

STANDARD SPECIFICATIONS & DETAILS

For

WATER & SEWER CONSTRUCTION



**CITY OF NORTH MYRTLE BEACH
HORRY COUNTY, SOUTH CAROLINA**

**Public Water System No. 2610011
Ocean Drive WWTP NPDES SC0022152
Crescent Beach WWTP NPDES SC0022161
NPDES MS4 Stormwater Discharge Permit SCR035106**

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City Engineer**

**Updated:
January 2014**

TABLE OF CONTENTS

<u>GENERAL REQUIREMENTS</u>		<u>Pages</u>
SECTION 00800	GENERAL REQUIREMENTS	1-7
SECTION 00900	SPECIAL PROVISION SPECIFICATIONS	
	DIRECTIONAL DRILLING (13000)	1-5
	POLYETHYLENE PIPE FOR DRILLING (13010)	1-3
<u>DETAILED SPECIFICATIONS</u>		
SECTION 02000	SITE CLEARING	1-2
SECTION 02100	EXCAVATION	1-4
SECTION 02200	BACKFILLING	1-5
SECTION 02300	TRENCHING	1-3
SECTION 02400	ASPHALT PAVEMENT AND BASE	1-6
SECTION 02410	PATCHING ASPHALT PAVEMENT	1-6
SECTION 02420	CONCRETE SIDEWALK, CURB & GUTTER	1-3
	<i>ROADWAY STANDARD DETAIL DRAWINGS</i>	<i>R1 – R24</i>
SECTION 02500	STORM DRAINAGE SYSTEMS	1-8
SECTION 02525	PRECAST DRAINAGE STRUCTURES	1-11
	<i>STORM DRAINAGE & EROSION CONTROL STANDARD DETAIL DRAWINGS</i>	<i>SD1–SD19</i>
SECTION 02600	SANITARY SEWER GRAVITY SYSTEMS	1-10
	<i>SEWER STANDARD DETAIL DRAWINGS</i>	<i>S1-S19</i>
SECTION 02625	SEWER FORCE MAIN SYSTEMS	1-20
SECTION 02650	SEWER PUMPING STATIONS	1-6
	<i>PUMP STATION STANDARD DETAIL DRAWINGS</i>	<i>PS1-PS12</i>

TABLE OF CONTENTS

SECTION 02700	WATER DISTRIBUTION SYSTEMS	1-16
	<i>WATER STANDARD DETAIL DRAWINGS</i>	<i>W1-W27</i>
SECTION 02800	EROSION CONTROL, SEEDING, & SODDING	1-7
SECTION 03250	CAST IN PLACE CONCRETE	1-5
SECTION 03260	FLOWABLE FILL	1-3
SECTION 03300	CONCRETE CURING	1-2
SECTION 03500	PRECAST CONCRETE STRUCTURES	1-8

SECTION 00800

GENERAL REQUIREMENTS

- 1.1 PLANS & SPECIFICATIONS:** The Contractor shall maintain a set of approved plans and specifications on the job site at all times.
- 1.2 EXISTING SITE CONDITIONS:** The Contractor acknowledges that he has thoroughly investigated the existing conditions and has examined the plans and specifications, understanding clearly their requirements and the requirements necessary to construct the improvements contracted for; that he is fully prepared to sustain all losses and damages incurred by the actions of elements; is prepared to provide all necessary tools, appliances, machinery, skilled and unskilled workmen, and all necessary materials to successfully complete the work. The Contractor shall be responsible for providing and disposing of all materials.
- 1.3 SITE DRAINAGE:** The Contractor is hereby made aware that some areas of the site may not be well drained and it shall be the responsibility of the Contractor to provide positive drainage on the site during construction. Temporary drainage ditches, swales or piping required for this purpose must be approved by the Engineer before construction and must be constructed so as not to interfere with other work activities and shall comply as much as possible with the concept of the master drainage plan for the project.
- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 - B. Protect site from ponding or running water. Provide devices as required to protect site from soil erosion.
- 1.4 ENVIRONMENTAL REGULATIONS:** The Contractor shall be responsible for insuring that his forces comply with environmental regulations on site. Should construction forces violate laws, ordinances or regulations causing delays or adverse consequences on the site, the Contractor shall be held responsible for said actions.
- 1.5 STATE HIGHWAY ENCROACHMENT:** The Owner has obtained encroachment agreements for all work located in the public rights-of-way as required. The Contractor shall be responsible for complying with all provisions of the encroachment permit. A copy of the permit will be provided to the Contractor.
- 1.6 TRAFFIC SAFETY & CONTROL:** The Contractor shall provide adequate warning signs, and where necessary, flagmen to control traffic flow and movement at construction locations. Where public streets are affected, traffic will be maintained on such public streets at all construction locations and no public street or road shall be blocked completely at any time. The paved areas of all public roads and streets shall be sufficiently cleared each night and during other nonworking hours to assure safe, two-way traffic. Construction equipment such as excavation machines, loaders, tractors, trucks, pumps, etc., shall be removed from public traffic lanes and paved areas so as to provide a safe area for traffic. Excavations adjacent to roadways shall not be left open

overnight.

The Contractor shall erect such barricades, arrow-boards, and provide other traffic control measures, such as flagmen or arrow boards, in accordance with the **South Carolina Work Zone Safety Guidelines Handbook**: (2008 version, 50 pages). Contractor shall abide by SCDOT work restrictions as shown on the attachment.

**South Carolina Department of Transportation
Engineering Publications
Attention: Sandra W. Castor, Room G-19B
Post Office Box 191
Columbia, South Carolina 29202-0191
Telephone: (803)737-4533
Fax: (803)737-4530**

- 1.7 UTILITY LOCATION & CONFLICTS:** Telephone lines, power lines, cables, and other utilities may be encountered and should be anticipated. The Contractor shall contact representatives of all utilities to determine the exact locations of all existing facilities and underground utilities and shall make every effort to avoid damage to such. Exploratory hand excavation prior to machine excavation should be done to avoid damage to existing facilities. Any existing utilities damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.
- 1.8 SECURITY & SAFETY:** The Contractor shall provide security and adequate barriers to protect the Work, existing facilities, and the Owner's operations from unauthorized entry, vandalism, theft or damage from construction operations.
- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
 - B. Provide barricades and walkways required by governing authorities for public right-of-ways.
 - C. Provide suitable barriers and such warning lights as will effectively prevent the occurrence of any accident to health, limb, or property.
 - D. Lights shall be maintained between the hours of sunset and sunrise.
 - E. Provide protection for plant life designated to remain. Replace damaged plant life.
 - F. Protect non-owned vehicular traffic, stored materials, site and structures from damage.
- 1.9 RESTROOM FACILITIES:** Temporary restroom facilities shall be provided for employee use. Facilities must be cleaned regularly and may not remain on the job site after the job has been completed.

1.10 WORK DAYS & SCHEDULE:

- A. The Contractor shall furnish the Engineer a job schedule showing the various components of work and the anticipated beginning and completion date for each particular phase of the project. Work may not begin until all permits are issued for the project, including but not limited to: SCDHEC-Water and Sewer Construction Permit, SCDHEC/OCRM-Land Disturbance, SCDOT-Highway Encroachment, City of North Myrtle Beach-Grading Permit.
- B. The contractor's schedule shall be based on the City of North Myrtle Beach, Public Works Department standard operating hours, 7:00AM – 5:00 PM Monday through Thursday and 7:00AM – 11:00AM on Friday. No trenching operations may be conducted outside these hours, unless approved by the City Engineer. Any work scheduled for nights, weekends, and/or holidays shall be approved by the City Engineer at least one week in advance of the scheduled work.

1.11 PROJECT SUPERVISION: The Contractor shall provide a full time superintendent at the job site acceptable to the Engineer who shall have full authority to act for the Contractor. The Superintendent shall be fully responsible to maintain the activities of any and all subcontractors on the job, and to respond to job instructions from the Engineer and Owner.

1.12 SUBCONTRACTORS: In the interest of assuring the most expeditious and properly controlled project, unless specifically approved in writing, it is a condition of this contract that the Prime Bidder must accomplish not less than 50% of the work to be done with his own forces. This shall in no way prohibit the use of rental equipment by the Prime Contractor's forces. All equipment and personnel shall be subject to approval of the Engineer.

1.13 PRECONSTRUCTION CONFERENCE: The Engineer will schedule a pre-construction conference. The Owner, Engineer, Project Manager and Inspector, and Contractor or his representative shall attend. The following issues will be discussed:

1. Distribution of approved Plans & Specifications, Permits, and Encroachments
2. Submission of shop drawings and other submittal data regarding materials, methods of construction, etc.
3. Designation of personnel representing the Contractor, Engineer, and Owner
4. Procedures and processing of field decisions, submittals, and substitutions
5. Project schedule

1.14 CONSTRUCTION STAKE OUT & FIELD ENGINEERING:

- A. The Owner shall furnish vertical and horizontal control points, as may be Necessary.
- B. The Contractor shall give the Owner reasonable notice (72 hour minimum) of his

requirements for survey lines and grades.

- C. The contractor shall provide field-engineering services; establish elevations, lines, and levels utilizing recognized engineering survey practices.

1.15 SHOP DRAWING & MATERIAL SUBMITTALS:

- A. Transmit submittals to the Engineer for approval with adequate space for Engineer review stamps. The number of copies submitted shall equal the number required for the Contractor and Subs, plus two copies for the Engineer.
- B. Identify Project, Contractor, Subcontractor, or Supplier, pertinent drawing sheet and detail number(s), and specification section number, as appropriate. Indicate material or product conforms to or exceeds specified requirements. Clearly mark each submittal to identify applicable products, models, options, and other data. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. No partial submittals acceptable. Provide certification with submittals stating that all equipment proposed is in complete accordance with the Contract Documents without exception. Shop drawings will not be reviewed without this certification attached and if submitted without this certification will be returned, disapproved.
- D. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- E. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- F. When specified in individual specification Sections, submit manufacturer's certificate to Engineer for review, in quantities specified for Product Data.

1.16 PRODUCT OPTIONS:

- A. Products specified by reference standards or by description only: Any product meeting those standards or description.
- B. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products specified by naming one or more manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not named.

1.17 PRODUCT SUBSTITUTIONS:

- A. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- B. Document each request with complete data substantiating compliance of proposed

substitution with contract documents.

- C. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other work which may be required.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the contract documents.
- E. Substitution submittal procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
 - 3. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

1.18 MATERIAL HANDLING, STORAGE, & PROTECTION:

- A. Products: Only new materials and equipment shall be supplied and installed as part of the Work. Do not reuse materials removed from existing premises, except as specifically permitted by the Owner.
- B. Transportation and handling: The Contractor shall handle Products in accordance with manufacturer's instructions.
 - 1. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.
 - 2. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.
- C. Storage and protection: The Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather-tight, climate-controlled enclosures.
 - 1. For exterior storage of fabricated Products, place on sloped supports, above ground.
 - 2. Provide off-site storage and protection when site does not permit on-site storage or protection.
 - 3. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
 - 4. Store loose granular materials on solid flat surfaces in a well-drained area.

- Prevent mixing with foreign matter.
- 5. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- 6. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions.

1.19 QUALITY ASSURANCE & QUALITY CONTROL: The Contractor shall:

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions and workmanship to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship or specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.20 INSPECTION & TESTING:

- A. The Owner will appoint and pay for the services of an independent firm to provide inspection and testing services. The independent testing firm will perform inspections, tests, and other services as stated in the specifications or as required by the Engineer.
- B. Reports will be submitted by the independent firm to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- B. The Contractor shall provide access and coordinate the services of the testing firm and shall:
 - 1. Notify Engineer and independent firm 24 hours prior to expected time for operations that require testing services.
 - 2. Furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 - 3. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- D. Retesting required where initial tests reveal non-conformance to specified requirements shall be performed by the same independent firm on instructions by

the Engineer and paid for by the Contractor.

1.21 PROJECT CLOSEOUT:

- A. **Cleaning Up:** The contractor shall at all times keep the premises free from accumulations of waste materials or rubbish from and about the project as well as all his tools, construction equipment, machinery and surplus materials.
- B. **Project Record Documents:** The General Contractor shall maintain at the site for the Owner, one copy of all drawings, specifications, addenda, approved shop drawings, change orders and other modifications in good order and marked as "as built copy" to record all changes made during construction by all contractors. These shall be available to the Engineer. The drawings marked to record all changes made during construction shall be delivered to him for the Owner upon completion of the work.
- C. **Operations & Maintenance Manuals:** The Contractor shall provide all O+M manuals, spare parts, etc. as specified in the Detailed Specifications.
- D. **Adjusting:** Adjust operating Products and Equipment to ensure smooth and unhindered operation in accordance with manufacturers recommendations.

1.22 RECORD DRAWINGS (AS-BUILTS): The Contractor shall keep a complete record of variations between the contract drawings and the actual project installation. One set of drawings shall be marked in red by the Contractor showing such variations and delivered to the Engineer upon completion of the project.

- A. Store Record Documents separate from documents used for construction.
- B. Record information concurrent with construction progress.
- C. The Contractor shall locate all water meters, valves, manholes, sewer taps, etc. by measurement from two (2) property pins in addition to providing the following:
 - 1. Measured depths of foundations in relation to finish elevation.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible feature of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract Drawings.

1.23 GUARANTEE: The Contractor shall furnish a written guarantee that all work executed under the plans and specifications will be free from defects of materials and workmanship for a period of one (1) year from the date of final acceptance and that all defects occurring within that period shall be replaced at no cost to the Owner. Where guarantees or warranties are written in any section for a period of more than one year, such longer terms shall apply. The Contractor shall, in case of work performed by his subcontractors and where guarantees are required, be responsible for warranty of all

subcontractors' work.

END OF SECTION

SECTION 00900

SPECIAL PROVISION SPECIFICATIONS

1. The Contractor is solely responsible for safety in the project areas and shall be responsible for the erection and maintenance of barricades and other safety control measures. During the construction period, the work area shall be secured and adequate warning notices to the public must be erected to ensure the safety of the travelling public.
2. The Contractor will be allowed to close one lane of traffic during construction as shown on the traffic control plan. The Contractor shall erect such barricades and provide other traffic control measures, such as flagmen, as may be necessary for traffic control.
3. The City has received Encroachment Permits from the SC DOT for the work outlined on the Drawings. Copies of the Encroachment Permits are Included in the section of the Contract Documents. The Contractor is responsible for complying with the requirements shown on the SC DOT encroachment Permits for this project.
4. The Contractor shall use all reasonable means to notify property owners that will be impacted by the construction activities. This includes but shall not be limited to, notifying property owners when their driveway will be blocked and notifying them when landscaping will have to be removed or relocated.
5. Weekend work restrictions shall be in effect in accordance with the attached memo from SCDOT.
6. Specifications for directional drilling polyethylene pipe are included for use as specified on the plans.

SECTION 13000

DIRECTIONAL DRILLED WATER & SEWER

GENERAL

1.01 Section Includes

- A. Installation of underground pipelines by directionally controlled horizontal drilling

1.02 Related Sections

- A. Section 02000 - Site Clearing
- B. Section 02625 – Sewer Force Main Systems
- C. Section 02700 - Water Distribution Systems
- D. Section 13010 - Polyethylene Pipe

1.03 References

- A. ASTM D 1248 polyethylene plastics molding and extrusion materials.
- B. ASTM D 2774 recommended practice for underground installation of thermoplastic pressure piping.

1.04 Submittals

- A. Submit specifications for the directional boring machine and related equipment to be used.
- B. Submit documentation showing the following minimum experience:
 - 1. Two recently completed projects of comparable size and length.
 - 2. Two years of continuous experience in the drilling field.
- C. Bentonite slurry to be used.

PRODUCTS

2.01 Casing Pipe - Contractor shall supply all casing pipe according to the following specifications:

- A. Section 13010 - Polyethylene Pipe

2.02 Temporary Workspace and Access

Workspace and access shall be through an existing utility easement as shown on the plans. Any additional workspace required shall be the contractor's responsibility. The contractor shall coordinate his activities with the Owner.

2.03 Permits

The Owner shall be responsible for obtaining all SCDHEC, OCRM and SCDOT permits (as required). The contractor must obey all applicable regulations specified by the aforementioned regulatory agencies.

2.04 Bentonite

Bentonite shall conform to API Specification 13A and have the capacity of mixing with water to form a stable and homogenous suspension.

2.05 Drilling Water

The owner will provide water required for drilling and hydrostatic testing. Contractor is responsible for transporting and storing needed quantities of any water required. Contractor shall coordinate his water requirements with the owner.

2.06 Excess Drilling Fluid Disposal

Excess drilling fluid must be disposed of at an approved site. The Contractor shall describe in writing the disposal location to the engineer. Disposal of drilling fluids must meet all federal and state standards. Contractor is responsible for transporting all excess fluids to the disposal site and paying any disposal costs.

2.07 Inadvertent Drilling Fluid Return

Contractor shall immediately clean up all locations where drilling fluid inadvertently surfaces.

2.08 Concern for Other Underground Utilities

- A. Contractor's operations may be conducted in a location, which contains other underground utilities. The Contractor shall contact Palmetto Utility Location Service at 1-800-922-0983, seventy-two (72) hours (three (3) days) before beginning any work in this area.
- B. Verify the location of all adjacent underground utilities. The locations of other utilities are drawn on the plans in their approximate location for informational purposes only. This shall include exposing any utilities, which are located within 30 feet of the designed drilled path, to get an accurate depth measurement.
- C. Modify drilling practices or downhole assemblies to prevent damage to adjacent underground utilities.
- D. Any existing utilities, structures, monuments, etc. damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.

2.09 Carrier Pipe

Carrier pipe shall be manufactured of HDPE in accordance with specification Section 13010. Pipe shall be installed with either wood skids and stainless steel bands or prefabricated casing spacers. Skids shall be made of pretreated timber and spacers shall be Cascade Waterwork Mfg. Co. Or approved equal. Maximum spacing between supports shall be six (6) feet.

EXECUTION

3.01 Description

A. The Work to be performed under this contract shall consist of the installation of the lines shown on the construction plans by the directionally controlled horizontal drilling method. Services furnished by the contractor shall be performed in accordance with the best industry practice and these contract documents and shall include all labor, equipment and items necessary to accomplish the following tasks:

1. Supply of all pipe as required for the installation in accordance with the specification Section 13010.
2. Clearing, grading and general site/access preparation necessary for construction operations. These services will be performed in accordance with specification Sections 2100, 2200 and 2300.
3. Transportation of all equipment, labor, and items to and from the jobsite.
4. Erection of horizontal drilling equipment at the rig site defined in construction drawings.
5. Drilling of a pilot hole along the alignment defined in construction drawings.
6. Reaming the pilot hole to a diameter suitable for installation of the prefabricated pull section.
7. Installation of the prefabricated pull section along the reamed hole.
8. Prefabrication of the pull section in accordance with specification Section 13010.
9. Hydrostatic testing the installed segment in accordance with specification Section 2700.
10. Erosion control, clean up and restoration of all work areas in accordance with specification Section 2800.

3.02 Instrumentation

The Contractor will at all times provide and maintain instrumentation which will accurately

locate the pilot hole and measure drilling fluid flow discharge rate and pressure. The Engineer will have access to these instruments and their readings at all times.

3.03 Pilot Hole

- A. Directional Tolerance - The pilot hole shall be drilled along the path shown on the construction drawings to the following tolerances:
 - 1. Elevation - Plus 1 foot, minus 1 foot. A minimum 0.80% slope will be required at all times
 - 2. Horizontal Alignment - Plus or Minus three (3) feet.
 - 3. Entry Point Location - The pilot hole shall initially penetrate the ground surface at the exact location shown on the construction drawings.
 - 4. Exit Point Location - The pilot hole shall finally penetrate the ground surface within plus or minus three (3) feet of the alignment shown in the construction drawings.
 - 5. See construction drawings for further allowable tolerances.
- B. As-Built Survey - At the completion of pilot hole drilling, Contractor shall provide a tabulation of coordinates references to the drilled entry point, which accurately describe the location of the pilot hole. This survey will be reviewed by the Engineer before reaming operations shall begin.

3.04 Ream & Pull Back

- A. Pre-reaming - Pre-reaming operations shall be conducted at the discretion of the horizontal drilling contractor. All provisions of this specification relating to simultaneous reaming and pulling back operations shall also pertain to pre-reaming operations.
- B. Pulling Loads - The maximum allowable tensile load imposed on the pipeline pull section shall be equal to 90% of the product of the SMYS of the pipe and the area of steel in the pipe section. If more than one value is involved for a given pull section, the lesser shall govern.
- C. Torsional Stress - A swivel shall be used to connect the pipeline pull section to the reaming assembly to minimize torsional stress imposed on the section.
- D. Pull Section Support - The pull section shall be supported as it proceeds during pull back so that it moves freely.
- E. Hydrostatic Pretest - The entire pull section shall be subjected to a four hour hydrostatic test with zero leakage prior to being installed in the hole. The test pressure shall be equal to or exceed that required for final certification. See Section 2700 for further details.

- F. Pull Section Length - If space allows, the pull section shall be installed in one continuous length with no tie-in welds. If space is not available, tie-in welds shall be minimized and fully inspected by radiographic means prior to installation.

3.05 Drilling Fluids

- A. Composition - The composition of all drilling fluids used shall be submitted to the Engineer for approval prior to utilization. No fluid will be approved or utilized that does not comply with permit requirements and environmental regulations.
- B. Disposal - Disposal of drilling fluids shall be the responsibility of the Contractor and shall be conducted in compliance with all pertinent environmental regulations, right-of-way and workspace agreements and permit requirements. Disposal of drilling fluids within proposed area shall not be allowed.
- C. Inadvertent Returns - Drilling fluid returns at locations other than the entry and exit points shall be minimized. Contractor shall immediately clean up any inadvertent returns.
- D. Drilling efforts and recirculation when required across the proposed project shall not be conducted with the use of temporary piping or hoses.

END OF SECTION

SECTION 13010

POLYETHYLENE PIPE FOR DRILLING

GENERAL

1.01 DESCRIPTION

Work entails waterline piping necessary to directionally drilled crossing including material specification, production, storage and handling, and installation.

1.02 RELATED SECTIONS

- A. Section 13000 - Directional Drilled Crossing

PRODUCTS

2.01 MATERIAL SPECIFICATIONS

- A. All polyethylene pipe furnished under these specifications shall conform to all applicable requirements in the latest revision of the following standards, unless other wise specified herein:
 1. ASTM D-1248 Specification for Polyethylene Molding and Extrusion Materials.
 2. ASTM D-3350 Polyethylene Plastics (PE) Pipe and Fittings Materials
 3. ASTM D-1693 Environmental Stress-Cracking of Ethylene Plastics.
 4. ASTM 2321-74 Underground Installation of Flexible Thermoplastic Sewer Pipe.
 5. ASTM F-714 Polyethylene Plastic Pipe (SDR-PR) Based on Outside Diameter.
 6. AWWA C 906 Polyethylene (PE) Pressure Pipe and Fittings 4" through 63" for Water Distribution.

2.02 MATERIAL AND WORKMANSHIP

- A. The piping material and fittings shall meet the requirements of Type III, Class C, Category 5, Grade P34 polyethylene material as defined in ASTM D-1248, shall be identified by the cell classification system of ASTM D-3350 as PE 345434C and have the Plastic Pipe Institute (PPI) designation of PE3408. All pipe shall be American Made meeting the AWWA C 906 Specifications.
- B. All pipe shall be DIP (Ductile Iron Pipe Size) unless otherwise noted on the plans.

- C. The Owner may request certified lab data to verify the physical properties of pipe or may take random samples and have them tested by an independent testing laboratory.
- D. Design/Pressure Class: Pressure class (PC) ratings for pipe covered by this standard are given. The following expression, commonly known as the ISO (International Organization for Standardization) equation, is used to calculate the pressure class rating:

$$PC = \{ 2 \div (DR - 1) \} \times HDB \times DF$$

Where:

- PC = Pressure class, in psig
- HDB = Hydrostatic design basis, in psi...1,600 psi @ 73EF for PE 3408
- DR = Dimension ratio, ratio of the specified average outside diameter to the minimum specified wall thickness, both expressed in the same units
- DF = Design factor; includes consideration of degree of safety and all the variables, included limited surge pressure effects, in the end application...(normally "0.5" representing the industry accepted 2:1 safety factor)

In no case shall PE pipe with a pressure class less than DR 17 be used.

- E. Workmanship shall be of the highest level compatible with current commercial practice. The polyethylene pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.
- F. The manufacturer shall have adequate equipment and quality control facilities to continually result in a finished product that will have the properties indicated herein. The manufacturer shall be a current member of the Plastic Pipe Institute.

2.03 REJECTION

Polyethylene pipe and fittings may be rejected for failure to meet any of the requirements of this specification.

EXECUTION

3.01 HANDLING AND INSTALLATION

Pipe shall be stored on clean level ground to prevent undue scratching or gouging. Sections of pipe with deep cuts or gouges (>10%) shall be removed and the ends of the pipe rejoined. Handling of the joined pipe shall be in such a manner that the pipe is not damaged by dragging over sharp edges or cutting objects.

3.02 JOINING

Sections of the polyethylene pipe shall be joined into continuous lengths by the butt fusion method and shall be performed by factory certified technician in strict

conformance with the pipe manufacturers recommendations using approved equipment.

3.03 BURIAL

The trench and trench bottom, embedment materials and bedding and installation practices shall be as specified in ASTM 2321-74, Sections 6, 7, 8, and 9.

END OF SECTION

SECTION 02000

SITE CLEARING

GENERAL

1.01 SECTION INCLUDES

- A. Removal of surface debris.
- B. Clear site of plant life and grass.
- C. Remove trees and shrubs.
- D. Remove root system of trees and shrubs.
- E. Topsoil excavation.

1.02 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for disposal of debris.
- B. Coordinate clearing work with Owner.
- C. Clearing shall not begin until the SWPPP has been approved and permit coverage has been issued.

PRODUCTS

Not Used

EXECUTION

3.01 PREPARATION

- A. Verify that existing plant life and features designated to remain are identified and protected.

3.02 PROTECTION

- A. Locate, identify, and protect existing utilities from damage.
- B. Protect benchmarks and existing structures from damage or displacement.
- C. Protect trees, plant growth and features outside of designated construction limits.

3.03 CLEARING

- A. Clear areas required for access to the site and performance of the work.
- B. Remove all vegetation and organic material from earthwork (excavation, fill, etc.) area. Remove trees, shrubs, stumps, root mat, root system and surface rock to a depth of 24 inches.

3.04 REMOVAL & DISPOSAL

- A. The Contractor shall remove all cleared debris, rock, plant matter, and other unsalvageable materials from site and dispose of at an approved landfill.

3.05 TOPSOIL EXCAVATION

- A. Excavate topsoil from entire site.
- B. Stockpile in area designated on site to a height not exceeding 8 feet.

END OF SECTION

SECTION 02100

EXCAVATION

GENERAL

1.01 SECTION INCLUDES

- A. Grading and excavation for roadway and drives.
- B. Grading and excavation for pipelines and channels.
- C. All excavation, formation of embankments and finishing and dressing of graded earth areas, shoulders and ditches.

1.02 RELATED SECTIONS

- A. Section 00800 – General Requirements
- B. Section 02200 - Backfilling
- C. Section 02300 - Trenching

1.03 FIELD MEASUREMENT

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

PRODUCTS

Not Used

EXECUTION

3.01 GENERAL

- A. The term "excavation" used hereinafter is defined as "unclassified excavation". Excavation of every description regardless of material encountered within the grading limits of the project, shall be performed to the lines and grades indicated. Satisfactory excavated material shall be transported to and placed in the fill areas within the limits of the work. When directed by the Engineer, unsatisfactory material encountered within the limits of the work shall be excavated below the grade shown and replaced with satisfactory material as directed in order to obtain the required surface condition and density to sustain the subsequent work. Such material ordered as a replacement shall be paid for at the unit prices given in the stated allowance shown in the proposal. The Contractor shall dispose of excavated

material, which is not suitable for use as fill, at an approved landfill. During construction, excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Except where otherwise shown on the plans or as directed, the unsatisfactory soils shall be removed to a depth required and filled with selected sands and sand clays from borrow excavations that will provide a firm, unyielding sub-grade at the specified density.

- B. All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly graded. The finished surface shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from grader or scraper operations. The finished surface shall be not more than 0.10 foot above or below the established grade or approved cross section. Gutters and ditches shall be finished so as to permit adequate drainage.
- C. All vegetation, roots, brush, sod, broken pavements, rubbish and other unsatisfactory or surplus material stripped or removed from the limits of construction shall be hauled off the Owner's property and disposed of by the Contractor at an approved landfill.
- D. The Contractor shall be responsible for control of erosion and sedimentation during the work. Silt screens, hay bales or other devices as required shall be installed to prevent off-site deposits of eroded materials. Similar devices shall be placed around storm drain catch basins and inlets to prevent the infiltration of soil materials into the underground drainage system. Such devices shall be maintained until all site work is complete and a satisfactory stand of grass has been established as approved by the Engineer.

3.02 CONSERVATION OF TOPSOIL

- A. Areas designated for grading operations that contain a blanket of soil which is more satisfactory for the growth of grass than the embankment material to be placed, as determined by the Engineer, shall be stripped to a depth of approximately four to six inches and placed in convenient stockpiles as directed in the field, for later use as a topsoil blanket on the new graded areas specified herein, or as designated.
- B. Material ordered stockpiled shall be placed in a satisfactory manner to afford drainage.
- C. When grading operations permit, instead of stockpiling, the topsoil shall be hauled and spread directly on the areas to receive topsoil.
- D. Surplus topsoil shall remain the property of the Contractor.

3.03 PROTECTION OF EXISTING SERVICE LINES, UTILITIES & STRUCTURES

- A. Existing utility lines and structures that are shown on the drawings or the locations or other utility lines which may exist in the project area, as well as

utility lines constructed during excavation operations, shall be protected from damage during excavation, and if damaged, shall be repaired by the Contractor at his expense.

- B. When utility lines that are to be removed or relocated are encountered within the area of operations, the Contractor shall notify the utility company in ample time for the necessary measures to be taken to prevent interruption of the service.
- C. It shall be the Contractor's responsibility to contact all utility companies with services in the area for an accurate location of the respective utilities prior to beginning excavation.

3.04 EXCAVATION OF DITCHES

- A. Ditches shall be cut accurately to the cross sections and grades indicated by the drawings.
- B. All roots, stumps and other foreign matter in the sides and bottom of ditches shall be cut 18 inches below the grades indicated.
- C. Any excessive ditch excavation due to the removal of roots, stumps, etc., or due to over-excavation, shall be backfilled to grade either with satisfactory soils thoroughly compacted, or with suitable stone, as directed by the Engineer.
- D. The Contractor shall maintain all ditches excavated under this specification free from detrimental quantities of leaves, sticks and other debris until final acceptance of the work.
- E. Satisfactory earth material excavated from ditches and channel changes shall be placed in fill areas as directed.
- F. All excess excavation and debris shall be disposed of off-site unless otherwise directed by the Engineer.
- G. Berming of soils along the ditch bank will not be permitted.
- H. No excavated material shall be deposited within a distance of three feet from the edge of any ditches.
- I. The Contractor shall be responsible for maintaining these newly constructed ditches and take immediate action to keep erosion of the ditch bottom and slopes to a minimum during the life of the contract.

3.05 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify and mark known underground, above ground and aerial utilities.

- C. Protect above and below grade utilities which are to remain.
- D. Protect plant life, lawns and other features remaining as a portion of final landscaping.
- E. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.06 EXCAVATION

- A. Underpin adjacent structures, which may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving and site structures.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard measured by volume.
- F. The Contractor shall notify the Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- G. Correct unauthorized excavation.
- H. Stockpile excess excavated material not being used in an area.

3.07 FIELD QUALITY CONTROL

- A. Coordinate and provide access for visual inspection, compaction testing, proof rolling, etc. of bearing surfaces.

3.08 PROTECTION

- A. Protect excavations to prevent cave-in or loose soil from falling into excavation.

END OF SECTION

SECTION 02200

BACKFILLING

GENERAL

1.01 SECTION INCLUDES

- A. Structure backfilling to sub-grade elevations.
- B. Site filling and backfilling.
- C. Fill and compaction of trenches.
- D. Consolidation and compaction.
- E. Fill for over-excavation.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation.
- B. Section 02300 - Trenching.

1.03 REFERENCES

- A. ASTM C 136 - Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D 1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ASTM D 1557 - Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using a 10-lb Rammer and 18-in. Drop.
- D. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

PRODUCTS

2.01 FILL MATERIALS

- A. Type A (Class 1) - Coarse Stone Crushed: Angular, washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ASTM C 136 within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inches	100
1 inch	95
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

B. Type B (Class 2) - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C 136, to the following:

1. Minimum Size: 1/4 inch
2. Maximum Size: 5/8 inch

C. Type C (Class 3) - Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials or organic matter; graded in accordance with ASTM C 136, within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

D. Acceptable Native Material: Reused and/or imported, free of gravel larger than 3-inch size, roots and other organic material and trash and approved by the Engineer.

EXECUTION

3.01 EXAMINATION

A. The Contractor shall verify that fill materials to be reused are approved by the Engineer.

3.02 PREPARATION

A. Generally, compact sub-grade to density requirements for subsequent backfill materials.

B. Cut out soft areas of any sub-grade that is not capable of compaction. The Contractor shall place Type C backfill and compact to a density equal to or

greater than requirements for any subsequent backfill material.

- C. Prior to placement of aggregate base coarse material at gravel or paved areas, compact sub-grade to a minimum of 98% of its maximum dry density in accordance with ASTM D 1557 and AASHTO T-180.
- D. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started.
- E. In no case will unstable material remain in or under the fill area that will prevent the placement and compaction of subsequent layers to the specified densities.
- F. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped and benched, or broken up as directed, in such manner that the fill material will bond with the existing surface.
- G. Prepared surfaces on which compacted fill are to be placed shall be scarified, wetted or dried as may be required to obtain the compaction specified.

3.03 BACKFILLING

- A. Backfill areas at the locations and to lines and elevations shown on the drawings.
- B. Filled areas shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case.
- C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy sub-grade surfaces.
- D. Granular Fill: Place and compact materials in continuous layers not exceeding 6 inches compacted depth.
- E. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.
- F. Employ a placement method that does not disturb or damage utilities in trenches.
- G. Maintain optimum moisture content of backfill materials to attain required compaction density.
- H. Slope grade away from structures at a minimum 2 inches in 10 ft., unless noted otherwise.
- I. Make grade changes gradual. Blend slope into level areas.
- J. Stockpile surplus reusable backfill materials on Owner's property at Owner's designated site.

- K. Leave fill material stockpile areas completely free of excess unsuitable materials.

3.04 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus one tenth from required elevations.

3.05 FIELD QUALITY CONTROL

- A. The Engineer shall conduct field inspections with assistance from an independent testing lab.
- B. Tests and analysis of fill material shall be performed in accordance with ASTM D 1557 (AASHTO T-180).
- C. Compaction testing shall be performed in accordance with ASTM D 1557 (AASHTO T-180) and ASTM D 2922.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to Owner.
- E. Frequency of tests: As required by the testing firm or as directed by the Engineer.
- F. Proof-roll all compacted fill surfaces under paving.

3.06 PROTECTION OF FINISHED WORK

- A. Protect all finished Work.
- B. Re-compact fills subjected to vehicular traffic.

3.07 COMPACTION REQUIREMENTS

- A. The compaction of fill materials shall meet the following requirements as determined by the maximum density obtained at optimum moisture content by an approved laboratory.

1.	Fill under structures	100%
2.	Fill under paved areas	98%
3.	Fill in other areas	95%
- B. The Contractor shall be responsible for compaction of the existing soils to meet the above compaction requirements.
- C. The Contractor will be responsible for compacting the sub-grade to the required density by whatever means necessary.

3.08 SCHEDULE

- A. Fill under grassed areas.

1. Subsoil fill with acceptable native material to finished grade.
- B. Fill under asphalt concrete pavement.
1. Type C fill to 8 inches below finished paving elevation.

END OF SECTION

SECTION 02300

TRENCHING

GENERAL

1.01 SECTION INCLUDES

- A. Excavate trenches for utilities.
- B. Compacted bedding under fill over utilities.
- C. Backfilling and compaction.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation.
- B. Section 02200 - Backfilling.
- C. Section 02600 - Sanitary Sewer Gravity Systems.
- D. Section 02625 - Sewer Force Main System.
- E. Section 02700 - Water Distribution Systems.

1.03 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as shown on the drawings prior to proceeding with construction.

PRODUCTS

2.01 FILL MATERIALS

- A. Types A, B, and C subsoil materials as specified in Section 02200.
- B. Reuse native materials as approved by the Engineer.

2.02 BEDDING MATERIALS

- A. Type 1 Material: As specified for Type A in Section 02200.
- B. Type 2 Material: As specified for Type B in Section 02200.
- C. Type 3 Material: As specified for Type C in Section 02200.

- D. Acceptable Native Material: As specified in Section 02200.

EXECUTION

3.01 EXAMINATION

- A. The Contractor shall verify that fill materials to be reused are approved by the Engineer.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- C. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- D. Protect existing above and below grade utilities which are to remain.
- E. The Contractor shall cut out soft areas of the sub-grade that are not suitable for compaction and backfill with Type 3 fill and compact to density equal to or greater than the requirements for any subsequent backfill material.

3.03 EXCAVATION

- A. Excavate existing sub-grade required for storm sewer, sanitary sewer, or water line piping.
- B. Cut trenches sufficiently wide as shown in the standard details to enable installation of utilities and allow inspection.
- C. Hand trim for bell and spigot pipe joints. Remove loose material.
- D. Remove lumped subsoil, boulders and rock larger than 3 inches in diameter.
- E. Correct unauthorized excavation at no cost to Owner.
- F. Correct areas over-excavated by error in accordance with Section 02200.
- G. Stockpile excess excavated material, suitable for use as fill, at an approved location. Excess excavated material unsuitable for use as fill shall be removed from the site and disposed of by the Contractor.

3.04 BEDDING

- A. Support pipe during placement and compaction of bedding fill.

3.05 BACKFILLING

- A. Backfill trenches to elevations shown on plans.
- B. Systematically backfill work areas to allow maximum time for maximum compaction. Do not backfill over porous, wet, frozen or spongy sub-grade surfaces.
- C. Granular Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.
- D. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.
- E. Employ a placement method that does not disturb or damage foundation perimeter, pipe, or conduit in trench.
- F. Maintain optimum moisture content of backfill materials to attain required compaction density.
- G. Leave fill material stockpile areas completely free of excess unsuitable materials.

3.06 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus one tenth from required elevations.

3.07 FIELD QUALITY CONTROL

- A. Field inspection shall be performed by an independent material testing firm approved by the Engineer.

3.08 PROTECTION OF FINISHED WORK

- A. Protect all finished Work under provisions of Section 00500.
- B. Re-compact fills subjected to vehicular traffic.

3.09 TRENCH SAFETY

The Contractor shall be responsible for proper shoring and/or sloping of the trench in compliance with applicable OSHA regulations.

END OF SECTION

SECTION 02400

ASPHALT PAVEMENT AND BASE

GENERAL

1.01 SECTION INCLUDES

- A. Hot Laid Asphalt Concrete Pavement.
- B. Base Course Materials and Preparation.
- C. Sub-grade Preparation.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation.
- B. Section 02200 - Backfilling.

1.03 REFERENCES

- A. SCDOT Standard Specifications, 2000 Edition.
- B. SCDOT Manual of Uniform Traffic Control Devices for Streets and Highways.

1.04 QUALITY ASSURANCE

- A. Conform to SCDOT Standard Specifications except where more stringent requirements are specified herein.
- B. Obtain materials from same source throughout.

1.05 TESTING REQUIREMENTS

- A. Testing and analysis of asphalt mix will be performed under provisions of Section 01400 - Quality Control.

1.06 SUBMITTALS

- A. Provide certification from all suppliers stating that materials supplied comply with all specifications.
- B. Submit proposed mix design of each class of mix for review and approval prior to commencement of work.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Apply bituminous prime and tack coats when the ambient temperature is above 40 degrees F., and when temperature has been above 35 degrees F for 12 hours immediately prior to application. Do not apply when base is wet or contains excess moisture.
- B. Construct asphalt concrete paving only when atmospheric temperature is above 40 degrees F.

PRODUCTS

2.01 PAVEMENT MATERIALS

- A. Prime Coat: Medium, curing cutback asphalt, Type MC-30.
- B. Tack Coat: Emulsified asphalt, Type SS-1.
- C. Asphalt Cement: AASHTO M 226 (Table 2), Type AC-20.
- D. Aggregate for Mix: SCDOT Type 3

2.02 ASPHALT PAVING MIX

- A. Use dry materials to avoid foaming. Mix uniformly.
- B. Topping Course: 4.8 to 6.8 percent of asphalt cement by weight in mixture.

2.03 SAND ASPHALT LEVELING MIX

- A. Mixture of fine aggregate and asphalt cement, properly mixed at an approved plant to meet the requirements of SCDOT Standard Specifications Section 309.
- B. The aggregate in the mixture shall be composed of local sand or local sand containing crushed shell, blends of sand and stone, slag or limestone screenings or other approved materials. The local sand shall be non-plastic, sharp, hard durable grain free from deleterious substances.
- C. The constituents of the base course shall be combined in such proportions that, after mixing, the resultant mixture will be homogeneous and all particles coated with asphalt cement.

2.04 STABILIZED AGGREGATE BASE COURSE

- A. This work shall consist of a base course composed of coarse aggregate, together with fine aggregate or binder material and water, which shall be mixed, compacted, and primed when specified, all in accordance with the SCDOT Standard Specifications for Highway Construction, Section 306.

- B. The aggregate in the base course shall consist of a mixture of either crushed stone, crushed slag, or crushed or uncrushed gravel, together with sand, sand-gravel, soil or other approved materials having similar characteristics, combined as necessary to give a mixture conforming to the SCDOT requirements.
- C. The aggregate shall be free from lumps or balls of clay or other objectionable matter.
- D. The composite mixture of coarse aggregate and binder material shall meet the grading requirements specified for Types 1 or 2 after it has been mixed, laid down, and after initial compaction operations have begun. The composite mixture shall meet the requirements of SCDOT Standard Specifications for Highway Construction, Section 306.

2.05 OTHER BASE COURSE MATERIALS

- A. Other base course materials may be used with the approval of the engineer. All materials must meet the requirements of the SCDOT Standard Specifications for highway construction.

EXECUTION

3.01 SUBGRADE PREPARATION

- A. Prior to beginning paving work, inspect sub-grade for loose or soft material, rock or organic matter. No stones over 2" in diameter will be allowed in the top 6" of the sub-grade.
- B. Proof roll cut sub-grade using loaded 20 ton dump truck or similar weight construction equipment to verify that sub-grades are stable and to identify loose or soft areas requiring undercutting or stabilization.
- C. Stabilization of soft or unstable sub-grades shall be accomplished to a minimum depth of 12".
- D. Verify elevations and cross sections of sub-grade immediately prior to placing base course material.

3.02 BASE COURSE PREPARATION

- A. The base course shall be placed on the approved sub-grade and uniformly spread.
- B. Shape base to provide thicknesses and widths as shown on the drawings.
- C. The base shall be consolidated by rolling until it is thoroughly bonded and compacted.

3.03 APPLICATIONS

A. Prime Coat:

1. The prime coat shall not be applied until the base course has seasoned sufficiently to permit a uniform penetration. The base shall be dry when the prime is applied.
2. Apply prime coat to all base material surfaces where asphalt concrete paving will be constructed.
3. Apply prime coat in accordance with SCDOT Standard Specifications at a rate of 0.1 gallons per square yard.
4. Apply at a uniform rate of 0.25 to 0.30 gallons per square yard over compacted base material. Apply to penetrate and seal, but not flood surface.
5. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

B. Tack Coat:

1. Apply to contact surfaces of previously constructed asphalt concrete courses and surfaces abutting or projecting into asphalt concrete pavement.
2. Apply tack coat to contact surfaces of concrete curbing.
3. Apply tack coat at a rate of 0.1 gallons per square yard, in accordance with SCDOT Standard Specifications.
4. Allow tack to dry until at proper condition to receive paving.

3.04 ASPHALTIC CONCRETE PLACEMENT

- A. Place asphalt concrete mixture on completed compacted sub-grade surface, spread, and strike off.
- B. The mixture shall be delivered to the spreader at a temperature between 250° F. and 325° F. and within 20° F of the temperature set at the plant.
- C. Place asphalt to achieve the compacted thickness identified on the drawings.

3.05 ROLLING AND COMPACTION

- A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. The number,

weight, and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

- B. Compact mixture with hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- C. Breakdown Rolling: After longitudinal joints and edges have been compacted, breakdown rolling should follow immediately.
- D. Intermediate Rolling: Follow breakdown rolling as closely as possible, while the asphalt mix is still well above the minimum temperature at which densification can be achieved. Intermediate rolling should be continuous until all of the mix placed has been thoroughly compacted.
- E. Finish Rolling: Perform finish rolling while mix is still hot enough for removal of roller marks.
- F. Patching: Remove and replace defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact to maximum surface density and smoothness.

3.06 TOLERANCES

- A. Compaction and Density Requirements:
 - 1. Base and sub-grade: Compact sub-grade to 98% and base to 100% as measured by ASTM D 2922 and ASTM D 1557 (AASHTO T-180).
 - 2. Asphalt Pavement: Minimum acceptable density of in place material shall be 98% of recorded laboratory specimen density.
- B. Allowable Variation in Thickness:
 - 1. Base course: (+\-) 1/2".
 - 2. Surface (wearing) course: (+\-) 1/8".
- C. Surface Smoothness: Test finished surface of each asphalt course for smoothness using a 10'-0" straight edge. Intervals of tests shall be as directed by the Engineer. Surfaces will not be acceptable if exceeding the following:
 - 1. Base course: 1/2" in 10'-0".
 - 2. Surface (wearing) course: 1/4" in 10'-0".
- D. Laboratory shall test in place courses for compliance with specified density, thickness and surface smoothness. Engineer shall specify testing locations and number of tests.
- E. Laboratory shall take two 4" diameter cores per 1,000 sq. yards of paved surface (400 LF of roadway) at locations directed by the Engineer.

- F. Contractor's duties relative to testing shall include:
1. Notifying laboratory of conditions requiring testing.
 2. Coordinating with Engineer and laboratory for field testing.
 3. Paying costs for retesting where initial tests reveal nonconformance with specified requirements.
 4. Repair holes resulting from coring to match existing surface.

3.07 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 00800.

3.08 TRAFFIC CONTROL

- A. Comply with State Manual of Uniform Traffic Devices for Streets and Highways.
- B. Maintain vehicular and pedestrian traffic during paving operations as required for other construction activities.
- C. Provide flagmen, barricades, warning signs and warning lights for movement of traffic and safety and to cause the least interruption of work.

3.09 CLEANING AND PROTECTION

- A. At completion of each operation, remove excess or spilled materials from site. Do not dump or spread excess asphalt materials on the project site.
- B. After placement of surface course, no vehicular traffic shall be allowed on pavement until it has cooled and hardened and in no case sooner than 12 hours.

END OF SECTION

SECTION 02410

PATCHING ASPHALT CONCRETE PAVEMENT

GENERAL

1.01 SECTION INCLUDES

- A. Patching of existing asphalt pavements or asphalt resurfaced pavements for water lines, sewer lines, and utility service lines.

1.02 RELATED SECTIONS

- A. Section 00800 – General Requirements
- B. Section 02100 - Excavation
- C. Section 02200 - Backfilling
- D. Section 03250 - Concrete

1.03 REFERENCES

- A. SCDOT Standard Specifications, Current Edition.
- B. SCDOT Manual of Uniform Traffic Control Devices for Streets and Highways.
- C. City of North Myrtle Beach Standard Detail Drawing R7 and R14.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with the SCDOT standards.
- B. Obtain materials from same source throughout.

1.05 TESTING REQUIREMENTS

- A. Testing and analysis of asphalt mix will be performed under provisions of Section 00800 – General Requirements.

1.06 SUBMITTALS

- A. Certificates: Provide certification stating that materials supplied comply with the specifications, signed by the asphalt producer and Contractor.
- B. Mix Design: Submit mix design for base and pavement courses to Engineer for acceptance, prior to commencement of work.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Apply bituminous prime and tack coats when the ambient temperature is above 40 degrees F., and when temperature has been above 35 degrees F for 12 hours immediately prior to application. Do not apply when base is wet or contains excess moisture.
- B. Construct asphalt concrete paving only when atmospheric temperature is above 40 degrees F.

PRODUCTS

2.01 PAVEMENT MATERIALS

- A. Prime Coat: Homogeneous medium curing liquid asphalt. Type MC-30.
- B. Tack Coat: Emulsified asphalt Type SS-1.
- C. Asphalt Cement: AASHTO M226 (Table 2)
- D. Aggregate for Mix: SCDOT Type 3.

2.02 ASPHALT PAVING MIX

- A. Use dry materials to avoid foaming. Mix uniformly.
- B. Topping Course: 4.8 to 6.8 percent of asphalt cement by weight in mixture.

2.03 STABILIZED AGGREGATE BASE COURSE

- A. The composite mixture of coarse aggregate and binder material shall meet the grading requirements specified for Type 3 after it has been mixed, laid down, and after initial compaction operations have begun.

2.04 CONCRETE AND REINFORCING STEEL

- A. Concrete and reinforcing steel shall conform to requirements of Section 3250.
- B. Flowable fill shall conform to the requirements of Section 3260.

EXECUTION

3.01 INSPECTION

- A. Verify compacted trench backfill is dry and ready to support a compacted base course.

- B. Verify compacted base course is dry and ready to support paving and imposed loads.
- C. Verify that reinforcing steel is lean, of the proper size, properly positioned and free from kinks or other defects before pouring concrete (for patches requiring concrete base).
- D. Verify that the concrete base (where required) has set up for the proper length of time before covering patch with asphalt.

3.02 TRENCH BACKFILLING

- A. The trench shall be backfilled and compacted in accordance with Section 2200.
- B. All trenches across roadways shall be covered at the end of each working day and open to traffic.
- C. Trenches shall be brought level with the existing pavement using coquina base or gravel for at least the top 6 inches which shall be compacted in place. Any settlement or holes, which develop, shall be promptly filled by the Contractor at his expense with additional coquina or gravel.
- D. Pavement patch shall be brought level with the existing pavement using coquina base or gravel for at least the top 6 inches which shall be compacted in place. Any settlement or holes, which develop, shall be promptly filled by the Contractor at his expense with additional coquina or gravel.

3.03 PATCH PREPARATION

- A. The existing pavement shall be saw-cut at the required distance from the edge of the trench just prior to the final application of coquina or gravel base or concrete as called for on the plans.
- B. Immediately after saw cutting the existing pavement as described above the patch area shall be cleaned of extraneous material. The area shall be cleared to the required depth in neat lines and all excess material shall be removed.
 - 1. For patches to receive coquina or gravel base, the final application of coquina or gravel shall be made and compacted to bring the level up to the required distance below the existing pavement.
 - 2. For patches with concrete base the reinforcing steel (if required) shall be placed in the patch area and supported by concrete block, brick or approved chair supports the proper distance above the sub-base. Reinforcing steel shall not be allowed to rest on the sub-base. After the steel placement has been inspected and approved, concrete shall be poured and the top troweled to an even surface at the required depth below the existing pavement.
 - 3. Concrete shall be allowed to set at least 24 hours. During this time traffic shall be maintained by placing steel plates or other approved bridging

material across the trench. Such bridging shall be at the Contractor's expense.

4. For patches using flowable fill the trench must be filled with the flowable fill at the same time and brought to flush with the existing pavement or to the bottom of the existing pavement if a top section of pavement is to be used to finish the patch.
 5. Flowable fill shall be allowed to set at least 3 hours. During this time traffic shall be maintained by placing steel plates or other approved bridging material across the trench. Such bridging shall be at the contractor's expense.
- C. Traffic shall not be allowed to cross the saw-cut edges until the final asphalt course has been laid.

3.04 PLACING ASPHALT PATCH

- A. The asphalt surface shall be placed as soon as practical after the patch preparation is finished.
- B. Prior to placing the asphalt, a primer shall be placed over the stone base. A tack coat shall be used if placed over concrete and shall be used between layers if more than one layer is required. Such primer or tack coat shall be at the Contractor's expense.
- C. Place the asphalt within 24 hours of priming the base or placing the tack coat.
- D. Place the asphalt to the compacted thickness identified on the plans.
- E. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- F. Develop rolling pattern with consecutive passes to achieve required compaction and even and smooth finish, without roller marks.
- G. Asphalt pavement shall meet all SCDOT requirements unless otherwise stated on the plans or in the specifications.

3.05 TOLERANCES

- A. Compaction and Density Requirements:
 1. Base and sub-base: Compact to 100% as determined by AASHTO T 180 (Method D) by ASTM D698.
 2. Asphalt Pavement: Minimum acceptable density of in place material shall be 98% of recorded laboratory specimen density.
- B. Allowable Variation in Thickness:

1. Base Course: (+\-) 1/2".
 2. Surface (wearing) Course: (+\-) 1/8" in 10'-0".
- C. Surface Smoothness: Test finished surface of each asphalt course for smoothness using a 10'-0" straight edge. Intervals of tests shall be as directed by the Engineer. Surfaces will not be acceptable if exceeding the following:
1. Base Course: 1/2" in 10'-0".
 2. Surface (wearing) Course: 1/8" in 10'-0".
- D. Laboratory shall test in place courses for compliance with specified density, thickness and surface smoothness. Engineer shall specify locations and number of tests.
- E. Laboratory shall take two 4" diameter cores per 1,000 sq. yards of paved surface (400 LF of roadway) at locations directed by the Engineer.
- F. Contractor's duties relative to testing shall include:
1. Notifying laboratory of conditions requiring testing.
 2. Coordinating with Engineer and laboratory for field-testing.
 3. Paying costs for testing performed and for retesting where initial tests reveal nonconformance with specified requirements.
 4. Repair holes resulting from coring to match existing surface.

3.06 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 00800.

3.07 TRAFFIC CONTROL

- A. Comply with State Manual of Uniform Traffic Devices for Streets and Highways.
- B. Maintain vehicular and pedestrian traffic during paving operations as required for other construction activities. Flagmen may be required at busy intersections.
- C. Provide flagmen, barricades, warning signs and warning lights for movement of traffic and safety and to cause the least interruption of work.

3.08 MARKING AND SIGNAGE

- A. Pavement marking and road signs shall be as shown on the plans and in compliance with SCDOT.

3.09 CLEANING AND PROTECTION

- A. At completion of each operation, remove excess or spilled materials from site. Dump or spread no excess asphalt materials on the project site.
- B. After placement of surface course, no vehicular traffic shall be allowed on pavement until it has cooled.

END OF SECTION

SECTION 02420

CONCRETE SIDEWALK, CURB & GUTTER

GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete sidewalk construction.
- B. Cast-in-place concrete curb and gutter construction.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation.
- B. Section 02400 - Hot Laid Asphalt Concrete Pavement and Base.
- C. Section 03250 - Concrete.

1.03 REFERENCES

- A. ACI 347 - Recommended Practice for Concrete Form Work.

1.04 QUALITY ASSURANCE

- A. Obtain materials from same source throughout.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete in temperatures less than 40 degrees F without Engineer's approval.

PRODUCTS

2.01 MATERIALS

- A. Concrete Materials: Comply with requirements of Section 03250 for concrete materials, curing materials and others as required.
- B. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with non-staining type coating that will not discolor or deface surface

of concrete.

- C. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

2.02 MIX DESIGN

- A. Mix design shall comply with requirements of Section 03250.
- B. Design mix to produce normal weight concrete consisting of portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:
 - 1. Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated on Plans.
 - 2. Slump Range: 2" - 4" maximum.
 - 3. Air Entrainment: 5% to 8%.

EXECUTION

3.01 INSPECTION

- A. Verify reinforcement and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

- A. Form Construction
 - 1. Set forms to the specified grades and lines, rigidly braced and secured.
 - 2. Clean forms after each use, coat with form release agent as often as required to ensure separation from concrete without damage.
- B. Concrete Placement
 - 1. Do not place concrete until sub-grade and forms have been checked for line, grade and compaction.
 - 2. Place concrete using methods that prevent segregation of the mix.
 - 3. Automatic machine may be used for curb and gutter placement at Contractor's option. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

C. Joint Construction

1. Weakened Joints: Provide joints at intervals of 10 feet maximum each way. The joint shall be made by cutting the concrete with a trowel or by other acceptable methods.
2. Expansion Joints: Preformed expansion joints 3/4 or an inch thick, extending the full depth of the concrete sidewalk or curbing, shall be constructed at all radius points, junctions with existing concrete, inlets and manholes, and at not more than 100 foot intervals in continuous runs of curb.

D. Place concrete continuously between predetermined expansion joints. Do not break or interrupt successive pours such that cold joints occur.

E. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

3.03 FINISHING

A. Broom finish by drawing fine-hair broom across concrete surface parallel to line of traffic. Repeat procedure if required to provide fine line texture.

3.04 PATCHING

A. Notify Engineer immediately upon removal of forms.

B. Patch imperfections.

3.05 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details and elevations.

B. Repair or replace concrete not properly placed or the specified type.

C. Remove and replace defective concrete as directed, at no additional cost to the Owner.

3.06 FIELD QUALITY CONTROL

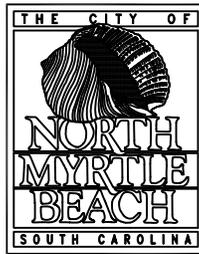
A. Field inspection and testing will be performed under provisions of Section 00800.

