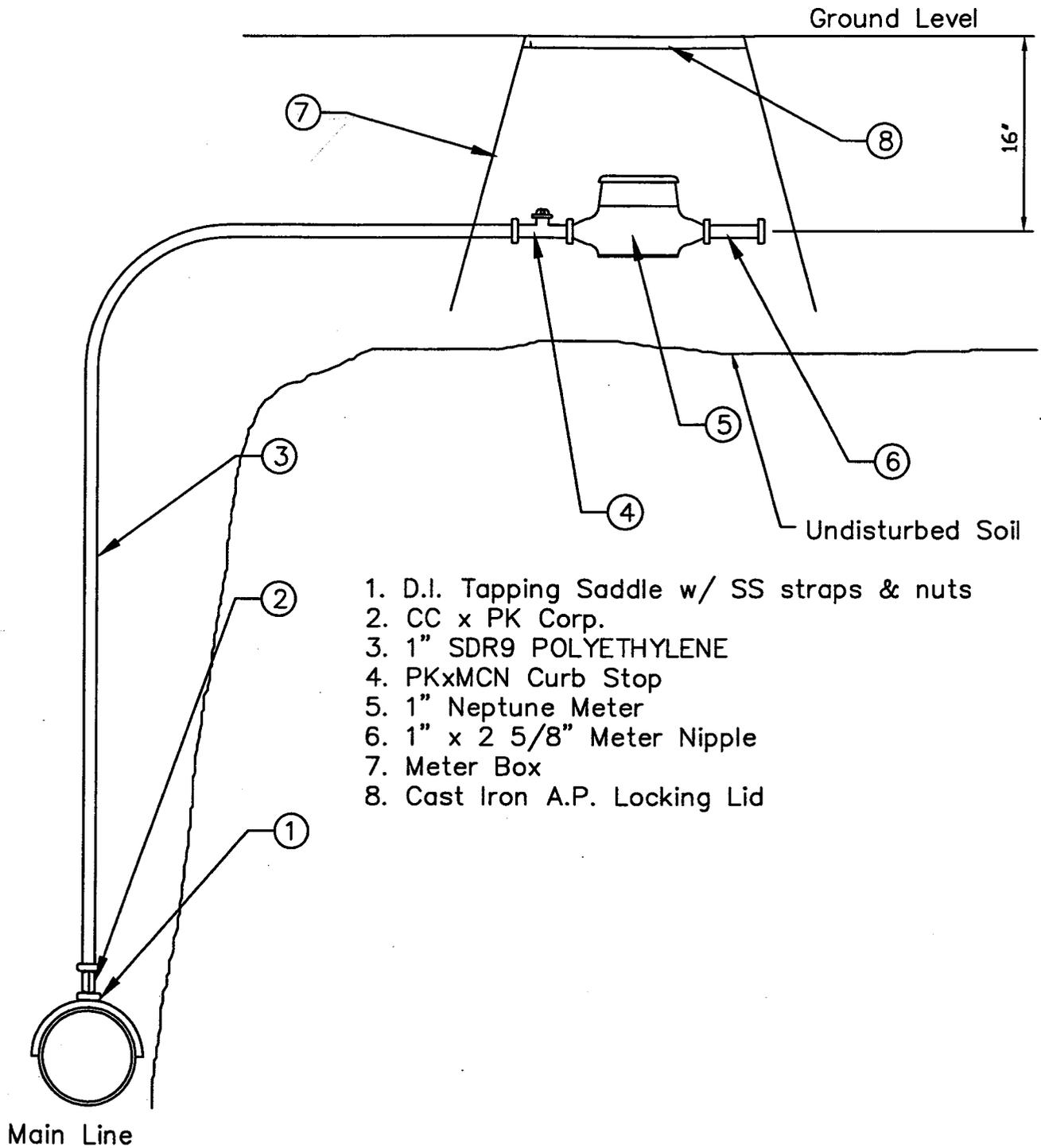
16"

8"