3.07 PROTECTION

A. Protect concrete from damage until acceptance of work.

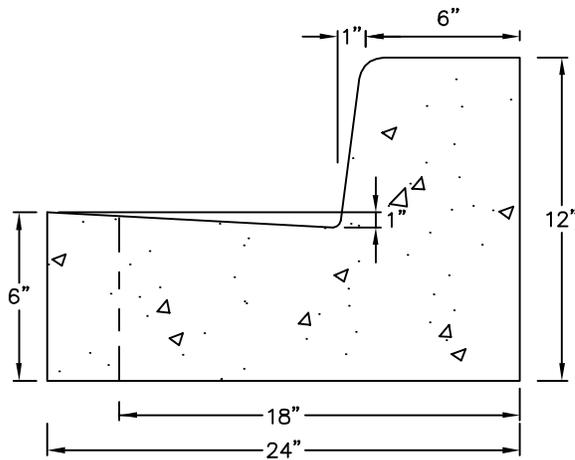
END OF SECTION

CITY OF NORTH MYRTLE BEACH STANDARD DETAILS
ENGINEERING DIVISION



ROADWAY:

- R-1 18" OR 24" CONCRETE BARRIER CURB
- R-2 18" CONCRETE ROLL CURB
- R-3 MINIMUM STANDARD DUTY PAVEMENT
- R-4 REINFORCED CONCRETE WHEEL STOP
- R-5 EXISTING PAVEMENT OVERLAY
- R-6 HANDICAP RAMP
- R-7 LOW VOLUME RESIDENTIAL PAVEMENT REPAIR
- R-7A LOW VOLUME PAVEMENT REPAIR WITHIN SCDOT R/W
- R-7B MEDIUM VOLUME PAVEMENT REPAIR WITHIN SCDOT R/W
- R-7C HEAVY VOLUME PAVEMENT REPAIR WITHIN SCDOT R/W
- R-8 TURNED DOWN CURB
- R-9 18" OR 24" EXPULSION TYPE CURB SECTION
- R-10 24" CONCRETE ROLL CURB
- R-11 TYPICAL PARKING LOT CROSS SECTION
- R-12 FLARED TYPE HANDICAP RAMP
- R-13 HANDICAP PARKING SIGN
- R-14 SECONDARY ROAD FLOWABLE FILL PAVEMENT REPAIR
- R-14A PRIMARY ROAD FLOWABLE FILL PAVEMENT REPAIR
- R-15 PEDESTRIAN SIGNAL
- R-16 MAST ARM MOUNTING HARDWARE
- R-17 MAST ARM POLE CONCRETE FOUNDATION
- R-18 GALVANIZED STEEL SIGNAL POLE WITH MAST ARM
- R-19 GALVANIZED STEEL SIGNAL POLE WITH SPAN WIRES
- R-20 GENERAL USE TRAFFIC CONTROL AND SIGN LEGEND
- R-21 TRAFFIC CONTROL GENERAL NOTES AND SYMBOL LEGEND
- R-22 TRAFFIC CONTROL SIGNS
- R-23 TYPICAL ROADWAY SECTION MEDIUM DUTY
- R-24 TYPICAL ROADWAY SECTION HEAVY DUTY
- R-25 18" OR 24" CONCRETE BARRIER CURB
- R-26 PERVIOUS PAVEMENT IMPERVIOUS PAVEMENT
- R-27 18" EXPULSION CONCRETE ROLL CURB
- R-28 CONCRETE SIDEWALK & DRIVEWAY



NOTE: CURB TO BE 18" OR 24" AS SHOWN ON PLANS.

18" OR 24"
CONCRETE BARRIER CURB

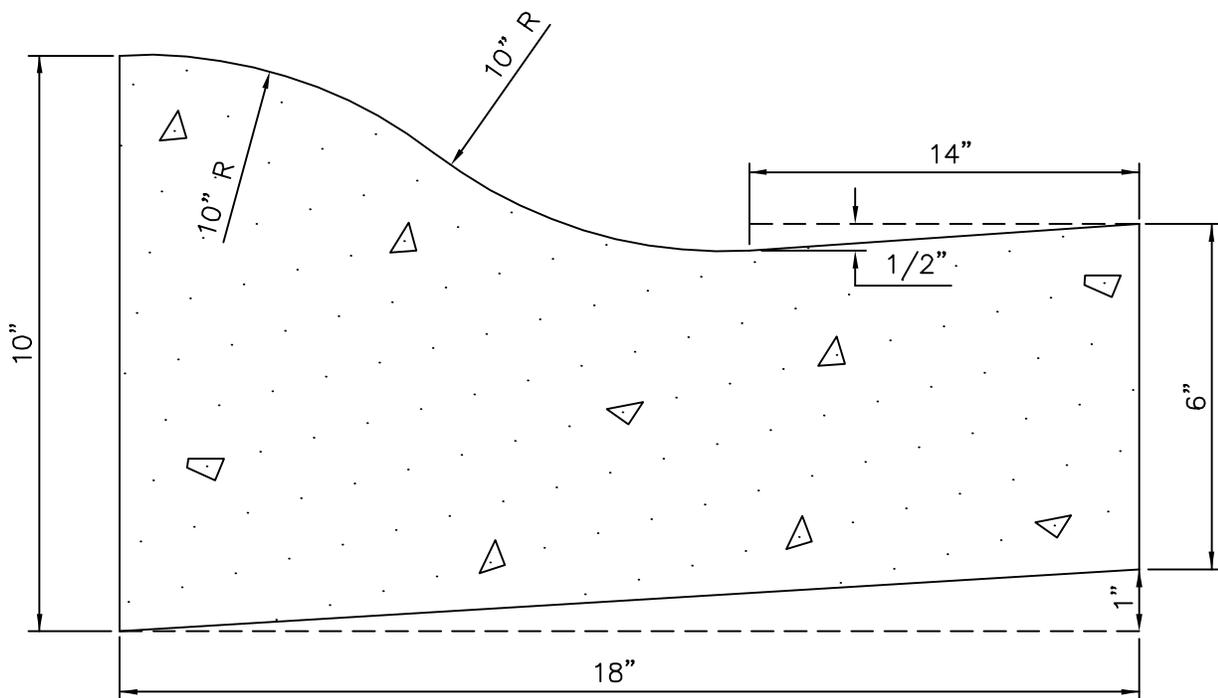
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
10/23/03

APPROVED BY: KDB
DRAWN BY: KJG

SHEET NO.
R-1





18" CONCRETE ROLL CURB

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

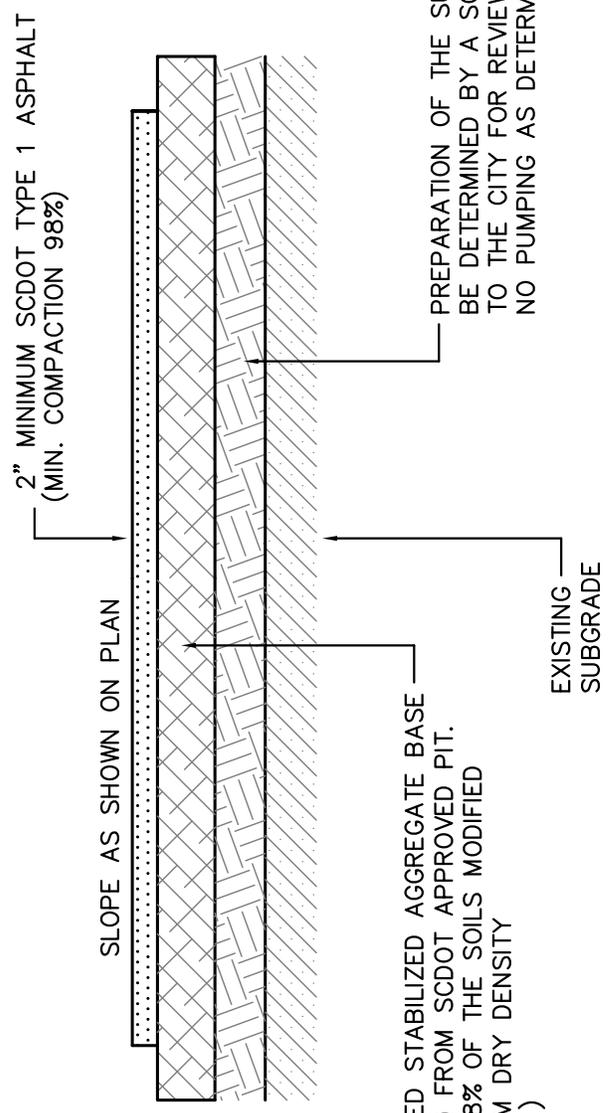
SHEET NO.
R-2



2" MINIMUM SCDOT TYPE 1 ASPHALT
(MIN. COMPACTION 98%)

6" MIN. COMPACTED STABILIZED AGGREGATE BASE COURSE (S.A.B.C.) FROM SCDOT APPROVED PIT. COMPACTED TO 98% OF THE SOILS MODIFIED PROCTOR MAXIMUM DRY DENSITY (ASTM D 1557-91)

PREPARATION OF THE SUBGRADE AND PAVEMENT TO BE DETERMINED BY A SOILS ENGINEER AND SUBMITTED TO THE CITY FOR REVIEW, MIN. 95% COMPACTION AND NO PUMPING AS DETERMINED BY THE PROOF ROLL TEST.

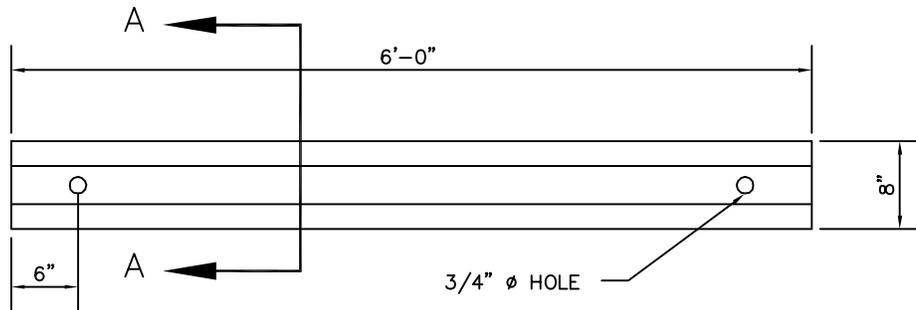


DATE: 10/23/03
SHEET NO. R-3

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

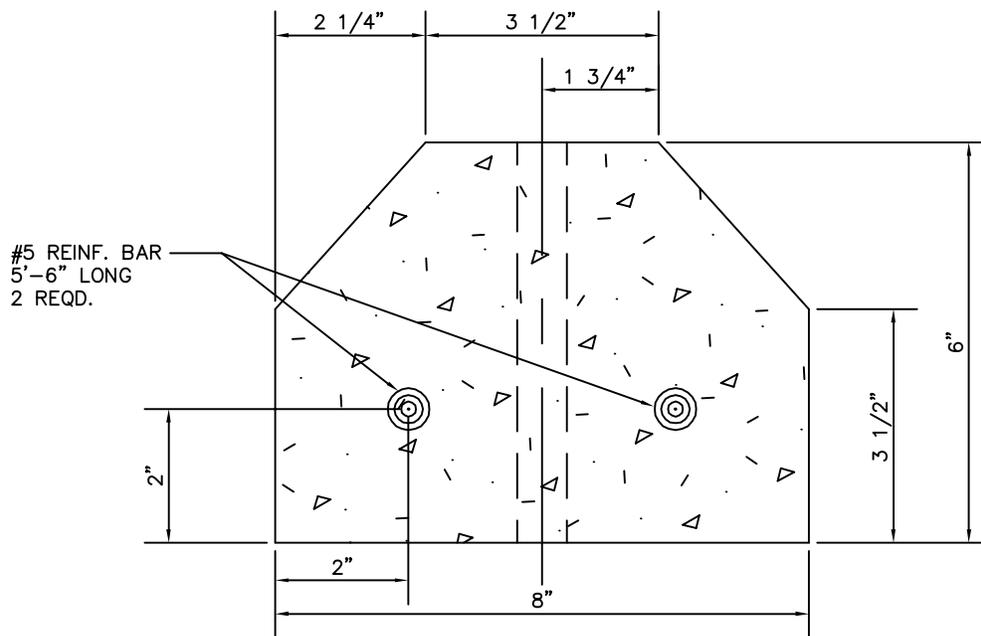
APPROVED BY: KDB
DRAWN BY: KJG

MINIMUM STANDARD
DUTY PAVEMENT



PLAN VIEW

3/4" ϕ HOLE TO BE USED FOR 2'-#4 REIN BAR TO BE INSERTED FOR ANCHORING WHEEL STOP TO PAVEMENT.



SECTION A-A

REINFORCED CONCRETE
WHEEL STOP

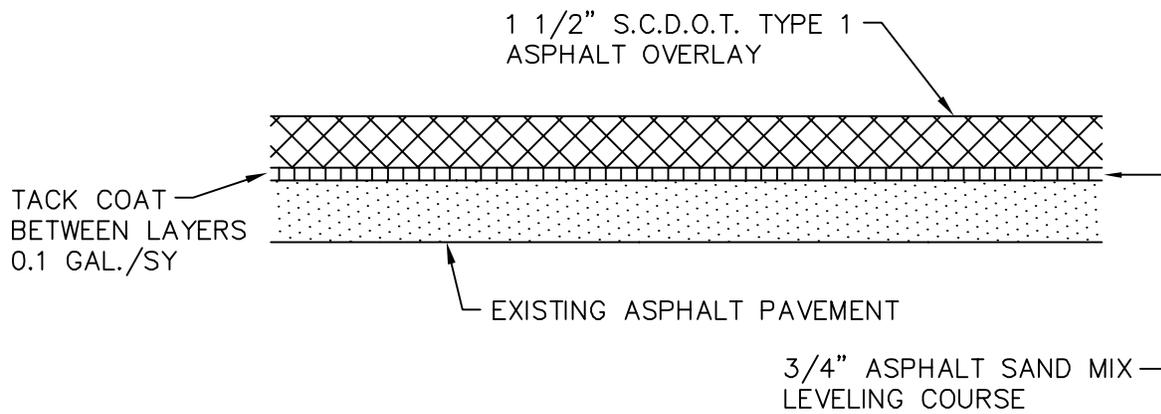
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
R-4





EXISTING PAVEMENT OVERLAY

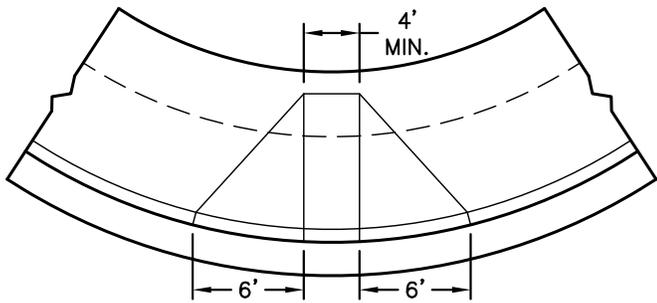
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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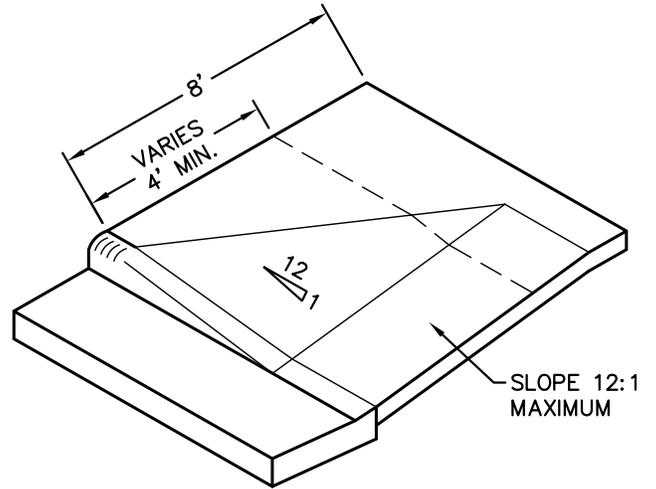
DATE:
10/23/03

SHEET NO.
R-5



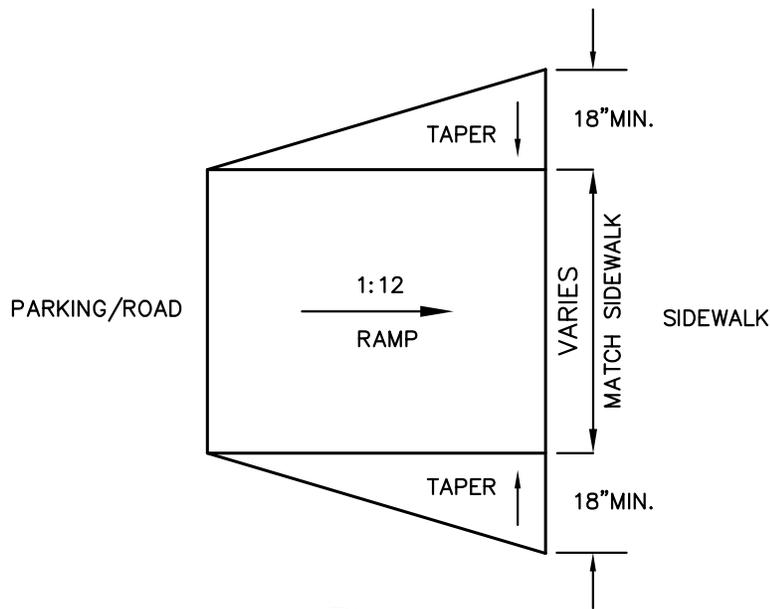


RADIAL PLAN

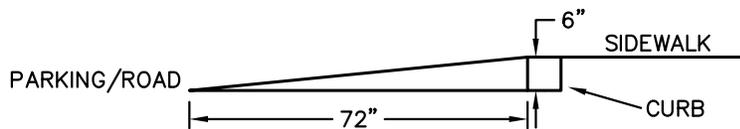


ISOMETRIC VIEW

1) DETECTABLE WARNING DEVICES SHALL BE INSTALLED PER SCDOT SPECIFICATIONS



PLAN



SECTION

HANDICAP RAMP

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

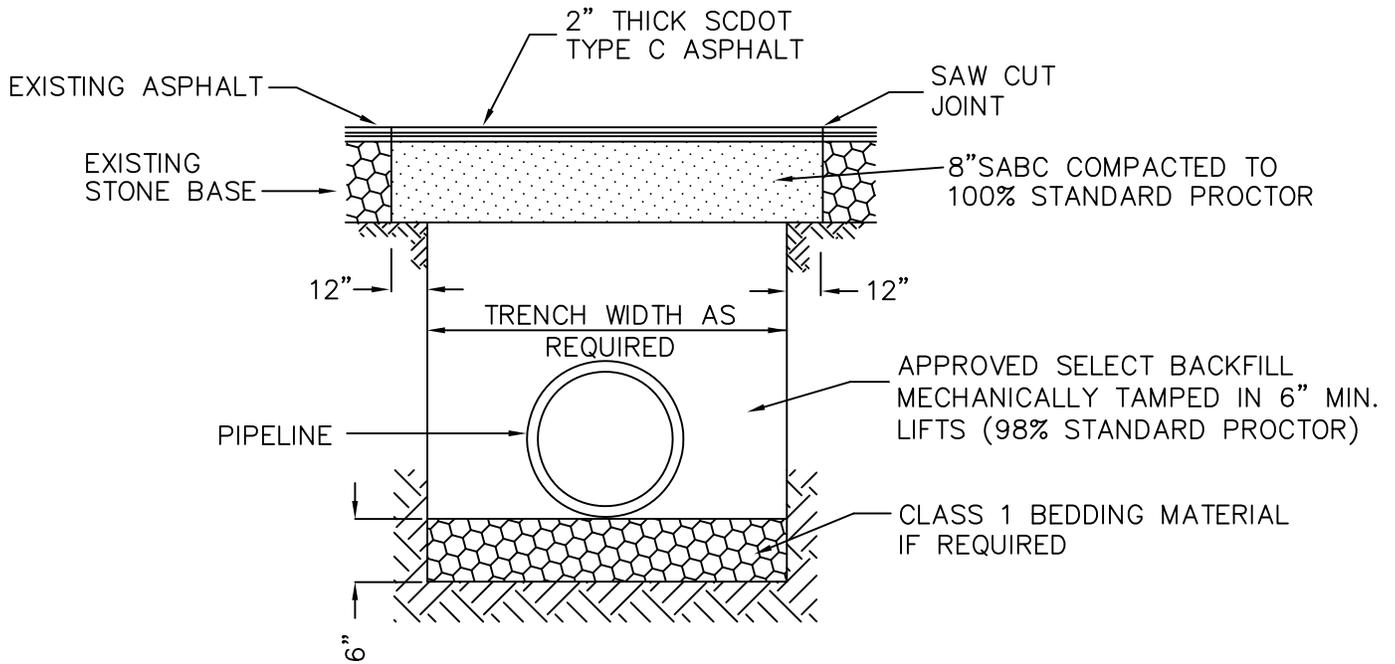
APPROVED BY: KDB
DRAWN BY: KJG

DATE:
02/24/14

SHEET NO.

R-6





1. TO BE USED FOR RESIDENTIAL ALLEYS, COMMERCIAL ALLEYS, LOCAL STREETS AND LOCAL COLLECTOR STREETS AS IDENTIFIED IN THE CITY OF NORTH MYRTLE BEACH LAND DEVELOPMENT REGULATIONS.
2. AN 1-1/2" THICK MILL AND OVERLAY USING SCDOT TYPE C ASPHALT SURFACE COURSE OVERLAY MAY BE REQUIRED WITHIN 1 YEAR OF REPAIR. (SEE HIGHWAY ENCROACHMENT) BY SCDOT.

LOW VOLUME RESIDENTIAL
PAVEMENT REPAIR

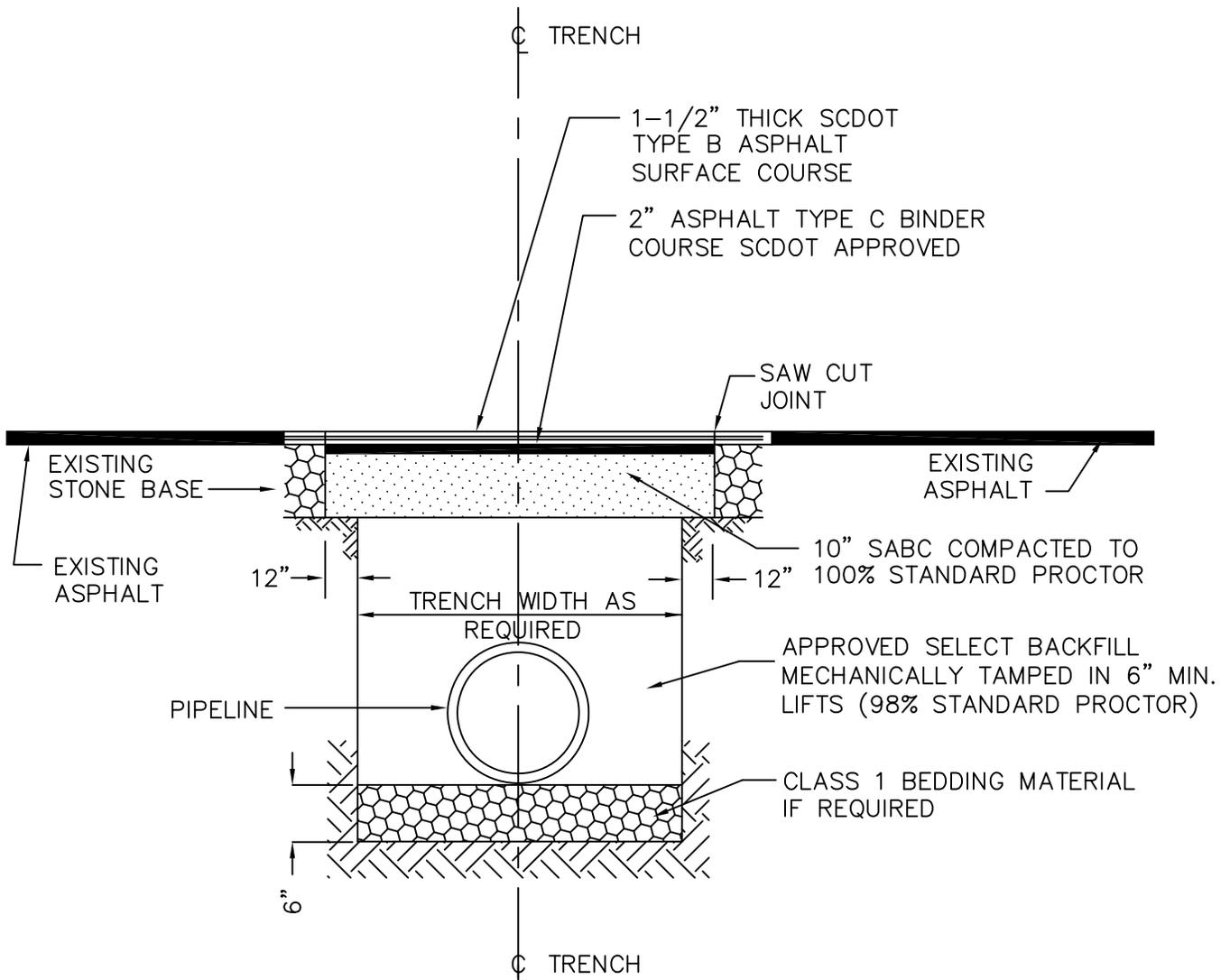
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
2/25/14

SHEET NO.
R-7





1. TO BE USED FOR RESIDENTIAL ALLEYS, COMMERCIAL ALLEYS, LOCAL STREETS AND LOCAL COLLECTOR STREETS AS IDENTIFIED IN THE CITY OF NORTH MYRTLE BEACH LAND DEVELOPMENT REGULATIONS.
2. AN 1-1/2" THICK MILL AND OVERLAY USING SCDOT TYPE B ASPHALT SURFACE COURSE OVERLAY MAY BE REQUIRED WITHIN 1 YEAR OF REPAIR. (SEE HIGHWAY ENCROACHMENT) BY SCDOT.

LOW VOLUME
PAVEMENT REPAIR
WITHIN SCDOT R/W

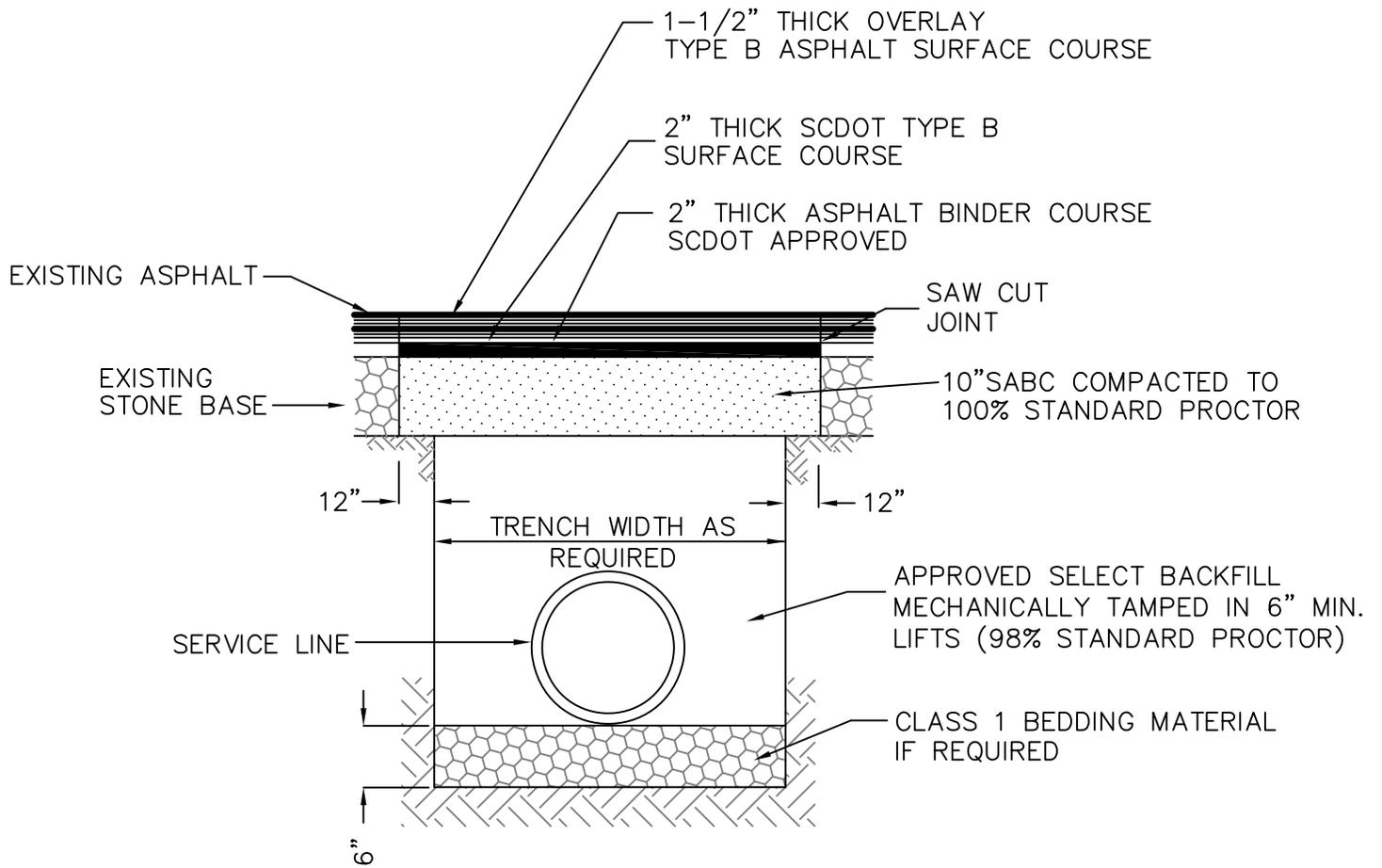
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

DATE:
2/25/14

SHEET NO.
R-7A





MEDIUM DUTY PAVEMENT REPAIR
WITHIN SCDOT R/W

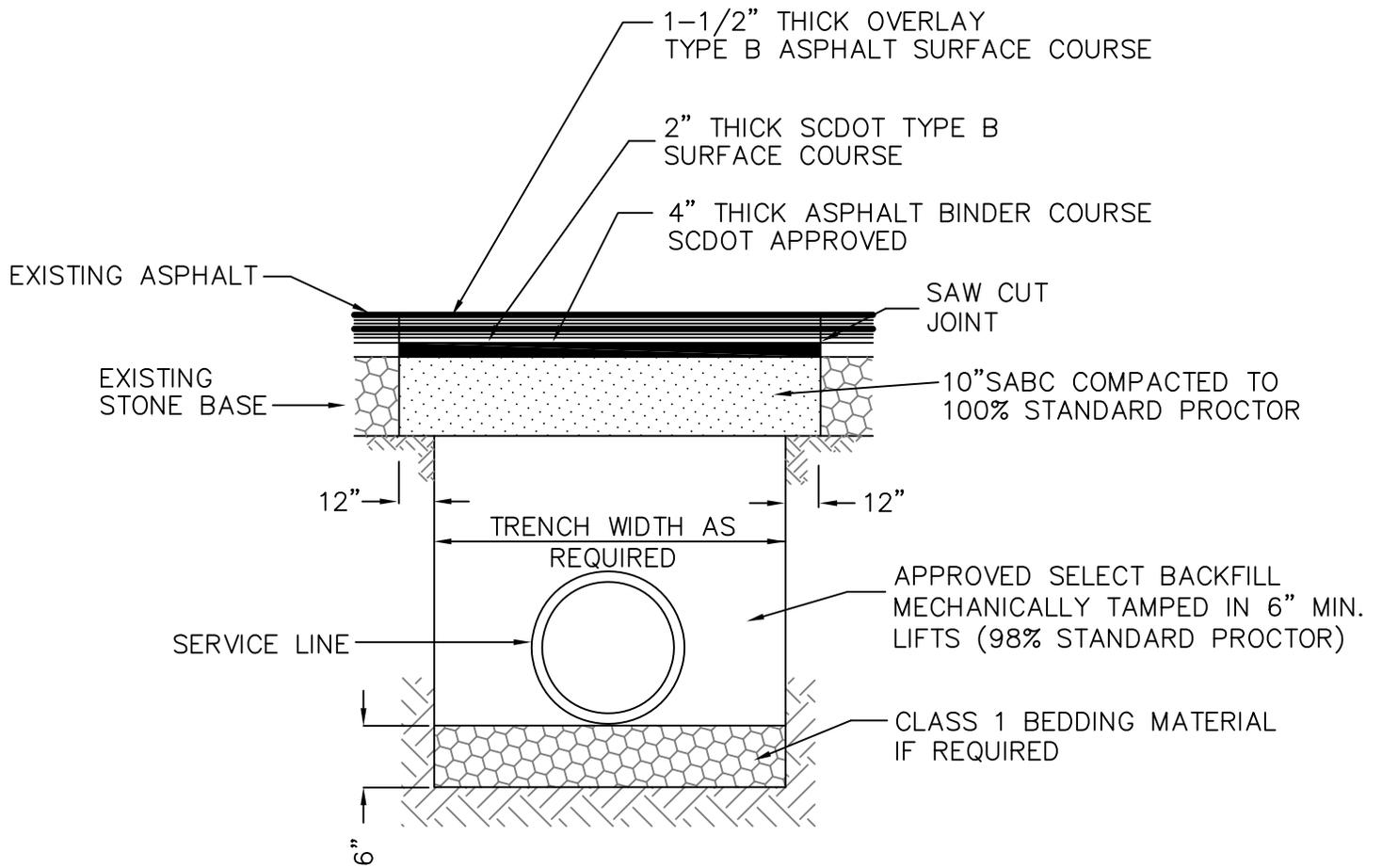
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DATE:
08/19/09

SHEET NO.
R-7B





HEAVY DUTY PAVEMENT REPAIR
WITHIN SCDOT R/W

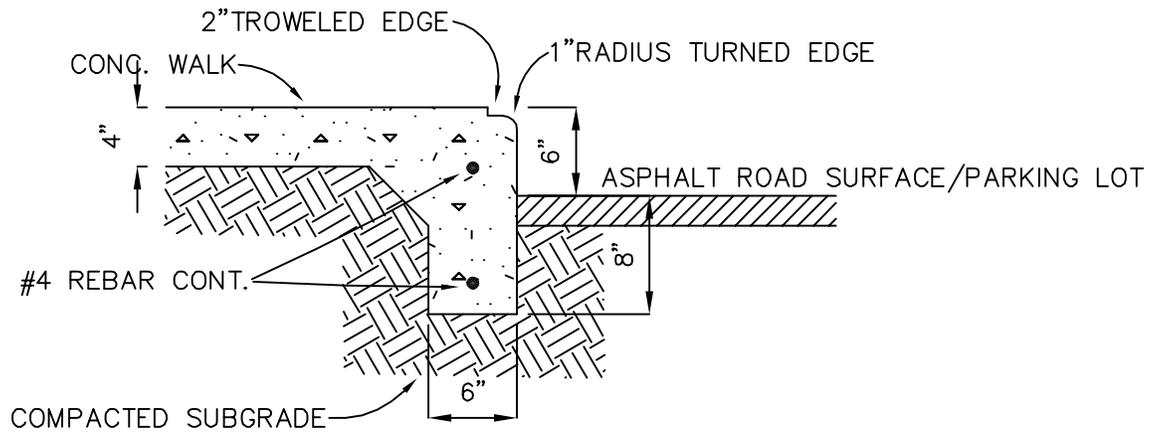
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DRAWN BY: HRT

DATE:
08/19/09

SHEET NO.
R-7C





TURNED DOWN CURB

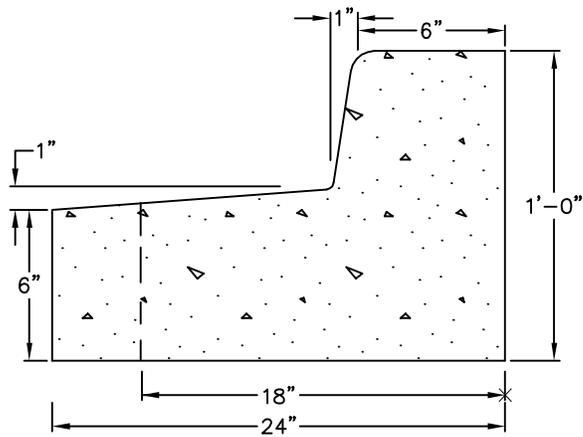
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ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
R-8





18" OR 24"
EXPULSION TYPE CURB SECTION

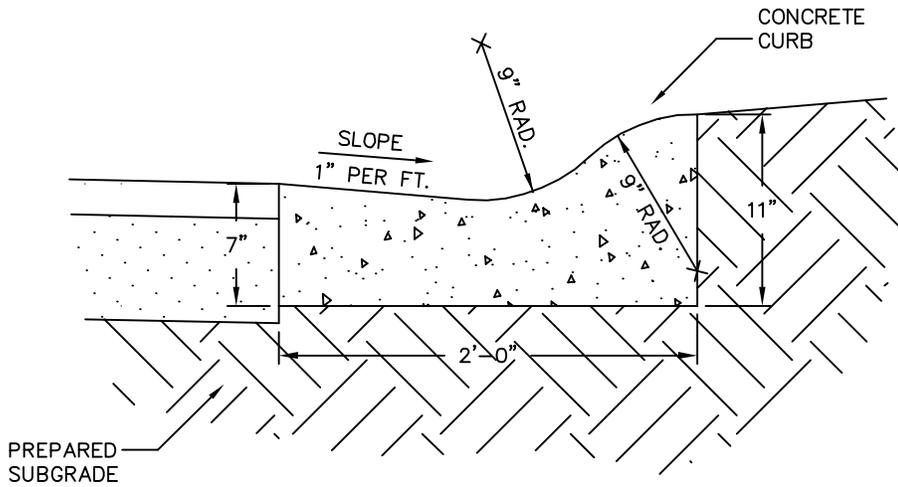
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ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
R-9





24" CONCRETE ROLL CURB

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

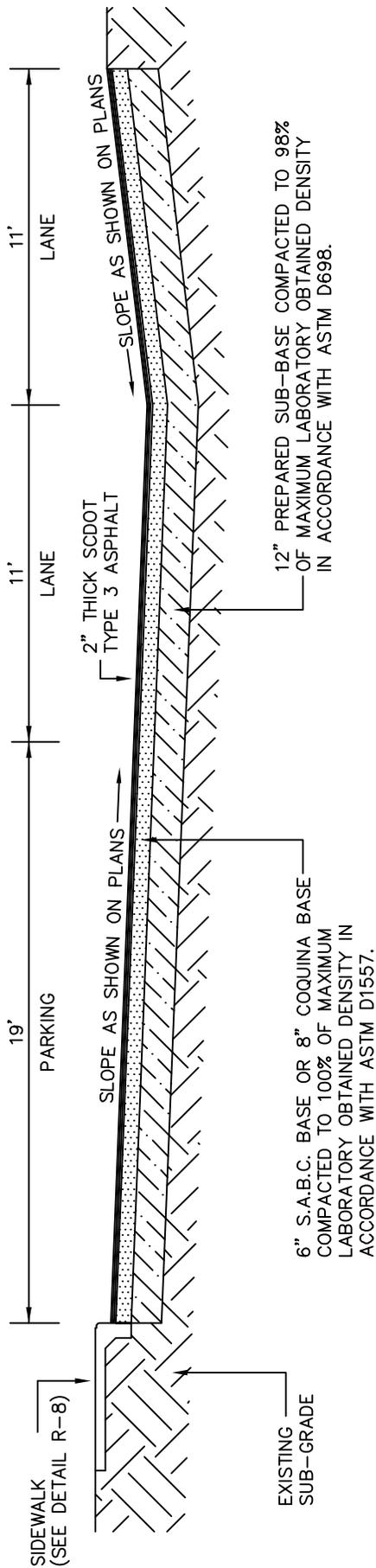
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10/23/03

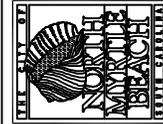
SHEET NO.
R-10



NOTE:
 IN AREA OF DOUBLE LOADED PARKING
 THERE SHALL BE A 1.00% CROSS SLOPE
 FROM CENTER LINE TO FACE OF SIDEWALK
 OR EDGE OF PAVEMENT.



NOTE: LONGITUDINAL SLOPE SHALL BE AS SHOWN
 ON GRADING AND DRAINAGE PLAN.

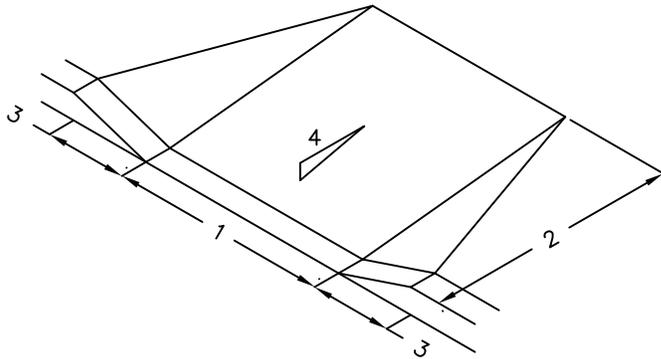


DATE: 10/23/03
 SHEET NO. R-11

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KDB
 DRAWN BY: KJG

TYP. PARKING LOT CROSS SECTION

1. RAMP WIDTH: 48" MINIMUM
2. RAMP LENGTH: 72" FOR 6" CURB RISE
3. FLARED SIDE: 18" MINIMUM
4. FLARED SIDE: 18" MINIMUM
5. DETECTABLE WARNING DEVICES SHALL BE INSTALLED PER SCDOT SPECIFICATIONS



FLARED TYPE
HANDICAPPED RAMP

CITY OF N. MYRTLE BEACH
ENGINEERING DIVISION

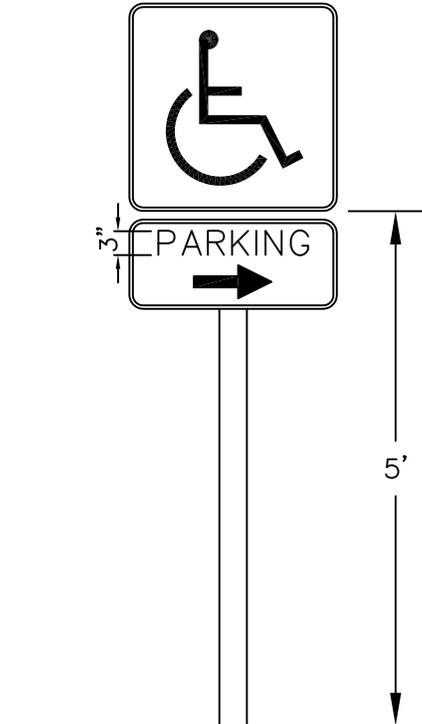
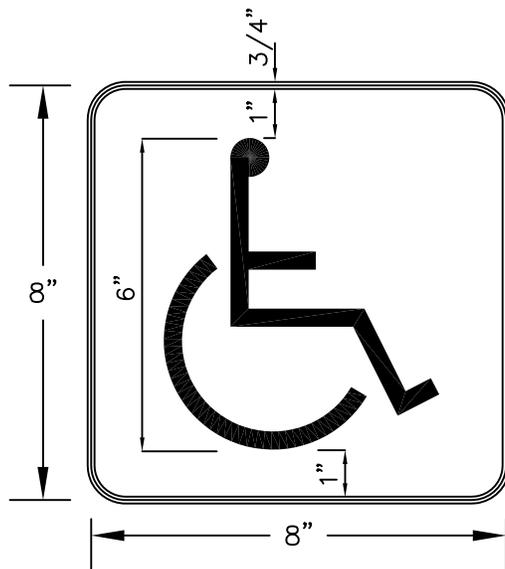
APPROVED BY: KB
DRAWN BY: TED

DATE:
02/24/14

SHEET NO.

R-12





COLOR: WHITE (REFLECTIVE) ON BLUE BACKGROUND, OR
WITHOUT BORDER, BLUE ON WHITE BACKGROUND.

LOCATION: HANDICAPPED PARKING SIGNS SHALL BE
LOCATED 4 FT. ON CENTER FROM THE WHEEL STOP.

HANDICAP PARKING SIGN

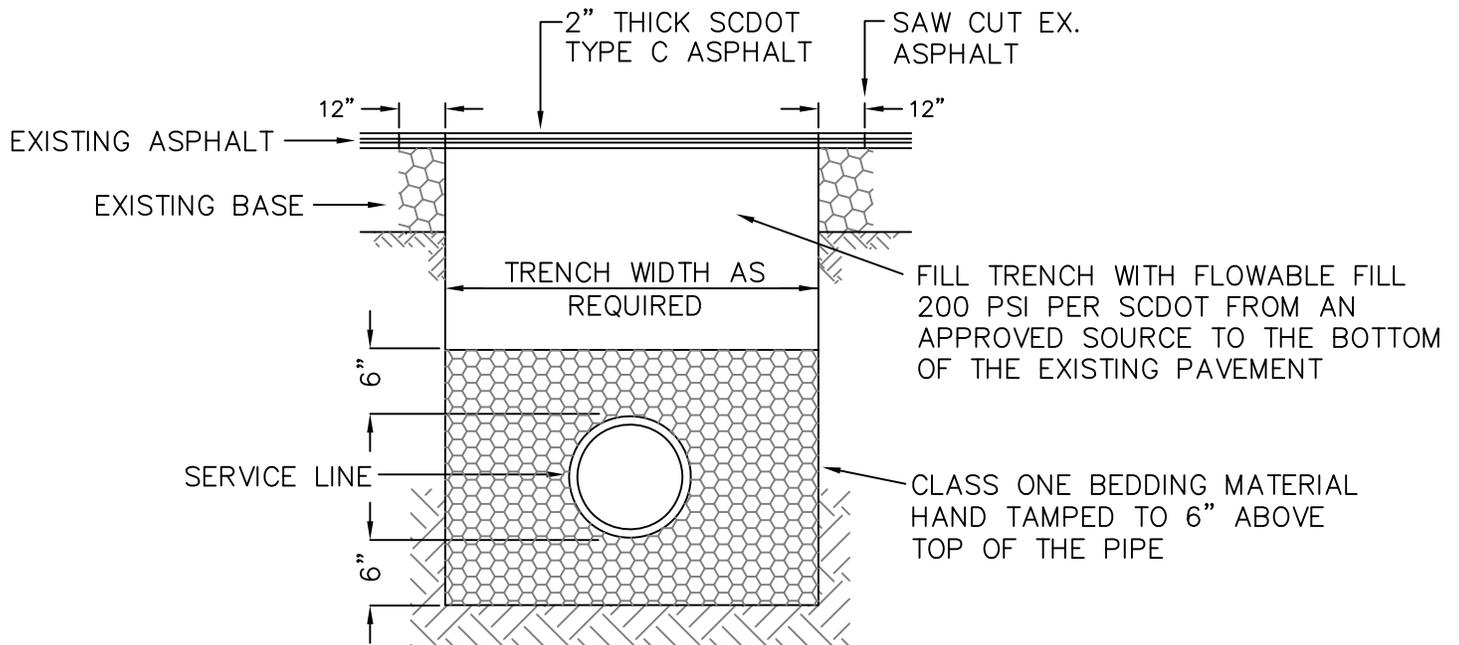
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
2/14/08

SHEET NO.
R-13





NOTES:

1. FLOWABLE FILL MAY BE USED AS A TEMPORARY RIDING SURFACE IF A PERMANENT TOP SECTION IS TO BE PAVED AT A LATER DATE.
2. PROTECT FLOWABLE FILL IN TRENCH UNTIL IT HAS SETUP SUFFICIENTLY TO SUPPORT TRAFFIC (USUALLY 8 TO 12 HOURS DEPENDING ON CONDITIONS) USE STEEL ROAD PLATES TO BRIDGE OVER THE TRENCH IF TRAFFIC MUST BE ALLOWED ON THE TRENCH BEFORE THE FLOWABLE FILL HAS SETUP ADEQUATELY.

SECONDARY ROAD
FLOWABLE FILL
PAVEMENT REPAIR

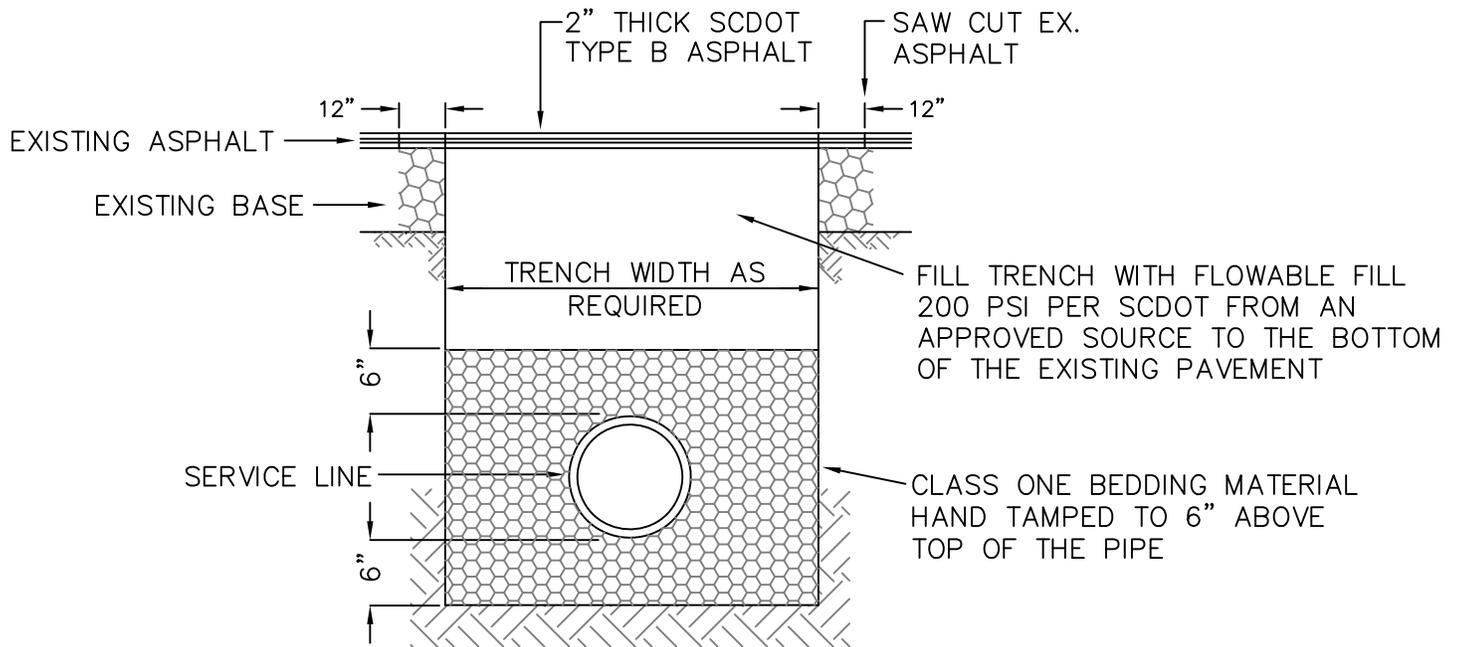
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
08/19/09

SHEET NO.
R-14





NOTES:

1. FLOWABLE FILL MAY BE USED AS A TEMPORARY RIDING SURFACE IF A PERMANENT TOP SECTION IS TO BE PAVED AT A LATER DATE.
2. PROTECT FLOWABLE FILL IN TRENCH UNTIL IT HAS SETUP SUFFICIENTLY TO SUPPORT TRAFFIC (USUALLY 8 TO 12 HOURS DEPENDING ON CONDITIONS) USE STEEL ROAD PLATES TO BRIDGE OVER THE TRENCH IF TRAFFIC MUST BE ALLOWED ON THE TRENCH BEFORE THE FLOWABLE FILL HAS SETUP ADEQUATELY.

PRIMARY ROAD
FLOWABLE FILL
PAVEMENT REPAIR

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

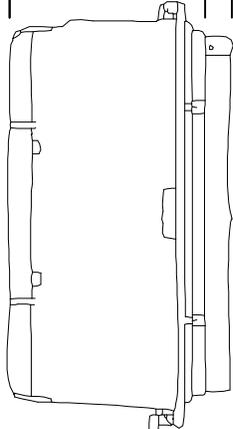
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DRAWN BY: HRT

DATE:
08/19/09

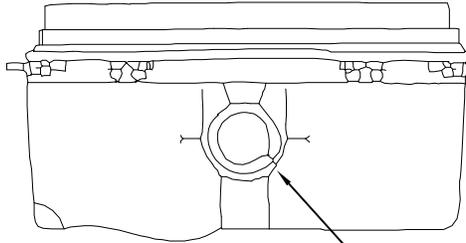
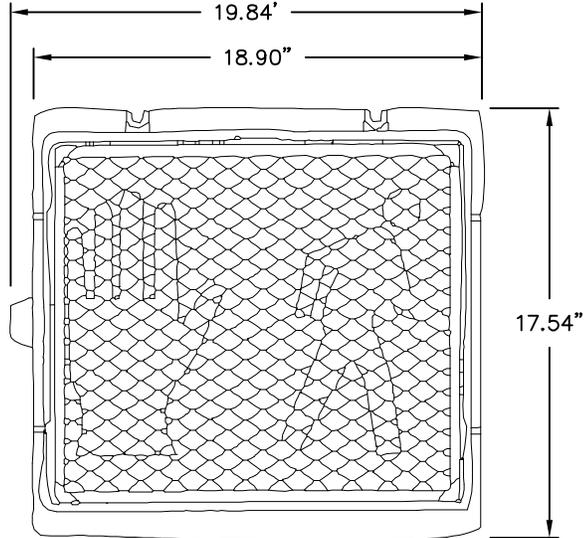
SHEET NO.
R-14A



9.31"
8.25"



SWING DOWN DOOR
WITH SUNSCREEN VISOR



2" OPENING W/SHURLOCK

PEDESTRIAN SIGNAL

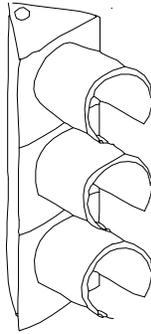
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DRAWN BY: KJG

DATE:
10/23/03

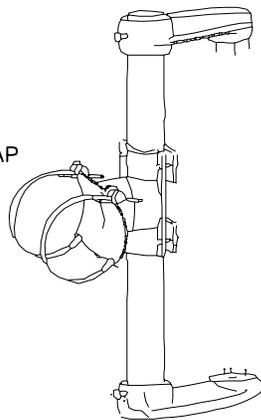
SHEET NO.
R-15





SIGNAL HEAD

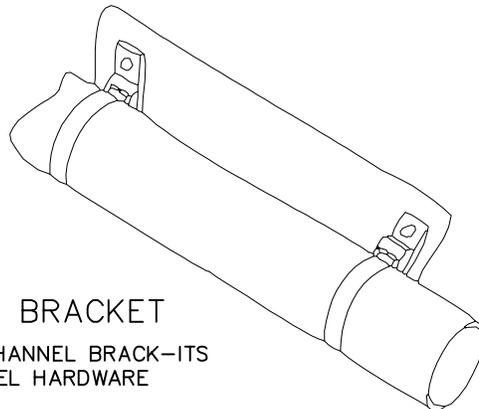
SIGNAL HEAD MOUNTING BRACKET
ALUMINUM TUBE WITH STAINLESS STEEL HARDWARE



STAINLESS STEEL STRAP

NOTES:

SIGNAL CABLE SHALL BE SPLICE-FREE.
CONNECTIONS SHALL BE MADE AT SIGNAL
HEAD TERMINAL STRIPS.
BRACKETS TO BE FINISHED (PAINTED) TO
MATCH THE POLE/ARM.
RIGID MOUNTING IS REQUIRED.



SIGN MOUNTING BRACKET
BANDED-ON ALUMINUM CHANNEL BRACK-ITS
WITH STAINLESS STEEL HARDWARE

MAST ARM MOUNTING HARDWARE

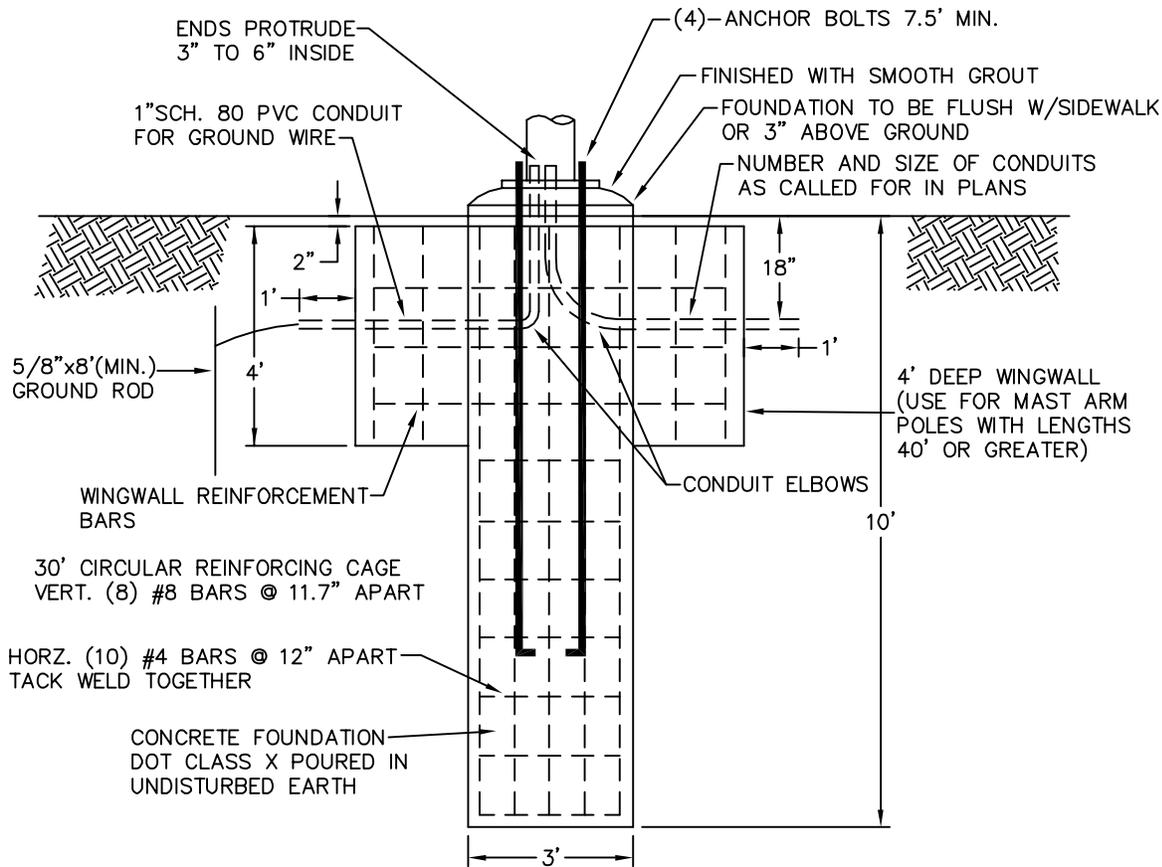
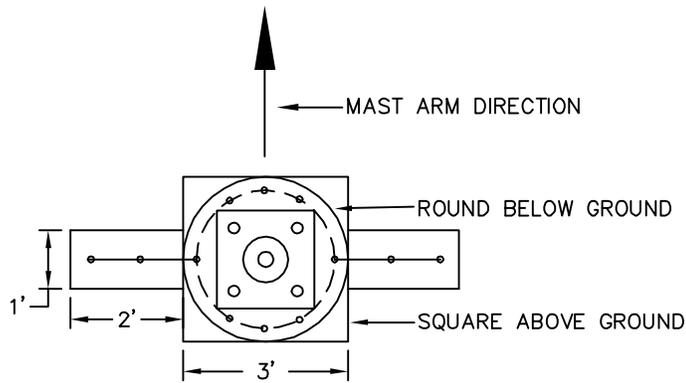
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
R-16





NOTES:

1. WING WALL SHALL HAVE VERTICAL #8 BARS AT 11.7" APART AND HORIZONTAL #4 BARS AT 12" APART.
2. TWIN MAST ARM FOUNDATIONS SHALL BE 48"x12' WITH WING WALLS.