Undisturbed Soil

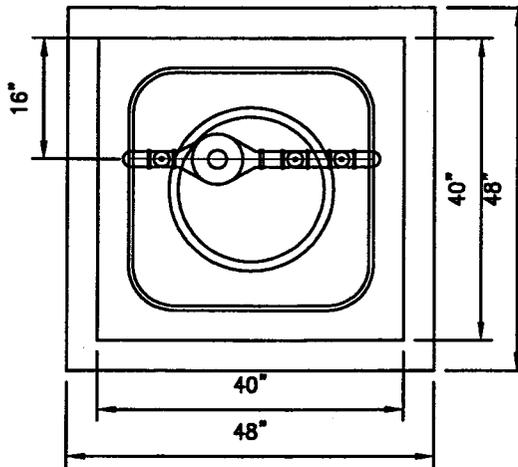
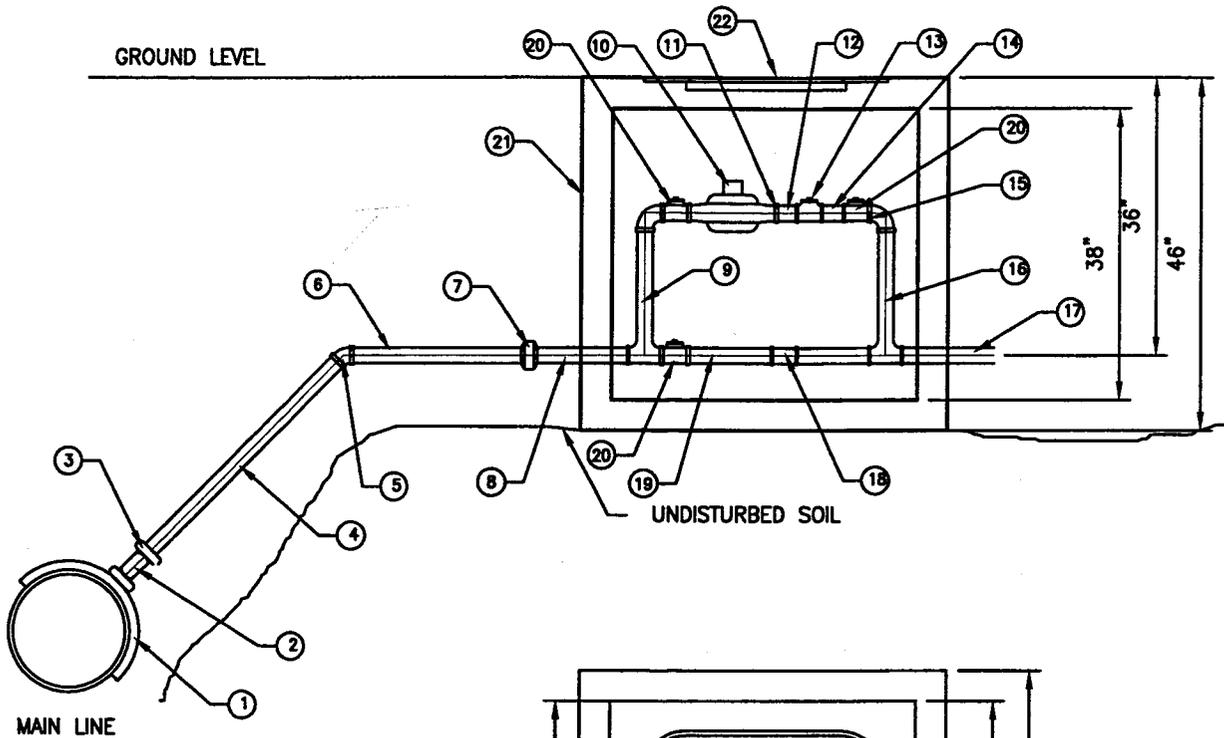
1. D.I. Tapping Saddle w/ SS straps & nuts
2. CC x PK Corp.
3. 3/4" Type K Copper
4. PKxMCN Curb Stop
5. 5/8"x3/4" Neptune Meter
6. 3/4" x 2 1/2" Meter Nipple
7. Meter Box
8. Cast Iron A.P. Locking Lid