MAST ARM POLE
CONCRETE FOUNDATION

CITY OF NORTH MYRTLE BEACH
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10/23/03

SHEET NO.
R-17





DATE:
10/23/03

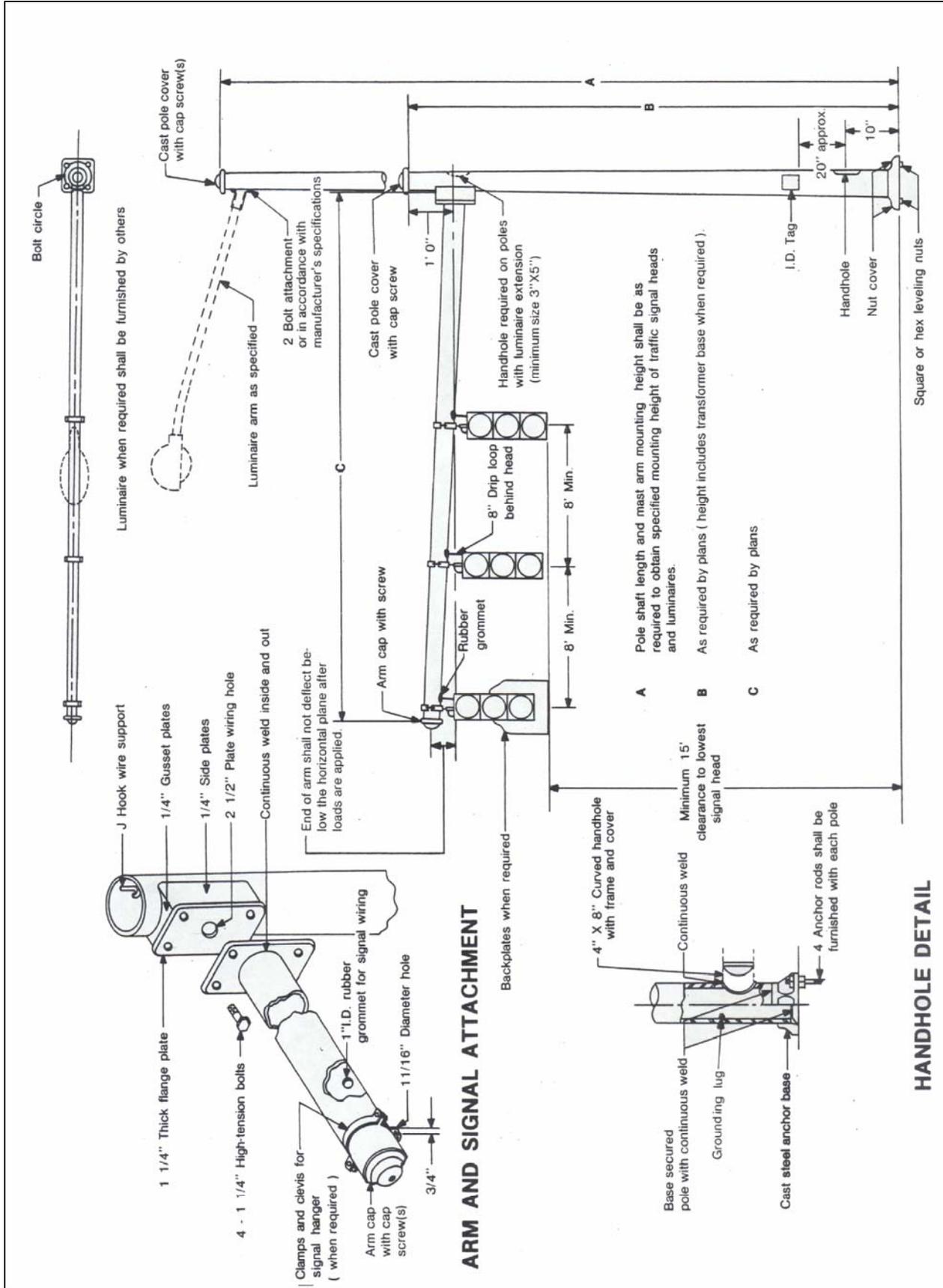
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R-18

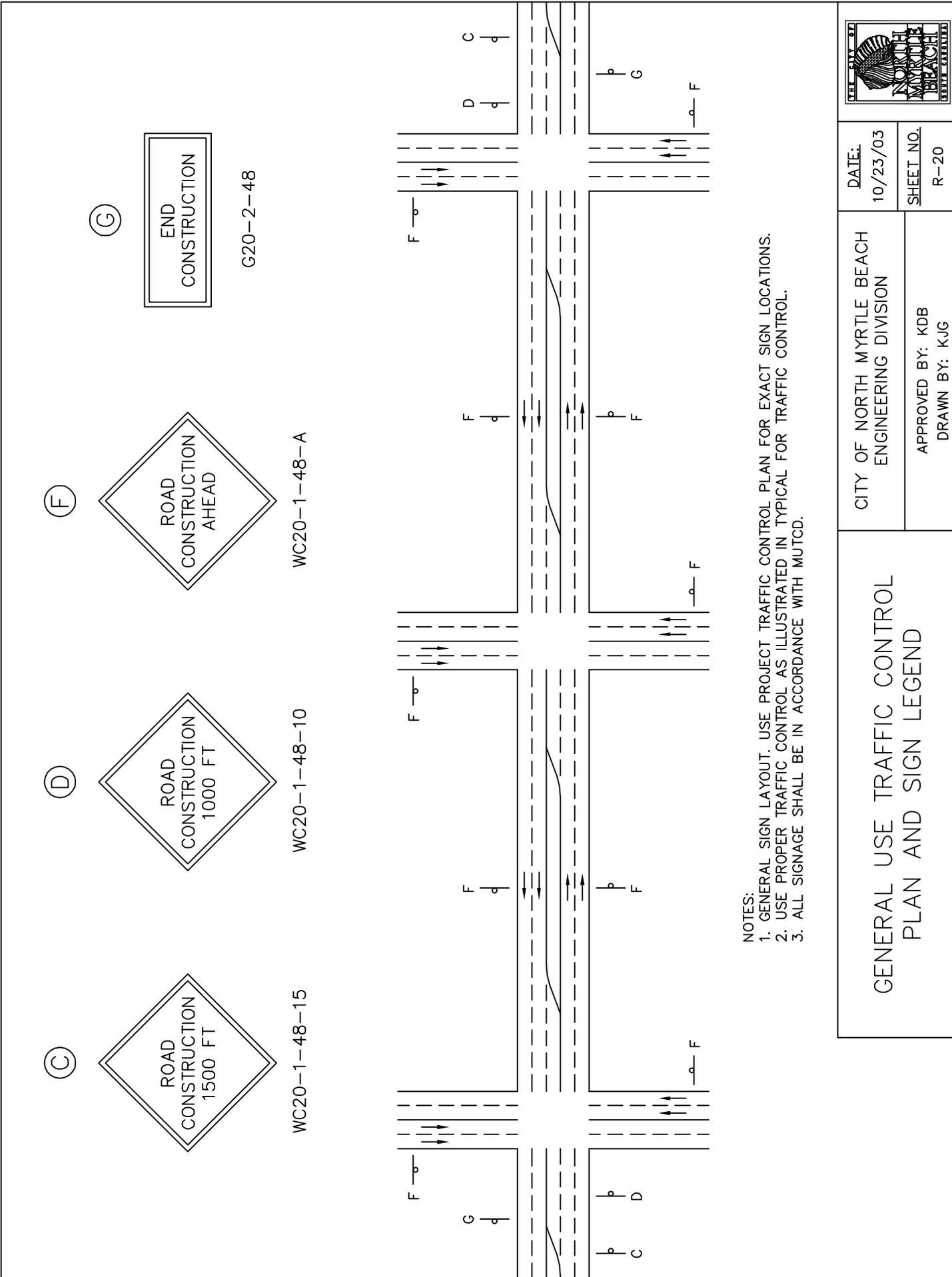
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DRAWN BY: KJG

GALVANIZED STEEL SIGNAL POLE
WITH MAST ARM

HANDHOLE DETAIL





R-20.DWG

- NOTES:
1. GENERAL SIGN LAYOUT. USE PROJECT TRAFFIC CONTROL PLAN FOR EXACT SIGN LOCATIONS.
 2. USE PROPER TRAFFIC CONTROL AS ILLUSTRATED IN TYPICAL FOR TRAFFIC CONTROL.
 3. ALL SIGNAGE SHALL BE IN ACCORDANCE WITH MUTCD.

	DATE:	10/23/03
	SHEET NO.:	R-20
CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION		APPROVED BY: KDB DRAWN BY: KJG
GENERAL USE TRAFFIC CONTROL PLAN AND SIGN LEGEND		

SYMBOL LEGEND

- CHANNELIZING DEVICES
- DRUMS
- SIGN SUPPORT – SIGN FACE
- DIRECTION OF TRAFFIC

GENERAL NOTES

1. TAPER FORMULAS:

$$L = W*S$$

$$L = W*S*S/60$$

FOR SPEEDS OF 45 MPH OR MORE

FOR SPEEDS OF 40 MPH OR LESS

WHERE: L = MINIMUM LENGTH OF TAPER
S = POSTED SPEED LIMIT (PRIOR TO CONSTRUCTION
OR 85th PERCENTILE TRAFFIC SPEED
W = WIDTH OF OFFSET (FEET)

2. SPACING:

$$D = S$$

IN THE TAPER, THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES, SHOULD BE APPROXIMATELY EQUAL (IN FEET), TO THE SPEED LIMIT (IN MPH).

3. EXTENSION:

CHANNELIZING DEVICES SHALL BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.

4. FLAGS:

FLAGS AND/OR FLASHING WARNING LIGHTS SHALL BE USED TO CALL ATTENTION TO EARLY WARNING SIGNS.

5. FLAGGER:

THE FLAGGER SHALL ONLY USE THE "STOP/SLOW" PADDLE. (A FLAG IS NOT ACCEPTABLE).

6. LIGHTS:

AT NIGHT, FLOODLIGHTS SHALL BE USED TO MARK FLAGGER STATIONS.

7. LIGHT:

AT NIGHT, FLOODLIGHTS SHALL BE USED TO MARK CHANNELIZING DEVICES (FLASHING OR STEADY BURN).

TRAFFIC CONTROL GENERAL
NOTES AND SYMBOL LEGEND

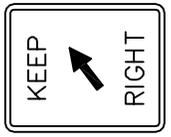
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
R-21

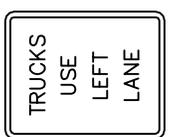




R-4-7b
24" x 30"



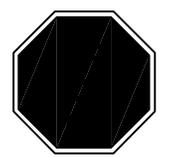
R-2-1
24" x 30"



R-4-5
24" x 30"

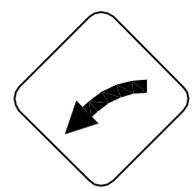
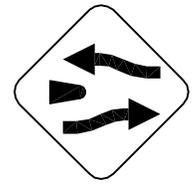
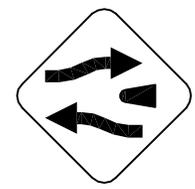
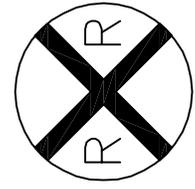


R-1-2
36" x 36" x 36"



R-1-1
30" x 30"

REGULATORY SIGNS



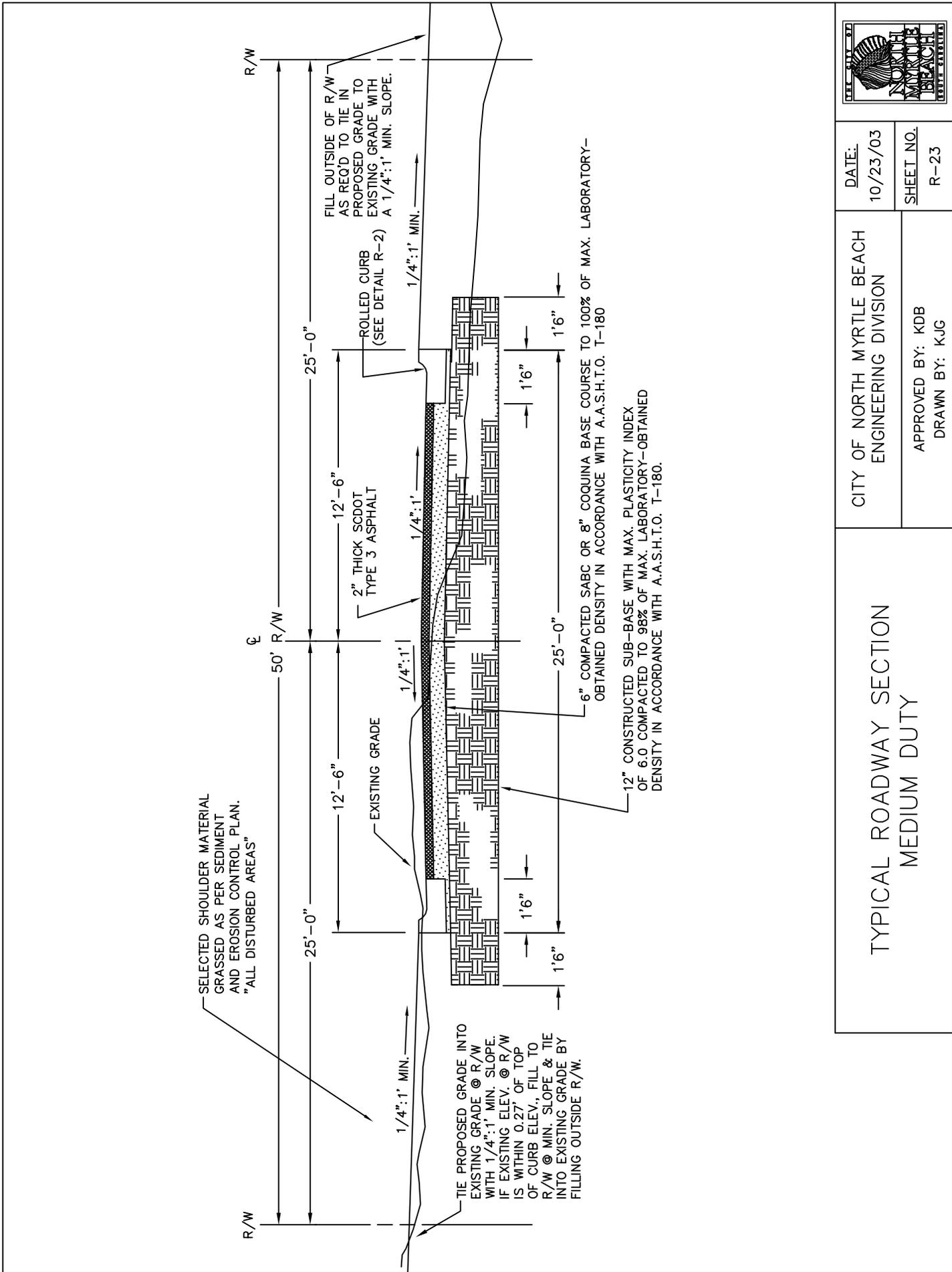
WARNING SIGNS



DATE:
10/23/03
SHEET NO.
R-22

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION
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DRAWN BY: KJG

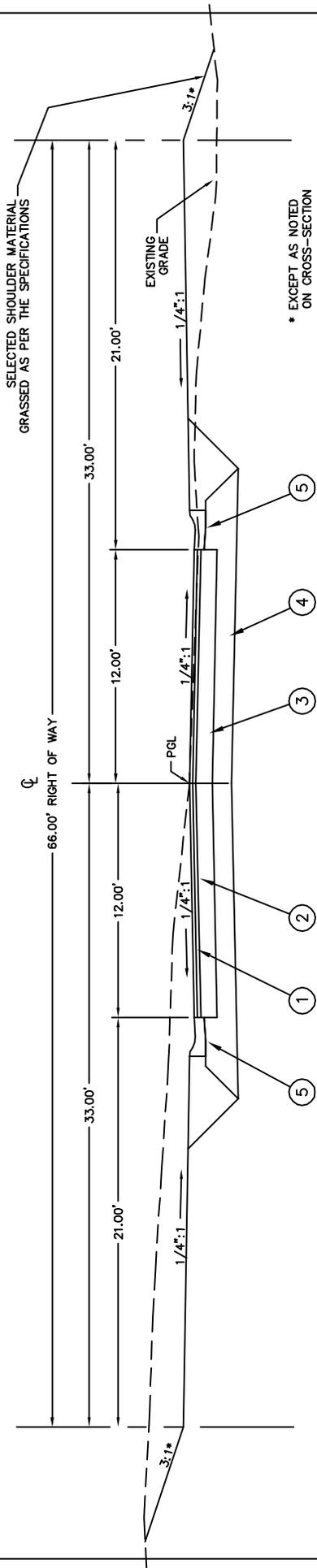
TRAFFIC CONTROL SIGNS



DATE: 10/23/03
SHEET NO. R-23

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION
APPROVED BY: KDB
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TYPICAL ROADWAY SECTION
MEDIUM DUTY



MATERIALS LEGEND	
①	PROPOSED 2" ASPHALT CONCRETE SURFACE COURSE, TYPE 1C
②	PROPOSED 2" ASPHALT CONCRETE BINDER COURSE, TYPE 1
③	PROPOSED 10" STABILIZED AGGREGATE BASE COURSE COMPACTED TO 100% OF MAXIMUM LABORATORY-OBTAINED DENSITY IN ACCORDANCE WITH ASTM D 1557
④	PROPOSED 12" CONSTRUCTED SUB-BASE WITH MAXIMUM PLASTICITY INDEX OF 6.0, COMPACTED TO 98% OF MAX. LABORATORY-OBTAINED DENSITY IN ACCORDANCE WITH ASTM D 698
⑤	PROPOSED 24" OGEE CONCRETE CURB & GUTTER(DETAIL R-10)

TYPICAL ROADWAY SECTION
HEAVY DUTY

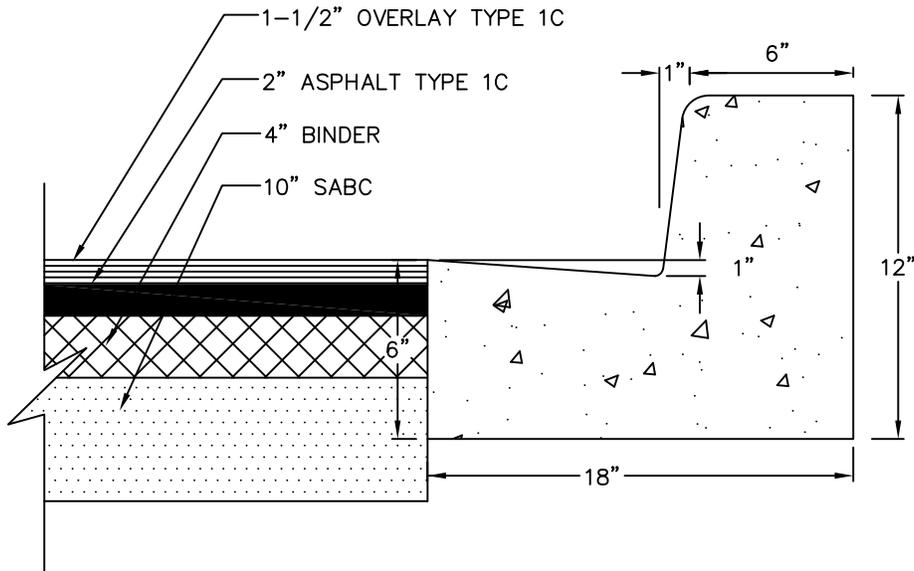
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
10/23/03



SHEET NO.
R-24

APPROVED BY: KDB
DRAWN BY: KJG



18" OR 24"
CONCRETE BARRIER CURB

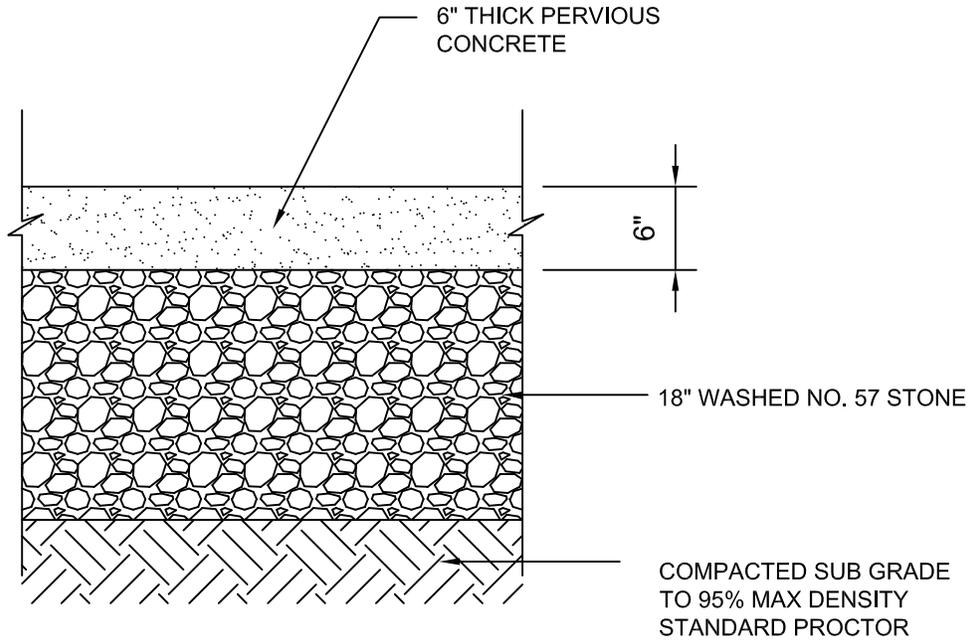
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
10/23/03

APPROVED BY: KDB
DRAWN BY: KJG

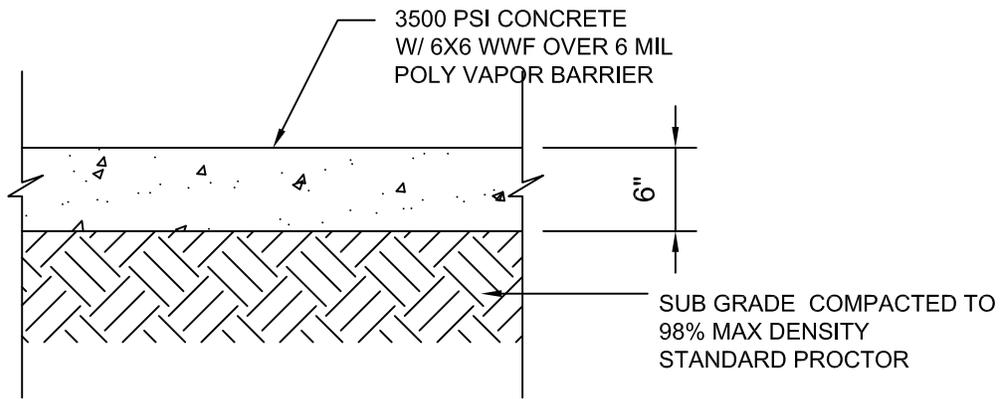
SHEET NO.
R-25





PERVIOUS PAVEMENT SECTION

NTS



IMPERVIOUS PAVEMENT SECTION

NTS

PERVIOUS PAVEMENT
IMPERVIOUS PAVEMENT

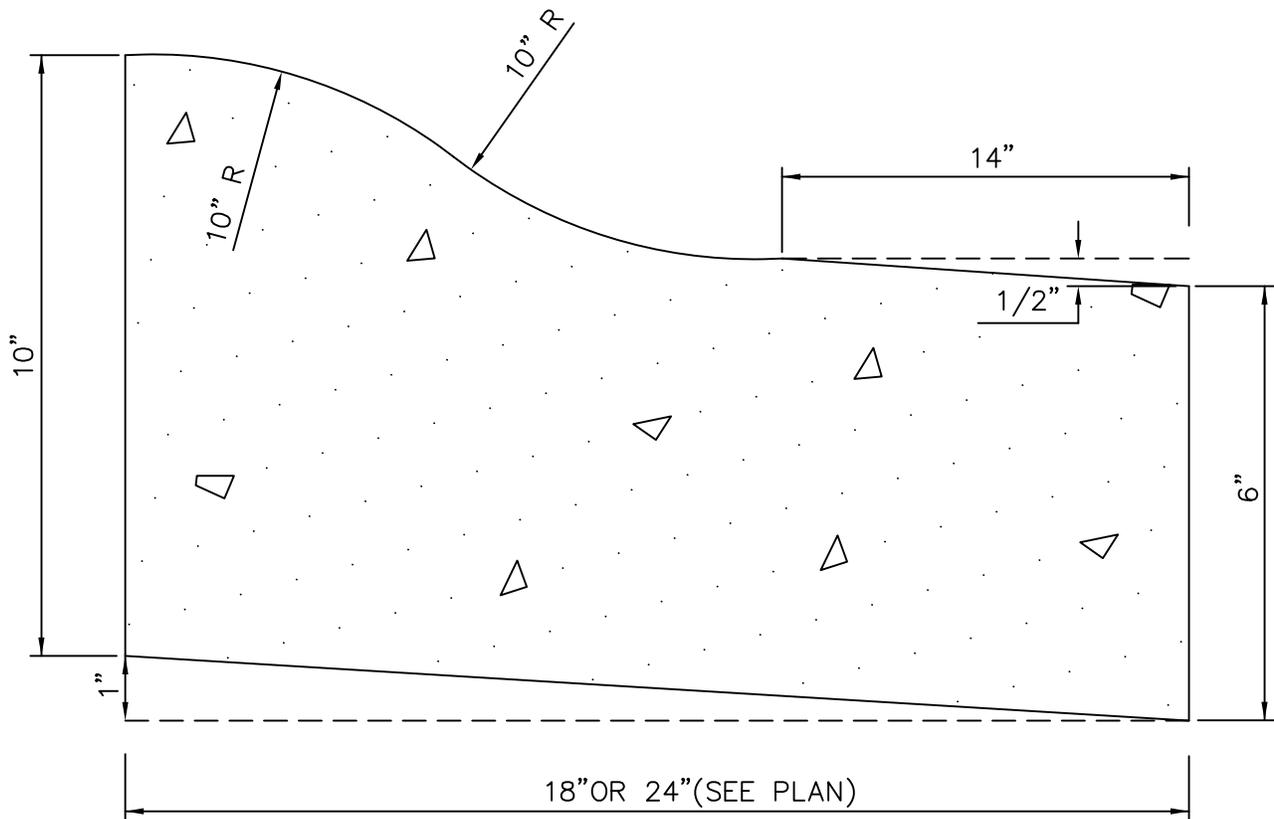
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

DATE:
11/9/09

SHEET NO.
R-26





18" OR 24" EXPULSION
CONCRETE ROLL CURB

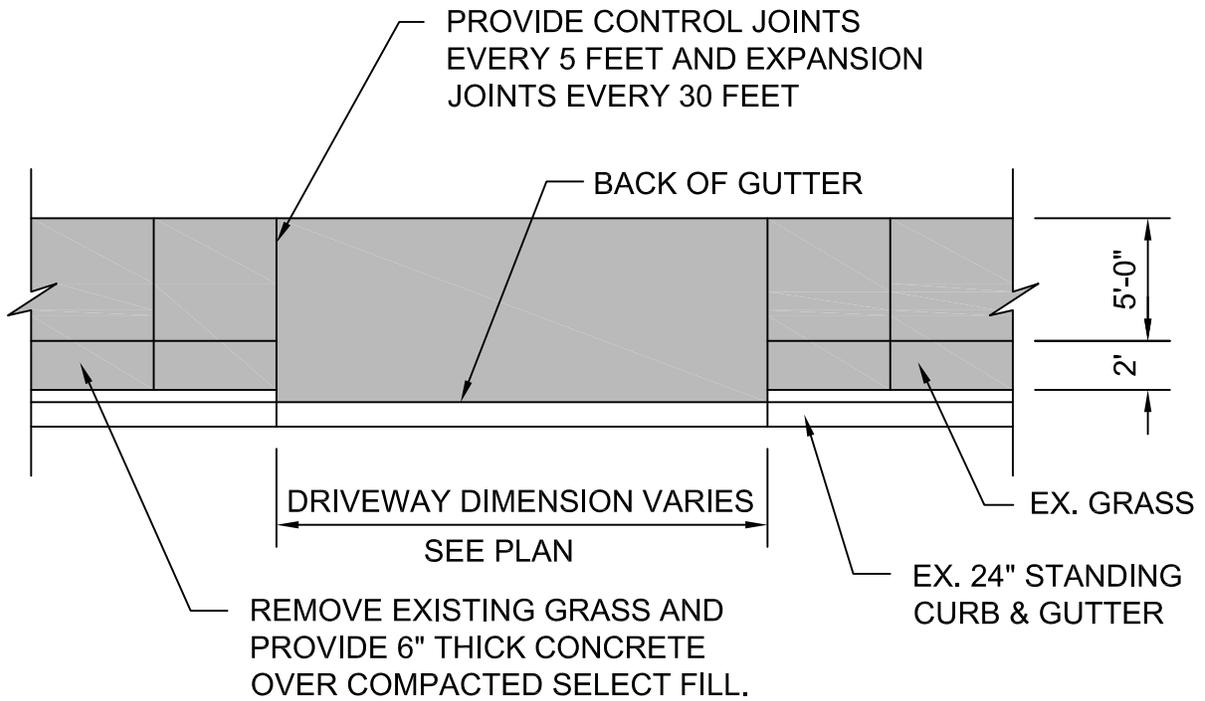
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

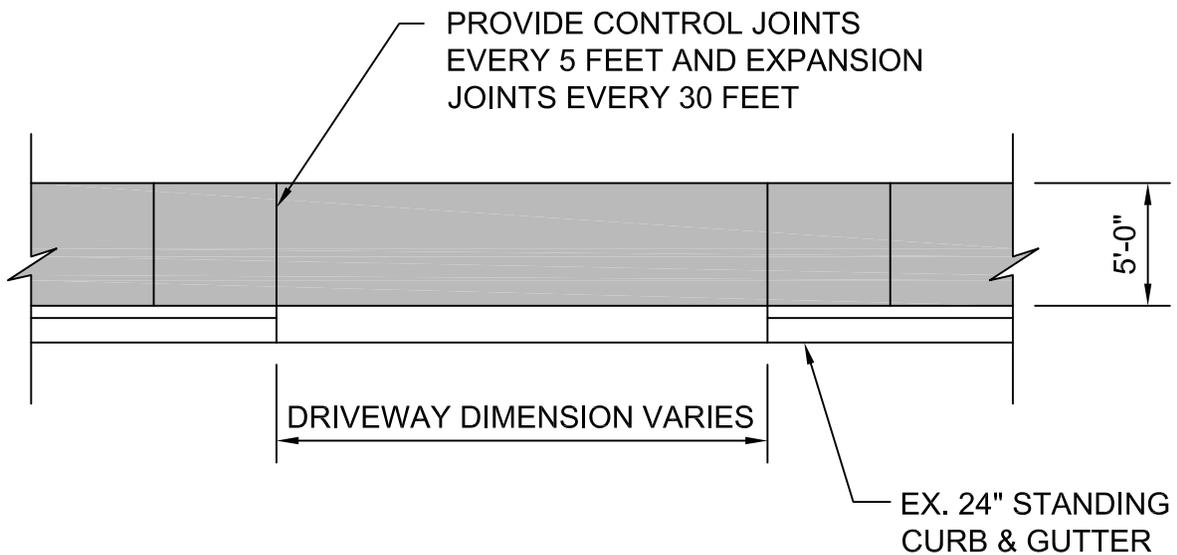
DATE:
2/8/11

SHEET NO.
R-27





LIMITS OF CONCRETE PAVING AT GRASS STRIP DRIVEWAY



LIMITS OF CONCRETE PAVING AT CURB AND GUTTER

CONCRETE SIDEWALK &
DRIVEWAY DETAIL

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
7/29/10

APPROVED BY: KDB
DRAWN BY: HRT

SHEET NO.
R-28



SECTION 02500

STORM DRAINAGE SYSTEMS

GENERAL

1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Catch basins, junction boxes and drop inlets.

1.02 RELATED SECTIONS

- A. Section 01500 - Construction Facilities and Temporary Controls
- B. Section 02100 - Excavation
- C. Section 02200 - Backfilling.
- D. Section 02300 - Trenching.
- E. Section 03250 - Concrete.
- F. Section 03500 – Pre-cast Concrete Structures

1.03 REFERENCES - The publications listed below form a part of this specification to the extent referenced.

- A. AASHTO M252 - 1990 (® 1992) Corrugated Polyethylene Drainage Tubing.
- B. AASHTO M294 - 1990 (R1992) Corrugated Polyethylene Pipe, 12" to 36" Diameter.
- C. ACPA 01-102 - 1998 Concrete Pipe Handbook.
- D. ACPA 01-103 - 1990 Concrete Pipe Installation Manual.
- E. ASTM A 497 - 1990 (Rev. B) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
- F. ASTM C 32 - 1991 Sewer and Manhole Brick (Made from Clay or Shale).
- G. ASTM C 76 - 1990 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- H. ASTM C 139 - 1973 (® 1989) Concrete Masonry Units for Construction of Catch Basins and Manholes

- I. ASTM C 150 - 1992 Portland Cement
- J. ASTM C 270 - 1992 (Rev. A) Mortar for Masonry
- K. ASTM C 478 - 1990 (Rev. B) Precast Reinforced Concrete Manhole Sections
- L. ASTM C 923 - Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- M. SCDOT SS - South Carolina Highway Department Standard Specifications, 1986 Edition.

1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the work of this section.

1.05 SUBMITTALS

- A. Submit product data and shop drawings for pipe, fittings, catch basins, junction boxes and accessories as specified in Section 00800.

1.06 DELIVERY AND STORAGE

- A. Inspect pipe materials delivered to site for damage; store with minimum of handling. Store plastic piping and jointing materials and rubber gaskets under cover and out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
- B. Check metal items upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.07 HANDLING

- A. Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care not to damage coating on pipe and fittings; if damaged, make repairs or replace as directed. Carry, do not drag pipe to trench.

PRODUCTS

2.01 MANUFACTURERS

- A. Hancor, Inc.
- B. Contech

- C. Advance Drainage Systems, Inc.
- D. Mid-Atlantic
- E. Sumter Machinery Company, Inc. - Standard Manhole Frames and Covers
- F. Knights Precast
- G. Substitutions - Under the provisions of Section 00800

2.02 GENERAL

- A. Intermixing of different types of pipe will not be permitted unless specified on the drawings or by approved written permission of the Engineer. If approved, all pipe changes shall occur at manholes, junction boxes or other approved structure.
- B. All pipe shall be of first quality with smooth interior and corrugated exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length.
- C. All pipe shall be subject to the inspection of the Engineer at the pipe plant, trench, or point of delivery, for purposes of culling and rejecting pipe (independent of laboratory tests), which does not conform to the requirements of these specifications. Such pipe shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.
- D. Gravity lines 36 inches in diameter and larger shall be reinforced concrete pipe.
- E. All pipe installed beneath roadway pavement shall be reinforced concrete pipe.

2.03 DRAINAGE PIPE MATERIALS

- A. Reinforced Concrete Pipe: ANSI/ASTM C76, Class III, unless otherwise shown on drawings, with mesh reinforcement and inside nominal diameter as shown on plans. Install with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M 198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.
- B. Plastic Piping: Corrugated, high density polyethylene pipe (HDPE) conforming to AASHTO M252 or AASHTO M294, Type S. The joint shall be bell and spigot design and shall include a rubber gasket conforming to ASTM F 477. Pipe shall have a smooth interior.
- C. Construction Fabric Pipe Wrap: Highly water permeable, needle punched, non-woven fabrics with random, three dimensional pore structure. (MIN 3 oz/yd²).

2.04 DRAINAGE STRUCTURES

- A. Construct of clay brick, solid concrete masonry units or provide pre-cast concrete

structures. Pipe-to-wall connections shall be mortared to produce smooth transitions and watertight joints. Provide a 4-inch layer of clean gravel bedding with a maximum size of 1.5 inches.

- B. Pre-cast Concrete Structures: ASTM C 478, except as specified herein. Provide an air content of 6 percent, plus or minus 2 percent and a minimum wall thickness of 5 inches. ASTM A 615/A 615 M reinforcing bars. ASTM A 497 welded wire fabric.
- C. Masonry Materials
 - 1. Brick: ASTM C 32, Grade MS, or ASTM C 62, Grade SW, except that the absorption test will be waived.
 - 2. Concrete Masonry Units: ASTM C 139
 - 3. Mortar: ASTM C 270, Type M.
 - 4. Water: Water for masonry mortar shall be fresh, clean, potable.
 - 5. Grout: ASTM C 476.

2.05 FRAMES, COVERS AND GRATINGS

- A. ASTM A 48, Class 30 gray cast iron designed for 25,000 lb wheel load.
 - 1. Grate Type Inlet: Frame and Grate; 24 inch by 36 inch with a minimum inlet flow of 10 cubic feet per second with an unobstructed opening area.
 - 2. Junction Box: 24 inch diameter Cast Iron Ring and Cover.

2.06 FLARED ENDS

Flared end sections shall be the same material as pipe material except that only reinforced concrete flared ends shall be provided for concrete pipe. Flared ends are included in the lengths of pipe indicated.

2.07 EROSION CONTROL RIP-RAP

Provide non-erodible rock not exceeding 15 inches in its greatest dimension and choked with sufficient small rocks to provide a dense mass with a minimum thickness as indicated.

2.08 BACKFILL MATERIALS

- A. Reused or imported acceptable native materials as specified in Section 02200 and approved by the Engineer.

- B. Type B for any pipe crossing beneath roadways as specified in Section 02200.
- C. Type C shall be utilized in areas of poor soil conditions as directed by the Engineer as specified in Section 02200.

EXECUTION

3.01 GENERAL

- A. The Contractor shall furnish all material and labor, and construct the storm sewers shown on the drawings, including all clearing, grubbing, excavating, sheathing, backfilling, foundations, catch basins, junction boxes, manholes and other appurtenances.
- B. The work shall include all dewatering, ditching, pumping, bailing, draining, flushing, testing, and all provisions necessary to project and maintain buildings, fences, water and sewer pipes, power and telephone lines, cables, and other structures.
- C. The Contractor shall be responsible for the cleaning away of all rubbish and surplus materials upon completion of the work required to build and put in complete working order the specified storm sewer and all structures appertaining thereto.
- D. All storm sewers and appurtenances shall be protected from foreign debris during construction and cleared of all foreign debris after construction has been completed.

3.02 ORDER OF WORK

- A. The Owner reserves the right to direct the contractor as to which portions of work should be constructed first, and upon order of the Engineer, to verify that any complete portion of work is as specified and acceptable for service.

3.03 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

- A. The Contractor shall fully adhere to the State Highway Department Encroachment Permit while operating in any state right-of-way and all construction techniques shall comply with the current edition of the State Highway Department Standard Specifications and Traffic Control Manual.
- B. Through traffic shall be maintained at all times during construction of sewer across all streets and highways. If the open cut method is used, two separate cuts must be made and one lane of traffic must be open at all times.
- C. The Contractor shall obtain, by agreement with property owner, any additional space required for construction on private property at no cost to the Owner of the project.

3.04 EXISTING UTILITIES AND STRUCTURES

- A. Any existing utilities, structures, monuments, etc. damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.
- B. The approximate location of existing underground utility lines are shown on the drawings for information only.
- C. The Contractor shall be responsible for having all underground utilities located by the appropriate party. Seventy-two (72) hour notice is required for utility locations.

3.05 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.
- B. Remove large stones or other hard material, which could damage drainage tile or impede consistent backfilling or compaction.

3.06 INSTALLATION - PIPE

- A. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.
- B. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.
- C. Storm drainage pipe and appurtenant structures shall be installed in accordance with Section 02300 - Trenching and Section 02200 - Backfilling.
- D. All pipe shall be laid with the bells uphill.
- E. Clean the pipe ends before the joint is made.
- F. Backfill shall be done so as not to disturb the joints.
- G. In all locations where storm water drainage pipe crosses beneath roadways, select granular fill shall be used to backfill above the pipe.
- H. When completed, each pipeline shall show a neat circular bore when lamped.
- I. For perforated pipe with gravel backfill, place an approved construction fabric in the excavated trench. Place a bed of Class 1 gravel on the fabric to the depth as shown on the plans. Install perforated pipe on the gravel bed and backfill over the pipe with Class 1 gravel to the desired grade. Overlap filter cloth across the gravel to finish the trench. Backfill with approved native soil to finish grade.

3.07 INSTALLATION - CATCH BASINS, DROP INLETS AND JUNCTION BOXES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad with provision for storm sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.
- E. Inverts shall be smooth with uniform slopes from invert to invert.
- F. Brick structures shall have every fifth course of brick laid as headers. Other courses shall be stretchers.
- G. All mortar joints shall be full.
- H. Inside mortar joints shall be rubbed full and struck.
- I. The outside of the brick work shall be covered with 0.5 inches of mortar.

3.08 INSPECTION

- A. All work done and materials furnished shall be subject to the inspection of the Engineer and his Inspector. The Engineer reserves the right to mark rejected materials to distinguish them as such.
- B. All improper work shall be reconstructed at the Contractor's expense.
- C. All materials that do not conform to the requirements of the specifications shall be removed and replaced with approved materials at the Contractor's expense.

3.09 FIELD QUALITY CONTROL

- A. The Engineer will conduct field inspections and witness field test specified in this section. The Contractor shall perform field test and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.
- B. Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line.
- C. Deflection of plastic pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of the pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through Mandrel, or

other deflection measuring device. If the pipeline does not pass the deflection test, remove the pipe that has the excessive deflection, replace with new pipe, and completely retest the pipeline.

3.10 WARRANTY

- A. All work performed under this section shall be guaranteed to be free from defects in material and workmanship for a period of one (1) year from the date of final acceptance of such work by the Owner.
- B. Latent defects arising during this period shall, upon notification by the Owner, be promptly corrected by the Contractor at no additional cost to the Owner.

END OF SECTION

SECTION 02525

PRECAST DRAINAGE STRUCTURES

GENERAL

1.01 SECTION INCLUDES

- A. Round and rectangular Pre-cast Concrete Drainage Structures including Inlet Structure Components, Sub-grade Structure Components, Grates, Covers, and accessories.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation.
- B. Section 02200 - Backfilling.
- C. Section 02300 - Trenching.
- D. Section 02500 - Storm Drainage Systems.

1.03 REFERENCES

- A. Pre-stressed Concrete Institute: Manual for Quality Control for Plants and Production of Pre-cast and Pre-stressed Concrete Products.
- B. National Pre-cast Concrete Association: Quality Control Manual for Pre-cast Concrete Plants.
- C. American Society for testing and Materials:
 - 1. ASTM C478 - Standard Specification for Pre-cast Reinforced Concrete Manhole Sections.
 - 2. ASTM C890 - Standard Practice for Minimum Structural design Loading for Monolithic or Sectional Pre-cast Concrete Water and Wastewater Structures.
 - 3. ASTM C891 - Standard Practice for Installation of Underground Pre-cast Concrete Utility Structures.
 - 4. ASTM C913 - Standard Specification for Pre-cast Concrete Water and Wastewater Structures.
- D. American Association of State Highway and Transportation Officials Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using

Flexible watertight Gaskets (AASHTO M198).

- E. American Concrete Institute: Building Code Requirements for Reinforced Concrete (ACI 318).
- F. Occupational Safety and Health Administration: Standard 1926.704 - Requirements for Pre-cast Concrete.

1.04 SUBMITTALS SHALL BE AS FOLLOWS:

- A. Completed Certificate from this Specification Section sealed by a Registered Professional Engineer on the staff of the Pre-cast Concrete Manufacturer.
- B. Copy of Certificate or Report showing that the Pre-cast Concrete Manufacturer conforms to Article 1.05 of this Specification Section.
- C. Schedule of the Drainage Structure Components to be provided on the project, charting the following:
 - 1. Sheet number where the structure plan and profile are shown.
 - 2. Line number when applicable.
 - 3. Drainage Structure or station number.
 - 4. Invert Elevation of the influent and effluent lines as shown on the plans.
 - 5. Inlet Structure Flowline Elevation as shown on the plans.
 - 6. Total height required from top of base slab to top of structure.
 - 7. Total height of the individual and assembled Drainage Structure Components.
 - 8. Top and bottom elevation of the Drainage Structure as calculated.
 - 9. Manufacturer's Part of Catalogue No. and number required of each component.
 - 10. Each Pipe size, type, and hole size and its distance from top of base slab.
 - 11. Pipe location in degrees clockwise from step centerline on round structures.
 - 12. Pipe location on rectangular structures by wall and intersecting angle relative to wall.
 - 13. Minimum round inside diameter or rectangular inside dimensions required.
- D. Detail of each pre-cast concrete component to be provided, sealed by the Registered Professional Engineer employed by the manufacturer showing or charting the following:
 - 1. Manufacturer's Part No. or Catalogue No.
 - 2. Inside Diameter or dimensions and lay length.
 - 3. Wall thickness and base or top thickness where applicable.
 - 4. Handling Weight and lift hole or insert or loop description and location.
 - 5. Wire Size, Spacing and area provided per vertical foot (when applicable).
 - 6. Reinforcing Bar size and spacing or location.
 - 7. Design loads for all rectangular components and round top slab

- components.
 - 8. Step Locations on round structures.
 - 9. Concrete design strength and Manufacturer's mix number.
 - 10. Height, width, slope and annular space of the tongue & groove for products requiring tongue and groove joints.
- E. Step Detail and Material Specifications.
- F. Joint Material Detail, material Specifications and calculations showing that the joint material cross section is greater than the joint's annular space times its height.
- G. Lifting Device and Hole Detail including design loads.
- H. Flow capacity of the assembled Inlet Structure Components using orifice flow, a discharge coefficient of 0.6, and the conditions shown in Article 2.02 of this Specification Section.
- I. At the request of the Engineer or Owner, submit the following:
- 1. Structural analysis and design calculations for pre-cast rectangular components and round top slab components, performed in accordance with applicable codes and standards, showing that allowable stresses will not be exceeded. All calculations must be sealed by a Registered Professional Engineer employed by the Pre-cast Concrete Manufacturer.
 - 2. Calculations or test results verifying that the lifting device components and holes are designed in accordance with OSHA Standard 1926.704.
 - 3. Concrete 28 day compression strength results for every day production of Pre-cast Components for the project was performed, showing the required strength according to the guidelines established in ACI 318.
 - 4. Reinforcing and Cement mill reports for materials used in the manufacture of Pre-cast Components for this project.
 - 5. The above test reports for similar Pre-cast Components recently produced, submitted prior to production of Pre-cast Components for this project.

1.05 QUALIFICATIONS

- A. The Pre-cast Manufacturer shall comply with one of the following requirements:
- 1. Manufacture Pre-cast Components for the project in a plant certified in the Pre-stressed Concrete Institute's (PCI) Plant Certification Program.
 - 2. Manufacture Pre-cast Components for the project in a plant certified in the National Pre-cast Concrete Association's (NPCA) Plant Certification Program.

3. Retain an independent testing or consulting engineering firm approved by the Engineer for Pre-cast plant inspection. The basis for plant inspection shall be the National Pre-cast Concrete Association Quality Control Manual or the Manual for quality Control for Plants and Production of Pre-cast and Pre-stressed Concrete Products. The above firm shall inspect the pre-cast plant 2 weeks prior to and at 1 week intervals during production of materials for this project and issue a report, certified by a Registered Engineer that materials, methods, products, and quality control meet the requirements of the above quality control manuals.
- B. The Pre-cast Manufacturer shall have a recognized Quality Improvement Process installed at the manufacturing facility.
 - C. The Pre-cast Manufacturer shall employ at least one Registered Professional Engineer at the manufacturing facility through the life of the project.
 - D. Concrete compressive strength testing shall be performed in a laboratory inspected by the CCRL of the National Bureau of Standards. Testing shall be performed by Grade I ACI Certified Laboratory Technicians or by Level I PCI Certified Technicians.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry, grouting or concrete work.

PRODUCTS

2.01 MATERIALS

- A. Concrete shall conform to ASTM C478 and as follows:
 1. Compressive strength: 5000 psi minimum at 28 days.
 2. Air Content: 4 percent minimum
 3. Cementitious Materials: Minimum of 564 pounds per c.y.
 4. Coarse Aggregates: ASTM C33. Sound, Crushed, Angular Granitic Stone only. Smooth or rounded stone shall not be used.
 5. Fine Aggregates: ASTM C33. Free from organic impurities.
 6. Chemical Admixtures: ASTM C494. Calcium Chloride or admixtures containing calcium chloride shall not be used.
 7. Air Entraining Admixtures: ASTM C260.
- B. Reinforcing steel shall be ASTM A615 grade 60 deformed bar, ASTM A82 wire or ASTM A185 welded wire fabric.
- C. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars shall not be allowed.

- D. Flexible Joint Sealants shall be butyl rubber based conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B - Butyl Rubber and as follows: Maximum of 1% volatile matter and suitable for application temperatures between 10 and 100 degrees F.
- E. Epoxy Gels shall be a 2-component, solvent-free, moisture-insensitive, high modulus, high-strength, structural epoxy paste adhesive meeting ASTM C-881, Type I and II, Grade 3, Class B and C, Epoxy Resin Adhesive.

2.02 COMPONENTS

- A. Pre-cast Components shall be designed and manufactured as described in this paragraph and in the following paragraphs for the specific components.
 - 1. Lifting Inserts, Holes and Devices shall comply with OSHA Standard 1926.704. Lift holes and inserts shall be sized for a precision fit with the lift devices and shall not penetrate through the structure wall. Lifting Devices shall be provided by the Pre-cast Manufacturer.
 - 2. Joints shall be sealed internally between the tongue and the groove and additionally around the external perimeter of the joint as follows:
 - a. External Seals shall consist of a polyethylene backed flat butyl rubber sheet no less than 1/16 inch thick and 6 inches wide applied to the outside perimeter of the joint.
 - b. Internal Seals shall consist of a plastic or paper-backed butyl rubber rope no less than 14 feet long and having a cross-sectional area no less than the annular space times the height of the joint.
 - c. At the option of the Contractor, Internal Seals on round joints may consist of an O-Ring Gasket conforming to ASTM C443, installed according to the Pre-cast Manufacturer's recommendation.
 - 3. Rings, Covers, Grates, and Frames shall be Class 30 gray cast iron and shall be designed for 25,000 lb wheel loads when located in roadways.
 - 4. Pre-cast Base Sections shall be cast monolithically without construction joints or with an approved galvanized or PVC waterstop cast in the cold joint between the base slab and the walls. The minimum size of the base section shall be as specified in the schedules.
 - 5. Wall and inside slab finishes resulting from casting against forms standard for the industry shall be acceptable. Form ties through the wall are not allowed. Exterior slab surfaces below grade level shall have a float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spills will be tolerated. Dimensional tolerances shall be as set forth in the appropriate References. Exposed Drainage Structure Top Components shall have a form finish or a light

broom finish on their exposed surfaces. Fins, voids, chips, or fractures over 3/8 inch in diameter shall be filled with thin cement paste and finished to a color and texture reasonably consistent with that of formed finish. Rings and covers cast in exposed tops shall be free from cement paste build up.

6. Provisions for pipe entrances in the structures shall be cast or cored openings or knockout panels.
 - a. Pipe openings in round structures shall remain 6 inches clear of other pipe openings.
 - b. Pipe openings in rectangular structures shall not extend into the corners and may extend across a joint only when structural analysis shows stresses to be within the allowable.
 - c. Knockout Panel dimensions shall be as required by structural design at their maximum burial depth using the design loads specified herein.
 7. Components shall be designed in accordance with ACI, ASTM C890 and the following loads:
 - a. Horizontal Load on Walls and Knockout Panels = an earth load of 80 psf per foot of burial depth plus a live lateral surcharge due to HS20 traffic loads.
 - b. Vertical Load on below grade adaptor slabs and tops = an earth load of 120 psf per foot of overburden plus a live HS20 traffic load.
 - c. Vertical Load on Exposed Inlet Tops = a live 300 psf load.
 - d. Vertical Load on Cast Iron Covers and Grates supported around perimeter = a live HS20 traffic load.
- B. Round Sub-grade Components shall be designed and manufactured in conformance with ASTM C478 and as follows:
1. Riser Sections shall have a minimum lay length of 16 inches.
 2. Pre-cast Concentric And Eccentric Cone Section shall have an inside diameter at the top of 24 inches. The width of the top ledge shall be no less than the wall thickness required for the cone section.
 3. Pre-cast Transition Cone or Top Sections may be used to provide an eccentric transition from 60 inch and larger structures to 48 inch diameter risers, cones, and adaptor slabs. Transition tops shall only be used in areas not subject to vehicle traffic and with no more than 20 feet of cover.

4. Provide Steps in Bases, Risers, Cones, Transition Cones, Transition Cones, and Transition Top sections aligned vertically on 16 inch centers with the bottom step no more than 26 inches from the base slab. Secure steps to the wall with a compression fit in cast or drilled holes or cast in place. Steps shall not be vibrated or driven into freshly cast concrete or grouted in place. The steps shall be Copolymer Polypropylene Plastic reinforced with a 1/2 inch diameter grade 60 bar and have serrated tread and tall end lugs. Pullout strength shall be a minimum of 2000 lbs when tested according to ASTM C497.
 5. Joints of Bases, Risers and Cones shall be manufactured to the joint surface design and tolerance requirements of ASTM C361. The maximum slope of the vertical surface shall be 2 degrees. The maximum annular space at the base of the joint shall be 0.10". The minimum joint height shall be 4".
- C. Rectangular Sub-grade Components shall be no less than 22 inches wide, 34 inches long, designed and manufactured in conformance with ASTM C913 and as follows:
1. Riser sections shall not be allowed on boxes smaller than 4 feet long by 4 feet wide. Risers may be used on base sections with knockout panels only when the burial depth limitations of the knockout panels will not be exceeded. Riser lay length shall be a minimum of 36 inches.
 2. Pre-cast Transition Top Sections may be used to provide an eccentric transition from 4 foot by 4 foot and larger storm drain structures to 48 inch diameter risers, cones, and adaptor slabs. The maximum amount of fill over the transition top section shall be 20 feet.
 3. If shown on Storm Drain Details, provide fixed ladders in rectangular structures greater than 8 feet deep and less.
 4. Joints between pre-cast components shall be keyways or tongue and groove. Joints to accept Cast Iron Frames shall be flat and no less than 5" wide.
- D. Grate Type Inlet Components shall provide for a minimum inlet flow of 10 cubic feet per second with an unobstructed opening area and 6 inches of ponded water. Adaptor Slabs shall have a minimum opening size of 22 inches by 34 inches.
- E. Curb Type Inlet Components shall provide for a minimum inlet flow of 8 cubic feet per second with an unobstructed opening area and ponded water to the top of the curb. Pre-cast Top Components shall have an integral cast iron Ring and Cover with a minimum opening diameter of 22 inches. Adaptor Slabs shall have a minimum clear opening of 34 inches by 34 inches.
- F. Ditch Type Inlet Components shall provide for a minimum inlet flow per open side of 6 cubic feet per second with an unobstructed opening area and 12 inches

of ponded water. Adaptor Slabs shall have a minimum clear opening of 34 inches by 34 inches.

- G. Access Manhole Inlet Components shall have Cast Iron Rings and Covers shall be as shown in the details with an opening diameter of 22 inches. Adaptor Slabs and Cones shall have a minimum opening diameter of 24 inches. Pre-cast Grade Rings conforming to ASTM C478, with a minimum lay length of 4 inches and totaling no more than 12 inches in height shall be used to adjust rings and covers to finished grade.

2.03 CONFIGURATION

- A. Construct [Grate Type] Drainage Structures to the elevations shown on the plans and as follows:
 - 1. A 24 inch by 36 inch Cast Iron Grate and Frame, and
 - 2. A 22 inch inside wide by 34 inch inside long by 24 inch to 72 inch inside tall Rectangular Sub-grade Structure, or
 - 3. An Adaptor Slab and a Round or Rectangular Sub-grade Structure sized according to the Schedule.

- B. Construct [Curb Type] Drainage Structures to the elevations shown on the plans with 46 inch wide by 7 inch tall Inlet Openings and as follows:
 - 1. A Rectangular Inlet Structure Top and a Rectangular Sub-grade Structure with a minimum inside length of 46 inches and a minimum inside width of 34 inches sized according to the Schedule, or
 - 2. A rectangular Inlet Structure Top with transition to the Adaptor Slab, an Adaptor Slab, and a Round or Rectangular Sub-grade sized according to the Schedule.

- C. Construct [Ditch Type] Drainage Structures to the elevations shown on the plans, with 34 inch wide by 7 inch tall minimum Inlet Openings, with Inlet Openings located as shown on the plans, and as follows:
 - 1. A Rectangular Inlet Structure Top with transition to the Sub-grade Structure and a Rectangular Sub-grade Structure with a minimum inside length of 46 inches and a minimum inside width of 34 inches sized according to the Schedule, or
 - 2. A Rectangular Inlet Structure Top with transition to the Adaptor Slab, an Adaptor Slab, and a Round or Rectangular Sub-grade Structure sized according to the Schedule.

- D. Construct [Access Manhole] Structures to the elevations shown on the plans and as follows:
 - 1. A 24 inch diameter Cast Iron Ring and Cover, and
 - 2. A Concentric or Eccentric Cone or an Adaptor Slab and a Round or Rectangular Sub-grade Structure sized according to the Schedule.

- E. Drainage Structures greater than 8 feet deep shall be no less than 48 inches in diameter or 48 inches wide by 48 inches long.

EXECUTION

3.01 EXAMINATION

- A. Inspect Drainage Structure Components prior to unloading from the delivery truck.

3.02 PREPARATION

- A. The Contractor shall coordinate delivery of the Drainage Structure Components to the jobsite with the Manufacturer. Handling of materials shall be done in accordance with ASTM C891 and the manufacturer's recommendations. Components should be handled and stored on the jobsite using methods that will prevent damage.

3.03 PLACING STORM DRAINAGE

- A. Excavate to the required depth and remove materials that are unstable or unsuitable for a good foundation. Prepare a level, compacted foundation extending 6" beyond the base.
- B. Set base plumb and level, aligning pipes in pipe openings 1 to 6 inches larger than the pipe OD.
- C. Thoroughly clean bells and spigots to remove dirt and other foreign materials that may prevent sealing. Unroll the Butyl Sealant rope directly against spigot or keyway. Leave protective wrapper attached until sealant is entirely unrolled. Do not stretch. Overlap from side to side - not top to bottom.
- D. Set risers, tops and cones for round structures so that steps align, taking particular care to clean, repair and seal joints.
- E. When recommended by the manufacturer, fill the void between horizontal joint surfaces with a sand cement grout around the outside perimeter.
- F. After joining sections, apply the butyl sealant sheet around the outside perimeter of the joint.
- G. Lift Holes leaving less than 2" of wall thickness shall be plugged from the outside using a sand cement mortar then covered with butyl rubber sheet. Lift Holes penetrating the wall shall be additionally sealed with epoxy gel on the interior.
- H. Set the frames or tops to the required elevation sealing joints with butyl sealant rope and sheet.

- I. Clean foreign matter from the structure interior and perform touch up to exposed top surfaces.

3.04 SCHEDULES

A. ROUND STORM DRAIN STRUCTURES

1. Provide round sub-grade structures with minimum inside diameters in inches based on the Pipe's outside diameter and the angle formed with the adjacent entering pipe as shown in the table below.

Largest Pipe OD	Minimum Degrees Between Pipe Entering Structure										
	180	165	150	135	120	105	90	75	60	45	30
15	48	48	48	48	48	48	48	48	48	72	96
21	48	48	48	48	48	48	48	60	60	84	120
27	48	48	48	48	48	48	60	60	72	96	NA
33	48	48	48	48	48	60	60	72	84	120	NA
39	48	48	48	60	60	60	72	84	96	NA	NA
45	60	60	60	60	72	72	84	96	108	NA	NA

2. Structures with smaller inside diameters may be supplied when pipe are of different diameters and calculations or shop drawings show that a minimum of 6 inches clearance will be maintained between pipe openings.
3. The minimum lay length of the base section shall be no less than the diameter of the pipe opening for pipe OD up to 87 inches.

B. RECTANGULAR STORM DRAIN STRUCTURES

1. Provide rectangular sub-grade structures with minimum inside wall widths based on the entering pipe's outside diameter and the angle formed with the penetrated wall as shown in the chart below.

Largest Pipe OD	Minimum Degrees Between Pipe and Wall						
	90	80	70	60	50	40	30
15	22	22	22	22	22	34	34
21	22	22	22	34	34	34	46
27	34	34	34	34	46	46	58
33	34	34	46	46	46	58	70
39	46	46	46	46	58	70	82
45	46	46	58	58	70	70	94

2. Structures with narrower walls may be supplied when pipe are different diameters than shown and calculations or shop drawings show that the pipe will not penetrate the corners of the structure.

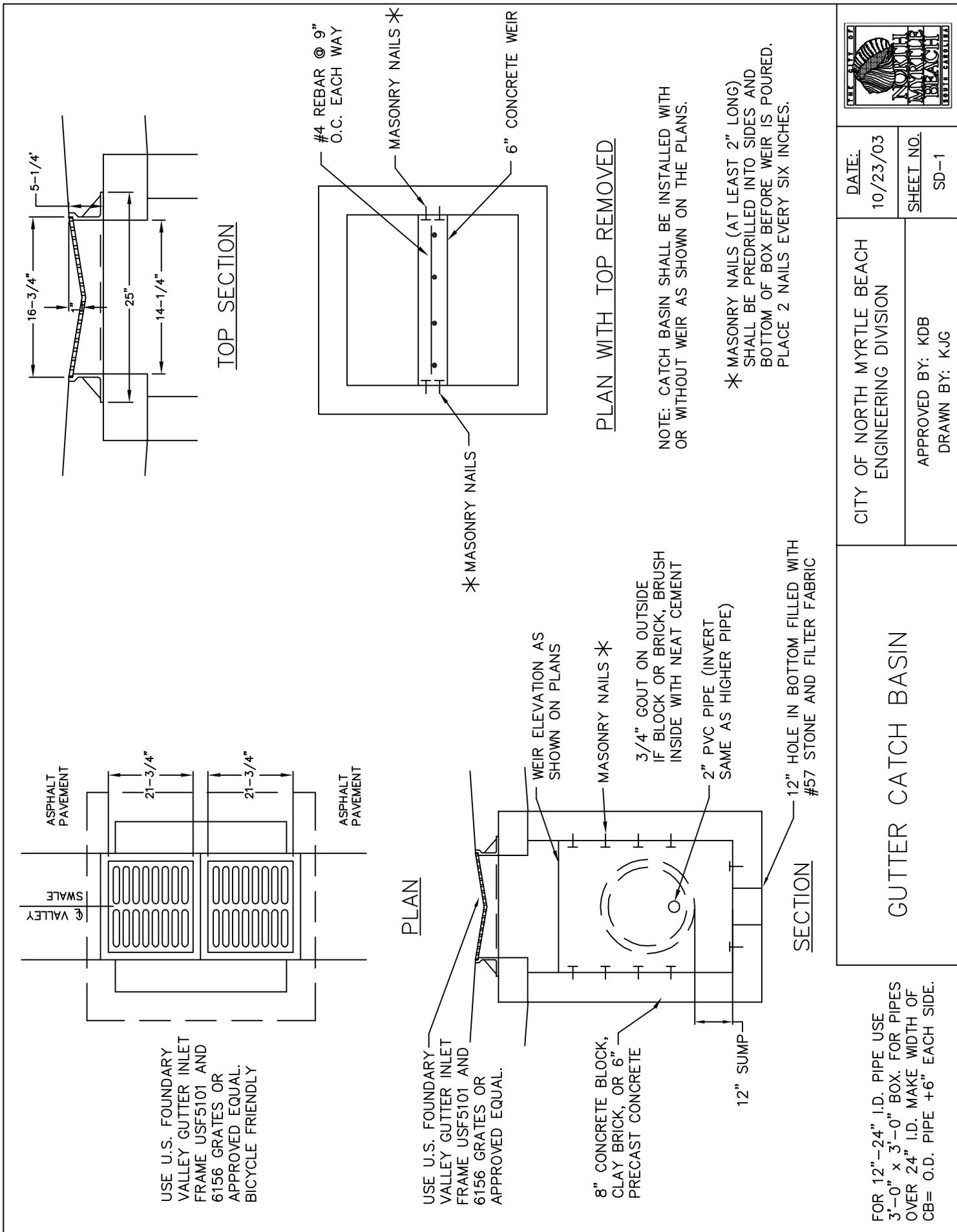
END OF SECTION

CITY OF NORTH MYRTLE BEACH STANDARD DETAILS
ENGINEERING DIVISION



STORM DRAINAGE AND EROSION CONTROL:

- SD-1 GUTTER CATCH BASIN
- SD-2 JUNCTION BOX/WEIR
- SD-3 HOODED FRAME CATCH BASIN
- SD-4 CLASS "C" REINFORCED CONCRETE PIPE BEDDING
- SD-5 CLASS "B" REINFORCED CONCRETE PIPE BEDDING
- SD-6 EXFILTRATION PIPE BEDDING
- SD-7 CATCH BASIN/JUNCTION BOX
- SD-8 PIPE SKEW
- SD-9 CURB INLET
- SD-10 FLORIDA TYPE CATCH BASIN
- SD-11 HAY BALE INSTALLATION
- SD-12 STRAW BALE DIKE
- SD-13 TYPICAL HAY BALE
- SD-14 GRAVEL CONSTRUCTION ENTRANCE
- SD-15 INLET PROTECTION
- SD-16 SILT FENCE
- SD-17 INLET PROTECTION TYPE "A"
- SD-18 INLET PROTECTION TYPE "B"
- SD-19 INLET PROTECTION TYPE "C"

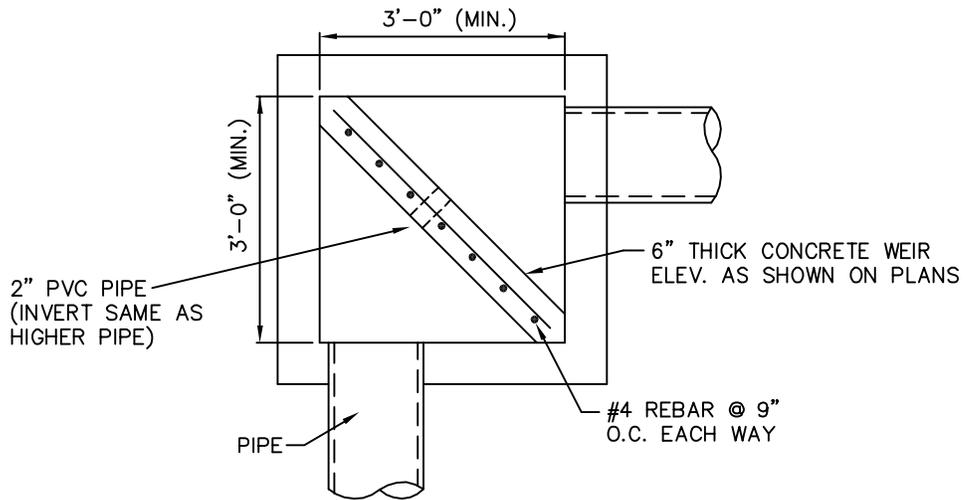


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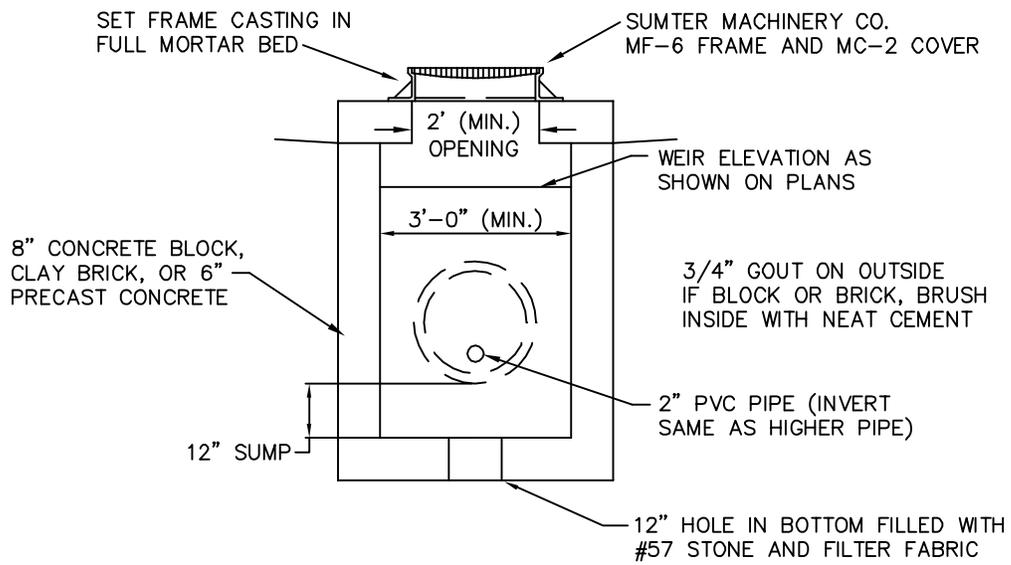
CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION
APPROVED BY: KDB
DRAWN BY: KJG

GUTTER CATCH BASIN

FOR 12"-24" I.D. PIPE USE 3'-0" x 3'-0" BOX. FOR PIPES OVER 24" I.D. MAKE WIDTH OF CB= O.D. PIPE +6" EACH SIDE.



PLAN VIEW



SECTION

NOTE:
 JUNCTION BOX SHALL BE INSTALLED WITH OR WITHOUT WEIR AS SHOWN ON PLANS.

JUNCTION BOX/WEIR

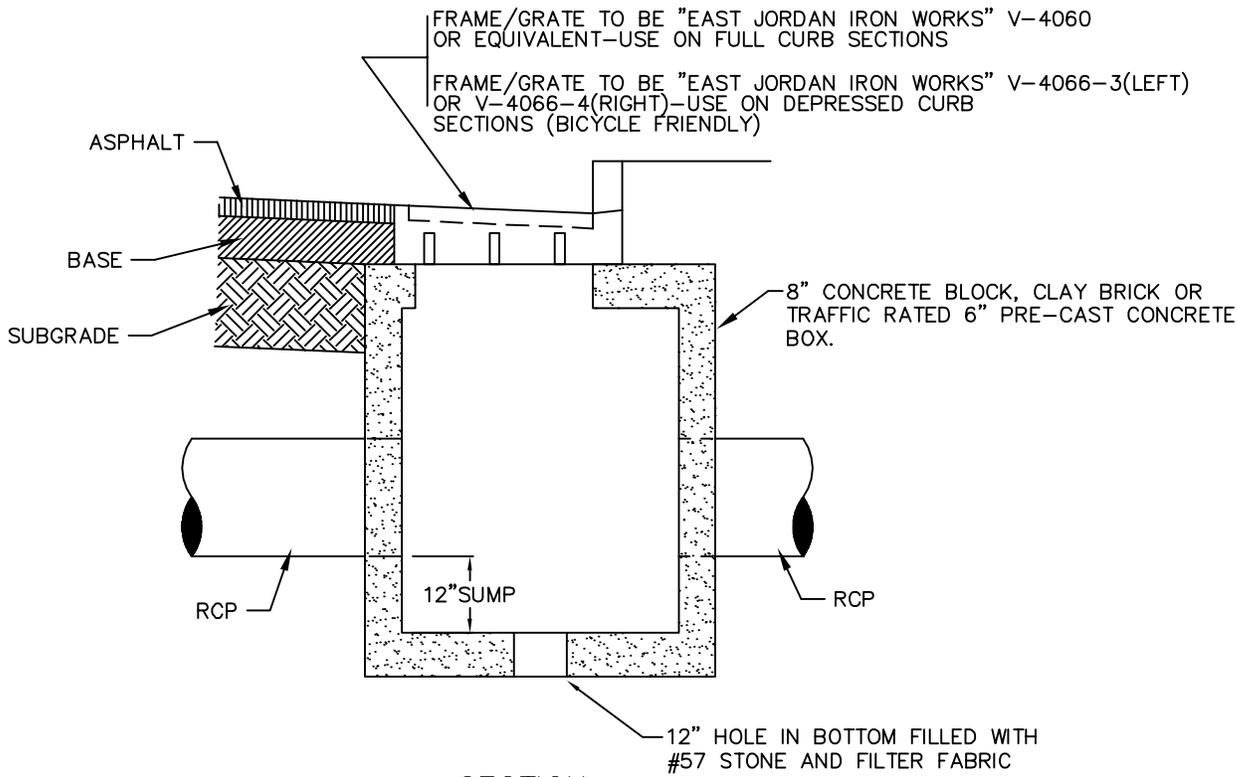
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 ENGINEERING DIVISION

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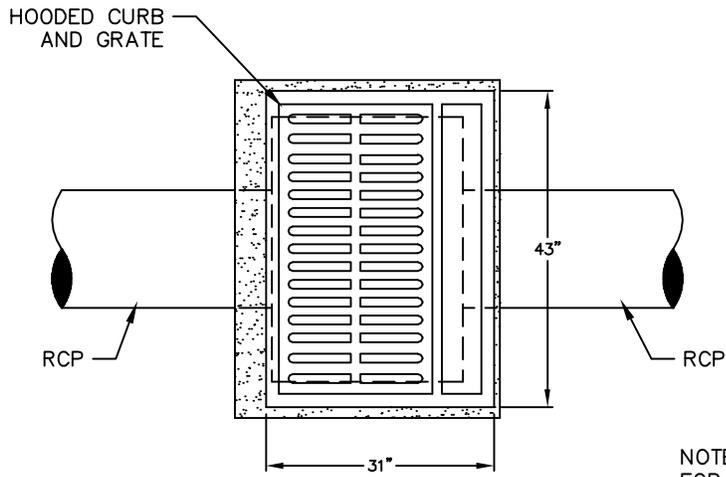
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 SD-2





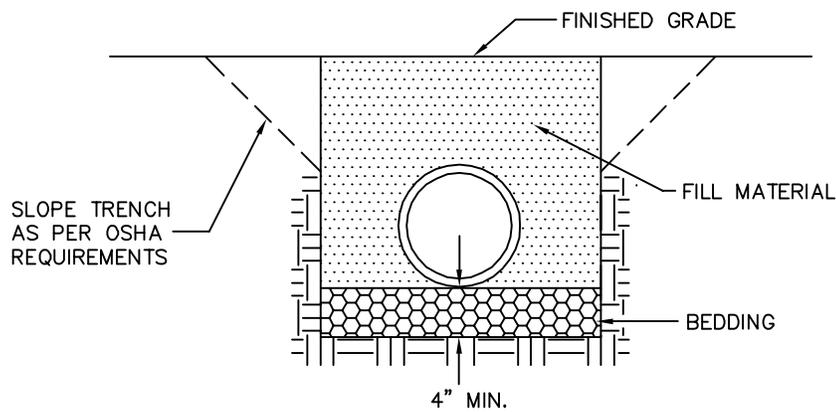
SECTION



PLAN VIEW

NOTE:
 FOR 12"-24" I.D. PIPE USE A 3'-0"x3'-0" BOX. FOR PIPES OVER 24" I.D. MAKE WIDTH OF BOX EQUAL O.D. PIPE PLUS 6" EACH SIDE.

HOODED FRAME CATCH BASIN	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 10/23/03	
	APPROVED BY: KDB DRAWN BY: KJG	SHEET NO. SD-3	



- NOTES:
1. BEDDING SHALL BE COMPACTED CRUSHED STONE (CLASS 1 MATERIAL) SHAPED TO THE BOTTOM OF THE PIPE.
 2. FILL SHALL BE NATIVE MATERIAL FREE OF LARGE ROCKS, DEBRIS OR ORGANICS AND COMPACTED TO 95% OF THE SOIL'S STANDARD PROCTOR.

CLASS "C" REINFORCED
CONCRETE PIPE BEDDING

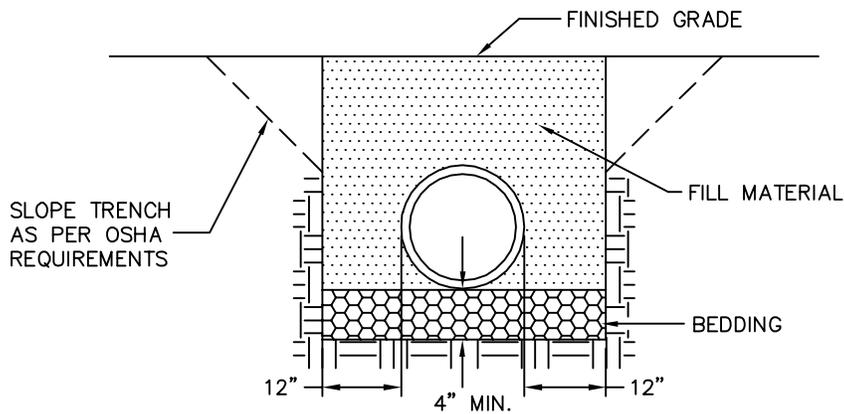
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ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
SD-4





- NOTES:
1. BEDDING SHALL BE COMPACTED CRUSHED STONE (CLASS 1 MATERIAL) SHAPED TO THE BOTTOM OF THE PIPE.
 2. SELECT FILL SHALL BE NATIVE MATERIAL FREE OF LARGE ROCKS, DEBRIS OR ORGANICS AND PLACED IN 6" OR 8" LOOSE LIFTS AND COMPACTED TO MIN. 90% OF THE SOILS STANDARD PROCTOR, AND 98% WHEN UNDER PAVEMENT.

CLASS "B" REINFORCED
CONCRETE PIPE BEDDING

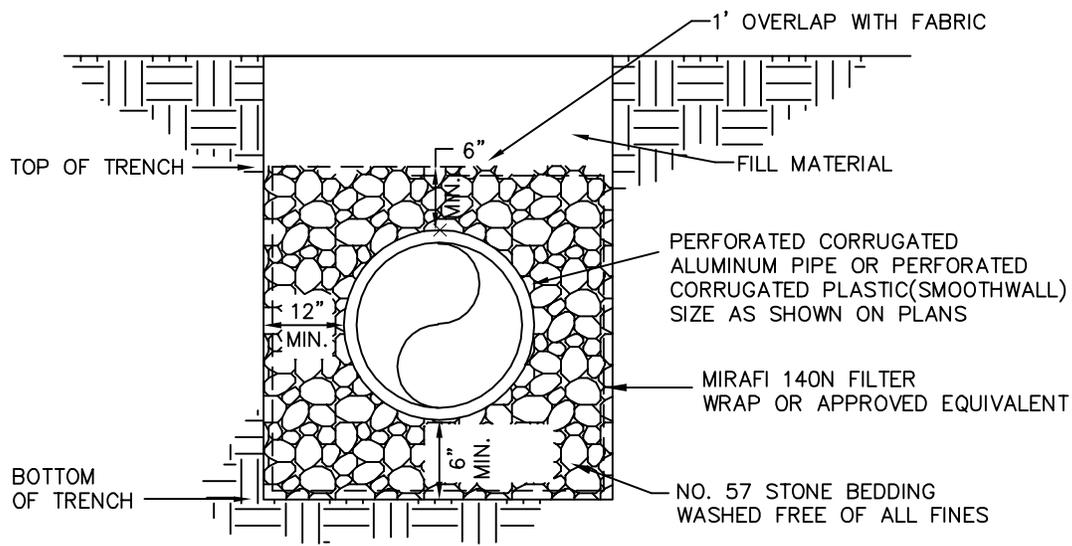
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ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
SD-5





EXFILTRATION PIPE BEDDING

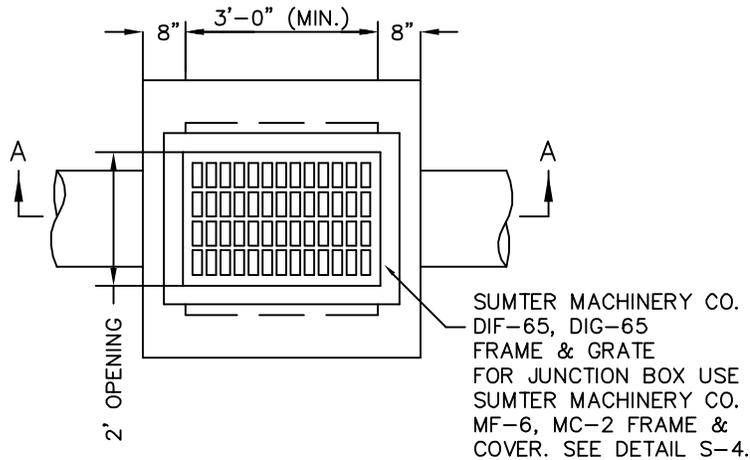
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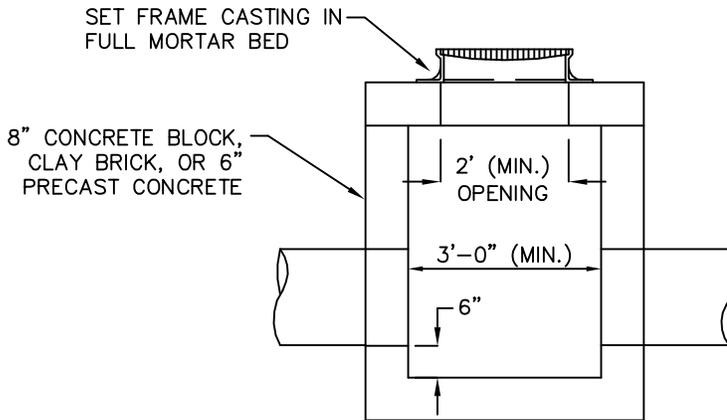
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SD-6





PLAN



SECTION "A-A"

FOR 12"-24" I.D. PIPE USE
3'-0" x 3'-0" BOX. FOR PIPES
OVER 24" I.D. MAKE WIDTH OF
CB= O.D. PIPE +6" EACH SIDE.

NOTE: 3'x3' MINIMUM SIZE CATCH BASIN ALLOWED.

CATCH BASIN / JUNCTION BOX

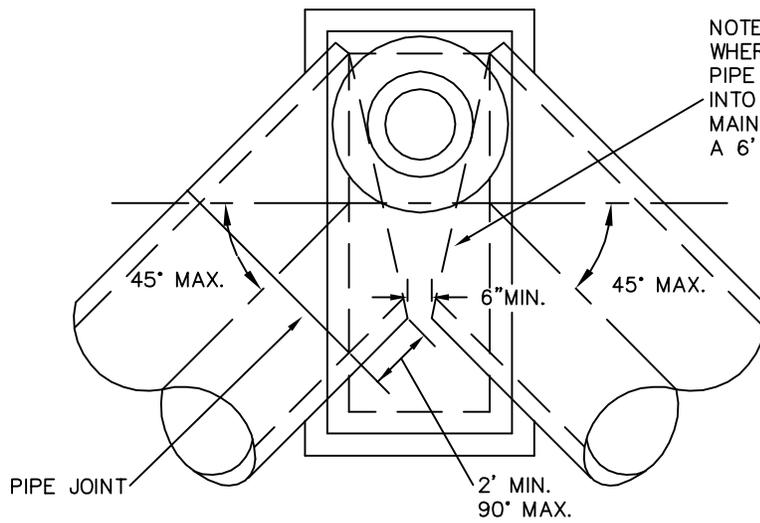
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DATE:
10/23/03

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SD-7



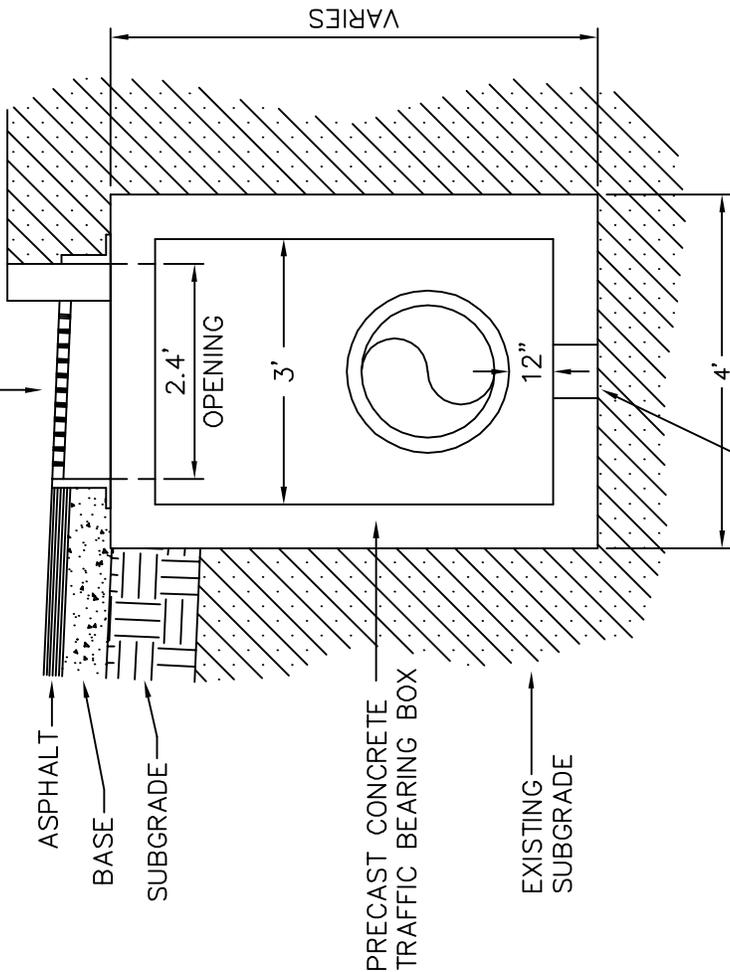
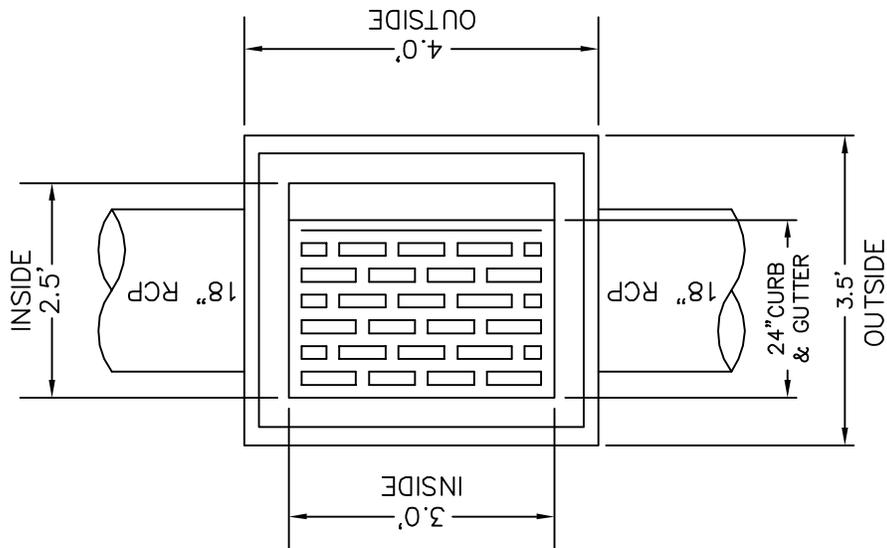


NOTE:
 WHERE PIPES ENTER THE CHAMBER ON A SKEW,
 PIPE WALLS SHALL BE EXTENDED IF REQUIRED,
 INTO THE CHAMBER A SUFFICIENT DISTANCE TO
 MAINTAIN A MINIMUM UNMOUNTED LENGTH OF 2' IN
 A 6' PIPE SECTION.

PIPE SKEW	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 10/23/03	
	APPROVED BY: KDB DRAWN BY: KJG	SHEET NO. SD-8	

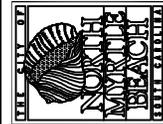
SD-8.DWG

FRAME/GRATE TO BE "EAST JORDAN
IRON WORKS" V-6069-1.



NOTE:
DIMENSIONS SHOWN ARE FOR AN 18" PIPE.
FOR PIPE OVER 24" I.D. MAKE LENGTH AND
WIDTH OF CATCH BASIN = O.D. OF PIPE
PLUS 6" ON EACH SIDE.

12" HOLE IN BOTTOM
FILLED W/ #57 STONE



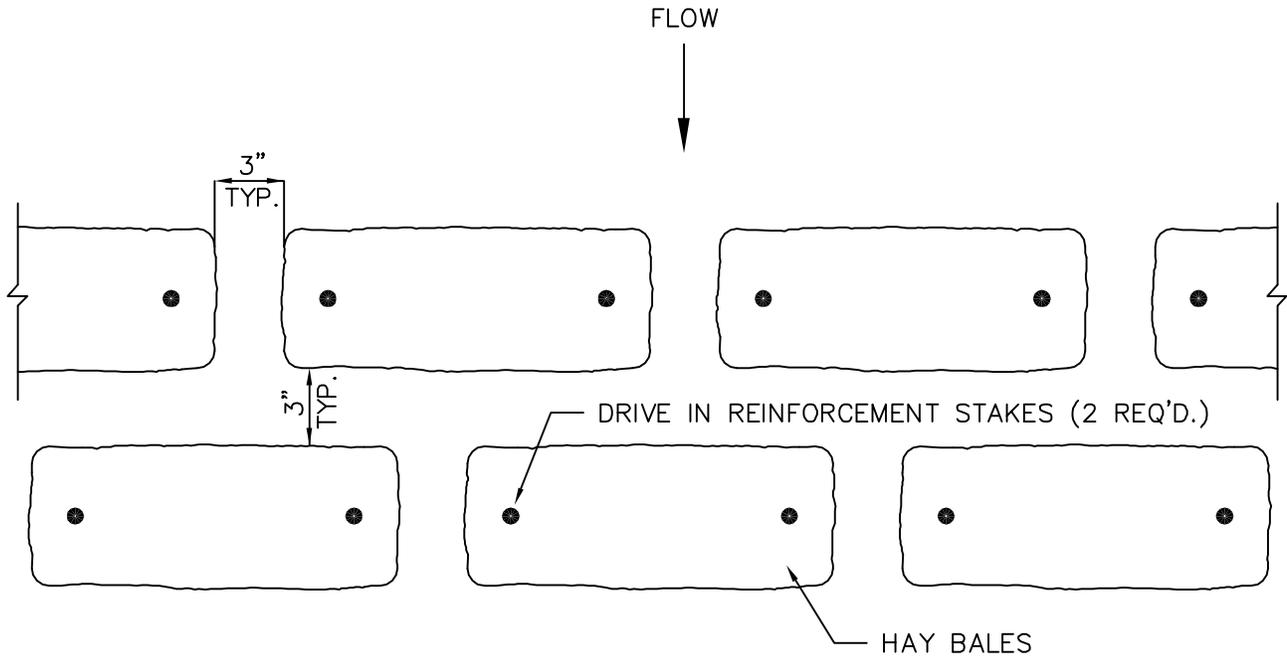
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SD-9

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

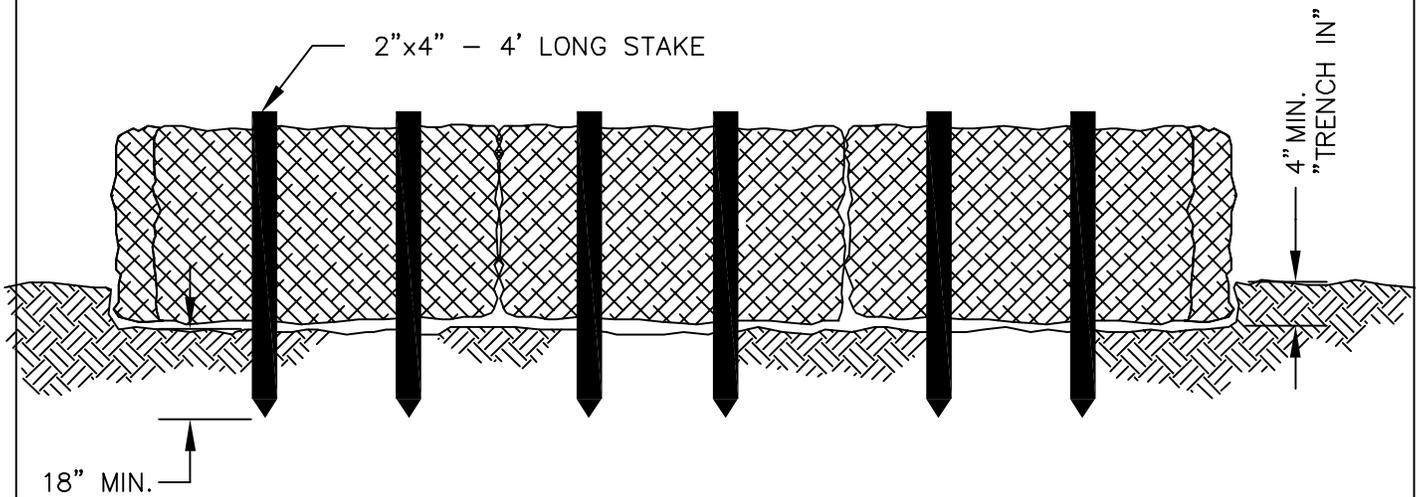
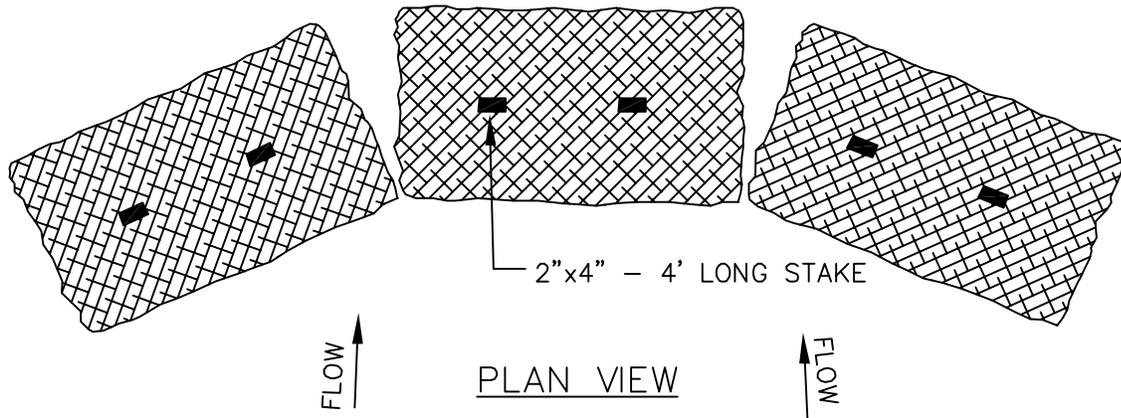
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CURB INLET



THE CONTRACTOR SHALL PLACE HAY BALES OR SILT FENCES AROUND ALL CATCH BASINS AND DRAINAGE STRUCTURES DURING CONSTRUCTION TO PREVENT SILTATION. THE CONTRACTOR SHALL ALSO PLACE THESE DEVICES AT ALL POINTS WHERE EROSION OCCURS AND AT ALL LOCATIONS DRAINAGE FLOWS OFFSITE.

<p>HAY BALE INSTALLATION</p>	<p>CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION</p>	<p>DATE: 10/23/03</p>	
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STRAW BALE DIKE

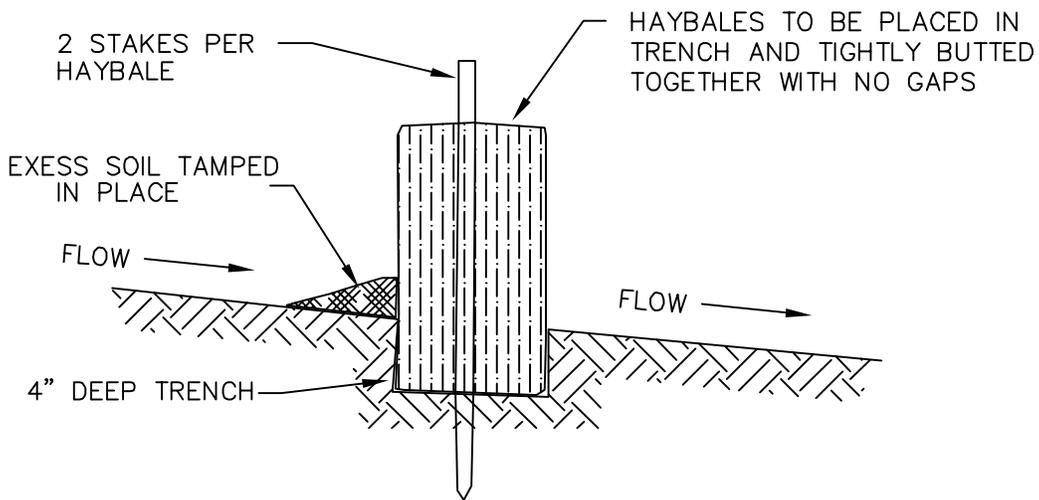
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10/23/03

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SD-12





TYPICAL HAY BALE

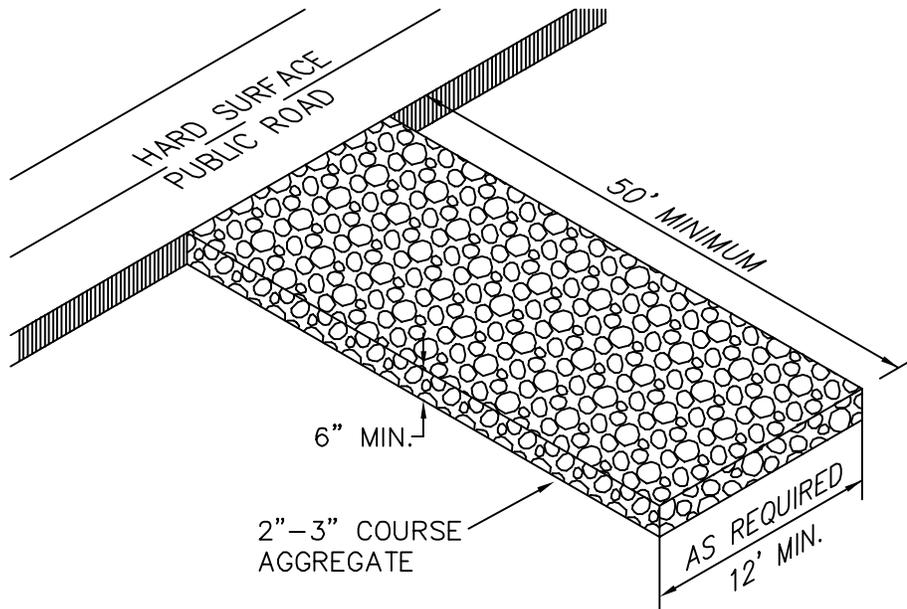
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ENGINEERING DIVISION

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DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
SD-13





GRAVEL CONSTRUCTION
ENTRANCE

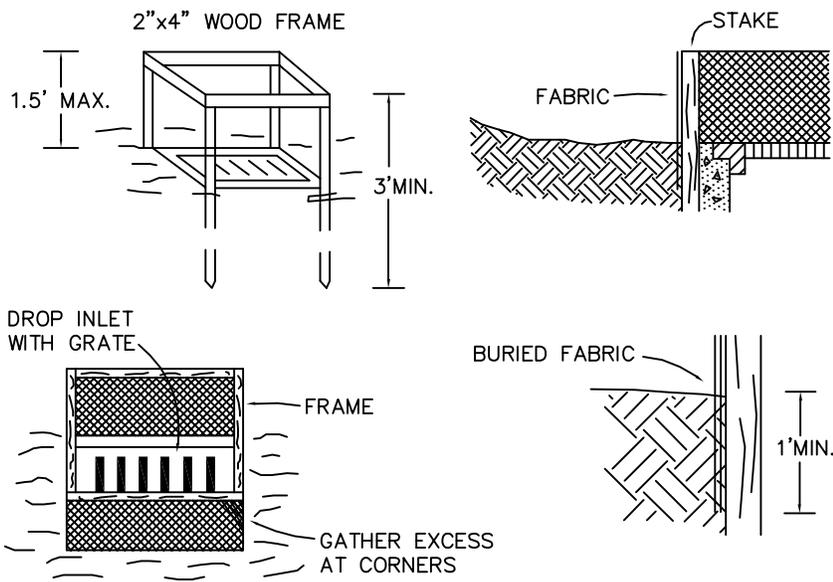
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
10/23/03

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SHEET NO.
SD-14





INLET PROTECTION

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

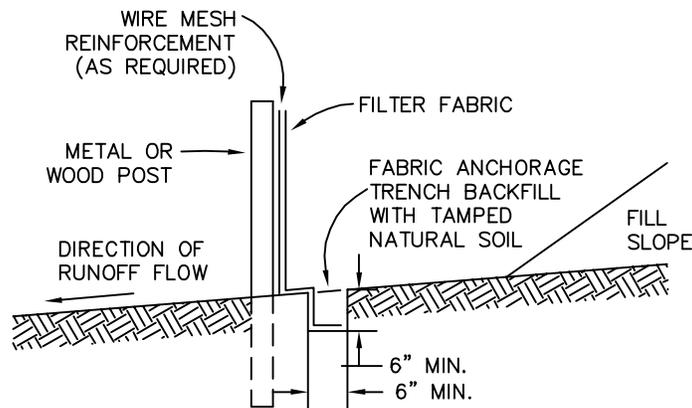
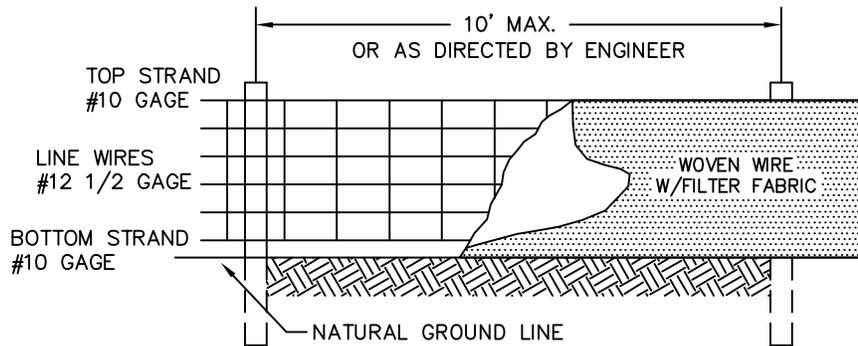
DATE:
10/23/03

SHEET NO.
SD-15



SILT FENCE NOTES:

1. WOVEN WIRE FENCE SHALL BE REQUIRED AS A BACKING FOR FILTER FABRIC WITH AN ELONGATION AS DETERMINED BY ASTM D 1682, OF 50% OR GREATER. THE WIRE FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
2. WOOD OR STEEL POST MAY BE USED. WOOD POST SHALL BE A MINIMUM OF 6' LONG AND 3" OR MORE IN DIAMETER. STEEL POST SHALL BE A MINIMUM OF 5' LONG WEIGH A MINIMUM OF 1.3 POUNDS/FOOT, AND HAVE PROJECTIONS FOR FASTENING THE WIRE OR THE FABRIC TO THE POST. STEEL POST SHALL ALSO HAVE A METAL PLATE SECURELY ATTACHED SUCH THAT WHEN THE POST IS DRIVEN TO THE PROPER DEPTH, THE PLATE WILL BE BELOW GROUND LEVEL FOR ADDITIONAL STABILITY. POSTS SHALL BE INSTALLED TO A DEPTH DIRECTED BY THE ENGINEER, WITH 1 TO 2 INCHES OF THE POST PROTRUDING ABOVE THE TOP OF THE WIRE FENCE OF FABRIC BEING IDEAL, BUT IN ANY CASE, NO MORE THAN 3' OF THE POST SHALL PROTRUDE ABOVE THE GROUND.



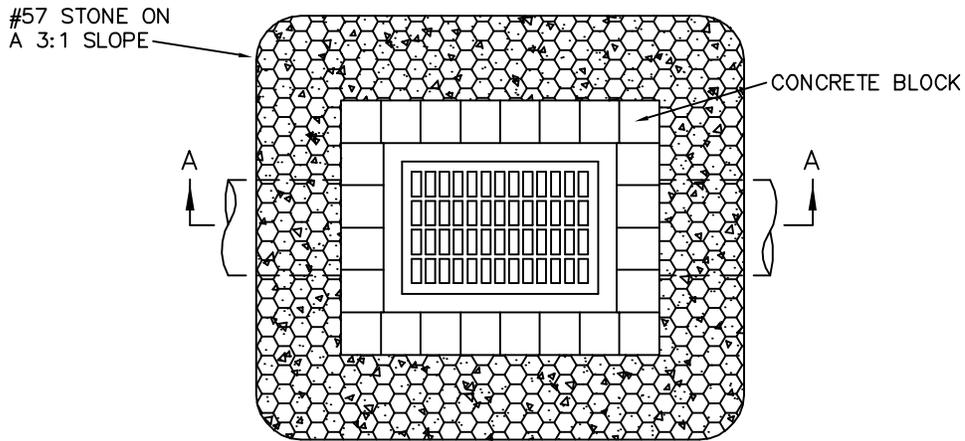
SILT FENCE

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

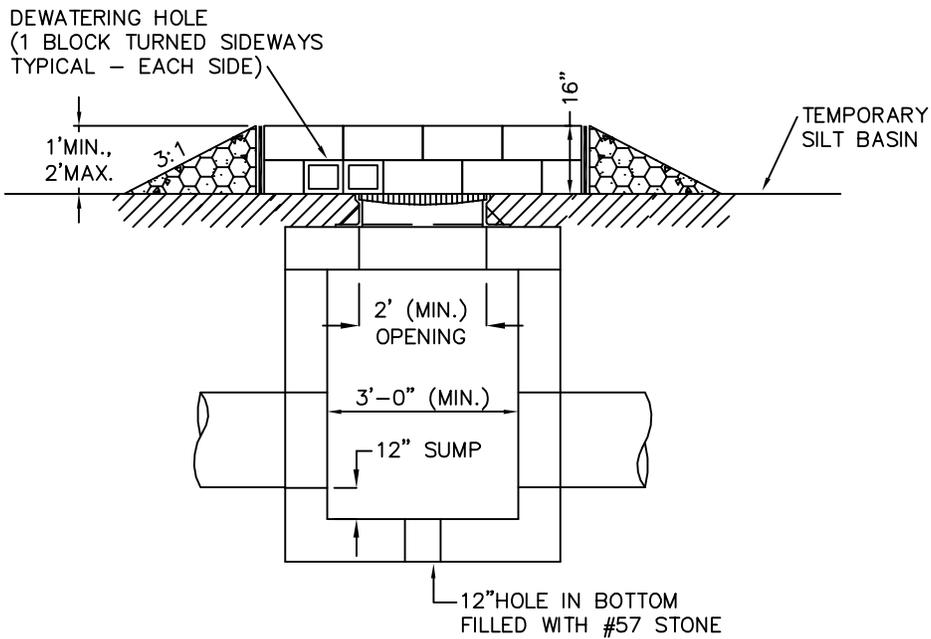
APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03
SHEET NO.
SD-16





PLAN



SECTION "A-A"

INLET PROTECTION - TYPE A

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

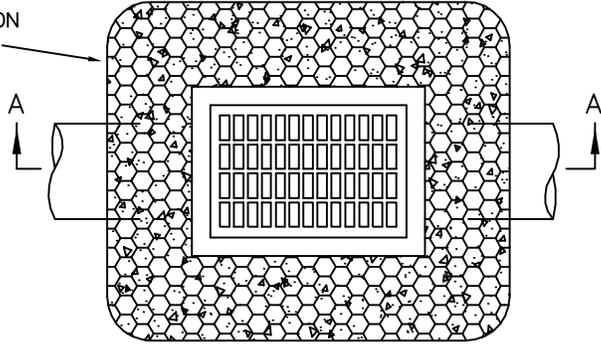
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10/23/03

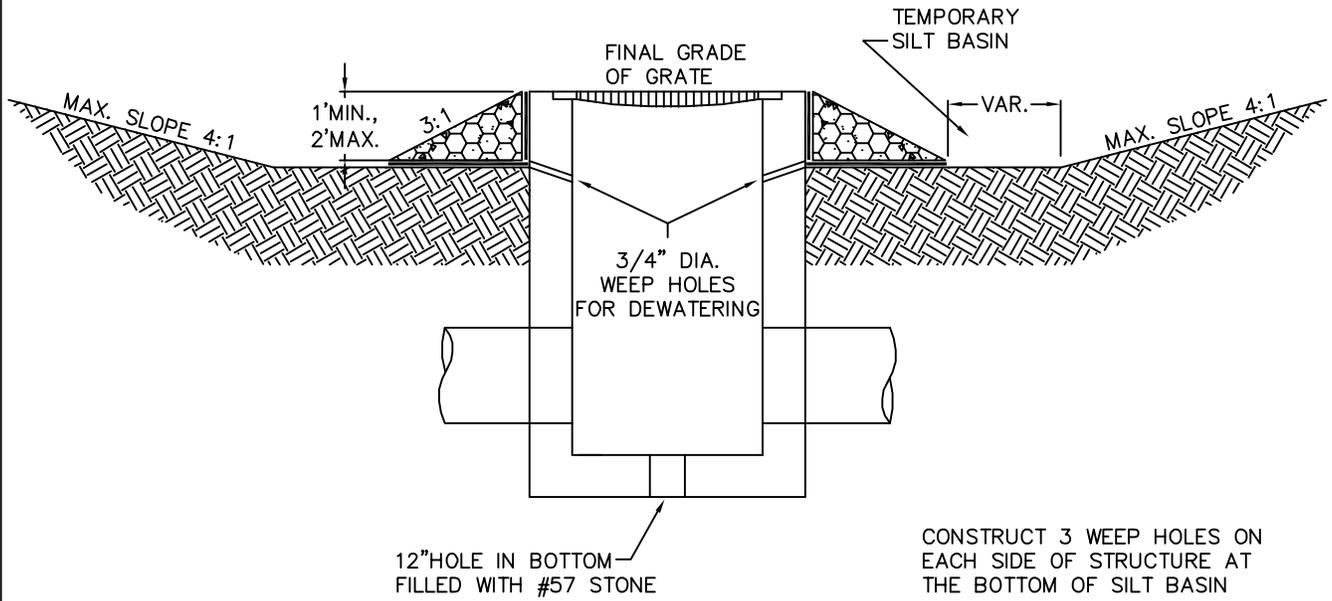
SHEET NO.
SD-17



#57 STONE ON
A 3:1 SLOPE



PLAN



CONSTRUCT 3 WEEP HOLES ON
EACH SIDE OF STRUCTURE AT
THE BOTTOM OF SILT BASIN

SECTION "A-A"

INLET PROTECTION — TYPE B

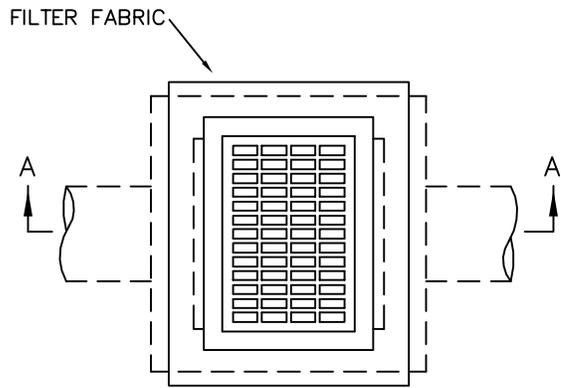
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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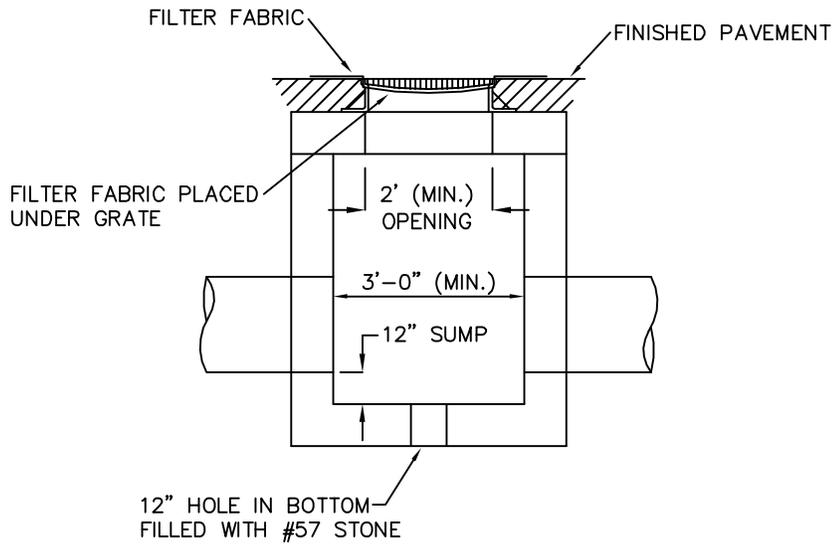
DATE:
10/23/03

SHEET NO.
SD-18



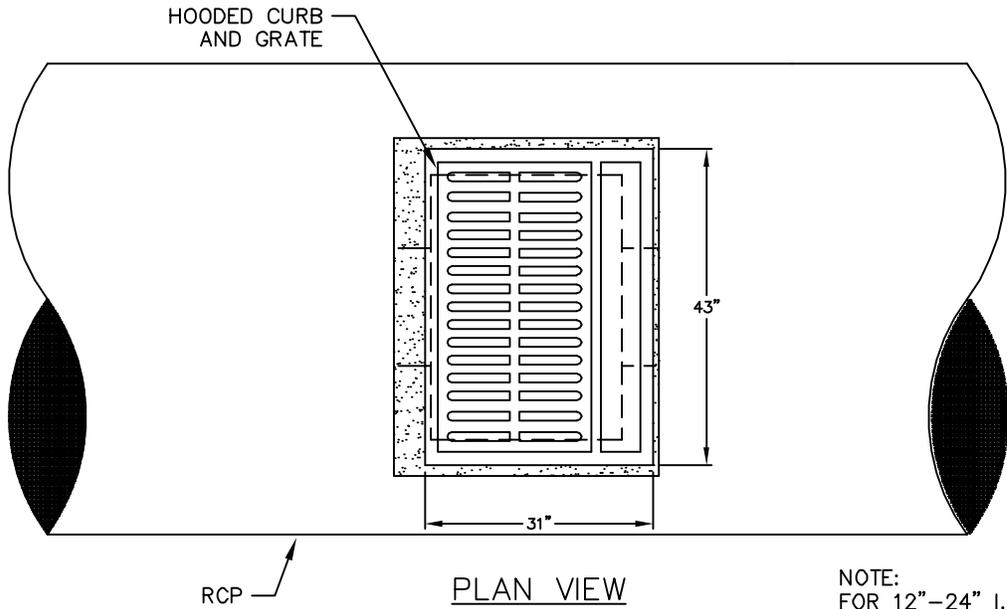
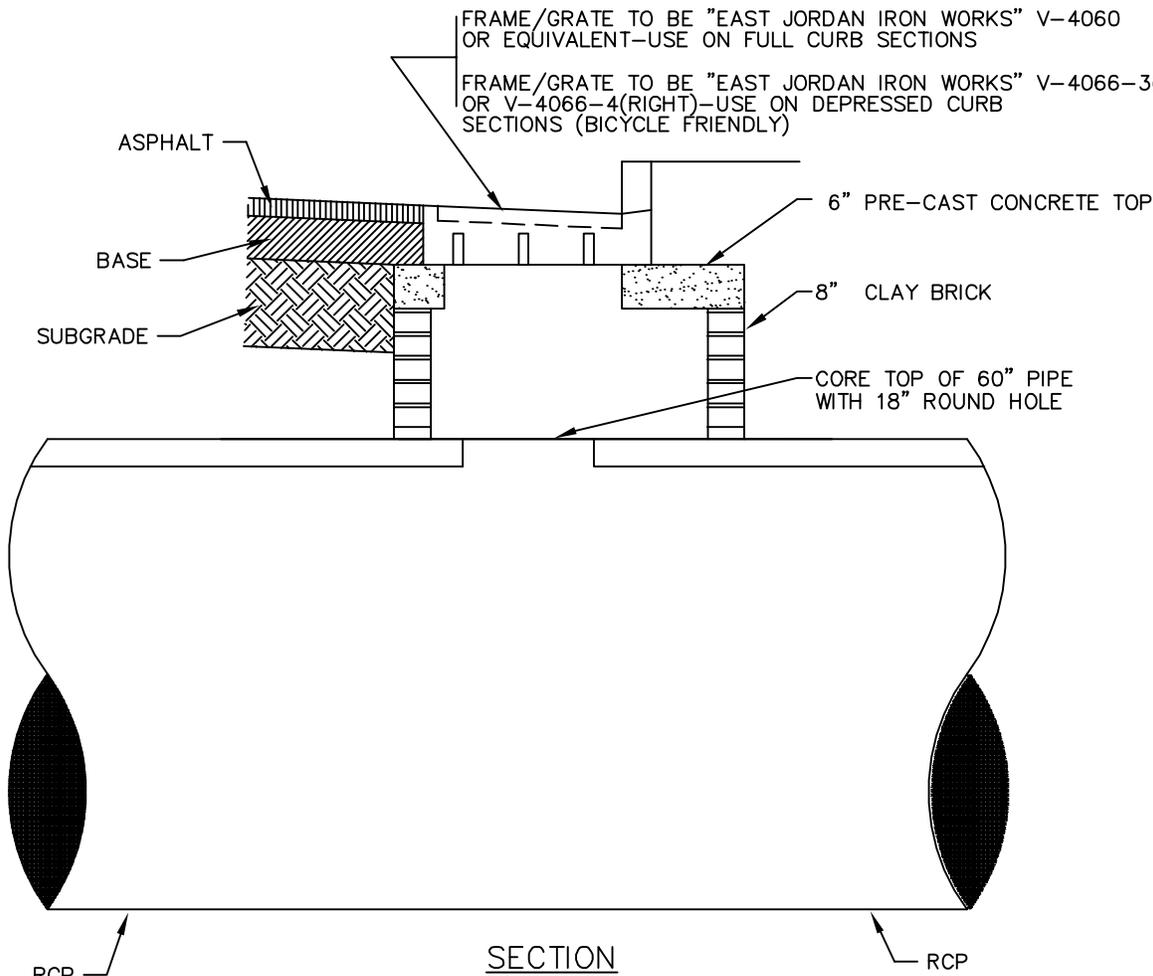


PLAN



SECTION "A-A"

<p>INLET PROTECTION – TYPE C</p>	<p>CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION</p>	<p>DATE: 10/23/03</p>	
	<p>APPROVED BY: KDB DRAWN BY: KJG</p>	<p>SHEET NO. SD-19</p>	



NOTE:
 FOR 12"-24" I.D. PIPE USE A 3'-0"x3'-0" BOX. FOR PIPES OVER 24" I.D. MAKE WIDTH OF BOX EQUAL O.D. PIPE PLUS 6" EACH SIDE.