Main Line



CITY OF CLAREMORE  
1 1/2" POSITIVE DISPLACEMENT METER SETTING

FIGURE STD.W13

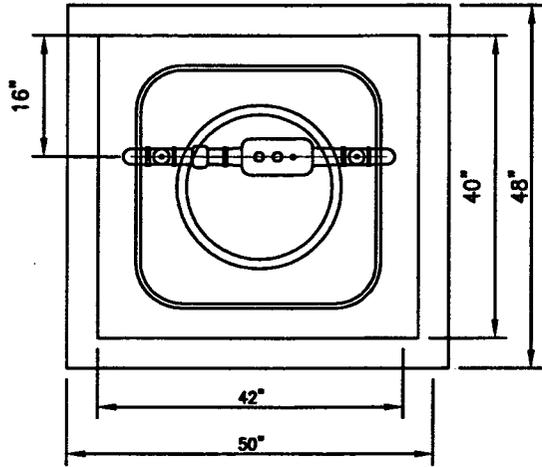
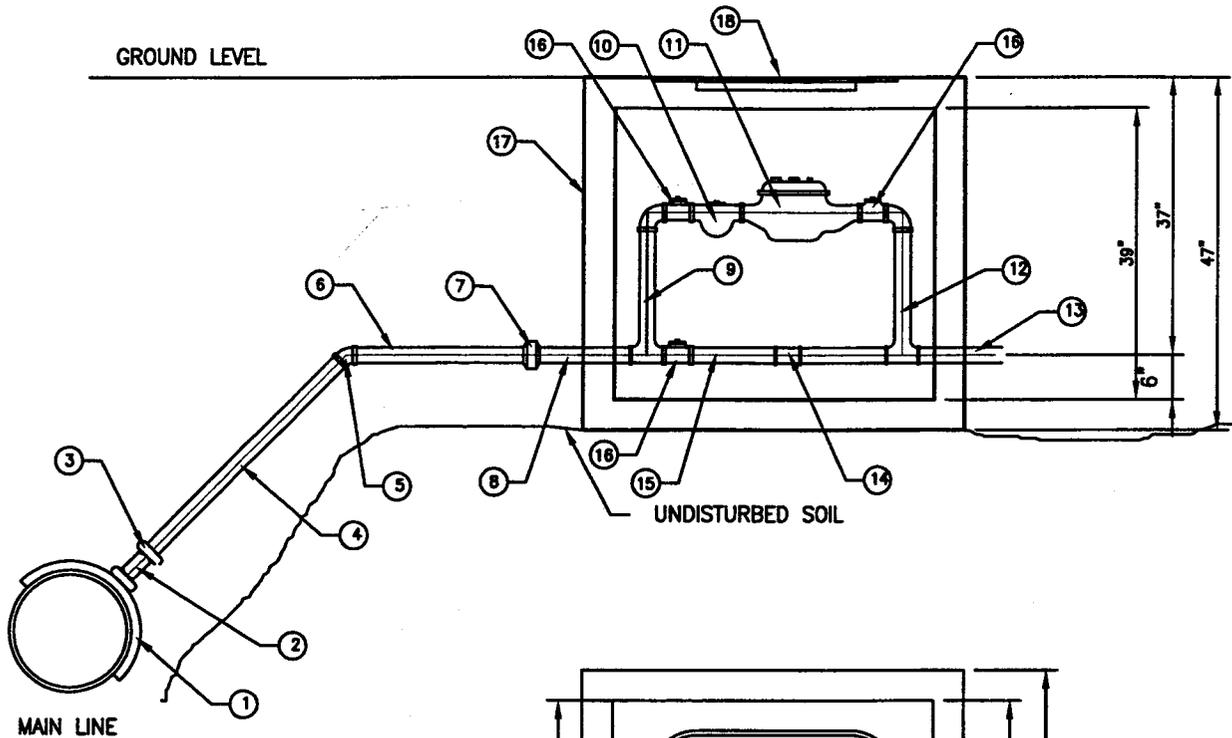


THE TAP IS TO BE  
MADE AT A 45° ANGLE

1. C.I. TAPPING SADDLE W/  
SS STRAPS & NUTS
2. CORP
3. BRASS COLLAR
4. BRASS PIPE
5. BRASS 45° BEND
6. BRASS PIPE
7. BRASS UNION
8. 12" BRASS NIPPLE
9. INLET HALF OF RISER
10. POSITIVE DISPLACEMENT METER (NEPTUNE)
11. FLANGE BRASS
12. 3" BRASS NIPPLE
13. BRASS TEE W/ PLUG
14. CLOSE NIPPLE BRASS
15. FLANGE BRASS
16. OUTLET HALF OF RISER
17. 12" BRASS NIPPLE
18. 1 1/4" SOLDER X SOLDER COLLAR
19. 1 1/4" COPPER TUBING
20. LOCKING BALL VALVE
21. VAULT
22. VAULT RING & LID