HOODED FRAME CATCH BASIN	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 3/07/06	
	APPROVED BY: KDB DRAWN BY: HRT	SHEET NO. SD-20	

SECTION 02600

SANITARY SEWER GRAVITY SYSTEMS

GENERAL

1.01 SECTION INCLUDES

- A. Gravity Sewer piping, fittings, and accessories.
- B. Connection of building sanitary sewer system to municipal sewers.
- C. Manholes, cleanouts and accessories.

1.02 RELATED SECTIONS

- A. Section 00800 – General Requirements
- B. Section 02100 - Excavation
- C. Section 02200 - Backfilling.
- D. Section 02300 - Trenching.
- E. Section 03250 - Concrete.
- F. Section 03500 – Pre-cast Concrete Structures

1.03 REFERENCES - The standards listed below are included in this specification by reference. Specifications cited shall refer to the latest standards revision under the same specification number, or to superseding specifications under a new number, except for provisions in revised specifications, which are clearly inapplicable.

- A. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
- B. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or other Liquids.
- C. AWWA C104 - Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- D. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings.
- E. AWWA C110 - Ductile-Iron Fittings and Grey-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.
- F. ASTM D 1719 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

- G. ASTM D 3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- H. ASTM D 2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- I. UNI-B-3-88 - Installation of Polyvinyl Chloride (PVC) Pressure Pipe.
- J. UNI-B-6-90 - Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.
- K. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- L. ASTM A 48 - Gray Iron Castings.
- M. ASTM C 478 – Pre-cast Reinforced Concrete Manhole Sections.
- N. City of North Myrtle Beach Standard Detail Drawings: S1 - S19.

1.04 REGULATORY REQUIREMENTS

- A. Conform to all applicable SCDHEC Regulations for materials and installation for Sanitary Sewer Construction.

1.05 SUBMITTALS

- A. Submit product data in accordance with Section 00800 for pipe, pipe accessories, manholes, manhole accessories, cleanouts and cleanout accessories, for approval prior to construction.

PRODUCTS

2.01 MANUFACTURERS

- A. Pipe
 - 1. U.S. Pipe
 - 2. American Cast Iron Pipe Company.
 - 3. Griffin Pipe Products Company.
 - 4. McWane Cast Iron Pipe Company.
 - 5. J M Pipe and Pipe Products.
 - 6. Scepter Pipe.
- B. Manholes
 - 1. Mid-Atlantic
 - 2. Knight's Pre-cast
 - 3. Concrete Design

4. Tindall
- C. Manhole Frame & Cover
 1. Sumter Machinery Company Inc.
 2. US Foundry
- D. Miscellaneous Accessories
 1. Trelleborg
 2. A-LOK Products
 3. MA Industries – Manhole Steps
- E. Substitutions: Under provisions of Section 00800.

2.02 GENERAL

- A. The Engineer will not permit intermixing of different types of pipe unless specified on the drawings or by approved written permission. If approved, pipe type changes shall occur only at manholes.
- B. All pipe shall be of first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length.
- C. All pipe shall be subject to the inspection of the engineer at the pipe plant, trench, or point of delivery, for purpose or culling and rejecting pipe (independent of laboratory test), which does not conform to the requirements of these specifications. The Engineer shall mark such pipe, and the Contractor shall remove it from the project site upon notice being received of its rejection.
- D. Ductile Iron Pipe shall be used at depths of 14 feet and deeper, as directed by the Engineer or as shown on the drawings.

2.03 GRAVITY SEWER PIPE MATERIALS

- A. Ductile Iron Pipe: AWWA C150 & AWWA C151, Pressure Class 350, “Protecto 401” Ceramic Epoxy Lined Pipe or “Sewpercoat” Lined Pipe; inside nominal diameter as shown on drawings. Joints shall be push on unless otherwise shown on the drawings.
 1. Ductile Iron Pipe Joint Device: AWWA C111 rubber gasket joint device.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D3033 & ASTM D3034, SDR 35, Type PSM, Polyvinyl Chloride (PVC) material; inside nominal diameter as shown. Bell and spigot style. Install in accordance with ASTM D2321. Laying length shall be 13 feet ± 1 foot.
 1. Polyvinyl Chloride (PVC) Fittings: ASTM D 3034 with minimum wall

thickness of SDR35. Fittings in sizes through 8" shall be molded in one piece with elastomeric joints and minimum socket depths as specified in sections 6.2 and 7.3.2. Fittings 10" and larger shall be molded or fabricated in accordance with section 7.11 with manufacturer's standard pipe bells and gaskets.

2. Gaskets shall have a minimum cross-sectional area of 0.20 sq. in. and conform to ASTM F 477.
 3. PVC material shall have a cell classification of 12454-B or C as defined in ASTM D 1784.
- C. Alternate Pipe Materials – Pipe that is not specified herein such as ABS, Vitrified Clay, CIP etc. shall not be installed unless otherwise shown on the Plans, approved by the Engineer and approved within the SCDHEC construction permit.

2.04 PIPE ACCESSORIES

- A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T", bends, elbows, cleanouts, reducers, traps, and other configurations required unless otherwise shown on drawings. Ductile iron fittings shall be lined to meet pipe material lining specification.
- B. All services or lateral lines shall be connected to mainline sewers with in-line service wyes only. Saddle wyes are not acceptable on new construction.

2.05 MANHOLES

- A. Manholes shall be pre-cast in accordance with Section 03500.
- B. Frame and Cover: Iron casting conforming to ASTM A48, Class 30C iron. Minimum manhole cover diameter shall be 24 inches, and the manhole ring and cover assembly shall not weigh less than 300 pounds. For elevations above the 50-year flood level, frames and covers shall be Sumter Machinery Company, MF-6, MC-2, or equivalent. For elevations below the 50-year flood level, frames and covers shall be watertight Sumter machinery MF-50GT, MC-50GT or equivalent.
- C. Shaft Construction and Eccentric Cone Top Section: Reinforced pre-cast or cast-in-place concrete pipe sections, lipped male-female, "O" ring gasket type joints; cast steel ladder rungs into shaft sections at 12 inches; nominal shaft diameter of 48,60, 72, 96 inches as shown on the drawings.
- D. Drop Manholes and Drop Connections shall be required where the invert differential is 24-inches or greater and shall be installed as shown on the Plans and standard detail drawings, or as directed by the Engineer.
- E. Manhole Steps: Neoprene coated steel steps cast or driven into manhole wall, 11 inches square and projecting from the wall 6 inches. Steps are to be a maximum of 16 inches on center.

- F. Rubber Boots: All manholes to be equipped with rubber boots and all stainless steel bands at each pipe portal.
- G. Coatings: Manhole coating shall consist of 21 mils, Kop-Coat 300-M Coal Tar Epoxy applied to the interior vertical surfaces as recommended by the manufacturer. Manhole coating shall be as shown on the plans or as specified elsewhere herein.

2.06 FILL MATERIAL

- A. Ductile Iron Pipe: Acceptable native materials as specified in Section 02200.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: Bed in accordance with bedding detail on drawings using material specified in Section 02200.

EXECUTION

3.01 GENERAL

- A. The Contractor shall furnish all material and labor, and construct the gravity sewers shown on the drawings, including all clearing, grubbing, excavating, sheathing, backfilling, foundations, manholes, and other appurtenances.
- B. The work shall include all ditching, pumping, bailing, draining, flushing, testing, and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drainage culverts, power and telephone lines and cables, and other structures.
- C. The contractor shall be responsible for the cleaning away of all rubbish and surplus materials upon completion of the work required to build and put in complete working order the specified sewer and all structures appertaining thereto.
- D. All sewers and appurtenances shall be cleared of all foreign debris.

3.02 ORDER OF WORK

- A. The Owner reserves the right to direct the Contractor as to which portions of work should be constructed first, and upon order of the Engineer, to verify that any complete portion of work is as specified and acceptable for service.

3.03 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

- A. The Contractor shall fully adhere to the SCDOT Permit while operating in any state right-of-way and all construction techniques shall comply with the current edition of the State Highway Department Standard Specifications and Traffic Control Manual.

- B. Through traffic shall be maintained at all times during construction of sewer across all streets and highways. If the open cut method is used, two separate cuts must be made and one lane of traffic must be open at all times.
- C. The Contractor shall obtain, by agreement with property owner, any additional space required for construction on private property.

3.04 EXISTING UTILITIES AND STRUCTURES

- A. Any existing utilities, structures, monuments, etc. damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.
- B. The approximate position of certain known underground lines is shown on the drawings for information only.
- C. The Contractor shall be responsible for having all underground utilities located by the appropriate party. Seventy-two (72) hours advance notice is required for utility locations.

3.05 POTABLE WATER PROTECTION (SEPARATION OF WATER & SEWER LINES)

- A. Adequate provision shall be made for the protection of potable water supplies from possible leakage from sewers located near water lines.
- B. There shall be no physical connection between a public water supply system and a sewer system. No potable water main shall pass through or come into contact with any part of a sewer manhole.
- C. Where possible, sewer mains should be located at least ten (10) feet horizontally from existing or proposed water main then:
 - 1. Sewer will be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen (18) inches below the bottom of the water main, or:
 - 2. Sewer will be laid in the same trench as the water main with the water main located on a bench of undisturbed earth, and with the elevation of the top of the sewer at least eighteen (18) inches below the bottom of the water main, or:
 - 3. If conditions prevent the eighteen (18) inch vertical separation, then the sewer will be laid under the water main and both the water and sewer shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.
- D. When conditions require a sewer line to cross over a water main, both the water main and sewer line shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.

- E. Water/sewer line separation shall be in accordance with Section R61.58.4D (12) of the State Primary Drinking Water Regulations.
- F. When it is not possible to maintain the separation distances specified in the regulation above, the Engineer may allow an alternative design subject to approval from SCDHEC. The alternative design shall: 1. Maximize the distance between the water main and sewer line and the joints of each; 2. Use materials that meet the state regulatory requirement (R61.58.4) and 3. Allow adequate distance for maintenance and repairs on each line without causing damage to the other line.

3.06 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.
- B. Remove large stones or other hard matter, which could damage the pipe or impede consistent backfilling or compaction.

3.07 INSTALLATION-PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM D2321, and manufacturer's instructions. All sewer lines shall be installed with a minimum of 3-foot cover over the pipe unless otherwise shown on the plans and approved in the SCDHEC construction permit.
- B. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times.
- C. Lay pipe to slope gradient noted on drawings. Pipe laying shall begin at the lowest grade point with spigot ends pointing down grade and forming a uniform invert.
- D. All surfaces of pipe to be jointed, as well as the rubber gaskets, shall be cleaned and lubricated with a vegetable soap or other lubricating agent as per the manufacturer's recommendations. Seal joints watertight.
- E. Pipe shall not be placed on blocking at any time unless approved by the Engineer, and then only at manholes or other structures where temporary blocking may facilitate installation of the pipe. After the pipe has been installed, all blocking shall be removed and all voids filled with select material and compacted in place.
- F. All end line pipe, temporary or permanent, shall be fully protected with a watertight stopper to prevent water, earth, or other foreign debris from entering the pipe.
- G. Pipe of different material shall not be joined together unless directly specified by the Engineer. Changes in pipe material shall be made at manholes only.

3.08 INSTALLATION - MANHOLES

- A. Minimum diameter of manholes shall be 4'-0" (48") and pre-cast manholes shall conform to all the requirements of ASTM C 478.
- B. Form bottom of excavation clean and smooth to correct elevation. Establish elevations and pipe inverts for inlets and outlets as indicated.
- C. All invert channels shall be smooth and semi-circular in shape, conforming to the inside of the adjacent sewer pipe section. Changes in direction of flow shall be made with a smooth curve, as large in radius as the size of the manhole will allow. Changes in the size and grade of the channels shall be formed directly in the concrete of the manhole base. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot nor more than two inches per foot.
- D. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer.
- E. Mount lid and frame level in grout, secured to top cone section at elevation indicated.

3.09 SEWER SERVICES AND CLEANOUTS

- A. All services shall have a watertight plug or cap at the end of the pipe.
- B. Services, unless otherwise directed, shall extend from the main sewer line to the property line or street right-of-way. Install cleanouts as shown on the drawings.
- C. The end of the service shall be marked with a pressure treated post marker (4"x4") or a PVC marker (painted pine markers are not acceptable). All pressure treated markers shall be painted with an exterior weatherproof paint, green in color. The marker shall extend 6" above ground and not less than 3 feet below ground. It shall be placed exactly 3 feet further than the end of the service and on a line perpendicular to the centerline of the main. If the 3 feet cannot be obtained due to obstructions, the marker shall be set within 3 feet of the service end location.
- D. All services and cleanouts shall be a minimum of 6 inches in diameter, unless otherwise directed.
- E. Services and cleanouts shall be of the same material as the main line sewer unless shown otherwise.
- F. Cleanouts located in asphalt or concrete pavement shall be protected by a frame and cover as manufactured by Vulcan Foundry Inc., catalog number V-8503 or equivalent.

3.10 INSPECTION

- A. All work done and materials furnished shall be subject to the inspection of the Engineer and his inspector. The Engineer reserves the right to mark rejected materials to distinguish them as such.
- B. All improper work shall be reconstructed at the Contractor's expense.
- C. All materials, which do not conform to the requirements of the specifications, shall be removed and replaced with approved materials at the Contractor's expense.

3.11 PIPE TESTING

A. Mandrel:

- 1. A mandrel shall be pulled through PVC line sections at any time prior to or during the one-year warranty period. A 5% mandrel shall be used on any line, which has been installed for less than thirty days. After 30 days a 7 1/2% mandrel will be allowed.
- 2. An approved mandrel, proving ring, pulling ropes and cables shall be provided by the Contractor for testing PVC pipe at no additional cost to the Owner.
- 3. The mandrel shall be hand-pulled through the pipe using no wrenched or other mechanical devices except a pulley at the manhole invert. The pulley allows the mandrel to be pulled from ground level rather than from inside the manhole.
- 4. If, at any point in the pipe in question, one (1) man is unable to hand pull the mandrel through the pipe, then the pipe will be deemed unacceptable. The failed pipe shall be re-excavated and the problem solved at the Contractor's expense.

B. Infiltration/Exfiltration Testing:

- 1. Measurements of infiltration/exfiltration will be made before sewage flows are allowed in the sewers.
- 2. Measurements for infiltration shall be made using a V-notch weir or by measuring the volume directly. Measurements for exfiltration shall be made by bulk heading the sewer at the end of the lower grade, partially filling the manhole at the upper end and computing the volume of leakage from the extent of the diminished volume of water in the manhole during the test period. (This method is only applicable for dry soil conditions).
- 3. All infiltration/exfiltration tests shall be conducted by the Contractor in the presence of the Engineer.

4. All testing shall be at the expense of the Contractor.
 5. Allowable limit of exfiltration and ground water infiltration for the entire system of new sewer or any one trunk, interceptor or outfall sewer line, including connecting laterals, shall not exceed 100 gallons per day per inch of pipe diameter per mile of pipe. This rate will be applied to any length of pipe in order to isolate excessive infiltration/exfiltration areas.
- C. Low Pressure Air Testing of Gravity Sewers:
1. Air testing may be performed in lieu of infiltration/exfiltration testing as approved by the Engineer. All testing shall conform to ASTM F1417.
- D. Digital Video Camera Inspection
1. Upon completion of a new installation or repaired sewer line, the line shall be recorded on digital media at no additional cost to the Owner. This video inspection shall be submitted to the Engineer for verification of work quality and completion of installation or repair. The contractor shall contact the Engineer prior to video inspection, so an Owner representative may be present during video inspection.

3.12 FIELD QUALITY CONTROL

- A. Field inspection will be performed by the Engineer and/or Owner.
- B. Materials testing (i.e., compaction, concrete strength, etc.) shall be performed as directed by the Engineer and as specified in Section 00800.

3.13 PROTECTION

- A. Protect pipe from damage or displacement until backfilling operation is in progress.

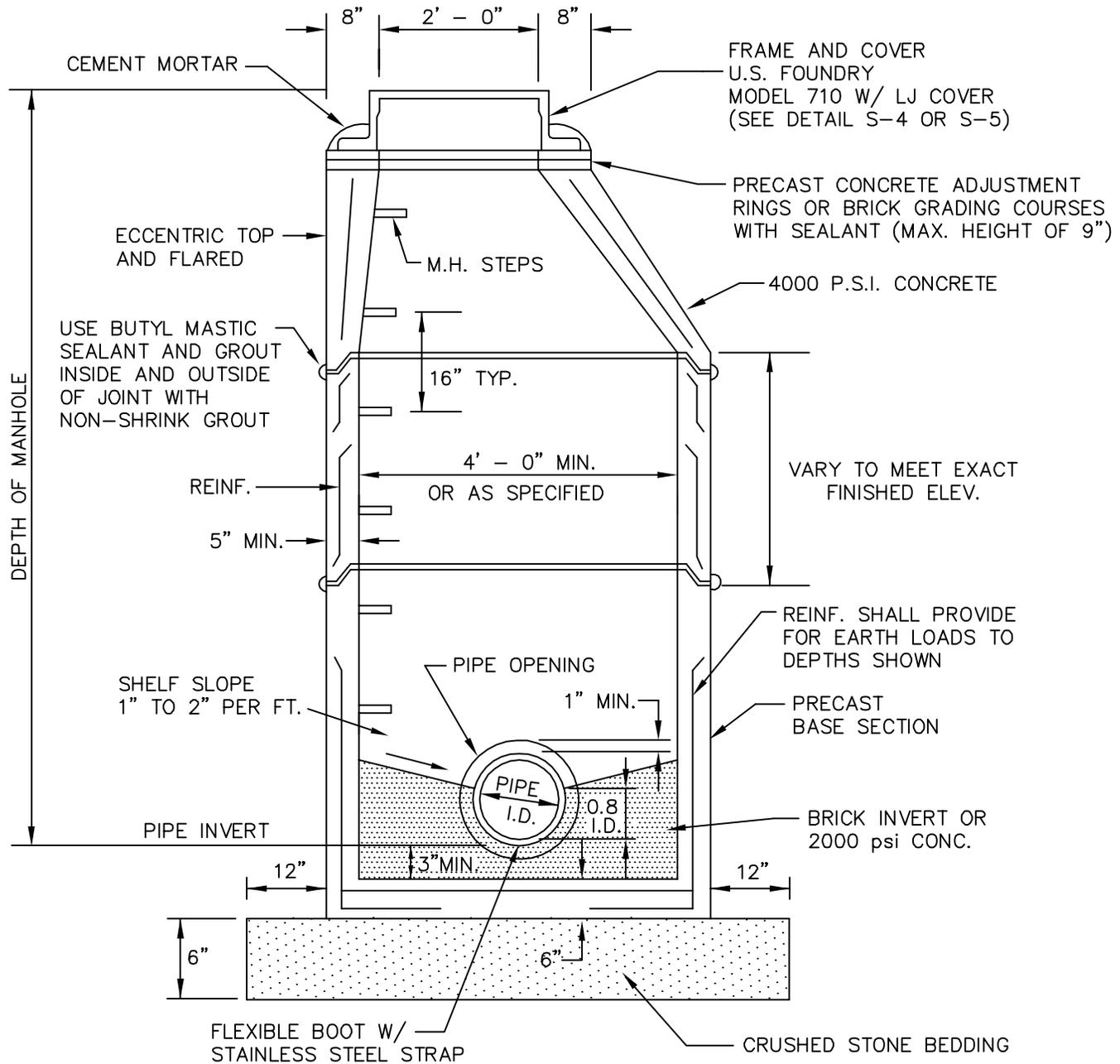
END OF SECTION

CITY OF NORTH MYRTLE BEACH STANDARD DETAILS
ENGINEERING DIVISION



SEWER:

- S-1 STANDARD PRECAST CONCRETE MANHOLE SECTION VIEW
- S-2 PRECAST CONCRETE MANHOLE PLAN VIEW AND NOTES
- S-3 DROP MANHOLE
- S-4 STANDARD MANHOLE RING AND COVER
- S-5 WATERTIGHT MANHOLE RING AND COVER
- S-6 GRAVITY SEWER PIPE BEDDING NON-PAVEMENT AREAS
- S-7 GRAVITY SEWER PIPE BEDDING PAVEMENT AREAS
- S-8 SINGLE SEWER SERVICE CONNECTION
- S-9 RESIDENTIAL DOUBLE SEWER SERVICE CONNECTION
- S-10 PLUG VALVE AND BOX 8" OR LARGER
- S-11 PLUG VALVE AND BOX 6" OR SMALLER
- S-12 AIR RELEASE VALVE MARKER POST
- S-13 MAIN VALVE MARKER POST
- S-14 AIR RELEASE VALVE AND MANHOLE
- S-15 SEWER FORCE MAIN TO MANHOLE CONNECTION
- S-16 INSIDE DROP MANHOLE
- S-17 GREASE TRAP 1000 GALLON SIDE VIEW
- S-17_a GREASE TRAP 1000 GALLON END VIEW
- S-18 SANITARY SEWER CLEANOUT
- S-19 SEWER SERVICE BUILDING CONNECTION
- S-20 MULTI-FAMILY & COMMERCIAL 6" SEWER SERVICE CONNECTION



SECTION

STANDARD PRECAST
CONCRETE MANHOLE
SECTION VIEW

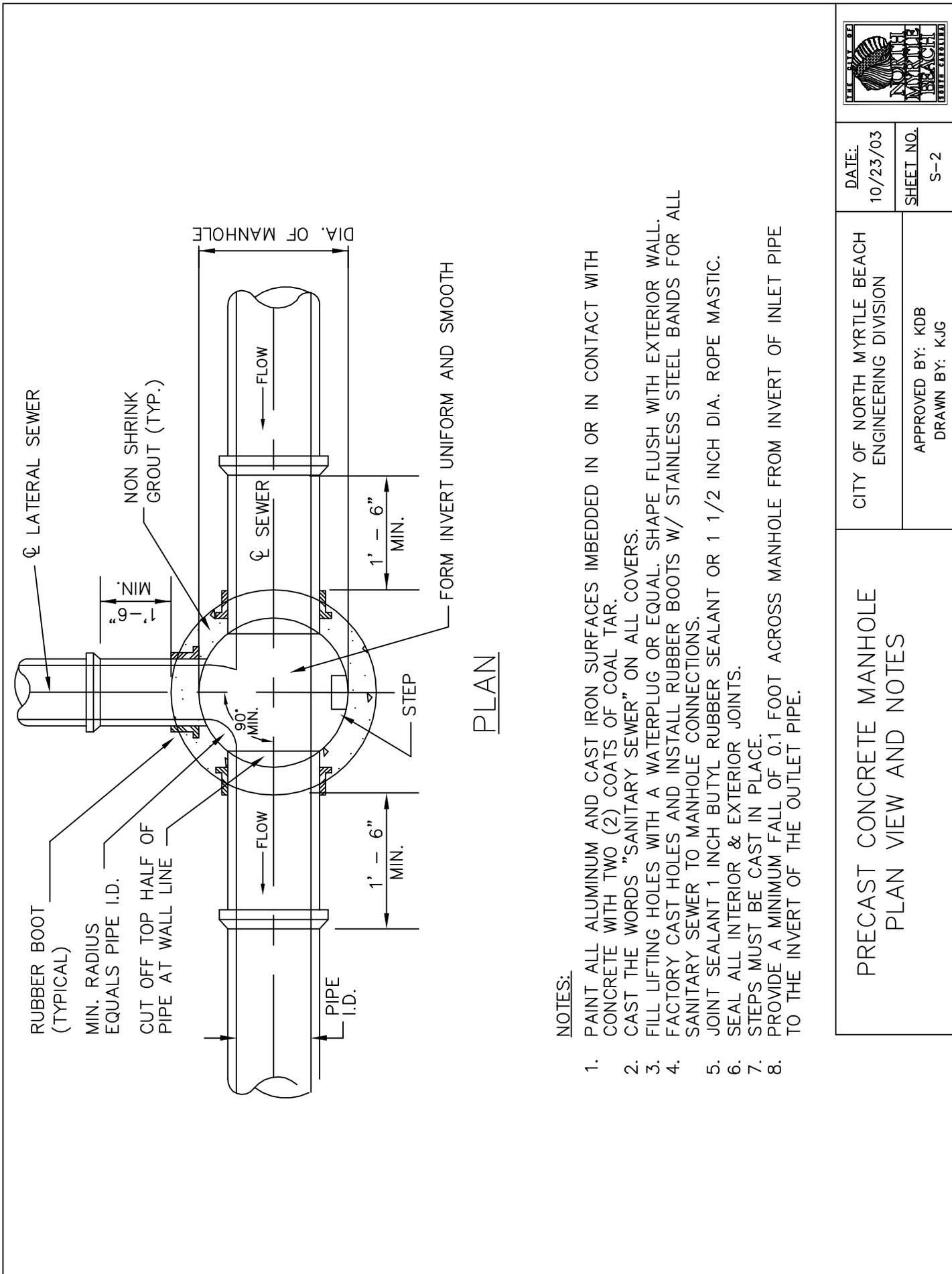
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
1/10/07

SHEET NO.
S-1





PLAN

NOTES:

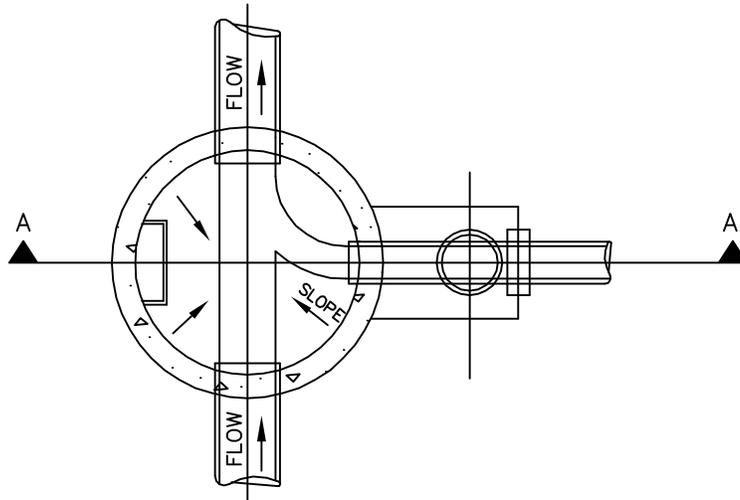
1. PAINT ALL ALUMINUM AND CAST IRON SURFACES IMBEDDED IN OR IN CONTACT WITH CONCRETE WITH TWO (2) COATS OF COAL TAR.
2. CAST THE WORDS "SANITARY SEWER" ON ALL COVERS.
3. FILL LIFTING HOLES WITH A WATERPLUG OR EQUAL. SHAPE FLUSH WITH EXTERIOR WALL.
4. FACTORY CAST HOLES AND INSTALL RUBBER BOOTS W/ STAINLESS STEEL BANDS FOR ALL SANITARY SEWER TO MANHOLE CONNECTIONS.
5. JOINT SEALANT 1 INCH BUTYL RUBBER SEALANT OR 1 1/2 INCH DIA. ROPE MASTIC.
6. SEAL ALL INTERIOR & EXTERIOR JOINTS.
7. STEPS MUST BE CAST IN PLACE.
8. PROVIDE A MINIMUM FALL OF 0.1 FOOT ACROSS MANHOLE FROM INVERT OF INLET PIPE TO THE INVERT OF THE OUTLET PIPE.



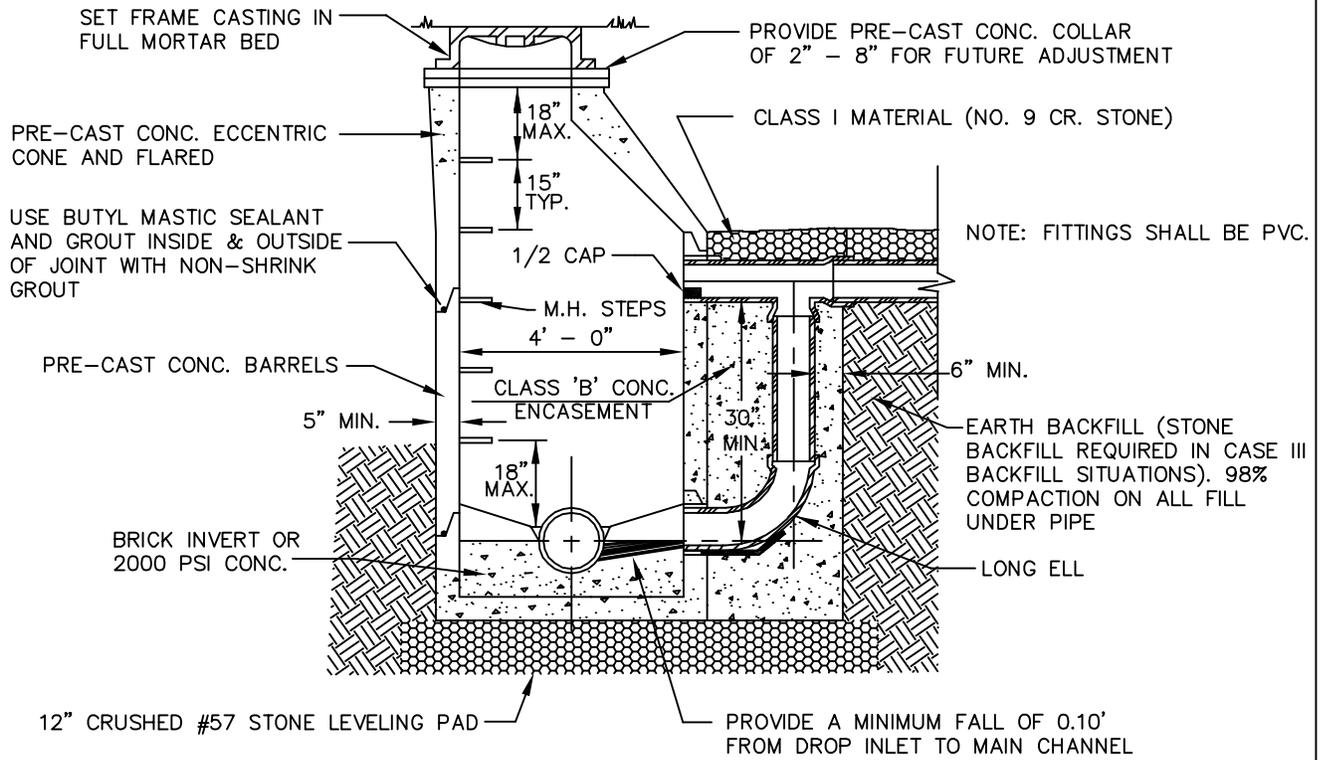
DATE: 10/23/03
 SHEET NO. S-2

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KDB
 DRAWN BY: KJG

PRECAST CONCRETE MANHOLE
 PLAN VIEW AND NOTES



PLAN



SECTION A-A

DROP MANHOLE

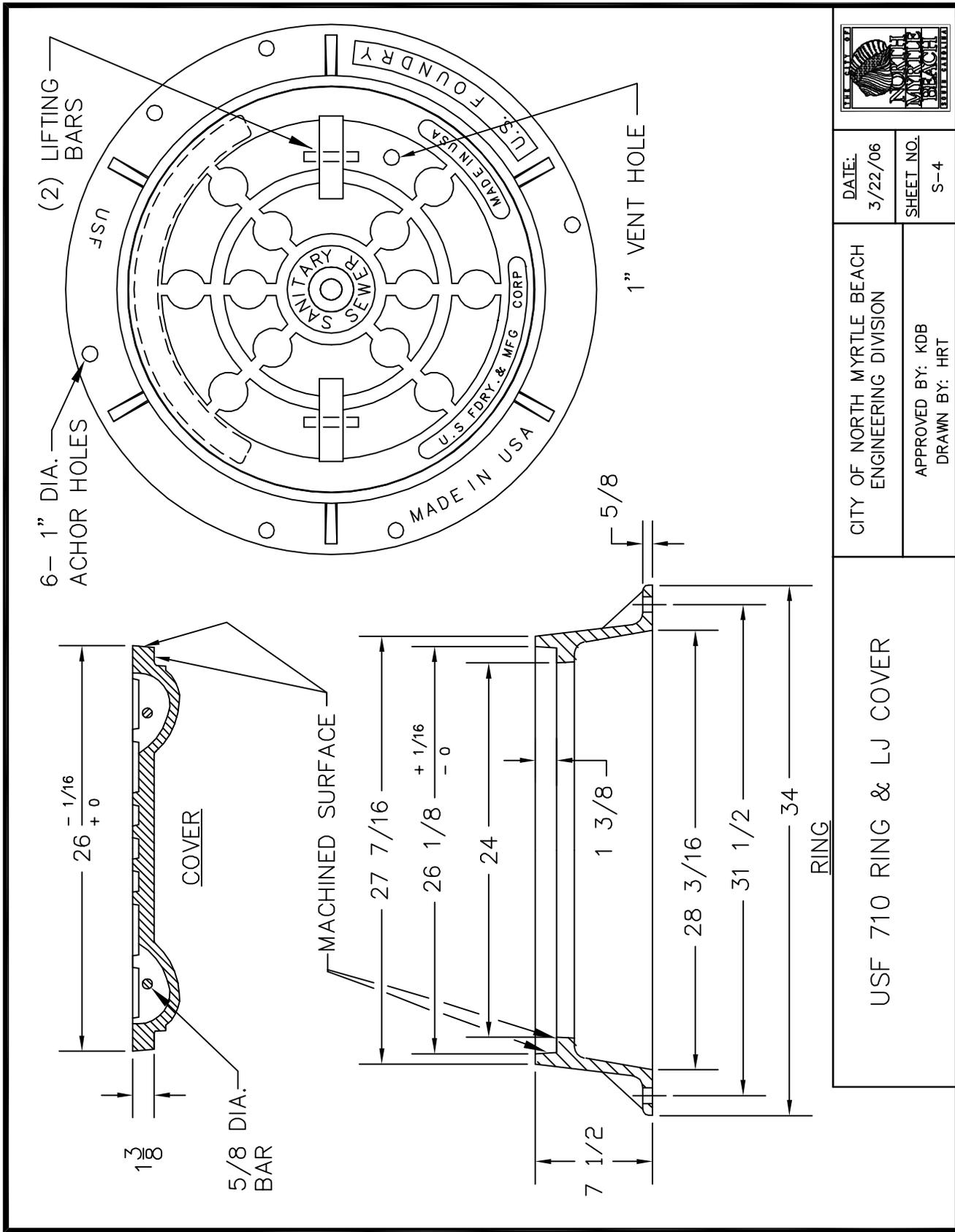
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
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10/23/03

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S-3

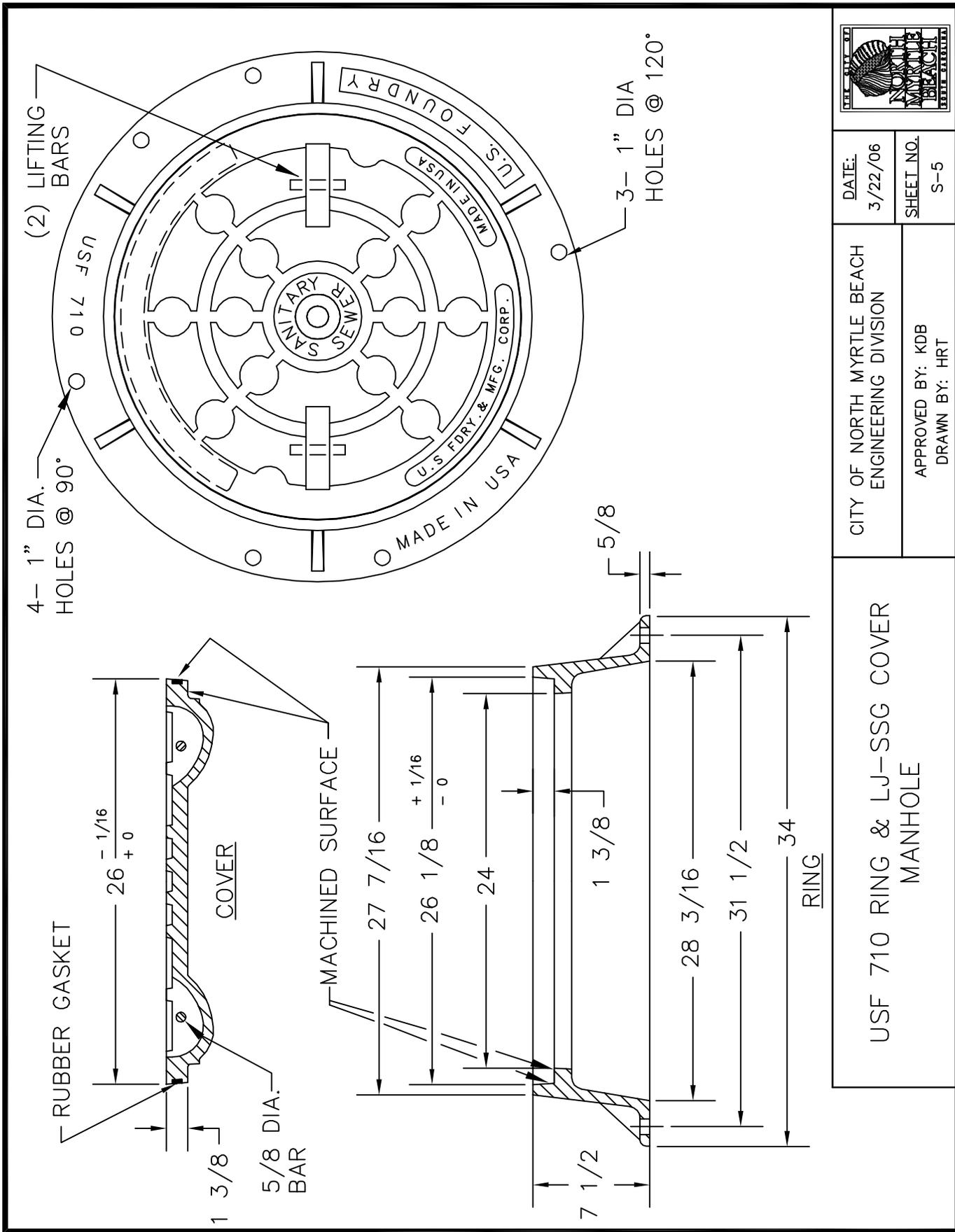




DATE: 3/22/06
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CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KDB
 DRAWN BY: HRT

USF 710 RING & LJ COVER

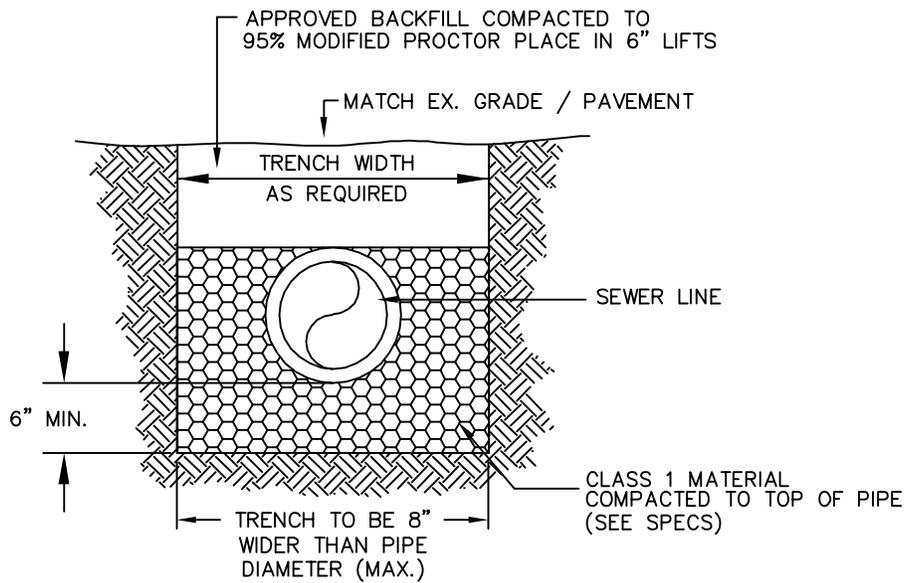


DATE: 3/22/06
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CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

USF 710 RING & LJ-SSG COVER
MANHOLE



GRAVITY SEWER PIPE BEDDING
NON-PAVEMENT AREAS

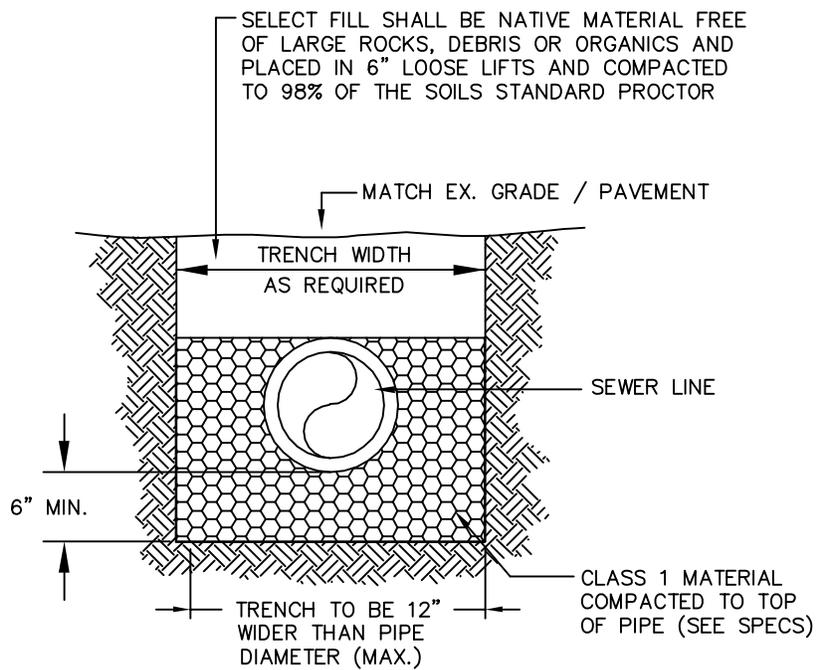
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ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
S-6





GRAVITY SEWER PIPE BEDDING
PAVEMENT AREAS

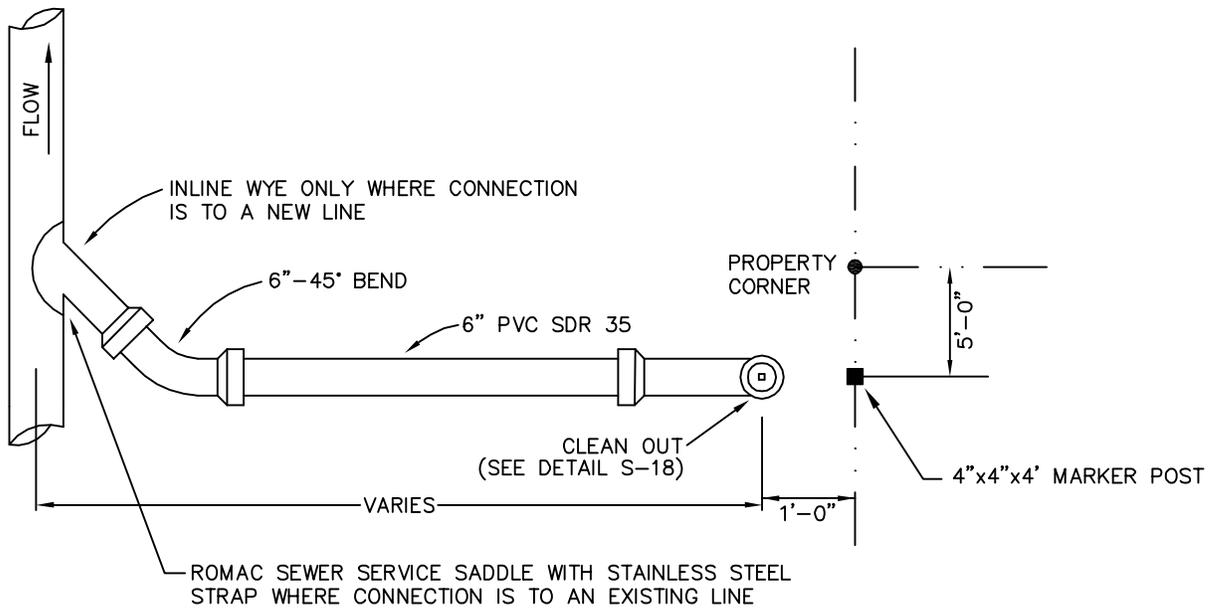
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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10/23/03

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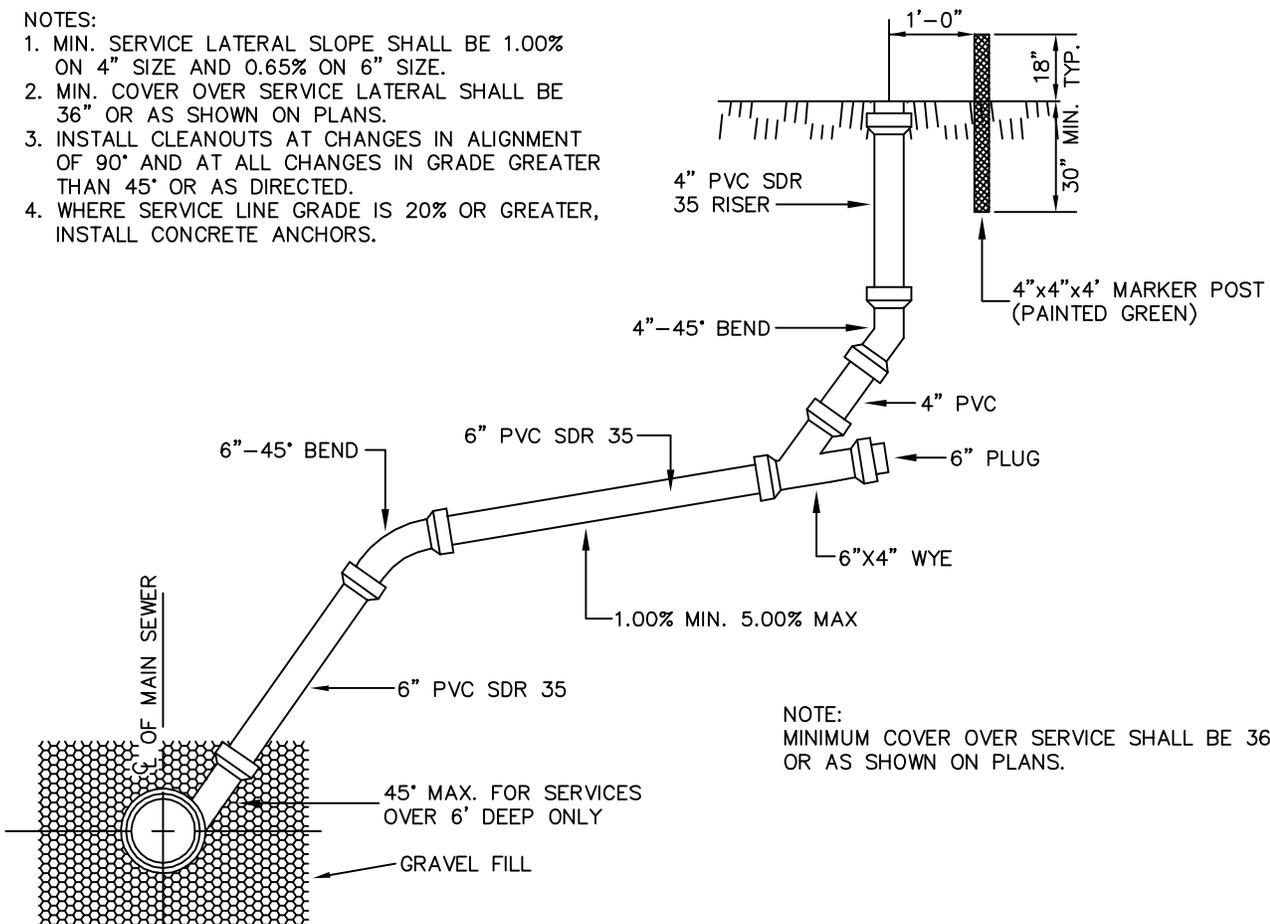
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S-7





NOTES:

1. MIN. SERVICE LATERAL SLOPE SHALL BE 1.00% ON 4" SIZE AND 0.65% ON 6" SIZE.
2. MIN. COVER OVER SERVICE LATERAL SHALL BE 36" OR AS SHOWN ON PLANS.
3. INSTALL CLEANOUTS AT CHANGES IN ALIGNMENT OF 90° AND AT ALL CHANGES IN GRADE GREATER THAN 45° OR AS DIRECTED.
4. WHERE SERVICE LINE GRADE IS 20% OR GREATER, INSTALL CONCRETE ANCHORS.



NOTE:
MINIMUM COVER OVER SERVICE SHALL BE 36"
OR AS SHOWN ON PLANS.