CITY OF CLAREMORE  
2" COMPOUND METER SETTING

FIGURE STD.W14

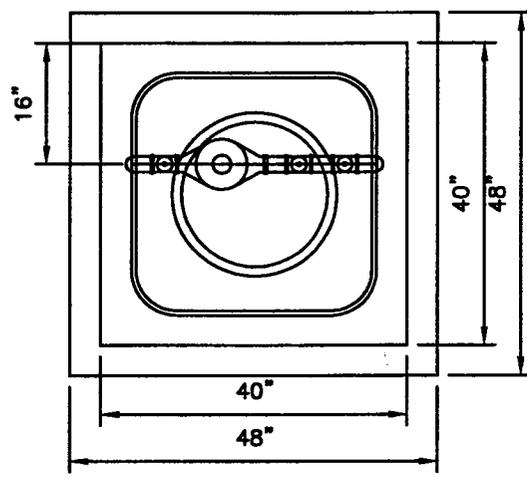
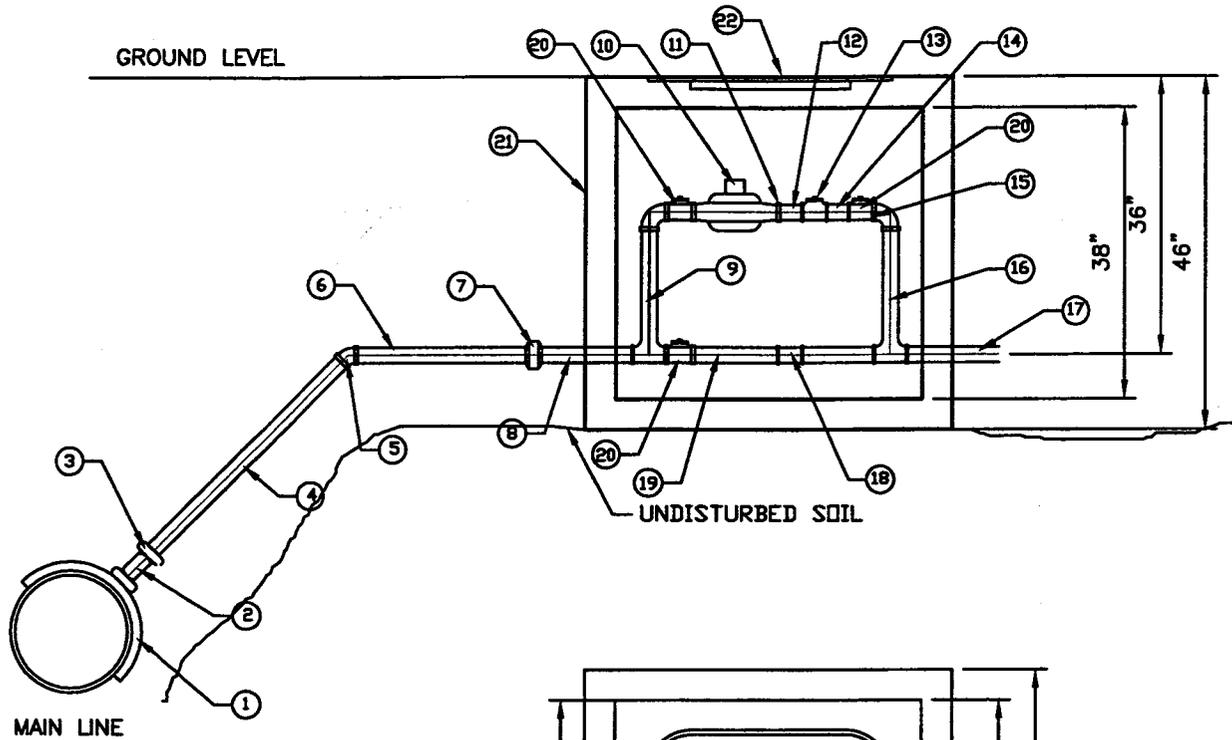


THE TAP IS TO BE  
MADE AT A 45° ANGLE

1. C.I. TAPPING SADDLE W/  
SS STRAPS & NUTS
2. CORP STOP
3. CORP FITTING
4. SDR
5. BRASS 45° BEND
6. BRASS PIPE
7. BRASS UNION
8. 12" BRASS NIPPLE
9. INLET HALF OF RISER
10. 2" STRAINER (NEPTUNE)
11. 2" COMPOUND METER (NEPTUNE)
12. OUTLET HALF OF RISER
13. 12" BRASS NIPPLE
14. 1 1/4" SOLDER X SOLDER COLLAR
15. 1 1/4" COPPER TUBING
16. LOCKING BALL VALVE
17. VAULT
18. VAULT RING & LID