SINGLE SEWER
SERVICE CONNECTION

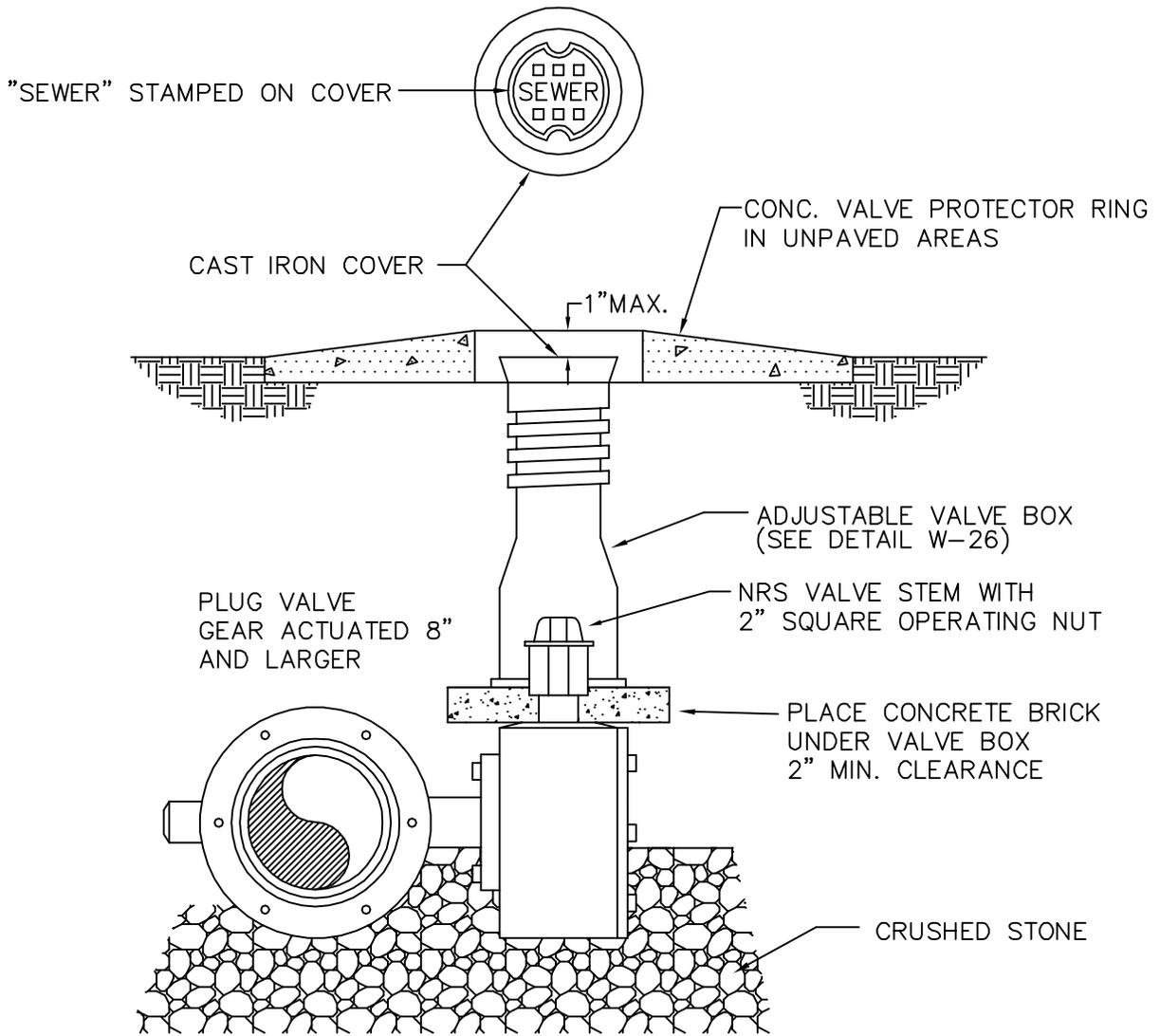
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ENGINEERING DIVISION

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DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
S-8





PLUG VALVE & BOX
8" AND LARGER

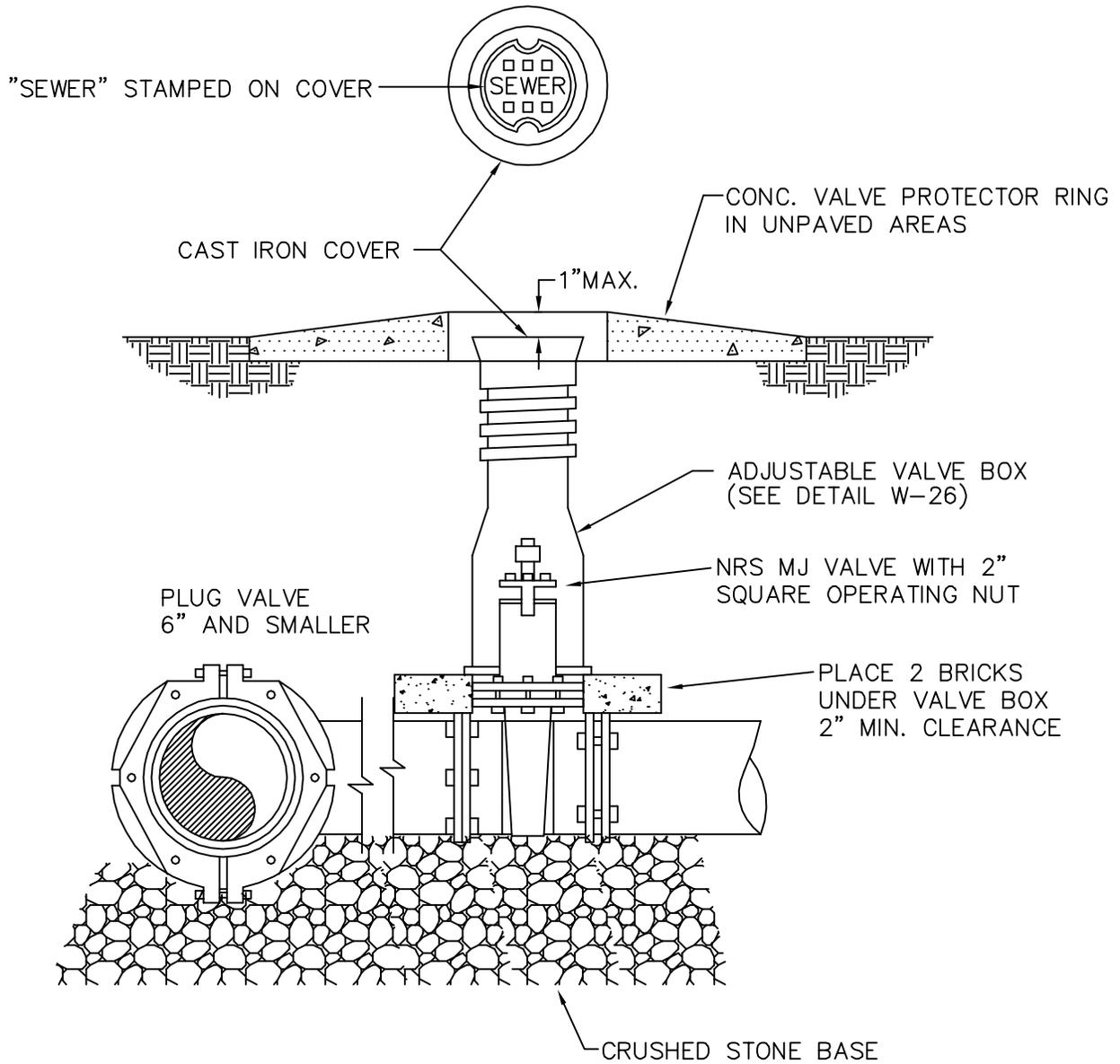
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ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
S-10





PLUG VALVE & BOX
6" AND SMALLER

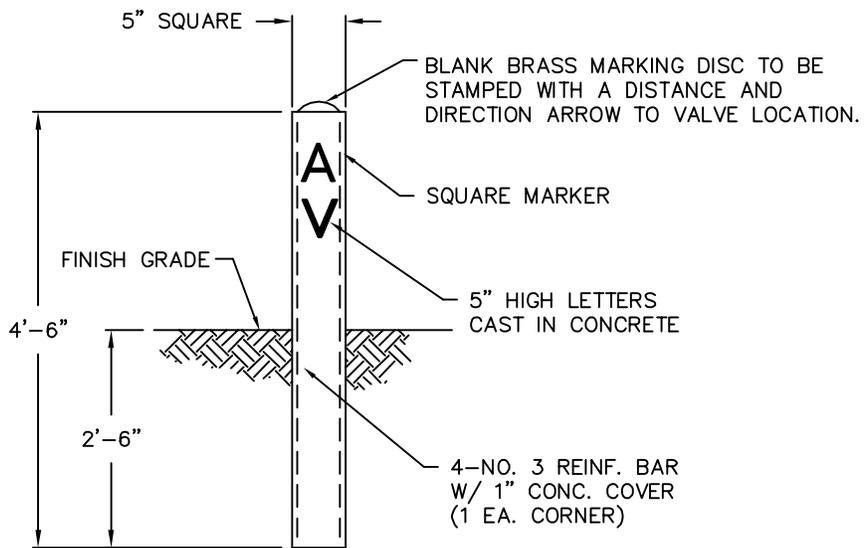
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ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
S-11





AIR RELEASE VALVE
MARKER POST

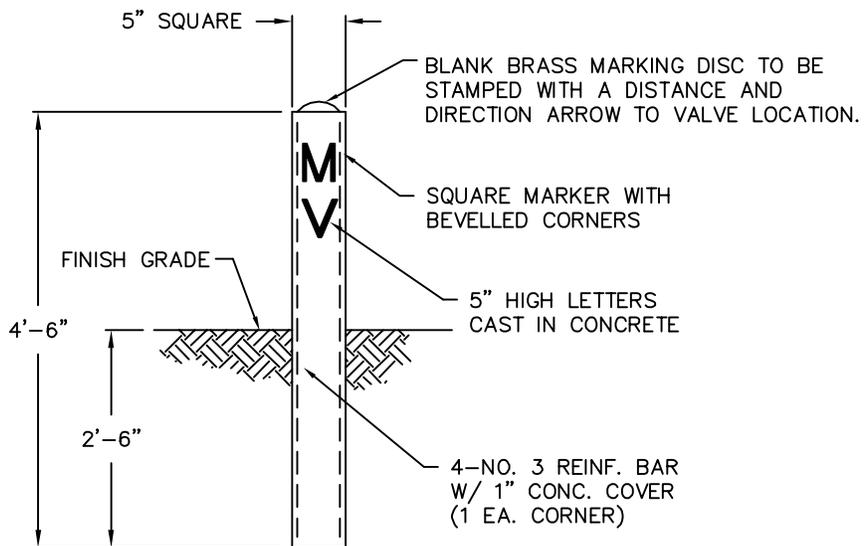
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
S-12





MAIN VALVE MARKER POST

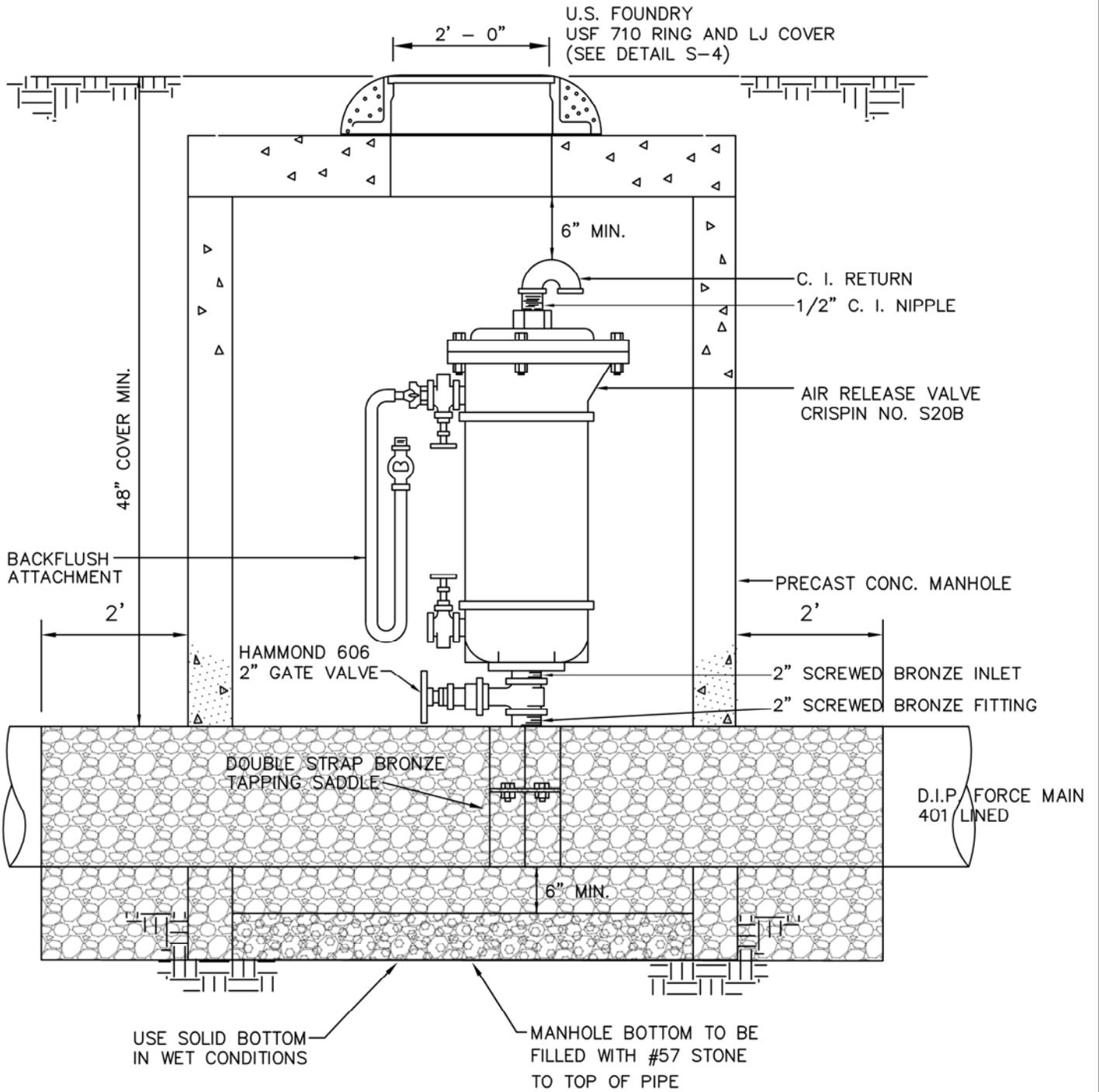
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
S-13





AIR RELEASE VALVE & MANHOLE

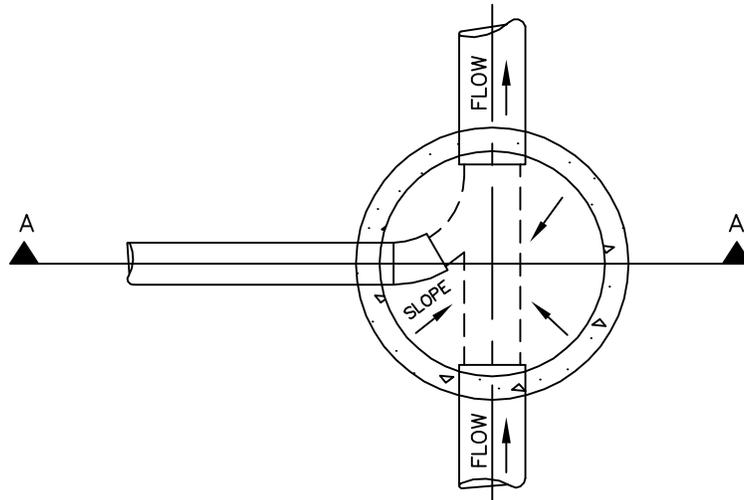
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

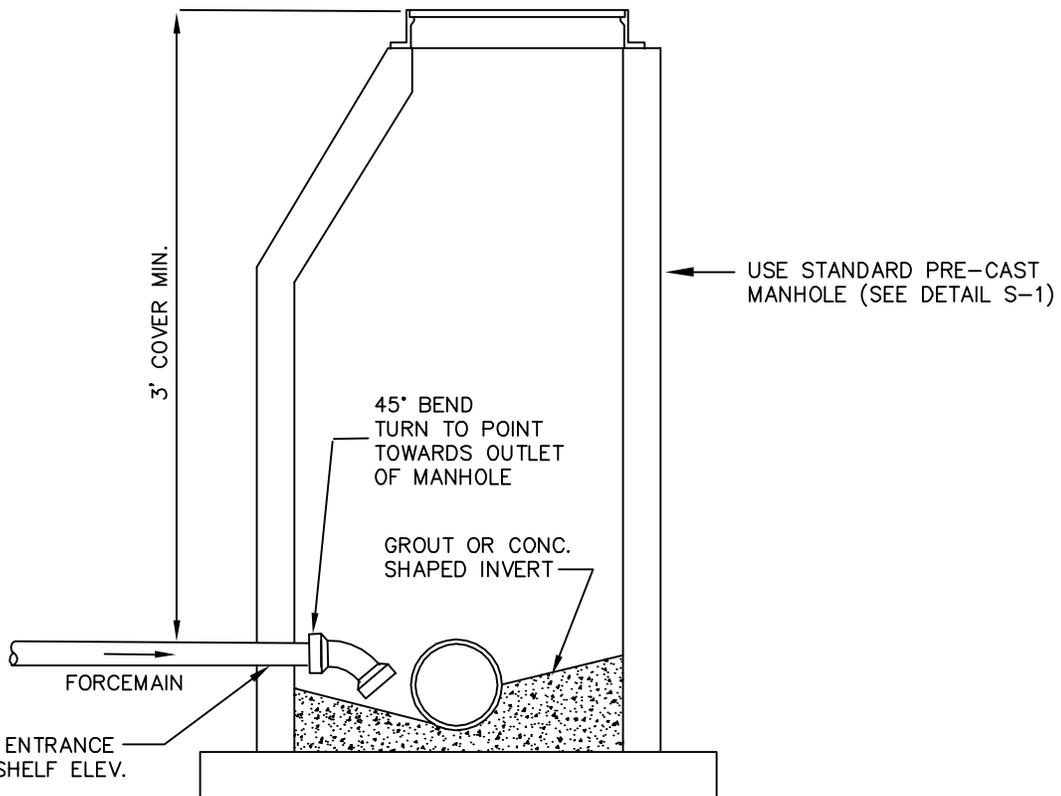
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3/26/09

SHEET NO.
S-14





PLAN



SECTION A-A

NOTE:
FORCE MAIN ENTRANCE
AT TOP OF SHELF ELEV.

SEWER FORCE MAIN TO
MANHOLE CONNECTION

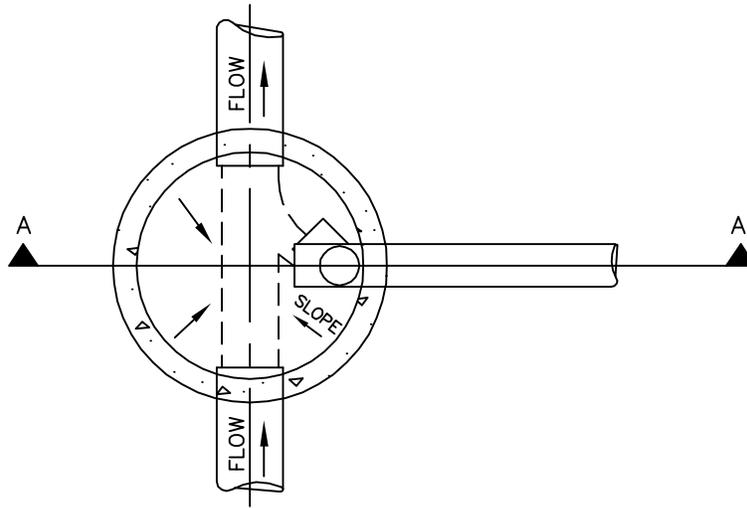
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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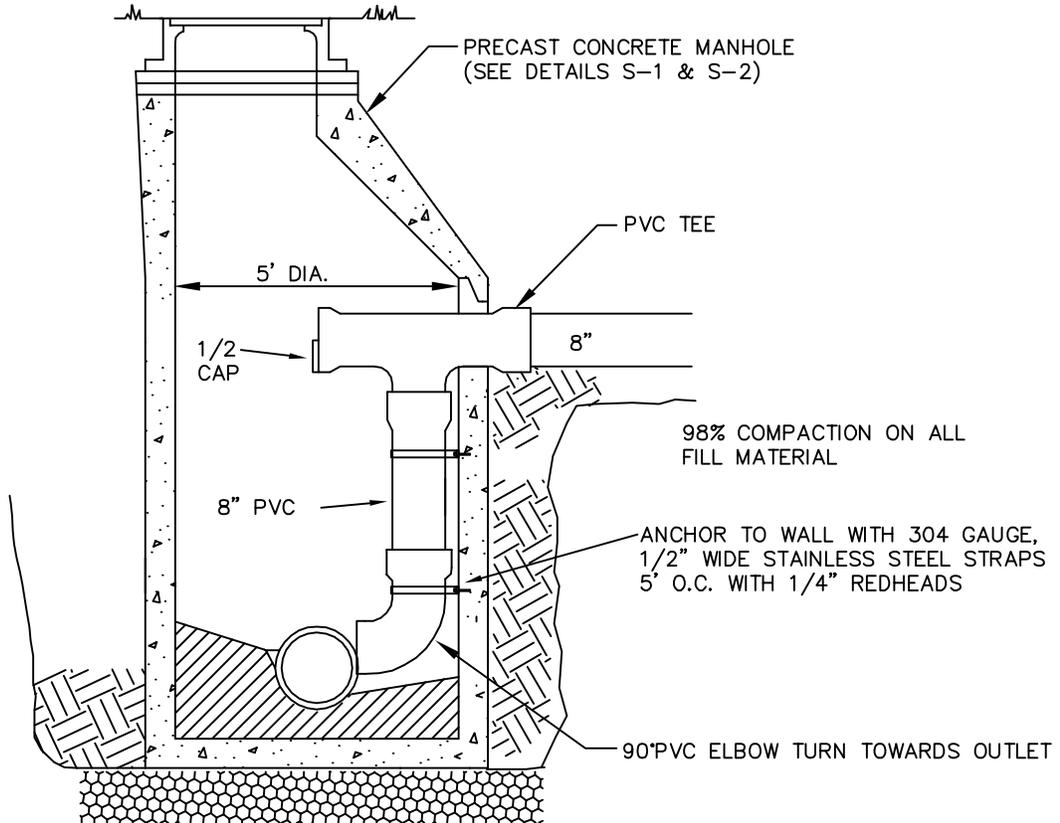
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SHEET NO.
S-15





PLAN



SECTION A-A

NOTES:

1. MANHOLE SHALL CONFORM TO ALL REQUIREMENTS SHOWN ON THE TYPICAL MANHOLE DETAIL. THIS DETAIL INDICATES ONLY THOSE ITEMS WHICH DIFFER FROM THE TYPICAL MANHOLE.
2. THIS DETAIL SHALL NOT BE USED EXCEPT WITH PRIOR WRITTEN PERMISSION.

INSIDE DROP MANHOLE

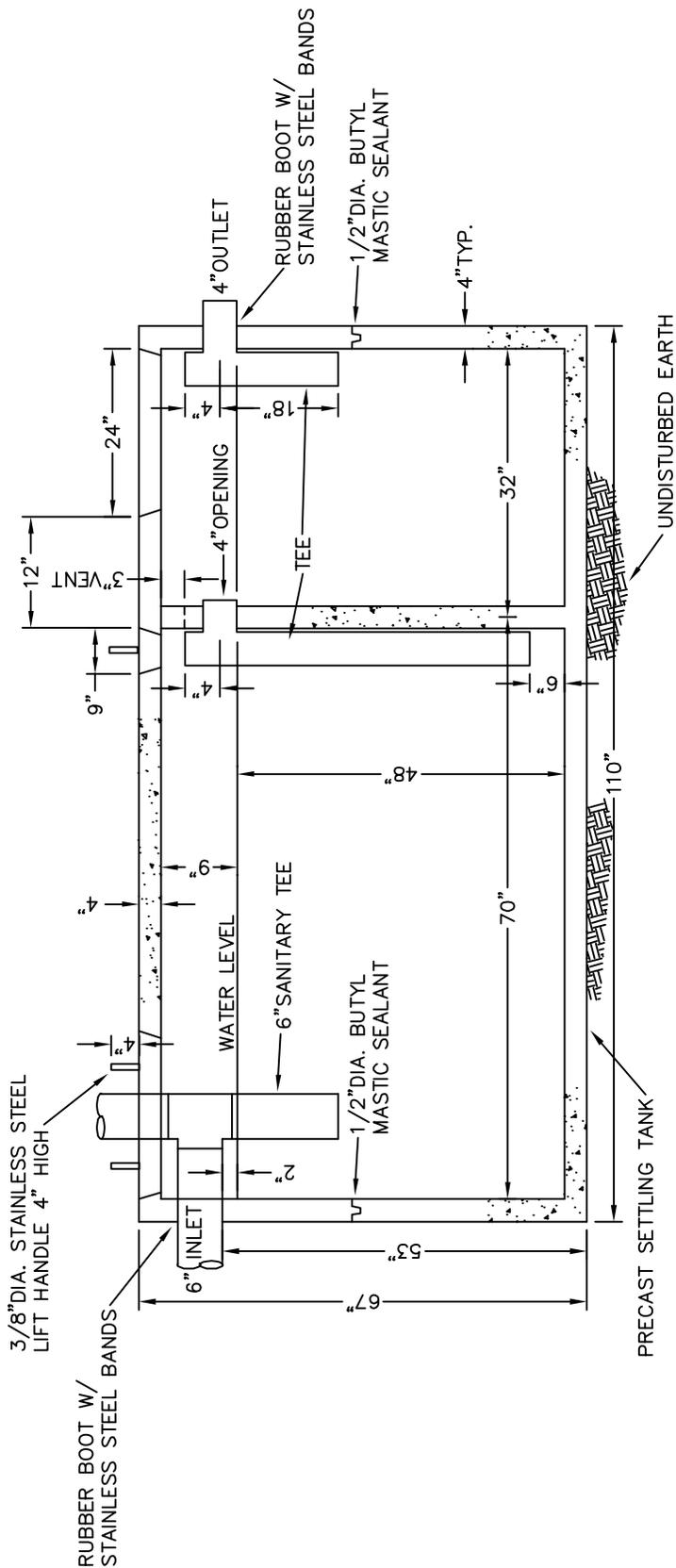
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

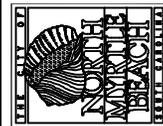
SHEET NO.
S-16





SIDE VIEW

NOTES:
 CONCRETE - 4000 PSI
 REINFORCING - 6"x6"x#10 WIRE MESH WITH #3 STEEL IN TOP AND BOTTOM SLAB
 TOP AND BOTTOM MUST BE MONOLITHICALLY CAST AND HAVE MATCHING KEY JOINT



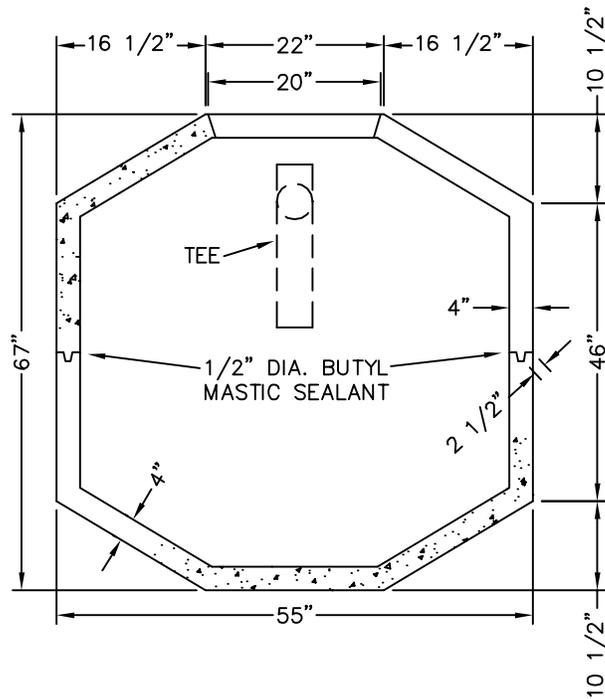
DATE:
10/23/03

SHEET NO.
S-17

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION

APPROVED BY: KOB
 DRAWN BY: KJG

GREASE TRAP - 1000 GALLON
 SIDE VIEW



END VIEW

GREASE TRAP – 1000 GALLON
END VIEW

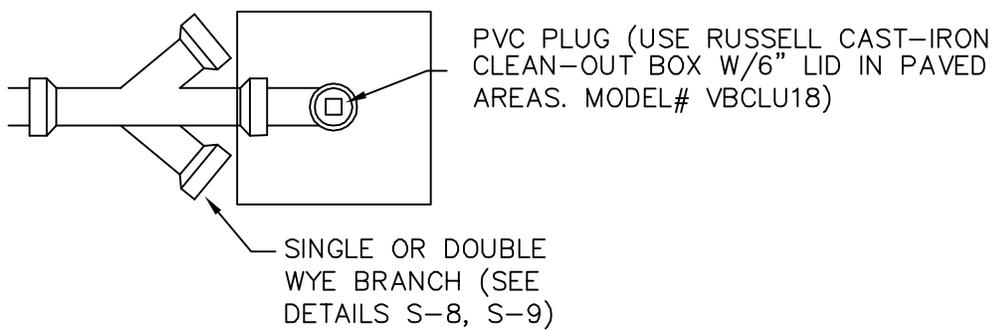
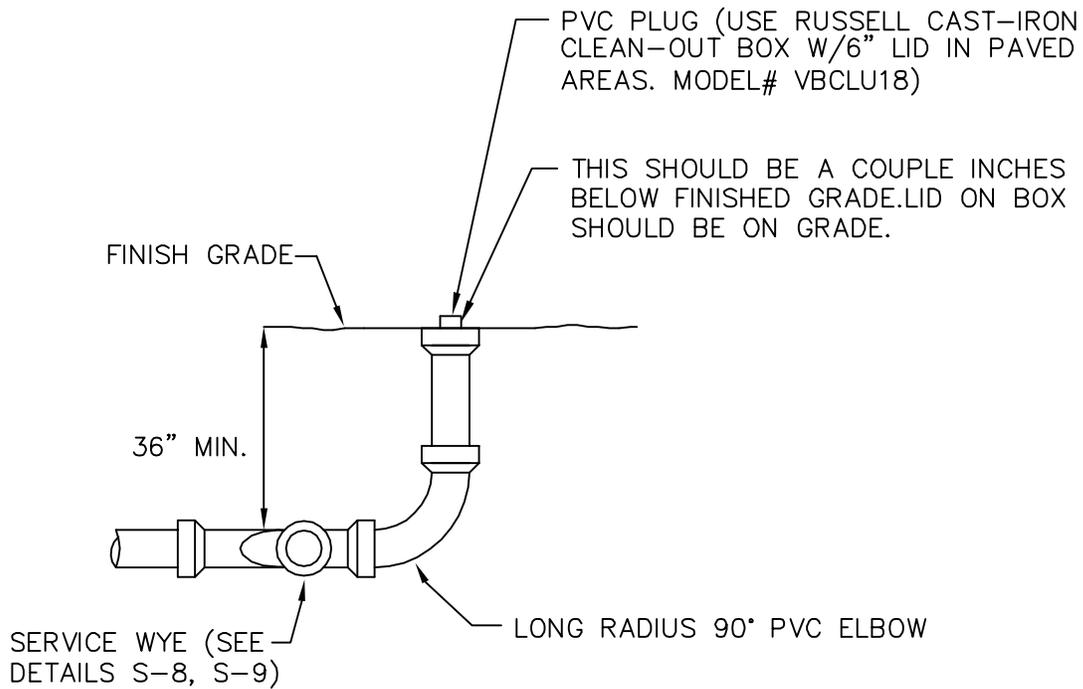
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
S-17a





SANITARY SEWER CLEANOUT

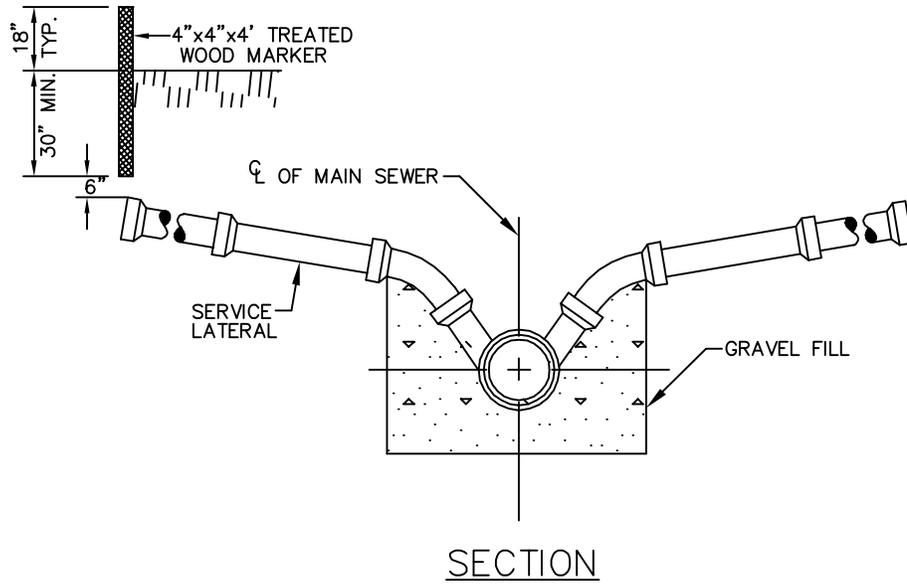
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

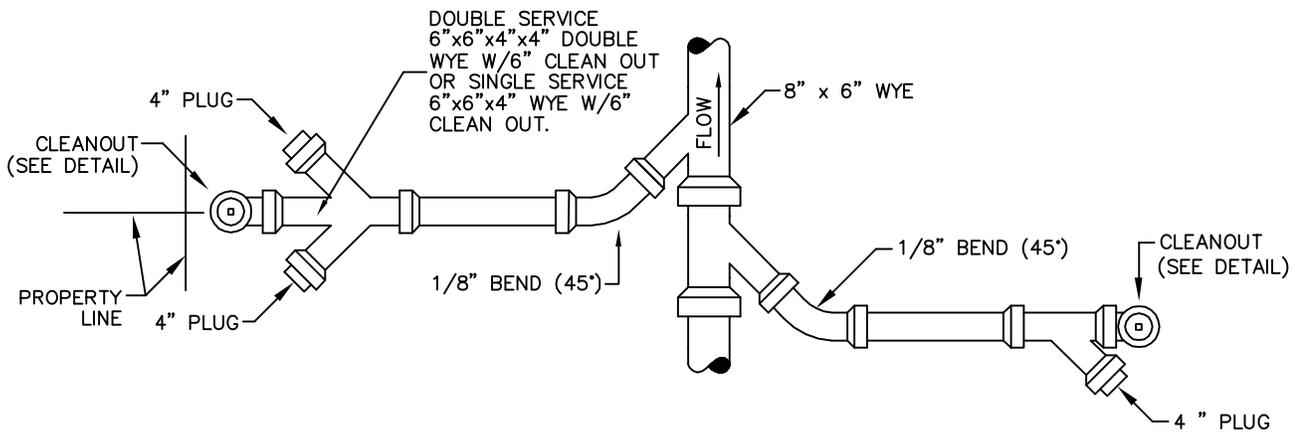
DATE:
10/23/03

SHEET NO.
S-18





SECTION



PLAN

NOTES:

1. MIN. SERVICE LATERAL SLOPE SHALL BE 1.00% ON 4" SIZE AND 0.65% ON 6" SIZE.
2. MIN. COVER OVER SERVICE LATERAL SHALL BE 36" OR AS SHOWN ON PLANS.
3. INSTALL CLEANOUTS AT CHANGES IN ALIGNMENT OF 90° AND AT ALL CHANGES IN GRADE GREATER THAN 45° OR AS DIRECTED.
4. WHERE SERVICE LINE GRADE IS 20% OR GREATER, INSTALL CONCRETE ANCHORS.

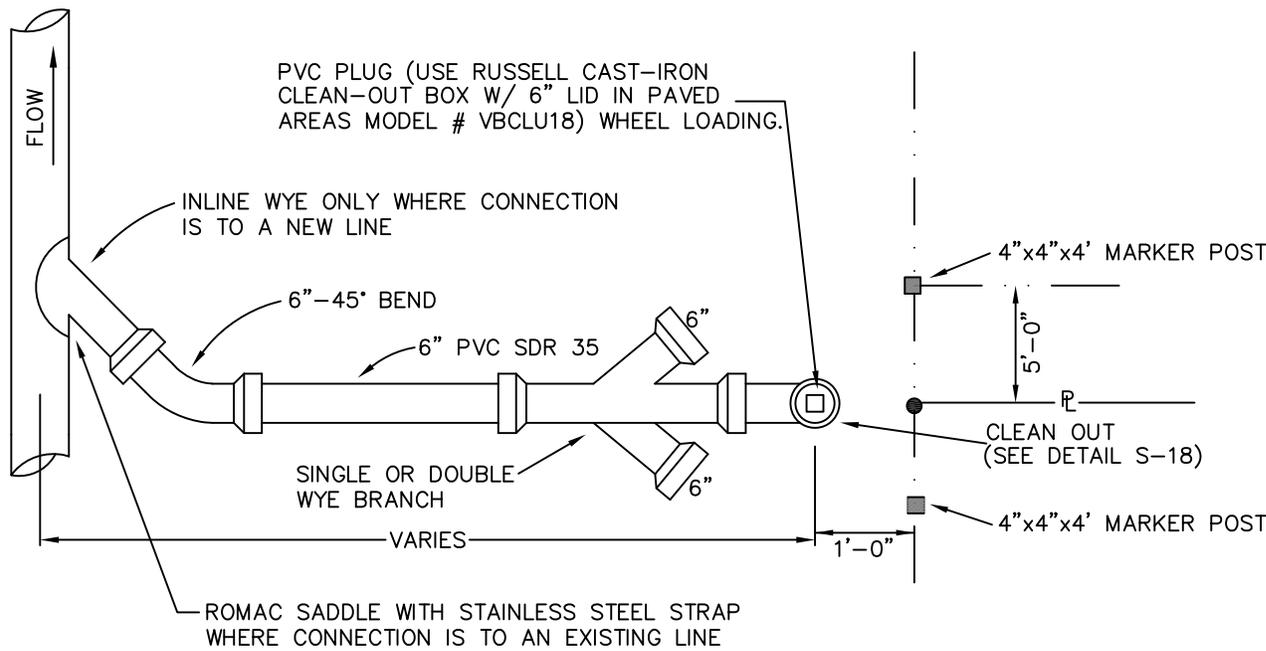
SEWER SERVICE
BUILDING CONNECTION

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

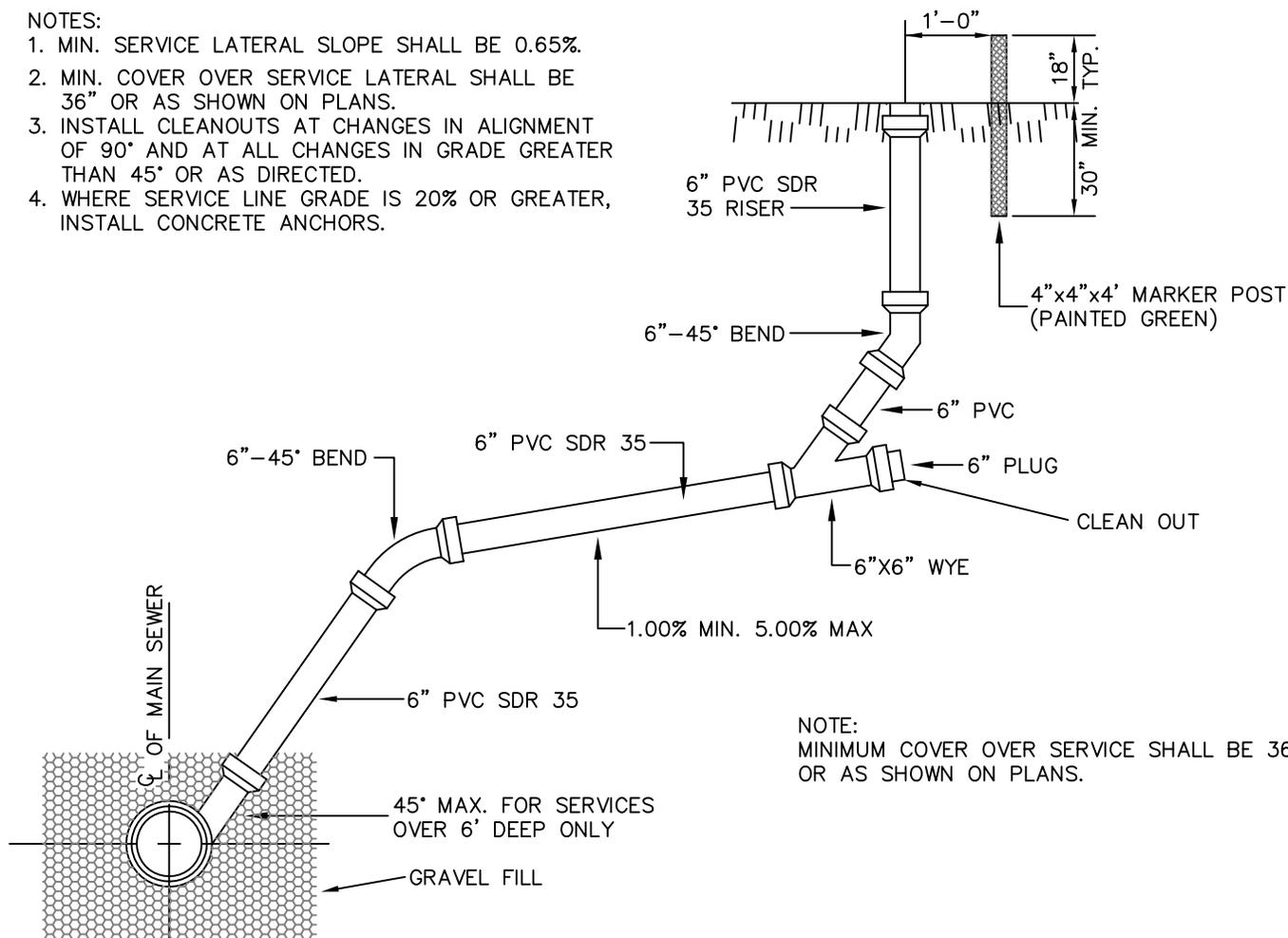
DATE:
10/23/03
SHEET NO.
S-19





NOTES:

1. MIN. SERVICE LATERAL SLOPE SHALL BE 0.65%.
2. MIN. COVER OVER SERVICE LATERAL SHALL BE 36" OR AS SHOWN ON PLANS.
3. INSTALL CLEANOUTS AT CHANGES IN ALIGNMENT OF 90° AND AT ALL CHANGES IN GRADE GREATER THAN 45° OR AS DIRECTED.
4. WHERE SERVICE LINE GRADE IS 20% OR GREATER, INSTALL CONCRETE ANCHORS.



NOTE:
MINIMUM COVER OVER SERVICE SHALL BE 36" OR AS SHOWN ON PLANS.

MULTI-FAMILY & COMMERCIAL
6" SEWER
SERVICE CONNECTION

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

DATE:
2/21/08
SHEET NO.
S-20



SECTION 02625

SEWER FORCE MAIN SYSTEMS

GENERAL

1.01 SECTION INCLUDES

- A. Sewer Force Main piping, fittings, and accessories.
- B. Sewer Pump Station piping, fittings, checks, and valves.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation
- B. Section 02200 - Backfilling
- C. Section 02300 - Trenching
- D. Section 02600 - Sanitary Sewer Gravity Systems
- E. Section 02650 - Sewage Pumping Stations
- F. Section 03250 - Concrete

1.03 REFERENCES: The standards listed below are included in this specification by reference. Specifications cited shall refer to the latest standards revision under the same specification number, or to superseding specifications under a new number, except for provisions in revised specifications, which are clearly inapplicable.

- A. ASTM A377 - Ductile Iron Pressure Sewer Pipe.
- B. AWWA C111 - Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Fittings.
- C. ASTM D2241 - Polyvinyl Chloride (PVC) (SDR 26) (160 psi) Sewer Pipe.
- D. ASTM D2774 - Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.
- E. AWWA C104 - Cement Mortar Lined Ductile Iron Pipe.
- F. AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems.
- G. AWWA C110 - Ductile Iron Fittings and Gray Iron Fittings, 3" through 48" for water and other liquids.

- H. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Molds, for Water or Other Liquids.
- I. AWWA C509 - Resilient Seated Gate Valves for Water and Sewerage Systems.
- J. AWWA C600 - Installation of Ductile Iron Pressure Pipe and Fittings.
- K. AWWA C600.4 - Testing of Sewer Force Mains.
- L. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4” through 12”.
- M. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe, 14” through 48”.
- N. AWWA M23 - PVC Pipe Design and Installation.
- O. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for use with Polyvinyl Chloride (PVC) Pipe.

1.04 REGULATORY REQUIREMENTS

- A. Conform to all applicable SCDHEC Regulations for materials and installation for Sanitary Sewer Construction.

1.05 SUBMITTALS

- A. Submit product data in accordance with Section 00800 for pipe, pipe accessories, manholes, manhole accessories, valve and valve accessories for approval prior to construction.

PRODUCTS

2.01 MANUFACTURERS

- A. Pipe
 - 1. U.S. Pipe
 - 2. American Cast Iron Pipe Company.
 - 3. Griffin Pipe Products Company.
 - 4. McWane Cast Iron Pipe Company.
 - 5. J M Pipe and Pipe Products.
 - 6. Scepter Pipe.
- B. Plug Valves
 - 1. DeZurik
- C. Gate Valves

1. Clow Corporation.
 2. Mueller Company.
 3. M & H Valve & Fitting Co.
 4. American Darling
- D. Air and Vacuum Valves
1. Crispin (Multiplex Manufacturing Co.)
 2. M & H Valve & Fitting Co.
- E. Manhole Frame & Cover
1. Dewey Bros. Inc.
 2. Sumter Machinery Company Inc.
 3. US Foundry
- F. Manholes
1. Mid Atlantic.
 2. Concrete Designs
 3. Tindall
 4. Knight's Pre-cast
- G. Miscellaneous Accessories
1. Trelleborg.
 2. A-LOK.
- H. Substitutions: Under provisions of Section 00800.

2.02 GENERAL

- A. These specifications shall apply to the materials to be furnished and installed to complete the sewer force main installations in accordance with the plans.
- B. All pipe and fittings shall be of the class and type as indicated on the plans and/or proposal designated herein.
- C. The Engineer will not permit Intermixing of different types of pipe unless specified on the plans or with approved written permission.
- D. All pipe shall be of first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length.
- E. All pipe shall be subject to the inspection of the engineer at the pipe plant, trench, or point of delivery, for purpose of culling and rejecting pipe (independent of laboratory test), which does not conform to the requirements of these specifications. The Engineer shall mark such pipe, and the Contractor shall

remove it from the project site upon notice being received of its rejection.

- F. All sewer force mains installed shall be Polyvinyl Chloride (PVC) pipe for force mains 16 inches in diameter or less.
- G. All sewer force mains greater than 16 inches in diameter shall be ductile iron pipe ANSI/AWWA - C104/A21.4 or as otherwise noted.
- H. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except for provisions in revised specifications, which are clearly inapplicable.
- I. All sewer force main materials shall conform to one or more of the specifications cited for each material classification noted below.

2.03 SEWER FORCE MAIN MATERIALS

A. Ductile Iron Pipe:

- 1. Pipe shall conform to AWWA C151, ASTM A746, and ASTM A377.
- 2. Pipe sizes 12" and smaller shall be Pressure Class 350.
- 3. Pipe sizes 14" and larger shall be Pressure Class 250.
- 4. The pipe shall be lined with "Protecto 401" ceramic epoxy coating or "Sewpercoat" calcium aluminate lining with epoxy coating.
- 5. Pipe shall be push-on, mechanical, flanged, or boltless ball joint (as needed or as shown on the plans) and conform to AWWA C111 and Federal Specification WW-P-421-C; for flanged joints ASA-B16.1; and for boltless ball joints ASA-B-16-B.
- 6. Boltless ball joints shall lock and permit a deflection of up to 15 degrees. The locking device shall include a spherical socket, spherical retainer, and locking ring.

B. POLYVINYL CHLORIDE PIPE (PVC)

- 1. PVC Pressure pipe shall be in accordance with the requirements of ASTM D2321, latest revision; ASTM D2241, latest revision; and shall bear the National Sanitation Foundation Seal.
- 2. Pipe 4 inches through 12 inches in diameter shall be Class 235 DR 18. (AWWA C900)
- 3. Pipe larger than 12 inches in diameter shall be Class 235 DR 18. (AWWA C905)

- 4 Pipe less than 4 inches in diameter shall be rated for 160 psi (SDR 26).
5. Rubber rings shall be of uniform solid cross-section and conform to ASTM D1869 or the manufacturer's recommendations.

C. PLUG VALVES

1. Sewer Force Main Valves 12 inches in diameter or smaller shall be plug valves.
2. Plug valves shall be DeZurik Series 100eccentric plug valves or approved equal.
3. Plug valves buried in the ground shall be furnished with mechanical joint type end connections and a standard 2-inch square operating nut.
4. Plug valves shall be epoxy coated inside and out.
5. Plug valves located inside sewer pump stations or buildings are to have flanged joints with hand-wheel actuators.
6. All plug valves shall be eccentric plug valves unless otherwise specified.
7. All plug valves shall be rated for 175-psi working pressure and 350-psi hydrostatic test pressure.

D. GATE VALVES

1. Sewer force main valves 14 inches in diameter and larger shall be resilient wedge gate valves (unless otherwise noted) and conform to AWWA Standard C-500 as latest revised.
2. Gate valves shall be of the non-rising stem type with O-ring seals.
3. All gate valves shall be furnished with mechanical joint type end connections.
4. Gate valves shall be epoxy coated, painted inside and out by the valve manufacturer.
5. Gate valves 16 inches in diameter and larger shall be gear actuated with a bypass valve and installed in a horizontal position.
6. All gate valves shall be equipped with a standard 2-inch square operation nut.
7. Gate Valves shall be Mueller, Clow, American-Darling, M & H, or approved equal.

8. Gate valves shall be rated for 150-psi working pressure and 300-psi hydrostatic testing pressure.

E. TAPPING SLEEVES & VALVES

1. Tapping sleeves will be JCM 432 all Stainless Steel or approved equal.
2. All tapping sleeves will be for cast iron, ductile iron, or PVC pipe. (Unless otherwise noted.)
3. All tapping valves shall be Mueller model T-2360 resilient wedge gate valve or approved equal.
4. Tapping valves shall have a standard 2-inch square operating nut.

F. VALVE BOX

1. Valve boxes shall be at least 5 1/4" in diameter, cast iron, and adjustable screw type with extension to grade. Cast iron box shall have a heavy coat of bituminous paint.
2. As required, extension stems shall be provided to raise valve operating nut to 36 inches below grade.
3. Each valve box is to be mounted flush with the finished grade.
4. Crushed stone backfill will be required between and around the valve and valve box.
5. Valve boxes in grassed areas shall have a pre-cast concrete collar mounted flush with the final grade.
6. Valve boxes in pavement areas shall be brought flush with the proposed pavement elevation.
7. Valve boxes to read "SEWER" on the top cover.

G. CHECK VALVES

1. Check valves buried in the ground and laid in the horizontal direction shall be mechanical joint gravity type check valve, Mueller model A-2600-20 or approved equal.
2. Check valves installed in sewer pump stations or valve vaults that are to be installed in the horizontal or vertical direction shall be a flanged lever and spring operation check valve, Mueller model A-2600-6-02, a flanged sinking ball type check valve, FLYGT HDL valve or approved equal.

H. SEWER AIR RELEASE VALVES

1. All air release valves shall be Crispin Model No. S20B pressure sewer valve as manufactured by Multiplex Manufacturing Company, Berwick, Pennsylvania, or approved equal.
2. Valves shall be a long body design capable of venting not less than 15 standard cubic feet of free air per minute at 10 pounds working pressure.
3. Valve inlet shall be 2 inches in diameter and shall be furnished with a 2-inch shutoff valve.
4. Automatic air release valves shall be located at each high point along the main as shown on the Plans to allow air to escape the main.

2.04 PIPE ACCESSORIES

- A. Fittings: All fittings shall be ductile iron, mechanical joint to suit pipe size and material, in required tees, bends, elbows, cleanouts, reducers, traps, and other configurations required unless otherwise shown on plans. Fittings shall be lined to meet the pipe lining specification.

2.05 MANHOLES

- A. Frame and Cover: Iron castings conforming to ASTM A48, Class 30C iron. Minimum manhole cover diameter shall be 24 inches, and the manhole ring and cover assembly shall not weight less than 300 pounds. For elevations above the 50-year flood level, frames and covers shall be Sumter Machinery Co. of Sumter, S.C., MF-6, and MC-2 or approved equal. For elevations below the 50-year flood level, frames and covers shall be water tight Sumter Machinery MF-50GT, MC-50GT or approved equal.
- B. Shaft Construction and Eccentric Cone Top Section: Reinforced pre-cast or cast-in-place concrete pipe sections, lipped male/female, "O" Ring gasket type joints; neoprene coated steel ladder rungs into shaft sections at 12 inches; nominal shaft diameter of 48, 60, 72, 96 inches as shown on the plans.
- C. Manhole Steps: Neoprene coated steel steps cast into manhole wall, 11 inches square and projecting from the wall 6 inches. Steps are to be a maximum of 16 inches on center.

2.06 FILL MATERIAL

- A. Ductile Iron Pipe: Acceptable native materials as specified in Section 2200.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: Bed in accordance with bedding detail on plans using material specified in Section 2200.

EXECUTION

3.01 GENERAL

- A. The Contractor shall furnish all material and labor, and construct the sewer force mains shown on the plans, including all clearing, grubbing, excavating, sheathing, backfilling, foundations, manholes, and other appurtenances, as shown on the plans or specified.
- B. The work shall include all ditching, pumping, bailing, draining, dewatering, flushing, testing, and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drainage culverts, power and telephone lines and cables, and other structures.
- C. The Contractor shall be responsible for the cleaning away of all rubbish, surplus materials, and the furnishing of all materials, tools, implements, and labor required to build and put in complete working order the specified sewers and all structures appertaining thereto.
- D. All sewers and appurtenances shall be cleared of all foreign debris.

3.02 SURVEYS, POINTS, AND INSTRUCTIONS

- A. The Engineer shall furnish horizontal and vertical control points as may be necessary. The Contractor shall create his own alignment between each horizontal control points and be responsible for establishing elevations of said points. This shall not relieve the Contractor of the responsibility to make careful and accurate measurements and for constructing the work accurately to the lines and grades furnished by the Engineer.
- B. The Contractor shall give the Engineer reasonable notice (72 hours minimum) of his requirements for such control survey lines and grades as he may require.
- C. The Contractor shall furnish and place, as directed, all necessary guide boards and appurtenances, and give such other incidental assistance at the site as may be required by the Engineer for staking out the work.
- D. The Contractor shall temporarily suspend construction operations, which interfere with the Owner's activities. Operations will be suspended for as long as the Engineer deems necessary.
- E. The Contractor shall carefully preserve the points furnished by the Engineer. Any re-staking required will be at the cost of the Contractor.
- F. The Contractor shall receive no extra compensation for any materials or services furnished by him incidental to these operations of the Engineer.

3.03 ORDER OF WORK

- A. The Owner reserves the right to direct the Contractor as to which portions of work should be constructed first, and upon order of the Engineer to verify that any complete portion of the work is as specified and acceptable for service.

3.04 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

- A. The Contractor's operations in highways or public streets shall be confined to as small a space as is practicable, so as not to cause undue inconvenience to the public or abutting properties, and shall be subject to the approval of the Engineer.
- B. The Contractor shall obtain, by agreement with property owner, any additional space required for construction on private property at no cost to the Owner of the Project.
- C. The Contractor shall fully adhere to the SCDOT Encroachment Permit while operating in any State Right-of-Way.
- D. Roadway crossings shall be accomplished by open ditch construction or by boring under pavement as required by the State.
- E. All materials shall be approved by the Engineer prior to the start of work.
- F. Pavement, base, and sub-grade courses which must be removed for constructing sewers and appurtenances in or across highways, roadways, and streets shall be replaced with the same general class and type of material used in the initial construction unless specified differently on the plans or in the specifications.
- G. Through traffic shall be maintained at all times during construction of sewers across all streets and highways. If the open cut method is used, two separate cuts must be made and one lane of traffic must be open at all times.
- H. All construction techniques shall comply with the current edition of the SCDOT Standard Specifications and Traffic Control Manual.
- I. The Contractor shall provide suitable bridges, approved by the Engineer, for any area where traffic will cross a trench.

3.05 EXISTING UTILITIES AND STRUCTURES

- A. The Contractor shall give written notice (copy to the Engineer) to the SCDOT, other Municipalities, and Public Service Corporations whose poles, wires, pipes, conduits, survey monuments, benchmarks, or other structures/utilities may be affected by his operations.
- B. Seventy-two hour advance notice is required for utility locations.
- C. Any existing utilities, structures, monuments, etc. damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.

- D. The approximate position of certain known underground lines is shown on the plans for information only. Existing small service lines are not shown.
- E. The Contractor shall locate all utilities by use of an electronic pipe locator or other satisfactory methods.
- F. The Contractor shall excavate and expose all existing underground lines in advance of trenching operations.
- G. The Contractor may, with the Owner or Engineer's consent, remove any obstructions to his operations, but the obstructions shall be removed and replaced at the Contractor's expense.
- H. Removing and relaying of such lines and appurtenances due to interference with the proposed line and grade, in the opinion of the Engineer, will be completed at the expense of the Contractor, unless otherwise shown on the plans or in the contract documents.

3.06 POTABLE WATER PROTECTION (SEPARATION OF WATER & SEWER LINES)

- A. Adequate provision shall be made for the protection of potable water supplies from possible leakage from sewers located near water lines.
- B. There shall be no physical connection between a public water supply system and a sewer system. No potable water main shall pass through or come in contact with any part of a sewer manhole.
- C. Where possible, sewer mains should be located at least ten (10) feet horizontally from existing or proposed water main then:
 - 1. Sewer will be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen (18) inches below the bottom of the water main, or:
 - 2. Sewer will be laid in the same trench as the water main with the water main located on a bench of undisturbed earth, and with the elevation of the top of the sewer at least eighteen (18) inches below the bottom of the water main, or:
 - 3. If conditions prevent the eighteen (18) inch vertical separation, then the sewer will be laid under the water main and both the water and sewer shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.
- D. When conditions require a sewer line to cross over a water main, both the water main and sewer line shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.

- E. Water/sewer line separation shall be in accordance with Section R61.58.4D (12) of the State Primary Drinking Water Regulations.
- F. When it is not possible to maintain the separation distances specified in the regulation above, the Engineer may allow an alternative design subject to approval from SCDHEC. The alternative design shall: 1. Maximize the distance between the water main and sewer line and the joints of each; 2. Use materials that meet the state regulatory requirement (R61.58.4) and 3. Allow adequate distance for maintenance and repairs on each line without causing damage to the other line.

3.07 LIGHTS AND PROTECTION

- A. The Contractor shall erect and maintain such strong and suitable barriers and such warning lights as will effectively prevent the occurrence of any accident to health, limb, or property.
- B. Lights shall be maintained between the hours of sunset and sunrise, or during any period as directed by the Engineer.
- C. Where pipe lines are to be constructed in the streets, highways or roadways, the Contractor shall take all precautions and comply with all requirements, as may be necessary, to protect the improvements. Including installation and maintenance of warning signs, lights, and barricades for the protection of traffic.

3.08 EXCAVATION

- A. Contractor to excavate in accordance with Section 2100 and the following.
- B. The Contractor shall do all excavation of whatever substances are encountered to the depth shown on the plans.
- C. Prior to any excavation Contractor shall provide adequate protection (as long as necessary to prevent damage) for any part or parts of the project site to remain (lawns, sidewalks, fences, landscape, hydrants, etc.).
- D. Any and all damaged items shall be repaired or replaced in such a manner that the items in question are returned to their original or better condition at the Contractor's expense.
- E. Unstable soil shall be removed and replaced with mechanically tamped gravel or crushed stone at no additional cost to the Owner. The Engineer shall determine the depth of removal of unstable soil.
- F. Excavation for manholes shall have a minimum of twelve (12) inches clearance on all sides.
- G. Remove any water accumulated in excavation at no additional cost to Owner.

- H. Excavation shall not be carried below the required level. Excess excavation below the required level shall be backfilled at the Contractor's expense with earth, sand, gravel, or concrete, as directed by the Engineer, and thoroughly tamped to the required proctor.
- I. At locations where existing walls or fences will be removed to permit the installation of the proposed sewer line, the Contractor shall remove and reset the wall/fence as rapidly as practicable to permit the installation. Fences/walls shall be reset in their original location in condition equal or better than prior to their removal. The Contractor will be required to establish temporary fencing or barriers for protection of children, livestock, etc. during construction.

3.09 TRENCHING

- A. Contractor to construct all trenching in accordance with Section 2300 and the following.
- B. Trench width shall be wide enough to provide adequate space for workman to place and joint the pipe properly.
- C. Trench bottom to be rounded to allow pipe to rest firmly on undisturbed soil or compacted bedding.
- D. Bell holes shall be excavated accurately to size by hand. In rock, excavation shall be carried 6 inches below the bottom of the pipe. Loose earth or gravel shall be used for backfill and tamped thoroughly.
- E. Contractor shall provide and use all bracing, sheathing, and shoring necessary to perform and protect all excavations as shown on the plans, as required for safety, as directed by the Engineer, or to conform to governing laws.
- F. Excavated material shall be stockpiled in such a manner to prevent interference with any traffic, and existing or proposed structures or utilities.
- G. Equipment, materials, trenches, and excavations which may cause a hazard or serve as obstructions to either vehicular or pedestrian traffic, shall be enclosed by fences or barricades, adequately lighted, to protect persons from injury and to avoid property damage.
- H. The Contractor shall furnish temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the process of work.
- I. Where traffic must cross open trenches, the Contractor shall provide suitable bridges, which shall be subject to approval by the Engineer.
- J. All safety requirements of OSHA must be followed, including but not limited to trenching, shoring, confined space, ingress/egress, etc.

- K. Trenches shall be properly dewatered prior to placement of the pipe. Where running sand is encountered well pointing method will be used. If soil conditions prohibit the well pointing method, then french drains of crushed stone or gravel shall be constructed to drain to suitably located sumps and the water removed by bailing or pumping. The Contractor shall provide all labor, materials, tools, and equipment required for the dewatering process at no additional cost to the Owner.
- L. Not more than 200 feet of trench shall be opened in advance of pipe laying unless otherwise approved by the Engineer.
- M. Wherever the sub-grade is by nature too soft or mucky, in the opinion of the Engineer, for the proper installation of the sewer force main, he may order the Contractor to undercut the trench and backfill with crushed stone or gravel, 3/4" in size and less.
- N. Trenches shall be excavated a sufficient distance in advance of laying the pipe, to prevent the entry of ground water, earth or debris during the construction. The exposed end of all pipes shall be fully protected with a watertight stopper to prevent water, earth, or other substances from entering the pipe during periods when work is not in progress.
- O. The invert profile, as shown on the plans, shall be followed except where changes are authorized in writing by the Engineer to avoid existing structures or to conform to the topography.
- P. The depth of the trench shall be increased where necessary to provide a smoothly curved profile or to avoid existing structures.
- Q. The trench shall be excavated in such a manner as to provide uniform and continuous bearing and support for the pipe, and excavated to the depth required to give a minimum of 36 inches of cover for the pipe from the finished grade to the top outside of the pipe barrel, except under roadways where the minimum cover shall be 30 inches from the sub grade to the top of the pipe barrel and at air release valves where the minimum cover shall be 54 inches from the sub-grade to the outside top of the pipe barrel.
- R. The depth of cover may be modified at creek crossings or at other dips in the profile, when approved by the Engineer, provided that the cover is not less than 36 inches for more than one full station (100) feet.
- S. Bell holes shall be provided at each joint to permit the joints to be "made-up" properly.
- T. Where the soil at the bottom of the trench is not uniformly good, with stone, dry clay, hard pan, shale, or cemented gravel exposed, the trench shall be excavated to at least three inches and not more than six inches below the specified grade, and shall be backfilled to grade with material, approved by the Engineer, containing no rocks, gravel or cinders, in layers not to exceed four inches loose depth. The bedding shall be finished by means of hand tools so as to provide uniform and

continuous bearing and support for the pipe.

- U. Where the bottom of the trench at grade is found to be unstable, or includes ashes, cinders, all types of refuse, vegetable or other organic material, the Contractor shall excavate and remove such unsuitable material to the width and depth ordered by the Engineer. The trench shall be backfilled to bedding grade with approved material in four-inch layers to loose depth. Each layer shall be thoroughly compacted to a density specified by the Engineer. The bedding shall be finished by means of hand tools so as to provide a uniform and continuous bearing and support for the pipe. There will be no additional compensation for such excavation and backfill.
- V. Where the bottom of trench grade is found to consist of material which is unstable to such a degree that, in the opinion of the Engineer, it cannot be removed and replaced with material suitable to support the pipe properly, the Contractor shall construct a foundation for the pipe, consisting of concrete, pilings, timber, or other suitable materials, as directed by the Engineer. Special foundations, if not called for on the plans, shall be paid for in accordance with the proposal, or at a price agreed upon by the Owner and Contractor and approved by the Engineer.

3.10 EXAMINATION

- A. Verify that trench cut and excavation base is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.
- B. Beginning of installation means acceptance of existing conditions.

3.11 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.
- B. Remove large stones or other hard matter, which could damage pipe or impede consistent backfilling or compaction.

3.12 INSTALLATION - PIPE

A. GENERAL

1. Install PVC pipe, fittings and accessories in accordance with ASTM D2241, ASTM D2321, ASTM D2774 and manufacturer's instructions. Install ductile iron pipe, fittings and accessories in accordance with ASTM A377, AWWA C600, and manufacturer's instructions. Seal joints watertight.
2. All pipes and fittings shall be protected during handling against impact shocks and free fall. Pipes and fittings shall be cleaned before they are laid, and shall be kept clean at all times.

3. All pipe and fittings shall be carefully examined for defects and no piece shall be laid which is known to be defective. Before lowering, and while suspended, cast and ductile iron pipe may be gently tapped with a hammer to sound for cracks. Any defective, damaged, or unsound pipe shall be rejected.
4. If any defective piece is discovered after having been laid, it shall be removed and replaced with a sound one at the Contractor's expense.
5. The pipe shall be supported its full length by the uniform grade of the trench, and a bell hole shall be dug at each joint, said hole being of sufficient size to ensure the proper "making up" of each joint.
6. Pipe ends shall not be left open at the end of a day's work or during temporary suspension of construction, but shall be securely covered to prevent the entry of foreign matter or small animals.
7. Under no circumstances will pipe deflection at any joint exceed the Manufacturer's recommendations. Excessive deflection, which puts pipe joints in strain, will not be permitted.
8. Horizontal and vertical curvature, where fittings are not specified, can be obtained by cutting pipe to short lengths.
9. When cutting short lengths of pipe, a pipe cutter will be used, and care will be taken to make the cut at right angles to the centerline of the pipe. In the case of "push-on" pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.
10. Where the use of nuts, bolts, washers, rods, straps, and clamps are required due to the peculiarities of the installation, these items shall be installed and be of the size and dimension as shown on the plans. After installation, and before backfilling, all the above items shall be painted with bituminous paint or coal tar enamel. In lieu of the above, accessories and fittings shall be provided using stainless steel or other non-corrosive metals.
11. Any pipe, fitting, or accessory not meeting the specified ASTM Standard shall not be used.
12. Place pipe on approved bedding in accordance with the plans and specifications.
13. Lay pipe to slope gradient noted on Drawings.
14. Pipe laying shall begin at the lowest grade point with spigot ends pointing down grade and forming a uniform invert.
15. Pipe shall not be placed on blocking at any time unless approved by the Engineer, and then only at manholes or other structures where temporary

blocking may facilitate installation of the pipe. After the pipe has been installed, all blocking shall be removed and all voids filled with select material and compacted in place.

16. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.

B. "PUSH-ON" JOINT PIPE

1. "Push-On" type joints, such as "Tyton", "Ring Tite", "Fastite", or approved equal, shall be prepared by removing all dirt or foreign material from the bell end of the pipe and inserting the gasket.
2. The spigot end of the pipe shall be prepared by cleaning and applying a thin coat of approved lubricant after which the spigot end is centered in the bell and jacked on by using a special jack and choker sling.
3. The procedure in making up this joint shall be performed in accordance with the recommendations of the manufacturer.

C. MECHANICAL JOINT PIPE

1. When "making-up" mechanical joints, the spigot end of each pipe shall be inserted into the adjoining bell to within 1/8 inch of the total depth of the bell.
2. The pipe shall be properly centered and have uniform space all around for reception of the packing material.
3. The packing material bolts; nuts, and other accessories used in making mechanical or sleeve type joints shall be obtained from the manufacturer of the pipe.
4. The surface of the spigot and bell are to be brushed thoroughly with a wire brush just prior to assembling. The spigot end is to be brushed with soapy water just prior to slipping the gasket on and entering it into the bell.
5. When tightening bolts, it is essential that the gland be brought up to the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This is to be done by partially tightening the bottom bolt first, then the top bolt, next two bolts at either side, and last, the remaining bolts. Repeat this cycle until all bolts are within the range of the torques listed below:

BOLT SIZE DIA.	RANGE OF TORQUES FT./LBS.
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5/8"	40-60
3/4"	60-90
1"	70-100
1-1/4"	90-120

If effective sealing is not obtained at the maximum torques indicated above, the joint must be disassembled and reassembled.

D. FLANGED JOINT PIPE

1. All flanged faces shall be free of all dirt or foreign material. Each face shall be cleaned prior to installing the gasket.
2. Flanges should be inspected to make sure that the flange is true and the boltholes line up with each other.
3. Flanges should be tightened to the proper torques listed in the mechanical joint pipe section.

3.14 INSPECTION

- A. All work done and materials furnished shall be subject to the inspection of the Engineer.
- B. All improper work shall be reconstructed at the Contractor's expense.
- C. All materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer of the rejection of such materials. The rejected materials shall be removed and replaced with approved materials at the Contractor's expense.
- D. The Engineer reserves the right to mark rejected materials to distinguish them as such.

3.15 MECHANICAL RESTRAINTS (THRUST RESTRAINT)

- A. Lines shall have restrained joints at all tees, bends, plugs, crosses, valves, and hydrants or as directed by the Engineer.
- B. Acceptable methods for joint restraint shall be the use of metal tie-rods or EBAA Iron Inc., MEGALUG or equivalent.
- C. Retainers for pipe bells shall be required with the use of the MEGALUG restraints.
- D. Concrete blocking shall not be used.

3.16 BACKFILLING

- A. Contractor to backfill in accordance with Section 2200 and the following.
- B. All trenches and excavation shall be backfilled immediately after the pipes are laid therein, unless other protection of the pipeline is directed.
- C. The backfilling materials shall be selected and deposited with special reference to the future safety of the pipes.
- D. Backfill material shall be free from cinders, ashes, refuse, vegetable or other organic materials, boulders, large rocks, or stones. However, from one foot above the top of the pipe to the original ground or the sub-grade, material containing stones up to four inches in their greatest dimension may be used, unless otherwise directed by the Engineer.
- E. The backfill material shall be deposited in the trench for its full width in six-inch layers loose depth to the height of one foot above the pipe. Except where special methods of bedding and tamping are provided for, clean earth, sand, or rock dust shall be solidly tamped and compacted as hereinafter described.
- F. Backfilling shall not be done in freezing weather, except by permission of the Engineer, and it shall not be done with frozen material. No backfilling shall be done where the material already in the trench is frozen.
- G. From the bottom of the trench to the centerline of the pipe, the backfill material shall be placed by hand and compacted with approved hand tamps to the required proctor. From the centerline of the pipe, to a height of one foot above the pipe, the backfill shall be placed by hand and compacted by use of approved mechanical tampers to the required proctor. The Contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. The remainder of the backfill in the trench shall be placed by hand or mechanical means in the specified lifts and compacted by the approved mechanical tamper to the specified proctor.
- H. Walking or working on the completed pipe lines, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least two feet over the top of the pipe.
- I. After placing the backfill up to a level slightly below the natural ground surface, surplus excavation shall be bermed and maintained in a suitable manner as to concentrate and pond runoff from rains over the trench. After sufficient settlement has been obtained, in the opinion of the Engineer, the Contractor shall complete the dressing, removal of surplus materials, and surface cleanup in accordance with these specifications.
- J. Whenever the trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off, and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the original surface restored to the full satisfaction of the Engineer or Owner.

- K. Backfill in open trenches across sidewalks and in roadways shall be made as specified above, except that fill above the pipes shall be deposited in layers not to exceed six inches and thoroughly compacted to the specified proctor.
- L. Excess material not needed for backfill, and material unsuitable for backfill, shall be removed from the site and disposed of as directed by the Engineer.
- M. Additional backfill material as required to make up deficiency, or to replace unsuitable excavated material, shall be furnished by the Contractor at no additional cost from approved borrow pits or from excavations on roadways.
- N. The Contractor shall backfill the trench to the original grade or as specified in the plans.
- O. The construction site shall be left in a neat and orderly condition to the Engineer or Owner's satisfaction.

3.17 TESTING AND LEAKAGE

- A. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the force main is being filled for the hydrostatic pressure test, all air shall be expelled from the pipe through blow-offs, air release valves, or temporary taps. An automatic air release valve shall be placed at each high point as shown on the plans to prevent air locking.
- B. The force main shall be subjected to a hydrostatic pressure of 150 pounds per square inch for a period of two hours. All testing shall be in accordance with AWWA C600 (DIP) and/or AWWA C605 (PVC)
- C. The leakage during the test shall not be more than calculated using the following table or AWWA C-600-4.
- D. The required hydrostatic pressure shall be applied to the force main by means of a hand pump for small lines or by the use of a gasoline pump or fire engine for larger lines.
- E. During the test the lines shall be thoroughly examined for leakage at the joints and repaired where applicable. All visible leaks shall be repaired, regardless of leakage amount.
- F. Any cracked or defective pipes, fittings, or valves discovered in consequence of the pressure test shall be removed and replaced by the Contractor at his own expense. Then the force main is to be retested to the required pressure for two hours.
- G. In the event that the pipeline is tested in sections and temporary thrust blocking is required, a temporary plug or cap shall be installed and blocked with a screw jack, firmly braced against the end of the trench or against a heavy timber embedded into the sides of the trench.

- H. Where pipeline construction ties into existing lines, and where it is not practicable to make a hydrostatic pressure test, the Contractor shall leave this section of pipeline uncovered at each applicable joint for inspection for a period of 48 hours after the connection has been made and the line is placed in service. The Contractor shall make the necessary restraints to make sure that the force main does not blow apart at these uncovered joints. The Contractor shall immediately correct any leakage discovered in these joints.
- I. All pressure tests must be witnessed for the two-hour duration by the Engineer's Inspector or Owner's Inspector. The Contractor is to notify the Inspector a minimum of 24 hours prior to the pressure test.
- J. The allowable leakage for a period of two hours shall be calculated using the following formula:

$$L = \frac{S * D * (P)^{1/2}}{133,200}$$

- Where L = (Leakage in gallons per hour)
- S = (Length of Pipe being tested in feet)
- D = (Diameter of the pipe in inches)
- P = (Test pressure in psi)

Test shall last for a period of 2 hours.

3.18 CLEANUP AND MAINTENANCE

- A. Cleanup shall follow immediately behind the pipe laying and backfilling operations. The Owner shall keep pipelines and the construction site clean and serviceable until final inspection and acceptance.

3.19 FIELD QUALITY CONTROL

- A. Field inspection will be performed by the Engineer and the independent testing lab.

3.20 PROTECTION

- A. Protect pipe from damage or displacement until backfilling is in progress.

END OF SECTION

SECTION 02650

SEWAGE PUMPING STATIONS

GENERAL

1.01 SECTION INCLUDES

- A. Pumps.
- B. Pump Station Support Equipment.
- C. Wetwell.
- D. Electrical Controls.
- E. Fencing.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation
- B. Section 02200 - Backfilling
- C. Section 02300 - Trenching
- D. Section 02600 - Sanitary Sewer Gravity Systems.
- E. Section 02625 - Sewer Force Main Systems.
- F. Section 03250 - Concrete
- G. Section 03500 – Pre-cast Concrete Structures

1.03 REFERENCES – The standards listed below are in this specification by reference.

- A. ASTM C 478 Pre-cast Reinforced Concrete Manhole Sections.
- B. ASTM C 361 Reinforced Concrete Low-Head Pressure Pipe.
- C. ASTM C 923 Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- D. City of North Myrtle Beach Standard Detail Drawings: PS1 – PS12.

1.04 REGULATORY REQUIREMENTS

- A. Conform to all applicable SCDHEC Regulations for materials and installation for

Sanitary Sewer Construction.

1.05 SUBMITTALS

- A. Submit product data to the Engineer and the City of North Myrtle Beach on all equipment included in the pump station. (i.e.: pumps, electrical controls, pipe, liquid level sensors, etc.)

PRODUCTS

2.01 MANUFACTURERS

- A. Griffin Pipe Products Company.
- B. Xylem Dewatering Solutions Inc. - ITT Flygt Corporation.
- C. Mid-Atlantic
- D. Substitutions: Under provisions of Section 00800.

2.02 GENERAL

- A. The sanitary sewer pumps and the applicable accessories shall be furnished by the Contractor from Xylem Dewatering Solutions Inc.

2.03 PUMPS

- A. Pump Station Schedule
 - 1. Pump Station - Pumps shall be submersible non-clog wastewater pumps, Flygt Model ___-_____ with a _____ impeller. Each pump shall be equipped with a _____ HP, submersible electric motor connected for operation on _____ V, _____ phase, 60 HZ, _____-wire service, with _____ feet of submersible cable (SUBCAB) suitable for submersible pump applications. The pumps shall be supplied with a mating cast iron _____ inch discharge connection and be capable of delivering _____ GPM at _____' TDH. Each pump shall be fitted with 20 feet of galvanized steel lifting chain.
- B. The pump manufacturer shall warranty the pumps being supplied to the Owner against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. In addition, the manufacturer shall replace certain parts which shall become defective through normal use and wear on a progressive schedule of cost for a period of five (5) years; parts included are the mechanical seal, impeller, pump housing, wear ring and ball bearings. The warranty shall be in published form and apply to all similar units.

2.04 CONTROL PANEL

- A. Automatic 3-pump motor control center in 316 stainless steel, NEMA 4X enclosure for 480 volts, 3-phase, 60 Hertz, 3-wire power supply.
- B. The enclosure shall be of the double-door design. The outer door shall be blank and lockable. The inner door shall contain all meters, switches or other controls which are required. All live circuitry shall be behind this inner door.
- C. For each pump motor, there shall be included an individual disconnect switch, three-phase overload protection with manual reset, magnetic contactors, hand-off-automatic selector switch.
- D. A 24-volt control circuit transformer with disconnect and overload protection shall be included with an automatic electrical alternator provided for duplex stations.
- E. Overload and disconnect function shall be provided as a single magnetic-hydraulic, temperature-insensitive component.
- F. Unit to be pre-calibrated to match motor characteristics and factory sealed to ensure trip setting is tamper proof.
- G. All times shall be wired to terminal strips for connection to external wiring.
- H. The motor control center shall be complete with all internal wiring and in a mounted enclosure, exposed to the atmosphere, adjacent to the wetwell.

2.05 LIQUID LEVEL SENSORS

- A. Furnish and install five (5) rotofloat/anchor scientific model w no-ss liquid level sensors with Hi-Level Alarm and forty (40) feet of electrical cable.
- B. Level sensors shall be of displacement design. Floats or restrained floats shall not be considered as equal. Hi-Level Alarm shall consist of red light and horn, side-mounted on the outside of the control panel.

2.06 EMERGENCY ENGINE RECEPTACLE AND TRANSFER SWITCH

- A. The Contractor shall furnish for each pumping station an emergency generator receptacle and transfer switch that will be compatible with the City of North Myrtle Beach's emergency generator and shall meet all their requirements.
- B. Submit selected receptacle data to the Engineer as part of the shop drawings submitted for approval.

2.07 ACCESS FRAME AND GUIDE BAR BRACKETS

- A. Furnish and install watertight aluminum access frames, complete with hinged and hasp equipped cover, upper guide bar brackets and liquid level sensor cable

holder.

- B. Access frame and cover shall be made entirely of structural aluminum with stainless steel hardware.
- C. All access covers shall have a built-in cylinder lock.
- D. Each cover shall be checkered plated.

2.08 WETWELL

- A. Pre-cast concrete risers, base sections, and tops shall conform to ASTM C 478.
- B. Gaskets for joints between sections shall be O-ring gaskets and conform to ASTM C 361.
- C. Wetwell interior shall be coated with 21 mils, Kop-Coat 300-M Coal Tar Epoxy applied according to the manufacturers recommendation.

2.09 FENCE MATERIAL

- A. Fencing shall be chain link type, 5' high, of number nine (9) zinc coated galvanized wire, two (2) inch mesh, twisted and barbed salvages and thoroughly galvanized after weaving, minimum coating 2 oz.
- B. Line posts shall be 2-1/2" O.D. galvanized standard pipe weighing 3.65 pounds per foot or hot dip galvanized 2" x 2-1/4" "H" column weighing 4.1 pounds per foot, carbon content 35%. No used, re-rolled, or open seam material will be permitted in any posts or rails. Posts shall not be spaced farther apart than 10 foot centers.
- C. End, corner, gate and pull posts shall be hot dip galvanized 3" O.D. weighing 5.79 pounds per foot except double gate posts shall be 4" O.D. weighing 9.11 pounds per foot.
- D. Top rail shall be hot dip galvanized 1-5/8" O.D. pipe, weighing 2.27 pounds per foot and shall be provided with couplings every 20 feet. Couplings shall be outside sleeve type. Top rail shall pass through base of line post tops to form a continuous brace from end to end of each stretch of fence.
- E. Braces shall be hot dip galvanized of same material as top rail and spaced midway between top rail and ground and to extend from terminal post to first line post. Braces shall be trussed from line post to terminal post with 3/8" round rod.
- F. Gate frames shall be 2" O.D. hot dip galvanized pipe, weighing 2.72 pounds per foot. Fabric shall be securely attached to the frame. Gates shall be furnished with gate hold backs, center rest catch for double gates with locking device and barb wire on top of gate.

EXECUTION

3.01 GENERAL

- A. The Contractor shall furnish and install a sewage pumping station as shown on the drawings and as specified herein.
- B. The sewage pumping station shall be complete, tested and certified by the Contractor to meet the herein specified conditions before being accepted by the City of North Myrtle Beach.
- C. Pump station shall include but is not necessarily limited to the following components:
 - 1. Three (3) submersible electric motor drive pumps with all required appurtenances.
 - 2. The concrete wet-well and valve vault with access doors.
 - 3. Triplex motor control center with level control switches.
 - 4. Discharge header piping and valves.

3.02 PUMPS

- A. The Contractor shall furnish and install totally submersible sewage pumps as listed. Pumps shall be capable of handling raw, unscreened sewage and shall pass a minimum 3-inch diameter solid, fibrous material, heavy sludge and other matter found in wastewater.
- B. The design shall be so that the pumps will be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. No portion of the pump shall bear directly on the sump floor.

3.03 ACCESS FRAME AND GUIDE BAR BRACKETS INSTALLATION

- A. All metal which contacts concrete and the underside of the access cover shall be coated with Kopper's Bitumastic or equal.
- B. The upper guide bar brackets shall be securely mounted above the pumps.
- C. Lower guide bar holders shall be integral with the discharge connection.

3.04 WETWELL INSTALLATION

- A. Install wet-well to finished lines and grades as shown on the plans.
- B. Excavate and dewater, if necessary, an adequate size hole to provide ample

working room to set and adjust wet-well. Dewatering, if required, will be considered subsidiary to the contract price.

- C. Place 12" minimum layer of course aggregate, Class I, as specified in Section 02100.
- D. Notify Engineer and the City of North Myrtle Beach prior to setting wetwell.
- E. After wet-well is set, verify finished slab elevations prior to backfilling. Seal all joints watertight, interior and exterior, as called for on the plans.

3.05 CHAIN LINK FENCE INSTALLATION

- A. Fencing and gates shall be properly made with all the necessary bracing, fittings and appurtenances.
- B. Posts shall be truly aligned and set plumb in concrete extending at least six inches below the bottom of the posts.
- C. The concrete footings shall be of such size and shape as to furnish adequate foundation and support to withstand any strain or shock ordinarily brought to bear on fences of this nature. A liberal factor of safety shall be provided.
- D. The tops of concrete foundations shall be slightly rounded so as to shed water. (3' minimum bury on post).
- E. Wire shall be tightly stretched and anchored to post and top rails with suitable anchors spaced no more than 18 inches apart. The fabric shall be carried at the bottom by No. 7 galvanized spring wire and shall be anchored thereto at 18 inch centers.
- F. Gates shall be properly installed, with all appurtenances so they will open and close freely without binding. They shall be capable of swinging outward against the fence, 180 degrees. All double gates shall have three (3) hinges (top, middle, bottom).

3.06 FIELD QUALITY CONTROL

- A. Testing shall be in accordance with Section 00800. Inspection will be performed by the Engineer, Owner, and/or independent testing lab.

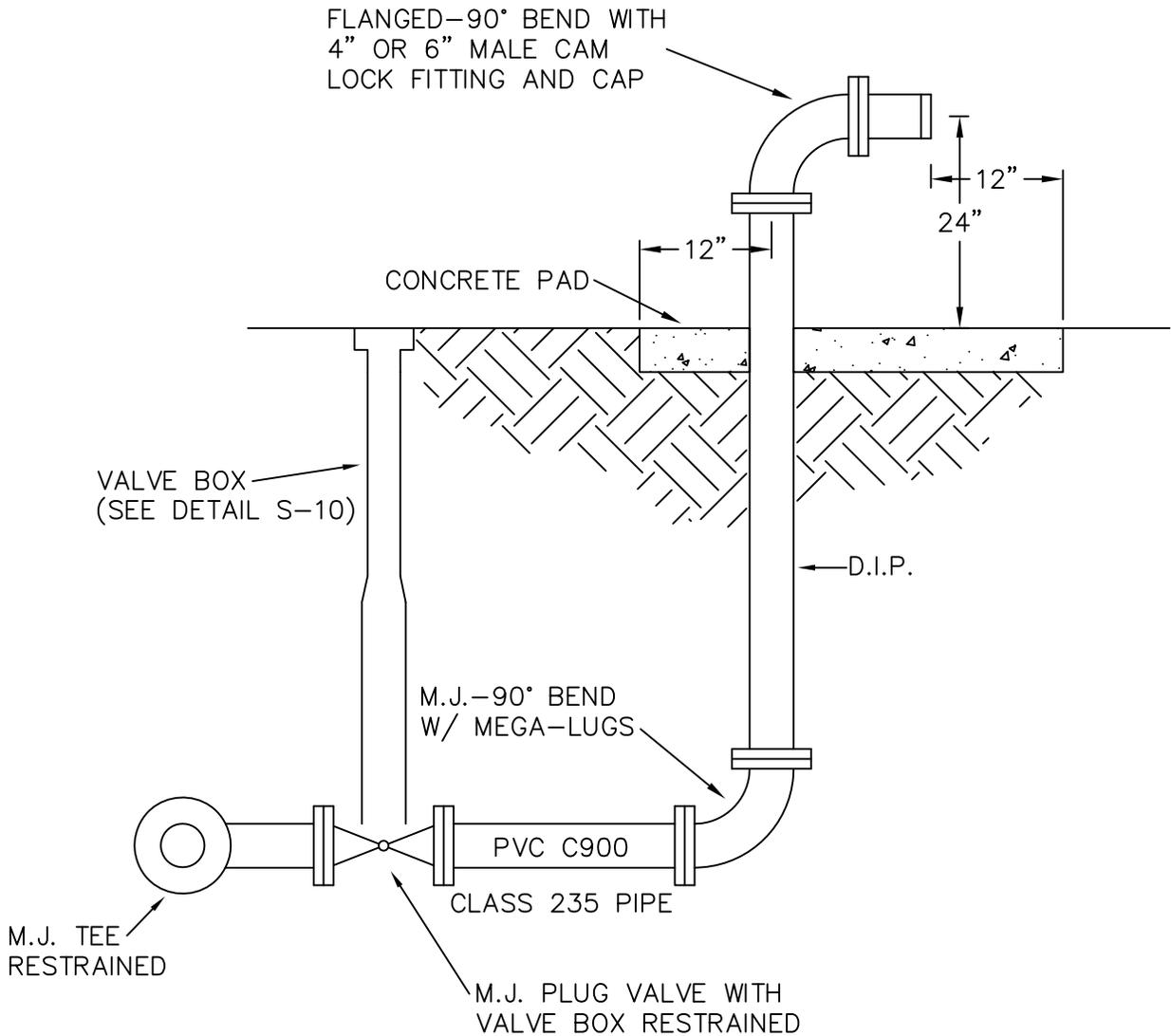
END OF SECTION

CITY OF NORTH MYRTLE BEACH STANDARD DETAILS
ENGINEERING DIVISION



PUMP STATION:

- PS-1 EMERGENCY CONNECTION
- PS-2 6'-0" GALVANIZED CHAIN LINK FENCE AND GATE
- PS-3 PUMP STATION METER AND DISCONNECT
- PS-4 PUMP STATION YARD HYDRANT
- PS-5 PRESSURE GAUGE
- PS-6 SUBMERSIBLE DUPLEX PUMP STATION SECTION AND NOTES
- PS-7 SUBMERSIBLE DUPLEX PUMP STATION PLAN AND SCHEDULE
- PS-8 TYPICAL SPLASH DEFLECTOR PLATE
- PS-9 CONCRETE PUMP STATION HATCH
- PS-10 CONCRETE WETWELL RISER SECTION
- PS-11 CONCRETE WETWELL MONOLITHIC BASE SECTION
- PS-12 CONCRETE WETWELL FLAT SLAB TOP SECTION



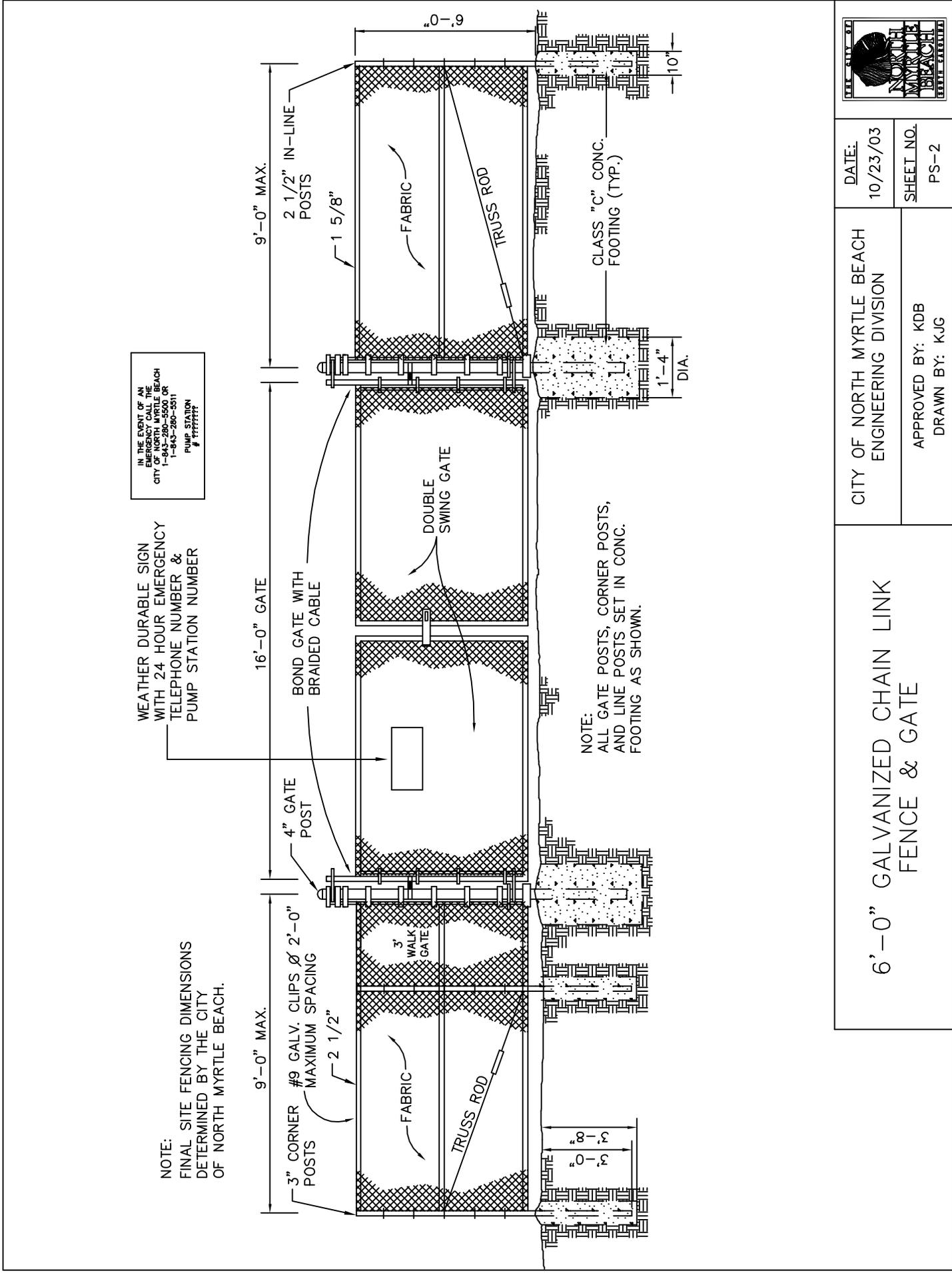
NOTE:
 4" CONNECTION FOR 500 GPM OR LESS
 6" CONNECTION FOR STATIONS ABOVE 500 GPM

EMERGENCY CONNECTION

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KDB
 DRAWN BY: KJG

DATE:
 2/25/14
 SHEET NO.
 PS-1





	DATE:	10/23/03
	SHEET NO.	PS-2
CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION		APPROVED BY: KDB DRAWN BY: KJG

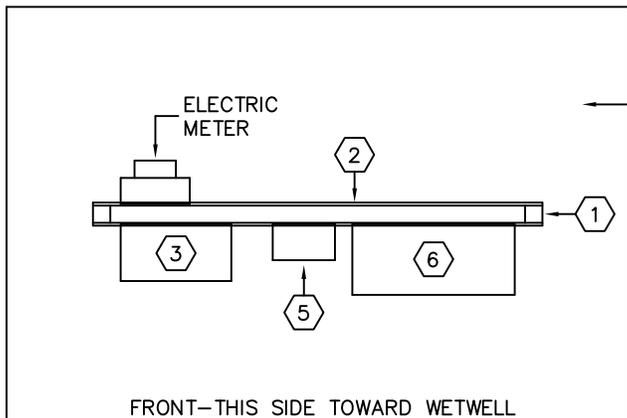
6'-0" GALVANIZED CHAIN LINK FENCE & GATE

ELECTRICAL KEY NOTES

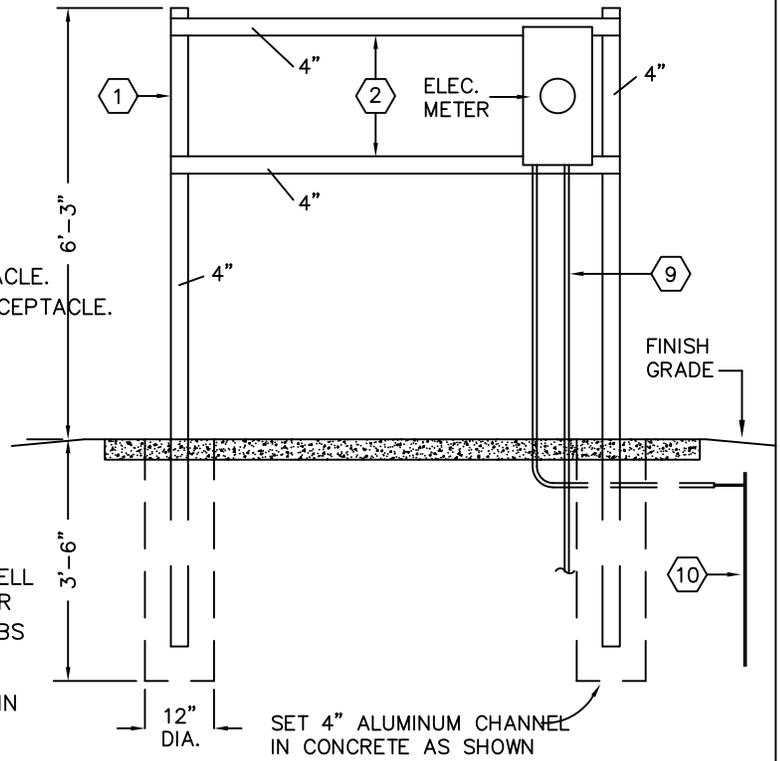
- ① 4" ALUMINUM CHANNEL SET IN CONCRETE.
- ② ALUMINUM CHANNEL 4". ALL BOLTS, NUTS, WASHERS, ETC., NECESSARY TO FABRICATE RACK AND INSTALL EQUIPMENT SHALL BE STAINLESS STEEL.
- ③ SQUARE D NEMA 3R DOUBLE THROW SWITCH.
- ④ CROUSE HINDS AR2031S-22 480V/3PH/3 WIRE RECEPTACLE. CROUSE HINDS AR4041-S22-M80 230V/3PH/4 WIRE RECEPTACLE.
- ⑤ NEMA TYPE 4X STAINLESS STEEL ENCLOSURE. SQUARE D FA KA OR QBI CIRCUIT BREAKERS.
- ⑥ PUMP CONTROLLER MOUNT TOP SIX FEET ABOVE SLAB. NEMA 4X STAINLESS STEEL.
- ⑦ EYS SEALOFF FITTINGS WITH CHICO.
- ⑧ 2-2" (MINIMUM) PVC CONDUITS TO WETWELL FOR PUMP POWER CABLES. 1-2" (MINIMUM) PVC CONDUIT TO WETWELL FOR FLOAT CABLES. LOCATE CONDUITS TO RIGHT CORNER OF CONTROL PANEL. ALL CONDUITS TO HAVE MYERS HUBS AT CONNECTIONS TO BOXES OR PANELS.
- ⑨ 2" SCHEDULE 80 (MINIMUM) PVC CONDUIT WITH 4 #2THHN CONDUCTORS TO UTILITY COMPANY TRANSFORMER.
- ⑩ GROUND ROD AND CLAMP.
- ⑪ TELEMETRY TO BE LOCATED PER SITE PLAN.
- ⑫ PUMP CONTROL PANEL TO BE STA-CON PER N.M.B. STANDARD ON FILE WITH STA-CON.
- ⑬ IF SITE FENCING IS OTHER THAN CHAIN LINK ALARM LIGHT MUST BE VISABLE ABOVE FENCE LINE.

GENERAL ELECTRICAL NOTES

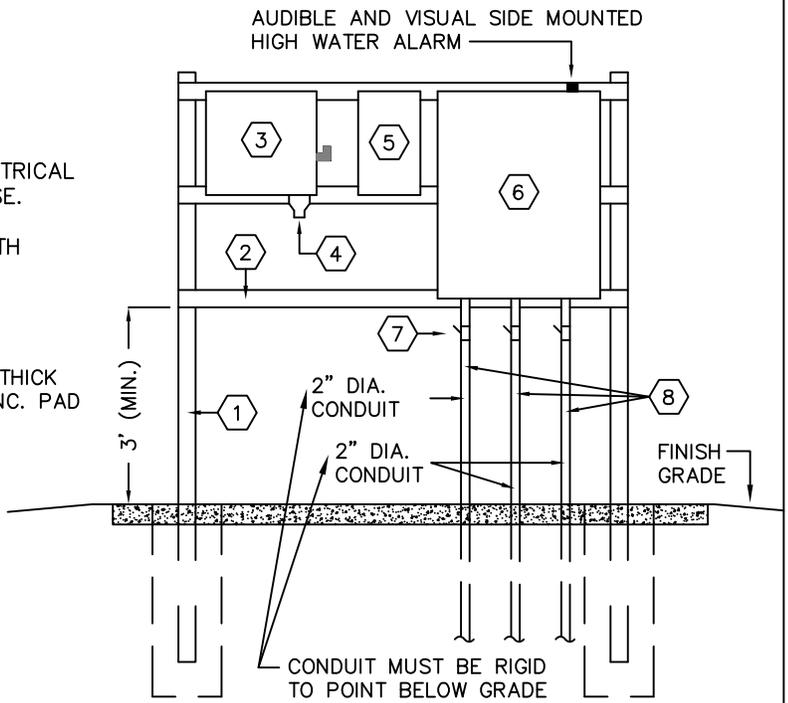
- 1. ELECTRICAL WORK SHALL BE PERFORMED BY AN ELECTRICAL CONTRACTOR WITH AN APPROPRIATE BUSINESS LICENSE.
- 2. ELECTRICAL PERMITS SHALL BE APPLIED FOR AT NORTH MYRTLE BEACH BUILDING INSPECTION OFFICE.



PLAN VIEW



REAR VIEW



FRONT VIEW

PUMP STATION METER
AND DISCONNECT

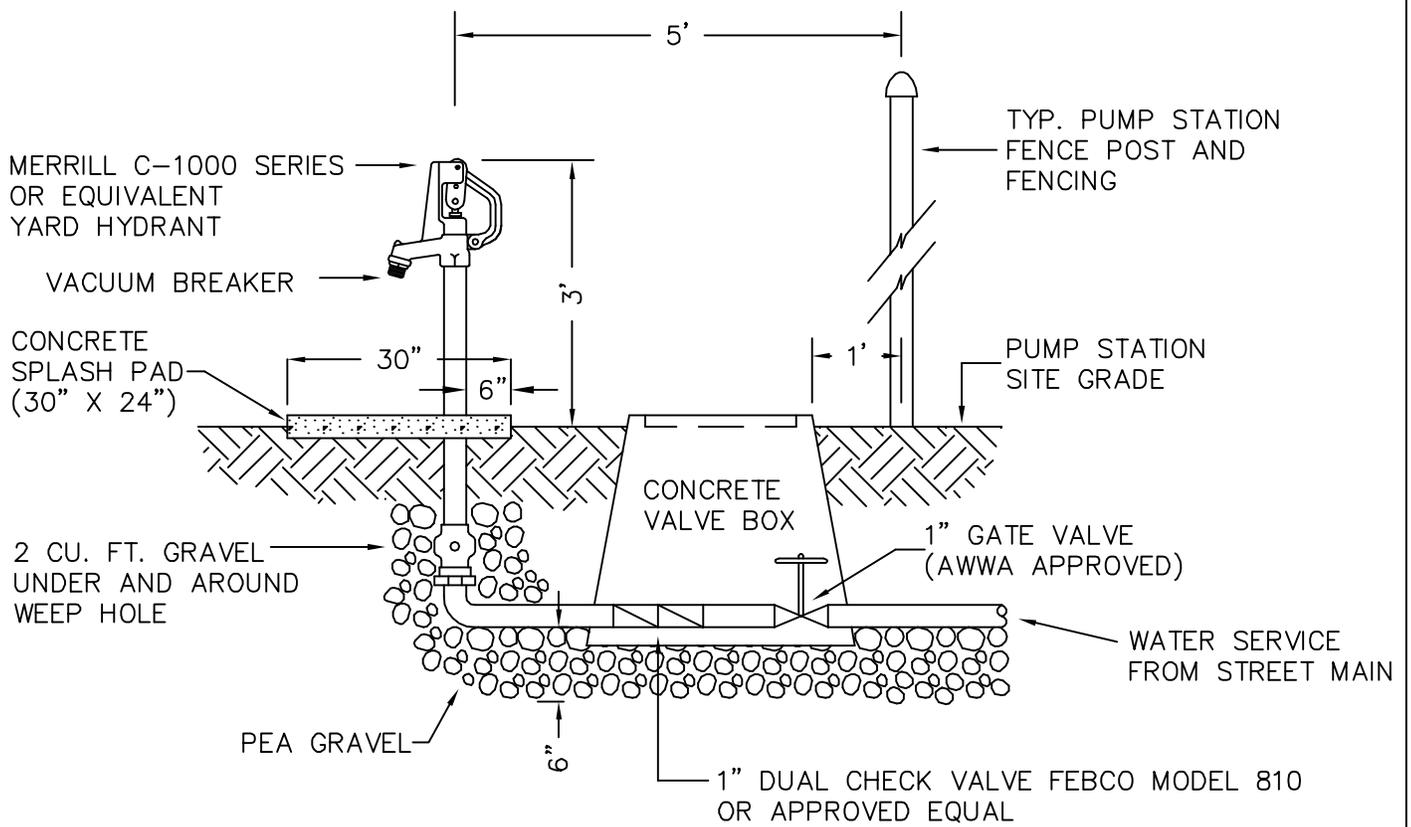
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
1/24/08

SHEET NO.
PS-3





PUMP STATION YARD HYDRANT

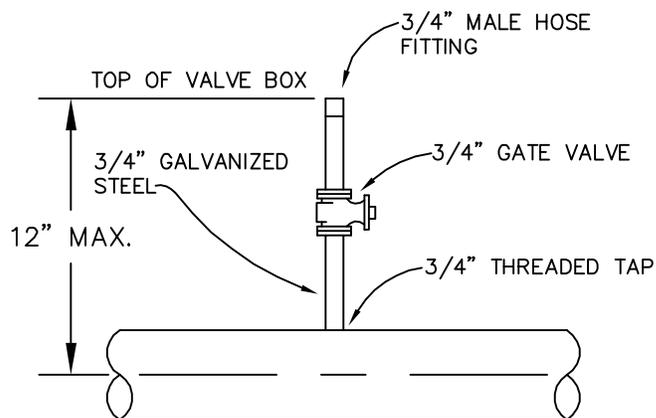
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DATE:
10/23/03

SHEET NO.
PS-4





PRESSURE GAUGE

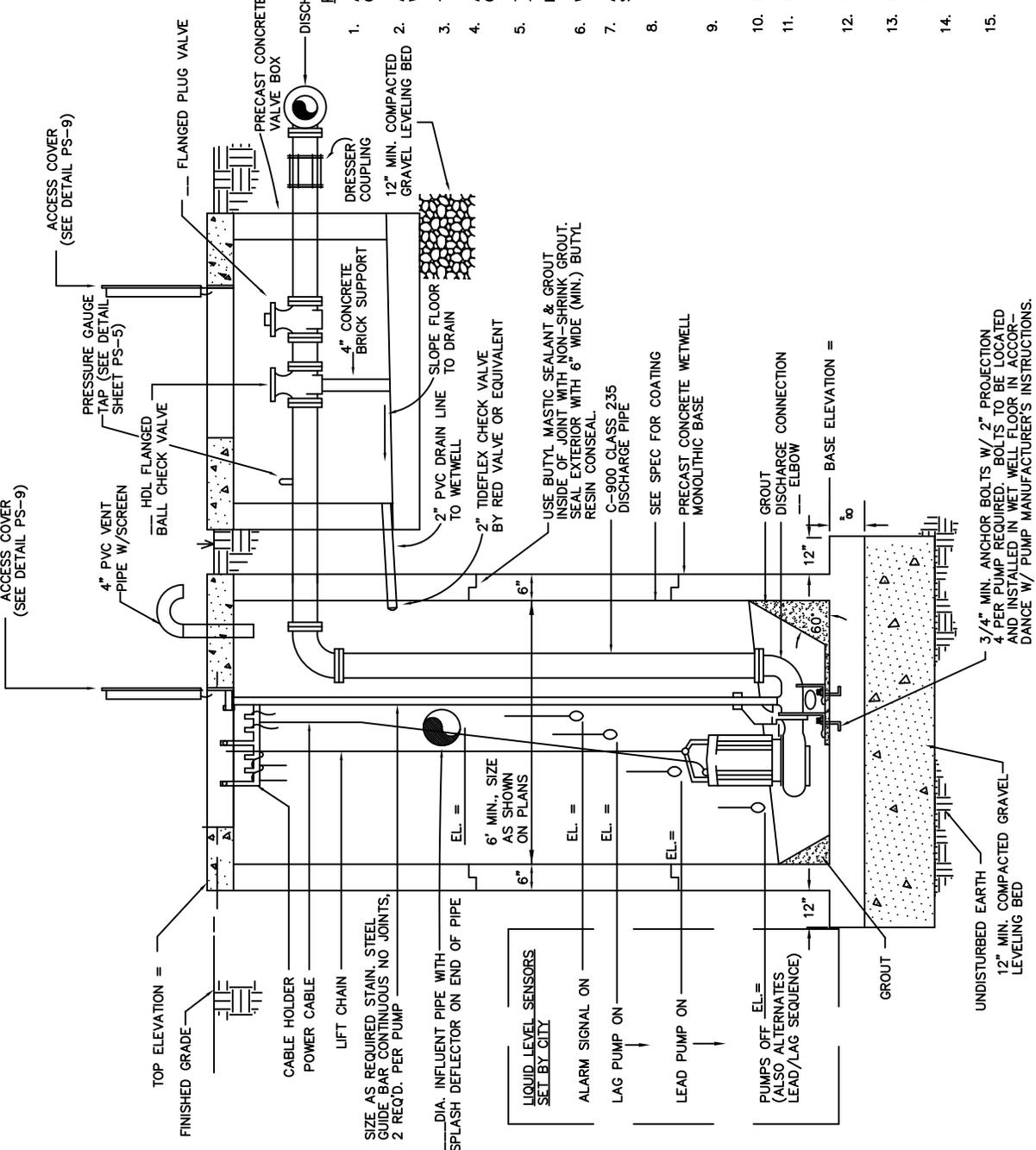
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
PS-5





EMERGENCY OPERATION PLAN:

A TRANSFER SWITCH IS PROVIDED FOR CONNECTION TO A PORTABLE GENERATOR IN THE EVENT OF A POWER FAILURE. (61-67.300.C.16.e) THE CITY OF NORTH MYRTLE BEACH WILL BE RESPONSIBLE FOR PROVIDING THE GENERATOR.

PUMP STATION NOTES:

1. ALL WORK AND MATERIALS SHALL CONFORM TO REQUIREMENTS OF THE CITY OF NORTH MYRTLE BEACH.
2. ALL HINGES, GUIDE HOLDERS, CHAIN HOLDERS, ALL NUTS, BOLTS, WASHERS, AND OTHER FASTENERS SHALL BE 302 STAINLESS STEEL.
3. THE NEMA 4X ENCLOSURES SHALL BE STAINLESS STEEL AND RAIN TIGHT.
4. ALL WETWELL HARDWARE SHALL BE MOUNTED SUCH THAT ANY COMPONENT CAN BE REMOVED.
5. THE POWER CABLE IS TO BE WIRED NON-STOP FROM THE PUMP TO THE BOTTOM OF THE STARTER WITH NO JUNCTION BOXES OR SPLICES IN BETWEEN.
6. WETWELL SECTIONS SHALL CONFORM TO ASTM C-478.
7. ALL PIPING & FITTINGS WITHIN THE WETWELL & VALVE PIT SHALL BE STAINLESS STEEL OR HDPE.
8. PUMPS AND MOTORS SHALL HAVE STAINLESS STEEL CHAINS FOR LIFTING. THE LENGTH SHALL REACH TO THE TOP OF THE STATION PLUS AN ADDITIONAL SIX FEET.
9. LOCATE THE CONTROL PANEL AS SHOWN ON THE PUMP STATION SITE PLAN.
10. INFLUENT TO PUMP STATION TO BE C-900 CLASS 235 PVC.
11. PUMPS ARE TO BE FLYGT MODEL _____ WITH IMPELLER _____ WITH A _____ HP. _____ VOLTS, 3 PH MOTOR. EACH PUMP SHALL DELIVER _____ GPM AT _____ T.D.H. SHOP DRAWINGS WILL BE REQUIRED.
12. CONTROL PANEL IS TO CONTAIN AN AUDIO AND VISUAL HIGH LEVEL ALARM.
13. FLOATS TO BE ROTO FLOAT / ANCHOR SYNTHETIC MODEL W NO-SS STAINLESS STEEL WITH 40' CORDS. HUNG ON STAINLESS STEEL CHAIN AND SIZED ACCORDINGLY.
14. ALL CHAINS, FLOATS AND INTERIOR PIPING SHALL BE STAINLESS STEEL OR HDPE.
15. THE RADIO TELEMETRY SYSTEM SHALL BE MANUFACTURED BY DATA FLOW SYSTEMS, INC. (DFS) AND SUPPLIED BY THE DFS NORTH SOUTH CAROLINA VAR, NIX, PURSER AND ASSOCIATES., MATTHEWS, NC, PHONE (704) 847-7036
16. FLOATS TO BE MOUNTED TO 5/16" STAINLESS STEEL CHAIN.

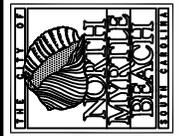
**SUBMERSIBLE DUPLEX PUMP
STATION SECTION AND NOTES**

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

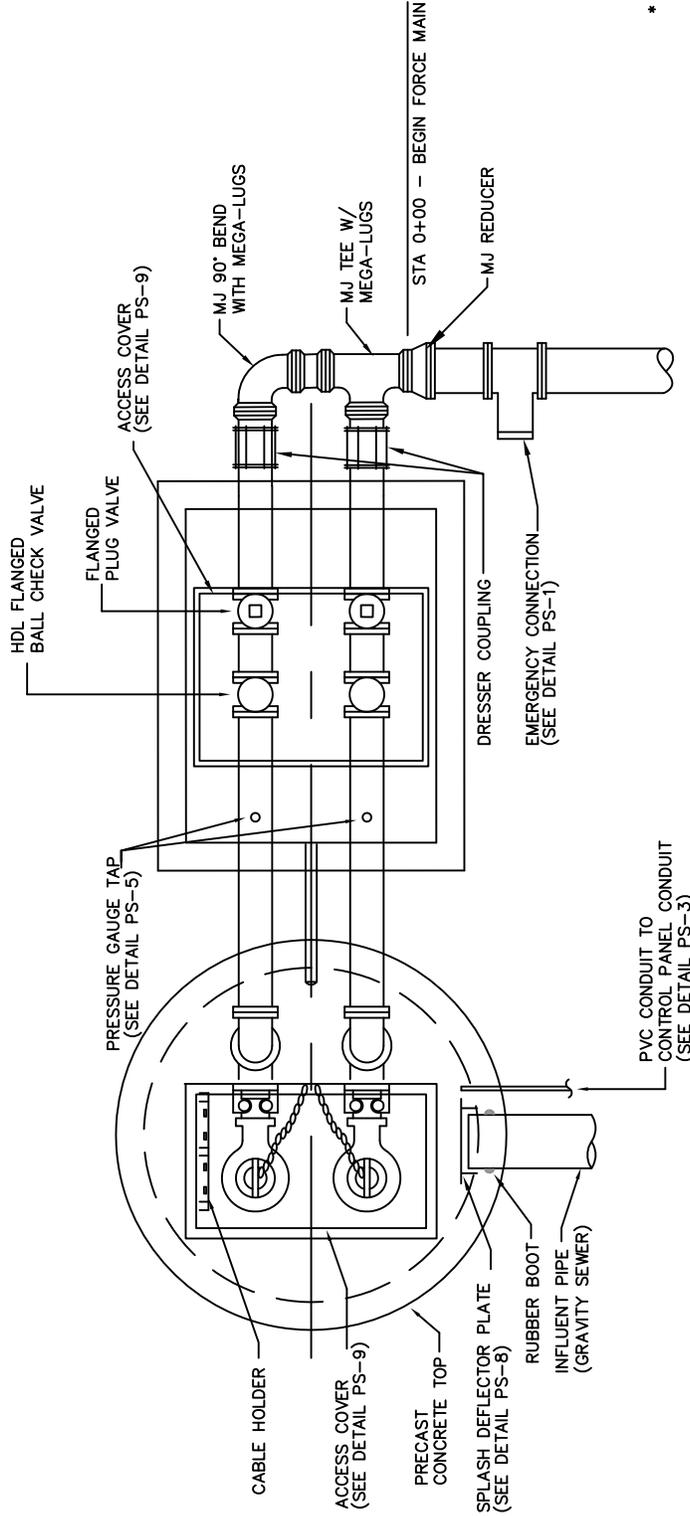
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SHEET NO.
PS-6



PUMP STATION SCHEDULE

PIPE I.D.	SEE PLAN
ELEVATION	SEE PLAN
INSIDE DIAMETER	?
TOP ELEVATION	?
HIGH WATER LEVEL	?
LOW WATER LEVEL	?
FLOOR ELEVATION	?
ALARM SIGNAL ON	?
LAG PUMP ON	?
LEAD PUMP ON	?
PUMPS OFF	?
MODEL	?
IMPELLER	?
DISCHARGE PIPING	?
CHECK VALVE	?
PLUG VALVE	?
DESIGN FLOW*	? GPM
DESIGN HEAD* (TDH)	? FT.
REQUIRED FLOW**	? GPM
REQUIRED HEAD** (TDH)	? FT.
VOLTAGE	? VOLTS
PHASE	? Ø
HORSEPOWER	? HP
RPM	?
EFFICIENCY	?% MIN.



* DESIGN FLOW AND HEAD ARE THE CALCULATED CONDITIONS SPECIFIED BY THE LOADING. (I.E. # OF LOTS SERVED IN PHASE)

** REQUIRED FLOW AND HEAD ARE CALCULATED CONDITIONS BASED UPON THE PUMP CURVE.

NOTE: TELEMETRY TO BE LOCATED PER SITE PLAN.

ALL PIPING AND FITTINGS TO BE STAINLESS STEEL OR HDPE FROM BASE ELBOWS THROUGH VALVE PIT.



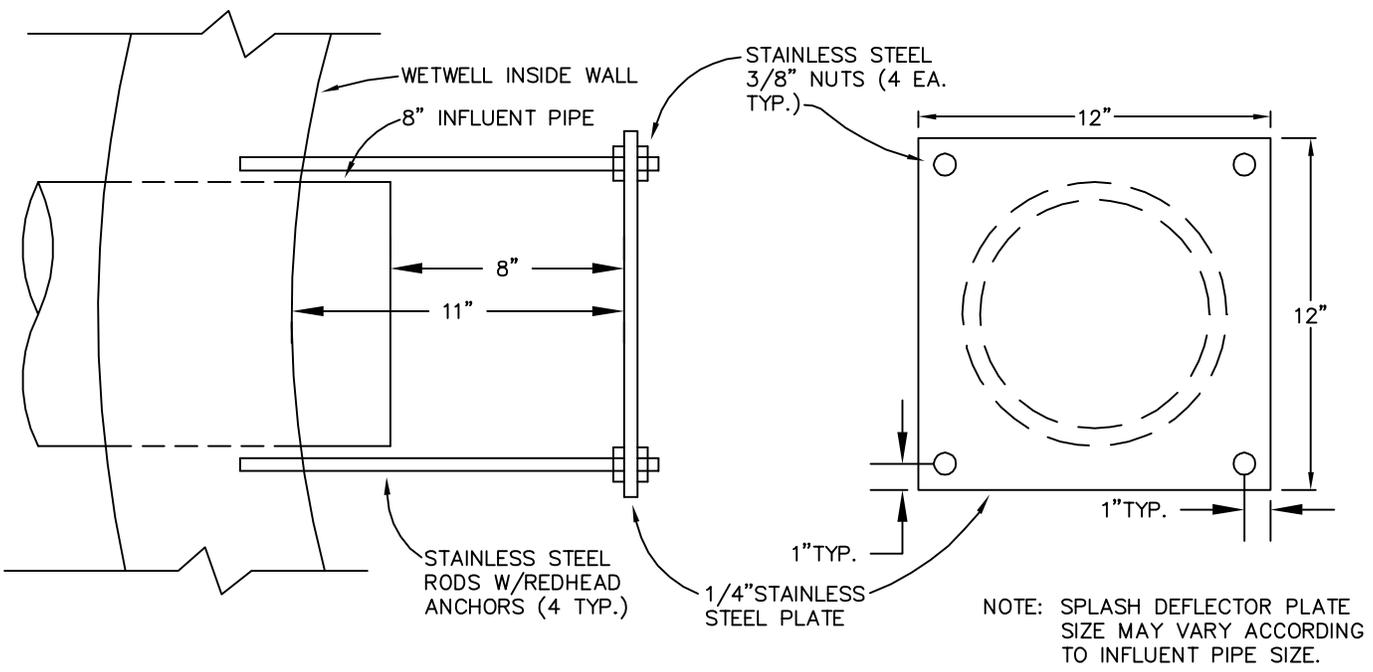
DATE:
1/24/08

SHEET NO.
PS-7

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

SUBMERSIBLE DUPLEX PUMP
STATION PLAN AND SCHEDULE



TYPICAL SPLASH DEFLECTOR PLATE

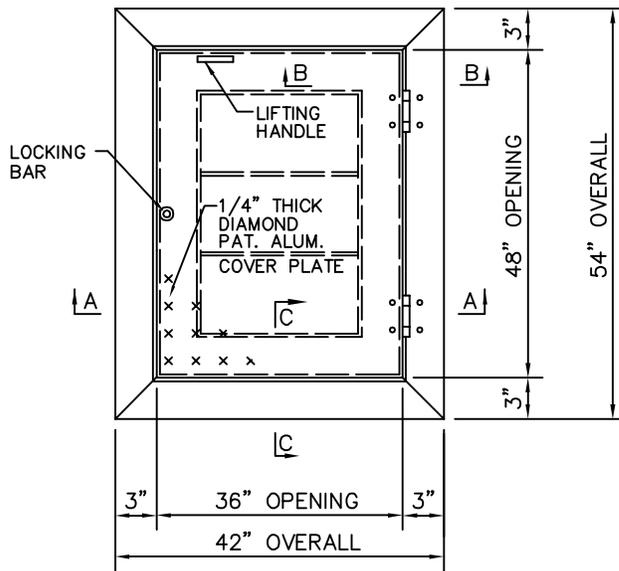
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

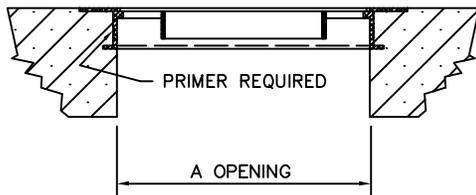
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10/23/03

SHEET NO.
PS-8





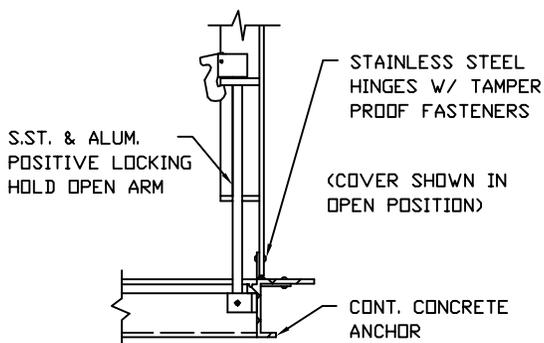
PLAN



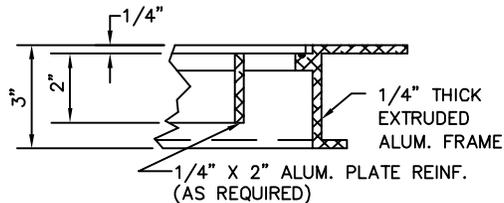
SECTION A-A

STANDARD FEATURES:

- AUTO-LOCK STAINLESS STEEL HOLD OPEN ARM WITH RELEASE HANDLE
- STAINLESS STEEL HINGES AND ATTACHING HARDWARE
- NON-CORROSIVE LOCKING BAR AND HANDLE
- SINGLE LEAF CONSTRUCTION
- 300 LBS. PER SQ. FT. LOAD RATING
- 10 YEAR GUARANTEE



SECTION B-B



SECTION C-C

CONCRETE PUMP STATION HATCH

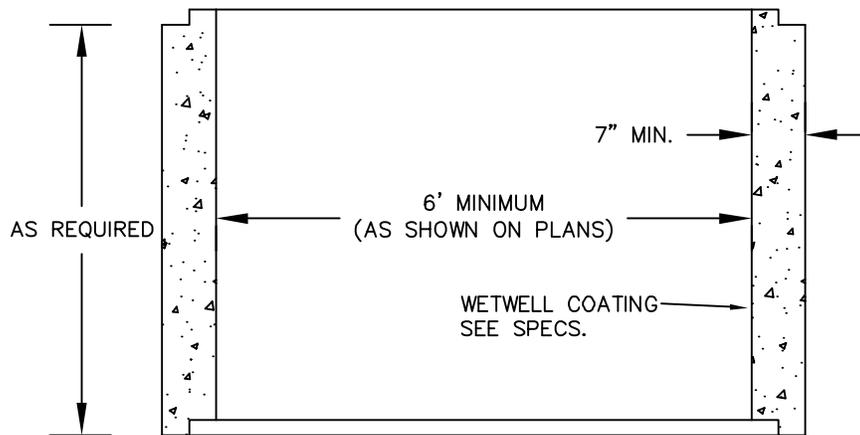
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
PS-9





NOTES:

1. ALL STANDARD SEWER MANHOLE SECTIONS TO MEET OR EXCEED THE REQUIREMENTS OF ASTM C478.
2. ALL STEPS INSTALLED IN MANHOLE SECTIONS TO HAVE SERRATED TREAD * TALL END LUGS TO PREVENT FEET FROM SLIPPING.
3. BUTYL RUBBER SEALANT IS REQUIRED FOR SEALING JOINTS. O-RING GASKETS MAY BE USED.