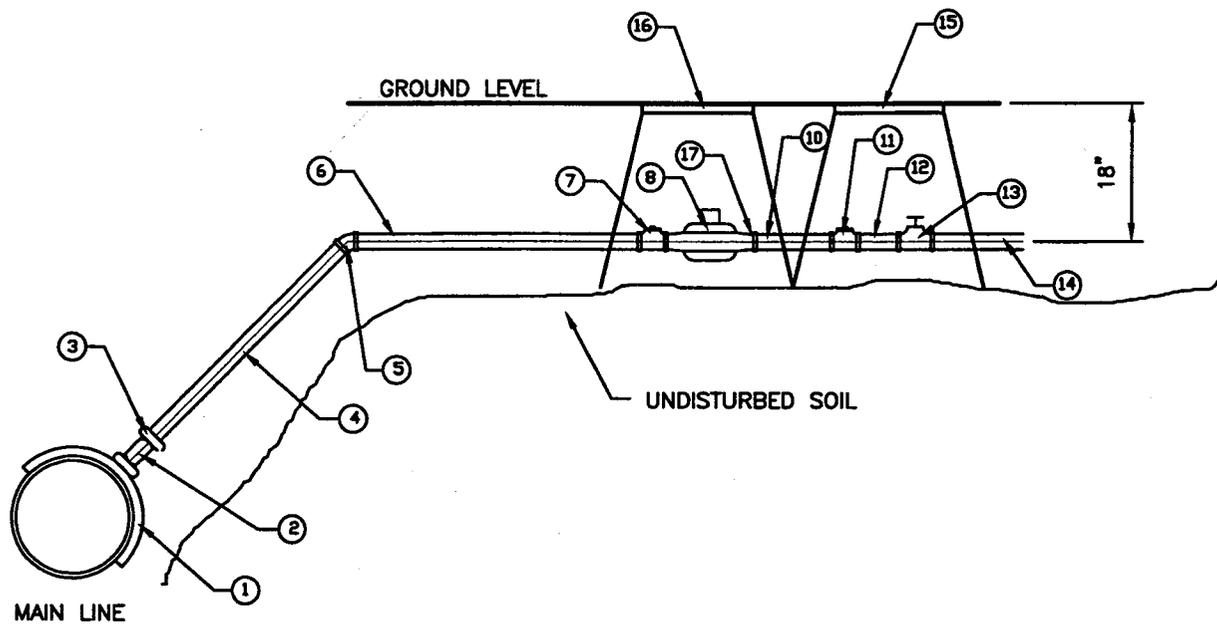
CITY OF CLAREMORE  
2" POSITIVE DISPLACEMENT METER SETTING

FIGURE STD.W15



THE TAP IS TO BE  
MADE AT A 45° ANGLE

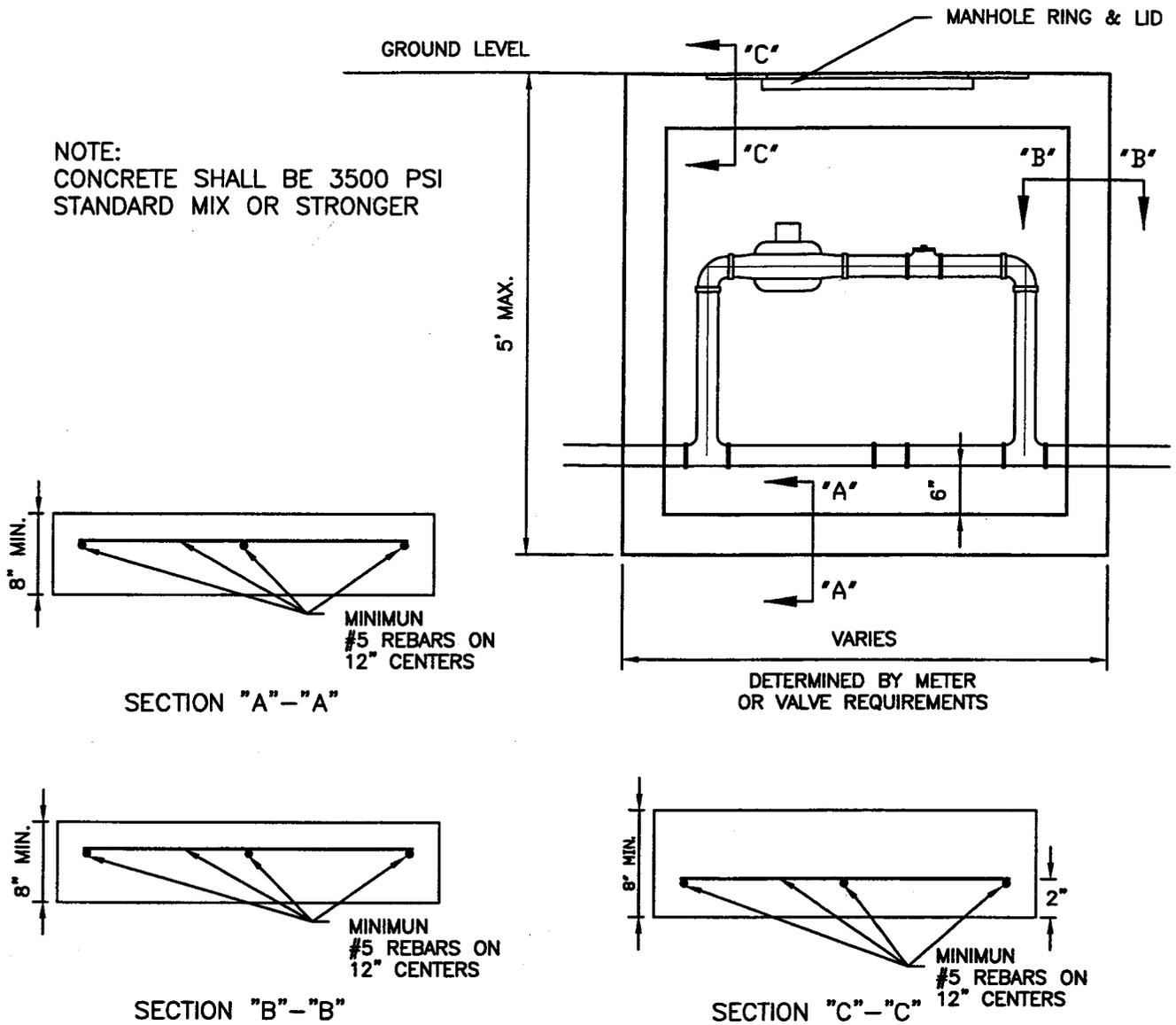
1. C.I. TAPPING SADDLE W/  
SS STRAPS & NUTS
2. CORP
3. BRASS COLLAR
4. BRASS PIPE
5. BRASS 45° BEND
6. BRASS PIPE
7. BRASS UNION
8. 12" BRASS NIPPLE
9. INLET HALF OF RISER
10. POSITIVE DISPLACEMENT METER (NEPTUNE)
11. FLANGE BRASS
12. 3" BRASS NIPPLE
13. BRASS TEE W/ PLUG
14. CLOSE NIPPLE BRASS
15. FLANGE BRASS
16. OUTLET HALF OF RISER
17. 12" BRASS NIPPLE
18. 1 1/4" SOLDER X SOLDER COLLAR
19. 1 1/4" COPPER TUBING
20. LOCKING BALL VALVE
21. VAULT
22. VAULT RING & LID



THE TAP IS TO BE  
MADE AT A 45° ANGLE

1. C.I. TAPPING SADDLE W/ SS STRAPS & NUTS
2. CORP
3. BRASS COLLAR
4. BRASS PIPE
5. BRASS 45° BEND
6. BRASS PIPE
7. FIP X FLANGE BALL VALVE
8. TURBINE METER (NEPTUNE)
9. FLANGE
10. 6" BRASS NIPPLE
11. BRASS TEE W/ PLUG
12. CLOSE NIPPLE BRASS
13. GATE VALVE
14. 12" BRASS NIPPLE
15. METER BOX W/ CAST IRON A.P. LOCKING LID
16. METER BOX /W CAST IRON A.P. LOCKING LID

NOTE:  
CONCRETE SHALL BE 3500 PSI  
STANDARD MIX OR STRONGER



NOTE:

1. FOR VAULTS LESS THAN 3 FEET DEEP MASONARY UNITS MAY BE SUBSTITUTED FOR CAST IN PLACE CONCRETE.
2. PRECAST MANHOLE SECTIONS OR CULVERTS MAY BE USED IN PLACE OF CAST IN PLACE VAULTS IF SIZE REQUIREMENTS ARE MET.
3. FOR VAULTS OVER 5 FEET DEEP , PRECAST MANHOLE SECTIONS WITH STEPS SHALL BE USED TO PROVIDE ACCESS TO THE VAULT.
4. EXACT DIMENSIONS AND REQUIREMENTS FOR EACH VAULT SHALL BE ESTABLISHED BY THE DESIGN ENGINEER.
5. MANHOLE RING AND LID SHALL BE THE CITY STANDARD AS SHOWN ON STD. W 03.