CONCRETE WETWELL
RISER SECTION

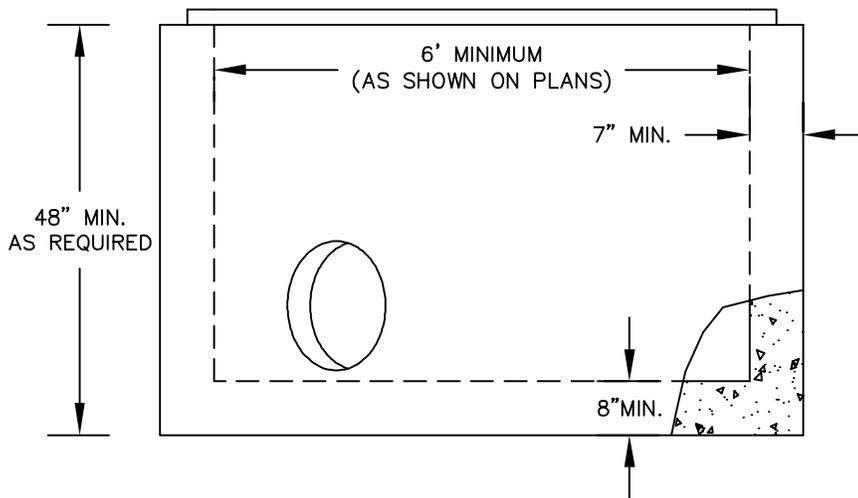
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

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DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
PS-10





NOTES:

1. ALL STANDARD SEWER MANHOLE SECTIONS TO MEET OR EXCEED THE REQUIREMENTS OF ASTM C478.
2. ALL STEPS INSTALLED IN MANHOLE SECTIONS TO HAVE SERRATED TREAD * TALL END LUGS TO PREVENT FEET FROM SLIPPING.
3. BUTYL RUBBER SEALANT IS REQUIRED FOR SEALING JOINTS. O-RING GASKETS MAY BE USED.

CONCRETE WETWELL
MONOLITHIC BASE SECTION

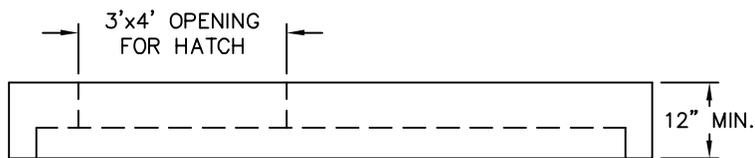
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
PS-11





NOTES:

1. ALL STANDARD SEWER MANHOLE SECTIONS TO MEET OR EXCEED THE REQUIREMENTS OF ASTM C478.
2. ALL STEPS INSTALLED IN MANHOLE SECTIONS TO HAVE SERRATED TREAD * TALL END LUGS TO PREVENT FEET FROM SLIPPING.
3. BUTYL RUBBER SEALANT IS REQUIRED FOR SEALING JOINTS. O-RING GASKETS MAY BE USED.

CONCRETE WETWELL
FLAT SLAB TOP SECTION

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
PS-12



SECTION 02700

WATER DISTRIBUTION SYSTEMS

GENERAL

1.01 SECTION INCLUDES

- A. Water main piping, fittings, and accessories.
- B. Pressure testing and sterilization.

1.02 RELATED SECTIONS

- A. Section 00800 – General Requirements
- B. Section 02100 - Excavation
- C. Section 02200 - Backfilling.
- D. Section 02300 - Trenching.

1.03 STANDARDS – The standards listed below are included in this specification by reference. Specifications cited shall refer to the latest standards revision under the same specification number, or to superseding specifications under a new number, except for provisions in revised specifications, which are clearly inapplicable.

- A. AWWA/ANSI C150/A21.50 - Thickness Design of Ductile-Iron Pipe.
- B. AWWA/ANSI C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and other Liquids.
- C. AWWA/ANSI C104/A21.4 - Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- D. AWWA/ANSI C111/21.11 - Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- E. AWWA/ANSI C110/A21.10 - Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.
- F. AWWA/ANSI C105/A21.5 - Polyethylene Encasement for Ductile Iron Pipe Systems.
- G. AWWA C600 - Installation of Ductile-Iron Water Mains and their Appurtenances.
- H. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4” through 12”.

- I. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe, 14” through 48”.
- J. ASTM D 2241 - Poly Vinyl Chloride (PVC) Pressure Pipe.
- K. AWWA C502 - Dry Barrel Fire Hydrants.
- L. AWWA C508 - Swing-Check Valves for Waterworks Service, 2" through 24" NPS.
- M. AWWA C509 - Resilient Seated Gate Valves for Water and Sewerage Systems.
- N. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4" through 63" for water distribution.
- O. AWWA M23 - PVC Pipe Design and Installation.
- O. ASTM D 2774 - Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.
- P. AWWA C651 - Disinfecting Water Mains.
- Q. City of North Myrtle Beach Standard Detail Drawings: W1 – W27.

1.04 REGULATORY REQUIREMENTS

- A. Conform to all applicable SCDHEC Regulations for materials and installation for Water Construction.
- B. All materials/products that contact potable water must be third party certified as meeting ANSI/NSF 61. The certifying party shall be accredited by ANSI/NSF.
- C. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to AWWA Standards, Section C.

1.05 SPECIAL DESIGN ISSUES

- A. Soil or Groundwater Contamination – Water mains shall be designed to avoid installation within contaminated areas where feasible. Unavoidable installations within a contaminated area shall utilize ductile iron pipe with chemical resistant gaskets.
- B. Wastewater treatment systems – Water mains shall not be installed within 25-feet (horizontally) of any wastewater spray field or drain tile field.
- C. Water-body crossing:
 - 1. All water mains that cross above a water body shall be readily accessible, adequately supported, anchored, and protected from freezing. Crossing above

a water body shall only be allowed as shown on the plans or specified by the Engineer.

2. All water mains that cross beneath a water body shall be installed with a minimum of 3-feet of cover below the channel. Crossings greater than 15-feet wide shall be designed using ductile iron pipe with joints designed to accommodate anticipated deflection or movement. Directional drilled crossings may be installed using HDPE as specified and directed by the Engineer. (see Section 00900 and Section 13010) Valves shall be located at an accessible location (flood proof) on each side of the crossing. A properly sized blow-off (see detail W-5) shall be installed on the crossing side opposite from the water supply.

1.06 SUBMITTALS - Submit the following in accordance with Section 00800.

- A. Submit product data for pipe, fittings, joints, valves, fire hydrants, and accessories.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Inspect materials delivered to the site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep insides of pipe, fittings, valves and hydrants free of dirt and debris.
- B. Handle pipe, fittings, valves, hydrants and other accessories in a manner to ensure delivery to the trench in a sound, undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged.

PRODUCTS

2.01 MANUFACTURERS

- A. Pipe and Fittings
 1. U.S. Pipe
 2. Griffin Pipe Products Company.
 3. American Cast Iron Pipe Company.
 4. McWane Cast Iron Pipe Company.
 5. J M Eagle
- B. Valves
 1. DeZurik.
 2. Clow Corporation.

3. Mueller Company.
4. M & H.
5. Rockwell International.

C. Substitutions: Under provisions of Section 00800.

2.02 GENERAL

- A. These specifications shall apply to the materials to be furnished and installed to complete the water line installation in accordance with the drawings.
- B. All pipe and fittings shall be of the class and type as indicated on the drawings and/or proposal and designated herein.
- C. The Engineer shall not permit intermixing of different types of pipe unless specified on the drawings or with approved written permission.
- D. All pipe shall be new, of first quality with smooth interior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length. Previously used pipe shall not be allowed.
- E. All pipe shall be subject to the inspection by the Engineer at the pipe plant, trench, or point of delivery, for purpose of culling and rejecting of any pipe (independent of laboratory test), which does not conform to the requirements of these specifications. The Engineer shall mark such pipe, and the Contractor shall remove it from the project site upon notice being received of its rejection.
- F. All water main materials shall conform to one or more of the specifications cited for each material classification noted below.
- G. Lubricants, natural rubber or other material which will support microbiological growth shall not be used on any pipe, fitting, valve, meter, etc. that may be exposed to potable water.
- H. Vegetable shortening shall not be used to lubricate pipe, gaskets, or joints.

2.03 WATER MAIN MATERIALS

- A. Ductile Iron Pipe:
 1. Pipe sizes 12" and under shall be Pressure Class 150, 14" and greater shall be Pressure Class 250 or better. All ductile iron pipes shall be cement mortar lined and conform to the following standard specifications: AWWA/ANSI C104/A21.9, AWWA/ANSI C151/A21.51.
 2. Pipe shall be Mechanical, Push-on, Flanged, or Boltless ball joint (as needed or as shown on the plans) and conform to standard AWWA/ANSI C111/A21.11.

3. Boltless ball joints shall lock and be watertight and permit a deflection of up to 15 degrees. The locking device shall include a spherical socket, spherical retainer and locking wedge.
 4. All pipe material, solder and flux, shall be lead free (less than 0.2 percent lead in solder and flux, and not more than a weighted average of 0.25% lead in wetted surfaces of pipes, pipe and plumbing fittings and fixtures.
- B. Polyvinyl Chloride (PVC) Pipe:
1. PVC Pressure Pipe shall be in accordance with the requirements of ASTM D 2321, latest revision; ASTM D 2241, latest revision; ASTM D 1784, latest revision; and shall bear the National Sanitation Foundation Seal.
 2. Pipe 4 inches through 12 inches in diameter shall be Class 150 - C900 (AWWA C900) or as noted on the proposal.
 3. Pipe larger than 12 inches in diameter shall be Class 165 - C905 (AWWA C905) or as noted on the proposal.
 4. Pipe less than 4 inches in diameter shall be rated for 160 psi (SDR 26).
 5. Rubber rings shall be of uniform solid cross-section and conform to ASTM D 1869 or the manufacturer's recommendations. Solvent weld pipe and fittings shall not be allowed.
- C. Polyethylene (PE) Plastic Piping - Pipe and heat-fusion fittings shall conform to AWWA C906. HDPE pipe shall only be used as shown on the plans and specified under Section 00900 and Section 13010.
- D. Alternate Pipe Materials – Pipe that is not specified herein such as asbestos cement, steel, etc. shall not be installed unless otherwise shown on the Plans, approved by the Engineer and approved within the SCDHEC construction permit.
- E. Gate Valves:
1. Water main valves 12 inches in diameter and smaller shall be resilient seated wedge type gate valves (unless otherwise noted) and conform to AWWA Standard C509 as latest revised.
 2. Gate valves shall be of the non-rising stem type with O-ring seals or the rising stem type (OS&Y) with conventional type packing.
 3. Gates shall be encapsulated in rubber where exposed to line velocity, be field replaceable and provide a dual seal on the mating body seat.
 4. Gate valves shall be furnished with flanged or mechanical joint type end connections.

5. Gate valves shall be epoxy coated, painted inside and out by the valve manufacturer.
6. All gate valves shall be equipped with a standard 2-inch square operation nut unless otherwise noted.
7. Gate valves shall be rated for 200-psi water working pressure and 400-psi hydrostatic test pressure.
8. Gate valves shall be Mueller, Clow, American Darling, M & H, or equivalent.

E. Butterfly Valves:

1. All butterfly valves shall be AWWA mechanical joint, BAW resilient seat butterfly valves.
2. Butterfly valves shall be epoxy coated, painted by the valve manufacturer.
3. Butterfly valves shall be used for water mains 14 inches in diameter and larger.
4. Butterfly valves shall be made to open to the left and shall have a 2" square operating nut upon the end of the stem with the direction arrow clearly and plainly cast thereon.
5. All butterfly valves shall be gear actuated.

F. Tapping Sleeves & Valves:

1. Tapping sleeves shall be JCM 432 all stainless steel or approved equivalent.
2. All tapping sleeves shall be for cast iron, ductile iron, or PVC pipe. (Unless otherwise noted.)
3. All tapping valves shall be Mueller model H-687 or equivalent.
4. Tapping valves shall have a standard 2-inch square operating nut.
5. All tapping valves shall be resilient seat valves.

G. Valve Box:

1. Valve boxes shall be at least 5 1/4" in diameter, cast iron, adjustable screw type, with extension to grade. Cast iron box shall have a heavy coat of bituminous paint.

2. As required, extension stems shall be provided to raise valve operating nut to 36 inches below grade.
3. Each valve box is to be mounted flush with the proposed grade.
4. Crushed stone backfill will be required between and around the valve and valve box.
5. Valve boxes in grassed areas shall have a pre-cast concrete collar mounted flush with the final grade.
6. Valve boxes in pavement areas shall be brought flush with the proposed pavement elevation.
7. Valve boxes to have the word "WATER" cast on the top cover.

H. Fire Hydrants:

1. Fire hydrants shall be traffic type, dry barrel, conforming to AWWA Standard C502 - "Fire Hydrant for Ordinary Waterworks Service", approved by the National Board of Fire Underwriters with National Standard Threads.
2. Hydrant shall have a breakaway barrel set for 3 feet of cover.
3. Hydrant shall be equipped with 6" mechanical joint bottom hub, strapping lugs, "O" ring seals and an operating stem with a 2-inch solid operation nut.
4. Main valve will be 5-1/4" and its seat shall have bronze-to-bronze threads into hydrant shoe.
5. Each hydrant shall have one 4 ½" pumper connection and two 2 ½" national standard threaded hose connections.
6. Hydrant shall be oil lubricated.
7. Hydrant shall be dry bonnet type and be provided with a drain outlet for draining when the valve is closed.
8. Hydrant shall open left and be rated at 150 psi working pressure and 300 psi test pressure.
9. Hydrants shall be as specified on the drawing details.

I. Sleeve-Type Mechanical Couplings:

1. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber

gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets.

2. The middle and follower rings shall be true circular sections free from irregularities, flat spots, and surface defects.
3. The middle ring shall be of cast iron and the follower rings shall be of ductile iron and conform to ASTM A47, and ASTM A 536, respectively.
4. Gaskets shall be designed for resistance to set after installation and shall meet the applicable requirements specified for mechanical joint gaskets in AWWA C111/A21.11.
5. Bolts shall be round-head square-neck type bolts, ANSI B18.5.1M and ANSI/ASME B18.5.2.2M with hex nuts.
6. Bolt shall be 5/8" in diameter.
7. Minimum number of bolts for each pipe size should be as follows: 4" - 4; 6" - 5; 8" - 6; 10" - 7; 12" and 14" - 8; 16" - 9; 18" - 10, 20" - 12; 22" - 13; 24" - 14.
8. Bolt holes in follower rings shall be of a shape to hold fast the necks the bolts used.
9. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used except where pipeline is adequately anchored to resist tension pull across the joint.

J. Tracer Wire for Non-Metallic Piping:

1. Provide blue-coated copper wire not less than 12" gauge in sufficient length to be continuous over each separate run of non-metallic pipe.
2. All mains shall be detectable within 3-feet, using electronic locating equipment.

2.04 PIPE ACCESSORIES

- A. Fittings: All fittings shall be ductile iron, mechanical joint to suit pipe size and material in required tees, bends, elbows, reducers and other configurations required unless otherwise shown on drawings.
- B. Mechanical joint restraints shall be installed for all tees, bends, and plugs on all water lines larger than two inches. Mechanical joint restraints shall be installed on all fire hydrants and post hydrants. Refer to Section 3.11 for material and installation requirements. Concrete blocking shall not be used for thrust restraint.

2.05 WATER SERVICES

- A. Water services shall be as specified on the plans and standard detail drawings.
- B. Water services are to have a minimum of 30" of cover over the line.
- C. Plastic piping shall bear the seal of the national sanitation foundation for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.
- D. Polyvinyl Chloride (PVC) plastic piping shall be SDR7 rating to provide 200 psi minimum pressure rating and meet the requirements of ASTM D 1785, Schedule 40; or ASTM D 2241. Pipe shall be "BLUE" in color. Pipe and fittings shall be of the same PVC plastic material. Solvent cement shall be in accordance with ASTM D 2564.

2.06 FILL MATERIAL

Continuous and uniform bedding shall be required within the trench for all pipe installations. Backfill material shall be placed and tamped in uniform layers around the pipe and to a sufficient height above the pipe for adequate protection and support. Rock or stone shall not be placed within six inches of the pipe, except for the specified stone bedding material. Refer to Section 2200 and Section 2300 for material and installation requirements.

- A. Ductile Iron Pipe: Approved subsoil as specified in Section 02200.
- B. Polyvinyl Chloride (PVC) and High Density Polyethylene (HDPE) Plastic Pipe: Bed in accordance with bedding detail on the drawings using material specified in Section 02200.

EXECUTION

3.01 GENERAL

- A. The Contractor shall furnish all material and labor, and construct the water lines as shown on the drawings, including all clearing, grubbing, excavating, sheathing, backfilling, and other appurtenances.
- B. The work shall include all ditching, diking, pumping, bailing, draining, flushing, testing, and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drainage culverts, power and telephone lines and cables, and other structures.
- C. The Contractor shall be responsible for the cleaning away of all rubbish and surplus materials upon completion of the work required to build and put in complete working order the specified water lines and all structures appertaining thereto.

- D. All water lines and appurtenances shall be cleared of all foreign debris.
- E. Pipe shall be installed with standard cover depth of 36-inches unless otherwise directed by the Engineer. Minimum cover of 30-inches shall be maintained at all times. Thermoplastic piping shall not be installed with less than 30-inch cover under any circumstance.

3.02 ORDER OF WORK

- A. The Owner reserves the right to direct the Contractor as to which portions of work should be constructed first, and upon order of the Engineer to verify that any complete portion of work is as specified and acceptable for service.

3.03 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

- A. The Contractor shall fully adhere to the State Highway Department Encroachment Permit while operating in any state right-of-way and all construction techniques shall comply with the current edition of the State Highway Department Standard Specifications and Traffic Control Manual.
- B. Through traffic shall be maintained at all times during construction of sewers across all streets and highways. If the open cut method is used, two separate cuts must be made and one lane of traffic must be open at all times.
- C. The Contractor shall obtain, by agreement with property owner, any additional space required for construction on private property at no cost to the Owner.

3.04 EXISTING UTILITIES AND STRUCTURES

- A. Any existing utilities, structures, monuments, etc. damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.
- B. The approximate positions of certain known underground lines are shown on the drawings for information only. Existing small service lines are not shown.

3.05 POTABLE WATER PROTECTION (SEPARATION OF WATER & SEWER LINES)

- A. Adequate provision shall be made for the protection of potable water supplies from possible leakage from sewers located near water lines.
- B. There shall be no physical connection between a public water supply system and a sewer system. No potable water main shall pass through or come into contact with any part of a sewer manhole.
- C. Where possible, sewer mains should be located at least ten (10) feet horizontally from existing or proposed water main then:
 - 1. Sewer will be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen (18) inches below the bottom of the water

main, or:

2. Sewer will be laid in the same trench as the water main with the water main located on a bench of undisturbed earth, and with the elevation of the top of the sewer at least eighteen (18) inches below the bottom of the water main, or:
 3. If conditions prevent the eighteen (18) inch vertical separation, then the sewer will be laid under the water main and both the water and sewer shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.
- D. When conditions require a sewer line to cross over a water main, both the water main and sewer line shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure tested to assure water tightness prior to backfilling.
- E. Water/sewer line separation shall be in accordance with Section R61.58.4D (12) of the State Primary Drinking Water Regulations.
- F. When it is not possible to maintain the separation distances specified in the regulation above, the Engineer may allow an alternative design subject to approval from SCDHEC. The alternative design shall: 1. Maximize the distance between the water main and sewer line and the joints of each; 2. Use materials that meet the state regulatory requirement (R61.58.4) and 3. Allow adequate distance for maintenance and repairs on each line without causing damage to the other line.

3.06 CROSS CONNECTION CONTROL (BACKFLOW PREVENTION DEVICES)

- A. No water service connection shall be installed or maintained unless the water supply is protected from contamination as required by state and local regulation. (Reference City of North Myrtle Beach Code of Ordinances, Section 15-47)
- B. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks where non-potable water or other contaminants may be discharged or drawn into the system.
- C. Bypassing a backflow prevention device shall not be allowed unless the bypass is also equipped with an equal, approved backflow prevention device.
- D. High hazard category, as determined by the Engineer, shall require an air gap separation or an approved reduced pressure principle backflow device.
- E. Reduced pressure principle devices shall be required in any area subject to flooding or water backup.
- F. All piping to the inlet of the backflow prevention device shall be suitable for

potable water and shall be AWWA and/or NSF approved. Black steel shall not be allowed.

- G. Fire line sprinkler systems and dedicated fire lines shall be protected by an approved double check valve assembly device, unless the fire line/sprinkler system serves a high hazard category.

3.07 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.
- B. Remove large stones or other hard matter that could damage tile or impede consistent backfilling or compaction.

3.08 INSTALLATION - PIPE

- A. All pipe and fittings shall be protected during handling against impact shocks and free fall. Pipe and fittings shall be cleaned before they are laid, and shall be kept clean at all times.
- B. All pipe and fittings shall be carefully examined for defects and no piece shall be laid which is known to be defective. Before lowering, and while suspended, cast and ductile iron pipe may be gently tapped with a hammer to sound for cracks. Any defective, damaged, or unsound pipe shall be rejected.
- C. If any defective piece is discovered after having been laid, it shall be removed and replaced with a sound one at the Contractor's expense.
- D. The pipe shall be supported its full length by the uniform grade of the trench, and a bell hole shall be dug at each joint, said hole being of sufficient size to ensure the proper "making up" of each joint.
- E. The procedure in making up the pipe joints shall be performed in accordance with the recommendations of the manufacturer. All accessories used in making the joints shall be obtained from the manufacturer of the pipe.
- F. Pipe ends shall not be left open at the end of a day's work or during temporary suspension of construction, but shall be securely covered to prevent the entry of any water, earth, or foreign matter.
- G. Kinks or sharp bends giving excessive deflection or which put pipe joints in strain will not be permitted.
- H. When cutting short lengths of pipe, a pipe cutter will be used, and care will be taken to make the cut at right angles to the centerline of the pipe. In the case of "push-on" pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.
- I. Where the use of nuts, bolts, washers, rods, straps, and clamps are required due to

the peculiarities of the installation, these items shall be installed and be of the size and dimension as shown on the drawings. After installation, and before backfilling, all the above items shall be painted with bituminous paint or coal tar enamel. In lieu of the above, accessories and fittings shall be provided using stainless steel or other non-corrosive metals.

- J. Any pipe, fitting, or accessory not meeting the specified AWWA/ASTM Standard shall not be used.
- K. Install pipe, fittings, and accessories in accordance with AWWA C600, ASTM D 2774, Section C AWWA Standards and manufacturer's instructions. Seal joints watertight.
- L. Place pipe on approved bedding in accordance with the drawings and specifications.
- M. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.

3.09 INSTALLATION - VALVES

- A. Install gate valves in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix to AWWA C500.
- B. Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.
- C. Crushed stone backfill must be installed around the valve and the valve box.

3.10 INSTALLATION - HYDRANTS

- A. Install hydrants in accordance with AWWA C600 for hydrant installation as indicated.
- B. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings.
- C. Bottom of hydrant must be restrained by use of tie-rods to adjacent fittings, concrete blocking, or other method approved by the Engineer.
- D. Install hydrants with the 4 ½" pumper outlet facing the nearest paved surface. If there is any question as to the direction the hydrant should face, contact the Owner or the Engineer.
- E. Base of hydrant must be backfilled with #2 stone washed of fines, or equivalent, to allow the drain holes adequate drainage.

3.11 INSPECTION

- A. All work done and materials furnished shall be subject to the inspection of the Engineer and his Inspector. The Engineer reserves the right to mark rejected materials to distinguish them as such.
- B. All improper work shall be reconstructed at the Contractor's expense.
- C. All materials that do not conform to the requirements of the specifications shall be removed and replaced with approved materials at the Contractor's expense.

3.12 MECHANICAL RESTRAINTS

- A. Lines shall have restrained joints at all tees, bends, plugs, crosses, valves, and hydrants or as directed by the Engineer.
- B. Acceptable methods for joint restraint shall be the use of metal tie-rods or EBAA Iron Inc., MEGALUG or equivalent.
- C. Retainers for pipe bells shall be required with the use of the MEGALUG restraints.
- D. Concrete blocking shall not be used.

3.13 TESTING AND LEAKAGE

- A. Each completed section of the pipeline shall pass pressure and leakage testing in accordance with AWWA C600.
- B. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the water main is being filled for the hydrostatic pressure test, all air shall be expelled from the pipe through blow-offs or temporary taps.
- C. The water main shall be subjected to a hydrostatic pressure of 1.5 times the maximum working pressure at the point of testing for a minimum period of two hours. The minimum test pressure shall be 150 psi unless otherwise specified on the plans, SCDHEC permit, or elsewhere in these specifications.
- D. The leakage during the test shall not be more than calculated using following formula and in accordance with AWWA C-600.
- E. The required hydrostatic pressure shall be applied to the water line by means of a hand pump for small lines or by the use of a gasoline pump or fire engine for larger lines.
- F. During the test the lines shall be thoroughly examined for leakage at the joints and fixed where applicable. All visible leakage shall be repaired regardless of the amount.

- G. Any cracked or defective pipes, fittings, or valves discovered in consequence of the pressure test shall be removed and replaced by the Contractor at his own expense. The water line is to be retested at the required pressure for two hours.
- H. Where pipeline construction ties into existing lines, and where it is not practicable to make a hydrostatic pressure test, the Contractor shall leave this section of pipeline uncovered at each applicable joint for inspection for a period of 48 hours after the connection has been made and the line is placed in service. The Contractor shall make the necessary restraints to make sure that the water line does not blow apart at these uncovered joints. The Contractor shall immediately correct any leakage discovered in these joints.
- I. The Engineer or his designee shall witness all pressure tests. The Contractor is to notify the Engineer a minimum of 24 hours prior to the pressure test.
- J. The allowable leakage shall be calculated using the following formula:

$$L(\text{for DIP}) = \frac{SD(P)^{\frac{1}{2}}}{133,200} \quad \text{or} \quad L(\text{for PVC}) = \frac{ND(P)^{\frac{1}{2}}}{7,400}$$

Where L = Allowable Leakage (gallons per hour)
 S = Length of pipe being tested (feet)
 D = Diameter of the pipe (inches)
 P = Average Test pressure (psi)
 N = Number of Joints being tested

Test shall last for a period of 2 hours

3.14 DISINFECTION

- A. The entire water distribution system shall be disinfected in accordance with AWWA C651, current version.
- B. The entire water distribution system shall be flushed thoroughly before chlorination begins to remove algae, deposits, and other foreign substances.
- C. Using the “continuous feed method”, fill all new piping and any existing piping affected by the Contractor’s operations with a chlorine solution containing a free chlorine residual of at least 50 ppm. Water from the existing distribution system shall be controlled to slowly fill all of the new pipe system during the application of chlorine. After the chlorine has been applied to the water in the system, the system shall be isolated and the chlorinated water shall remain in the lines for twenty-four (24) hours. At the end of this period, the treated water in all portions of the main must have a free chlorine residual of not less than 10 ppm. Flush all chlorine out of the system with potable water of satisfactory bacteriological quality prior to beginning sampling. Prior to sampling, the chlorine residual shall be reduced to normal system residual levels.

- D. Water samples shall be collected from various points along the main. A minimum of two samples shall be taken at each sampling point for total coliform analysis. The number of sample points is dependent on the system layout but shall include all dead-end lines, shall be representative of the water in the new mains, and shall be a minimum of one sample point every 1,200 linear feet and at least two sample points shall be required for all new mains. Two consecutive satisfactory bacteriological tests taken 24 hours apart must show the water line to be absent of total coliform bacteria and the chlorine residual shall be measured and reported for each sample. If the membrane filter method of analysis is used for coliform analysis, non-coliform growth shall be reported. If non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and shall be repeated. The required tests shall be conducted by a state certified laboratory and paid for by the Contractor. Copies of all test results shall be furnished to the Engineer promptly after the laboratory makes the results known.

3.15 CLEANUP AND MAINTENANCE

- A. Cleanup shall follow immediately behind the pipe laying and backfilling operations. The contractor shall maintain a clean orderly construction site.

3.16 FIELD QUALITY CONTROL

- A. The Engineer or his designee shall conduct routine field inspections and a final project inspection.

3.17 PROTECTION

- A. Protect pipe from damage or displacement until backfilling is in progress.

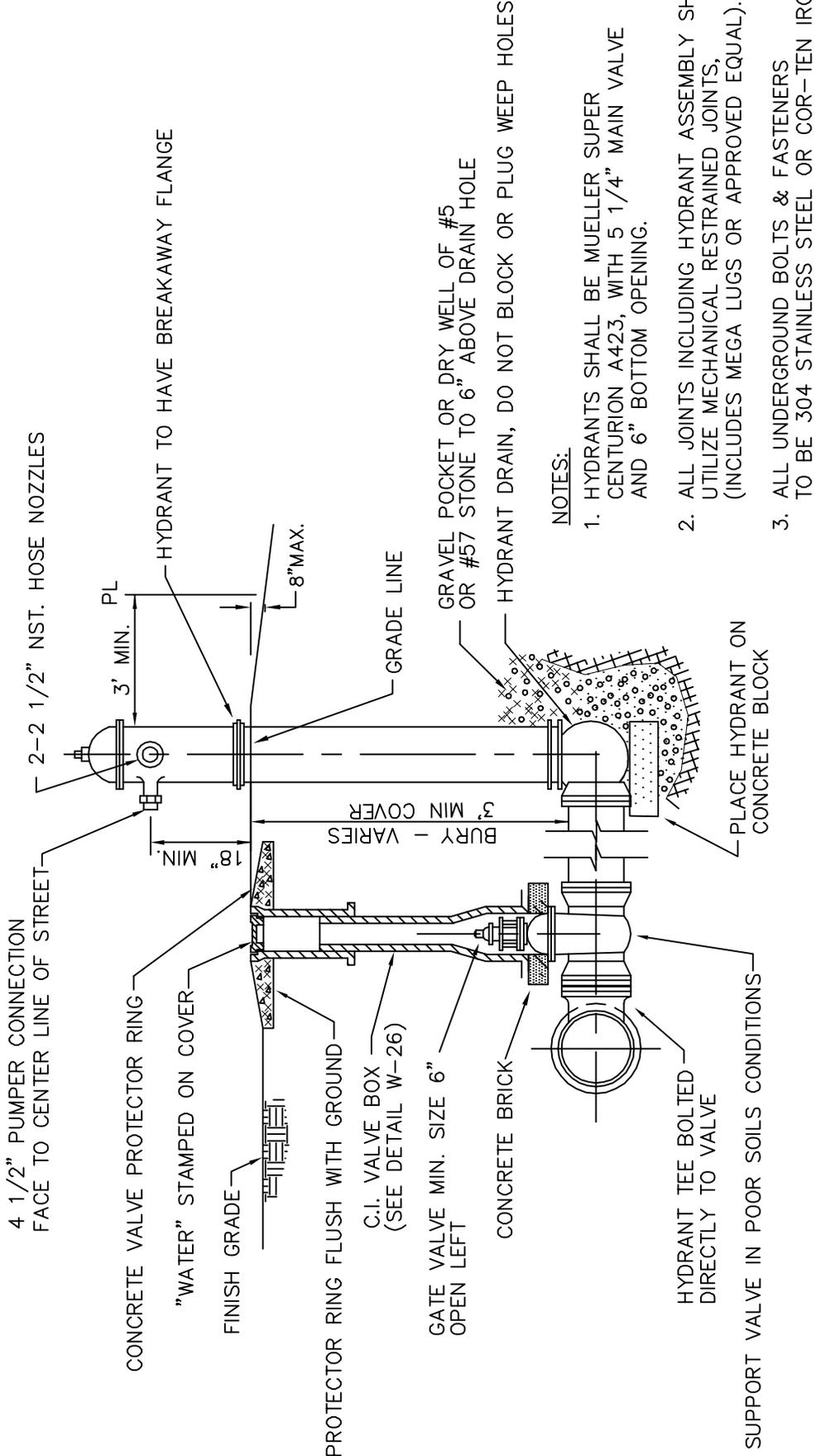
END OF SECTION

CITY OF NORTH MYRTLE BEACH STANDARD DETAILS
ENGINEERING DIVISION



WATER:

- W-1 FIRE HYDRANT WITH GATE VALVE IN PAVEMENT AREA
- W-2 FIRE HYDRANT WITH GATE VALVE IN UNPAVED AREA
- W-3 POST HYDRANT
- W-4 WATER SAMPLING STATION
- W-5 WATER BLOW OFF DEAD END LINES 2" OR SMALLER
- W-6 BUTTERFLY VALVE AND BOX
- W-7 GATE VALVE AND BOX
- W-8 MAIN VALVE MARKER POST
- W-9 AIR RELEASE VALVE AND MARKER POST
- W-10 AIR RELEASE VALVE AND MANHOLE
- W-11 CLASS 2 PIPE BEDDING
- W-12 CLASS 4 PIPE BEDDING
- W-13 TYPICAL 2" AND 3" WATER SERVICE WITH FIRE LINE
- W-14 FIRE HYDRANT AND GATE VALVE LOCATIONS
- W-15 TYPICAL 4" AND LARGER METER VAULT
- W-16 TYPICAL SINGLE WATER SERVICE
- W-17 TYPICAL DOUBLE WATER SERVICE
- W-18 TYPICAL 1" RESIDENTIAL WATER SERVICE
- W-19 STORM DRAINAGE AND SANITARY SEWER PIPE CROSSING WATER MAIN
- W-20 OBSTRUCTION BYPASS
- W-21 TYPICAL PVC PIPE WITH TRACER WIRE
- W-22 HORIZONTAL AND VERTICAL PIPE SEPARATION
- W-23 HIGHWAY BORE CASING
- W-24 2" AND 3" SERVICE CONNECTION TO WATER MAIN
- W-25 NOT USED
- W-26 ADJUSTABLE VALVE BOX
- W-27 TYPICAL DOUBLE WATER METER



NOTES:

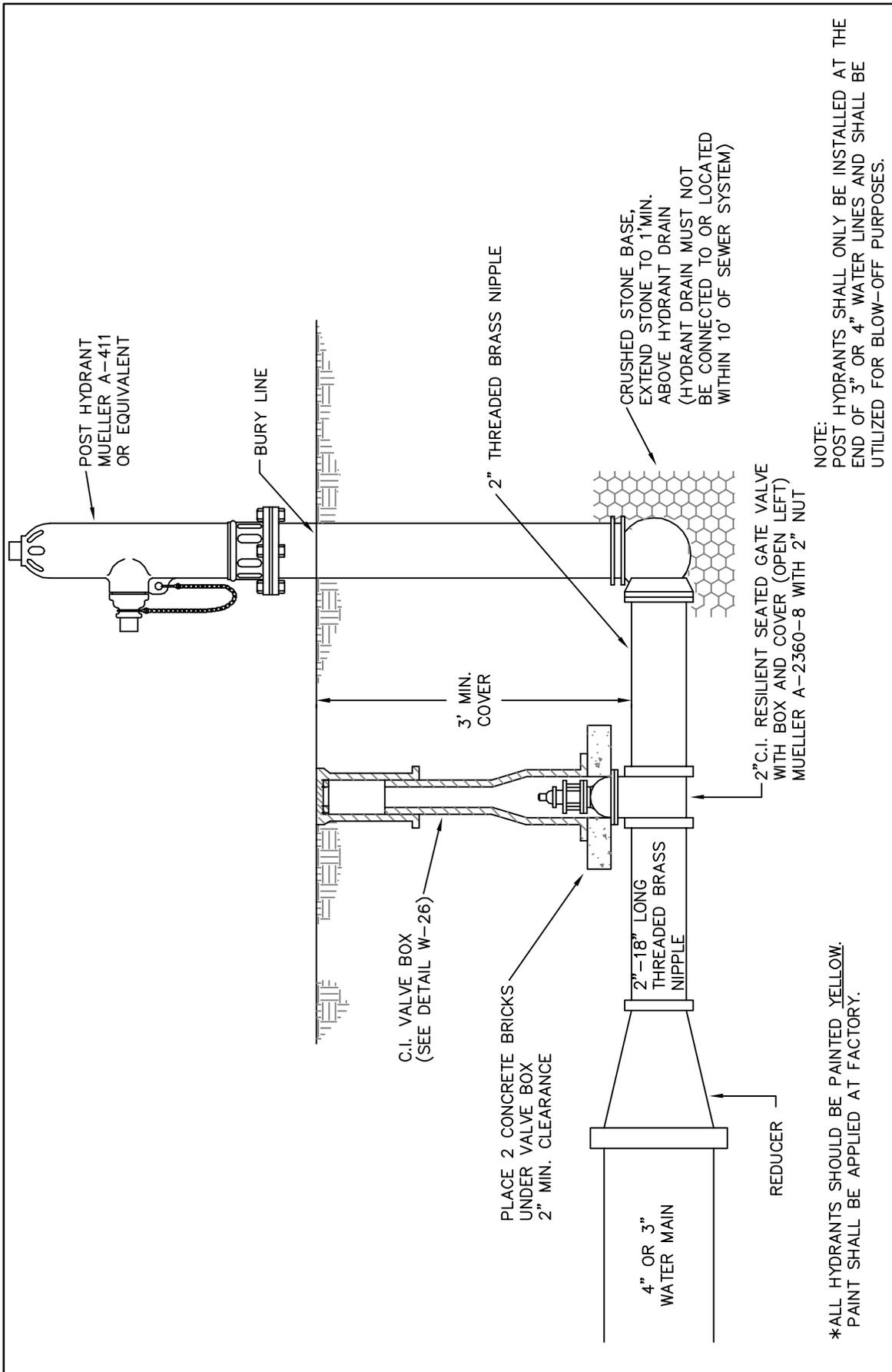
1. HYDRANTS SHALL BE MUELLER SUPER CENTURION A423, WITH 5 1/4" MAIN VALVE AND 6" BOTTOM OPENING.
2. ALL JOINTS INCLUDING HYDRANT ASSEMBLY SHALL UTILIZE MECHANICAL RESTRAINED JOINTS. (INCLUDES MEGA LUGS OR APPROVED EQUAL).
3. ALL UNDERGROUND BOLTS & FASTENERS TO BE 304 STAINLESS STEEL OR COR-TEN IRON.
4. MIN. OF 2" CLEARANCE BETWEEN VALVE BOX COVER AND LOWER SECTION OF VALVE BOX, CUT LOWER SECTION IF NECESSARY.
5. HYDRANT DRAIN MUST NOT BE CONNECTED TO OR LOCATED WITHIN 10' OF SEWER SYSTEMS.

*ALL HYDRANTS SHOULD BE PAINTED YELLOW. PAINT SHALL BE APPLIED AT FACTORY.

CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 10/23/03	APPROVED BY: KDB DRAWN BY: KJG
	SHEET NO. W-2	



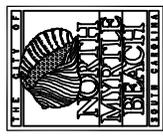
FIRE HYDRANT WITH GATE VALVE
IN UNPAVED AREA

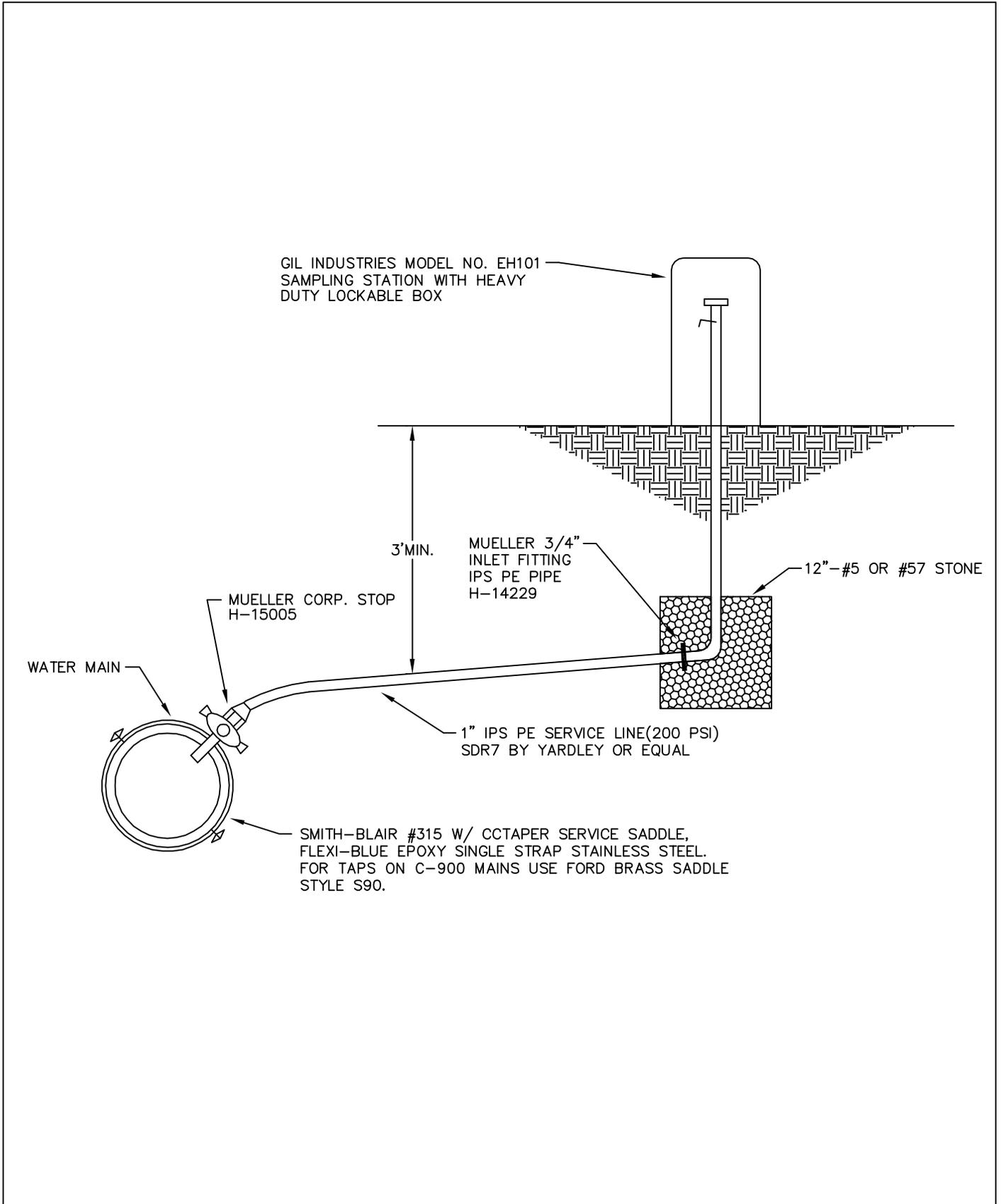


NOTE:
 POST HYDRANTS SHALL ONLY BE INSTALLED AT THE END OF 3" OR 4" WATER LINES AND SHALL BE UTILIZED FOR BLOW-OFF PURPOSES.

*ALL HYDRANTS SHOULD BE PAINTED YELLOW. PAINT SHALL BE APPLIED AT FACTORY.

<p>POST HYDRANT</p>	<p>CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION</p>		<p>DATE: 7/30/07</p>
	<p>APPROVED BY: KDB DRAWN BY: KJG</p>		<p>SHEET NO. W-3</p>



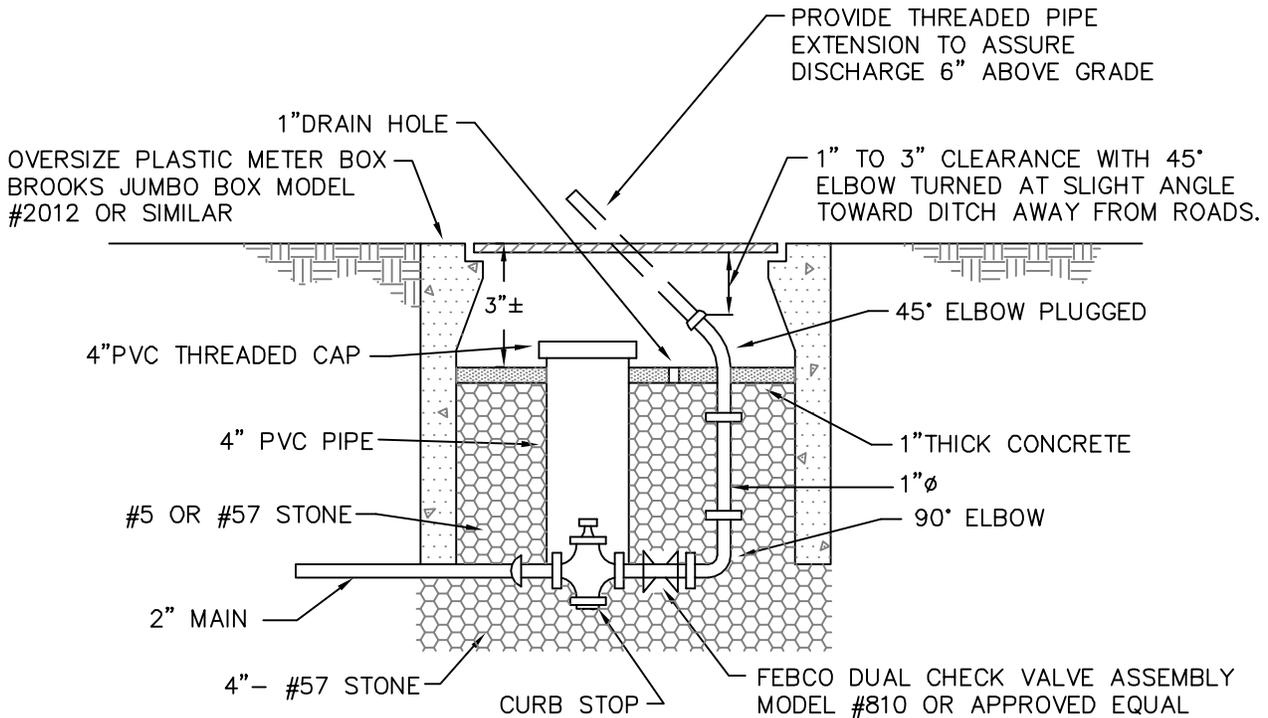


WATER SAMPLING STATION	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 10/23/03	
	APPROVED BY: KDB DRAWN BY: KJG	SHEET NO. W-4	

W-4.DWG

BLOW OFF SIZING

<u>MAIN</u>	<u>DETAIL</u>	<u>SIZE</u>
2" - 2-1/2"	W5	1" ORIFICE
3" - 4"	USE POST HYDRANT(DETAIL W3)	2" ORIFICE
6" - 12"	USE FIRE HYDRANT(DETAIL W1,W2)	4-1/2" ORIFICE
14" - GREATER	AS SHOWN ON PLANS	ORIFICE VARIES



ALL FITTINGS AND PIPE (CURB STOP & BEYOND) TO BE THREADED BRASS

NOTE
DIRECT WATER AWAY FROM ROADS, CREEKS AND STREAMS.

WATER BLOW OFF

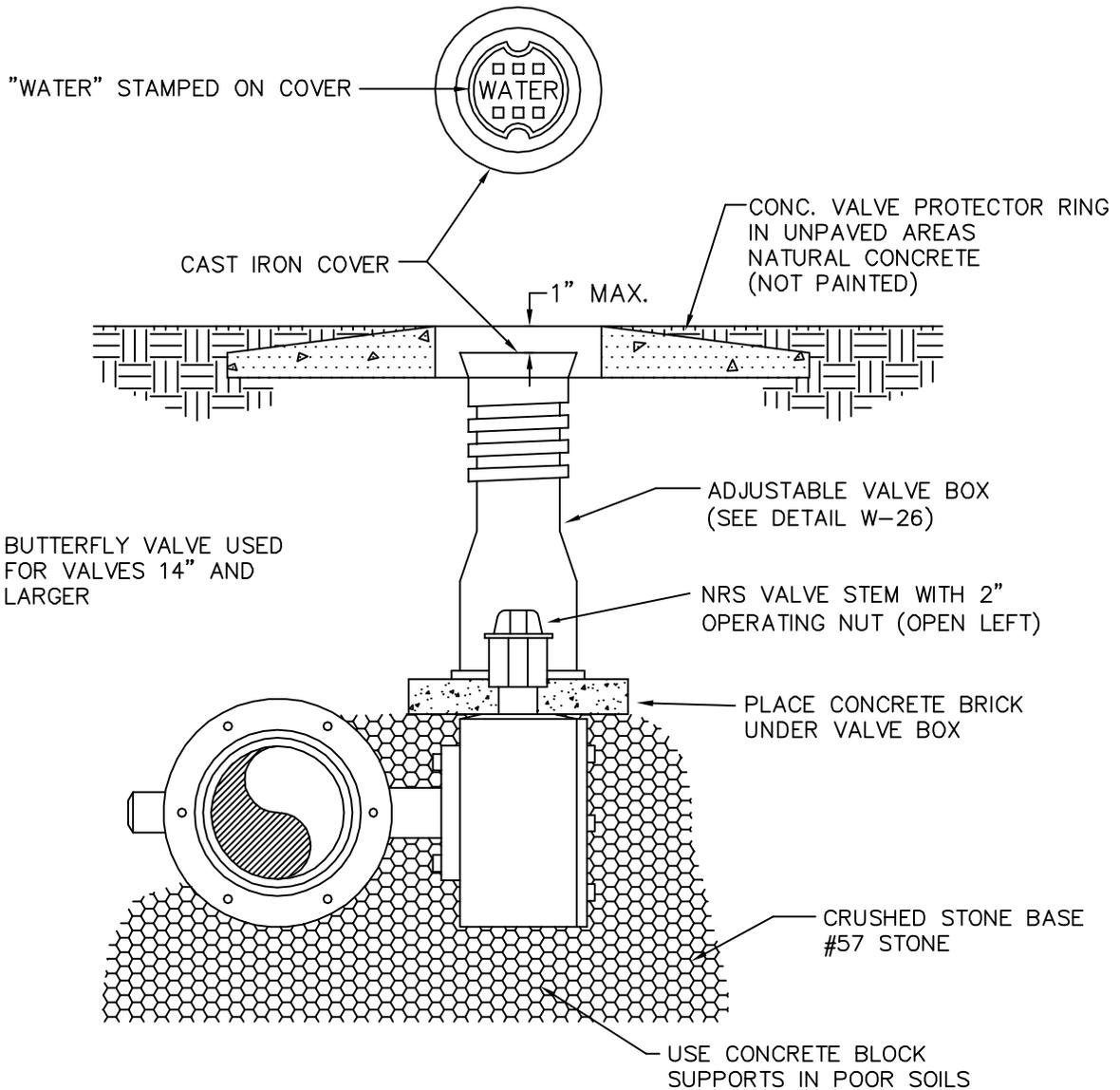
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
7/30/07

APPROVED BY: KDB
DRAWN BY: KJG

SHEET NO.
W-5





MIN. 2" CLEARANCE BETWEEN VALVE BOX COVER
AND LOWER SECTION OF VALVE BOX, CUT
LOWER SECTION IF NECESSARY

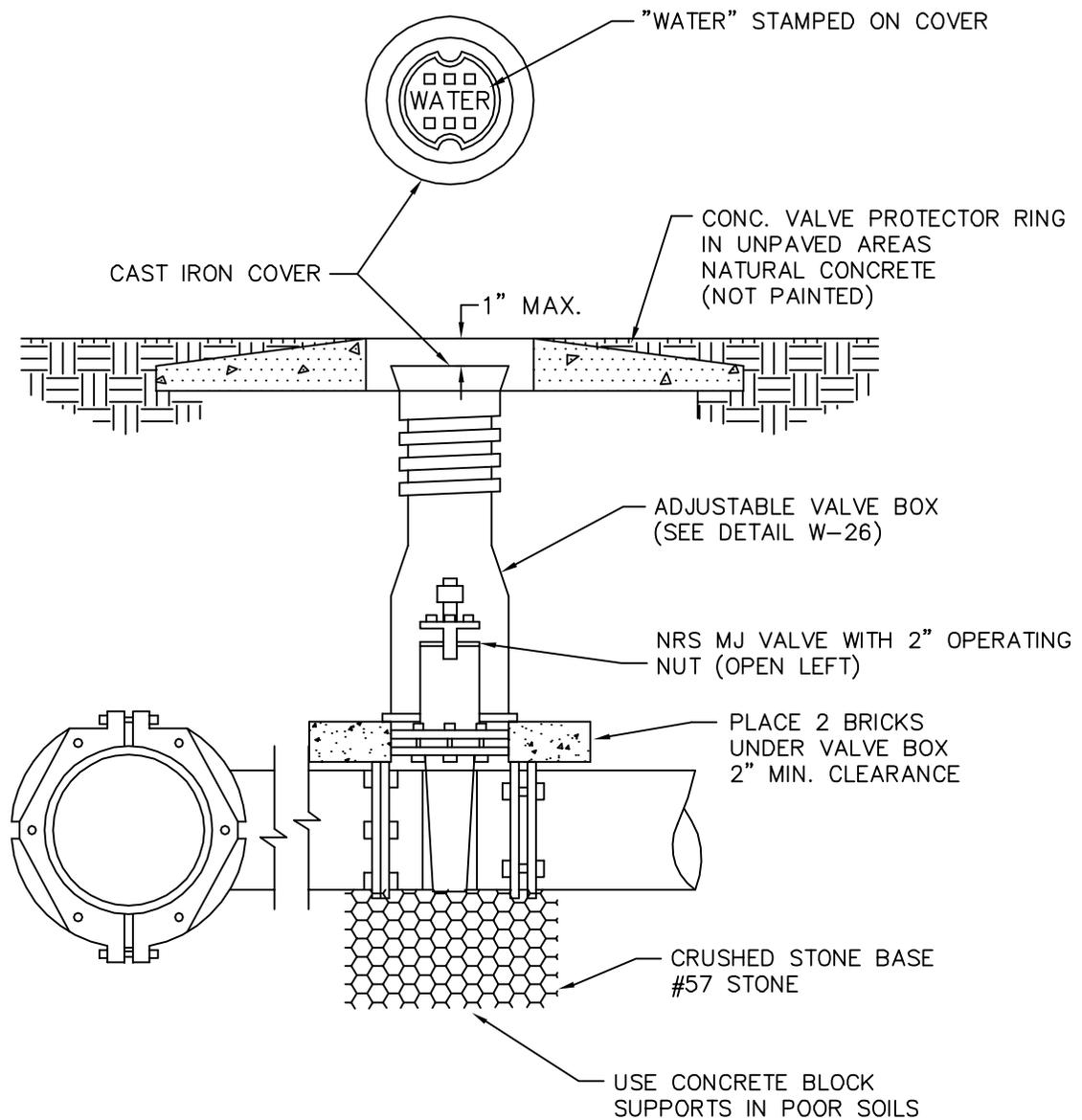
BUTTERFLY VALVE AND BOX

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03
SHEET NO.
W-6





GATE VALVE AND BOX

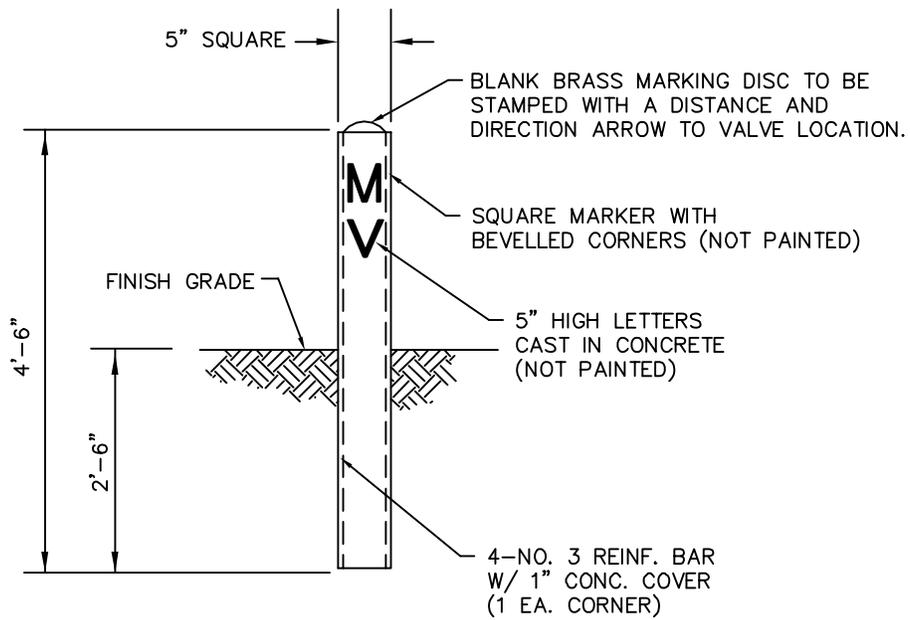
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-7





MAIN VALVE MARKER POST

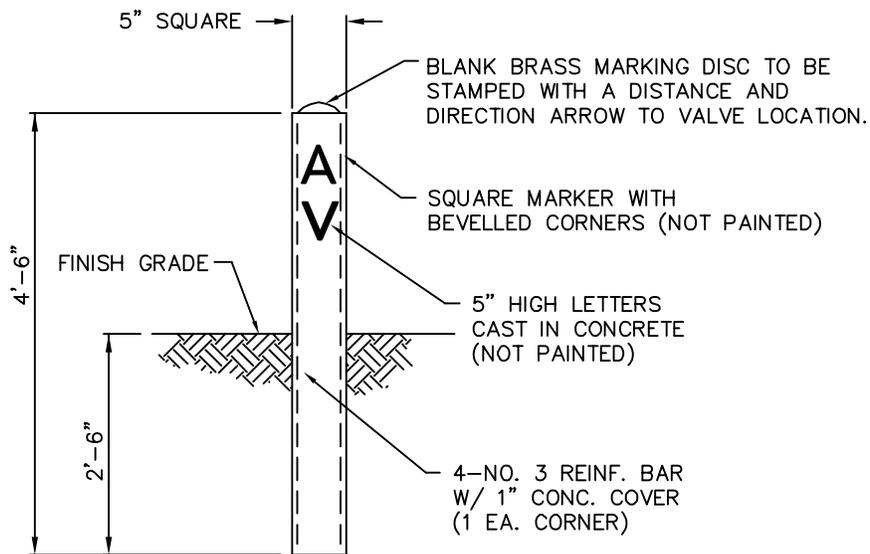
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-8





AIR RELEASE VALVE
MARKER POST

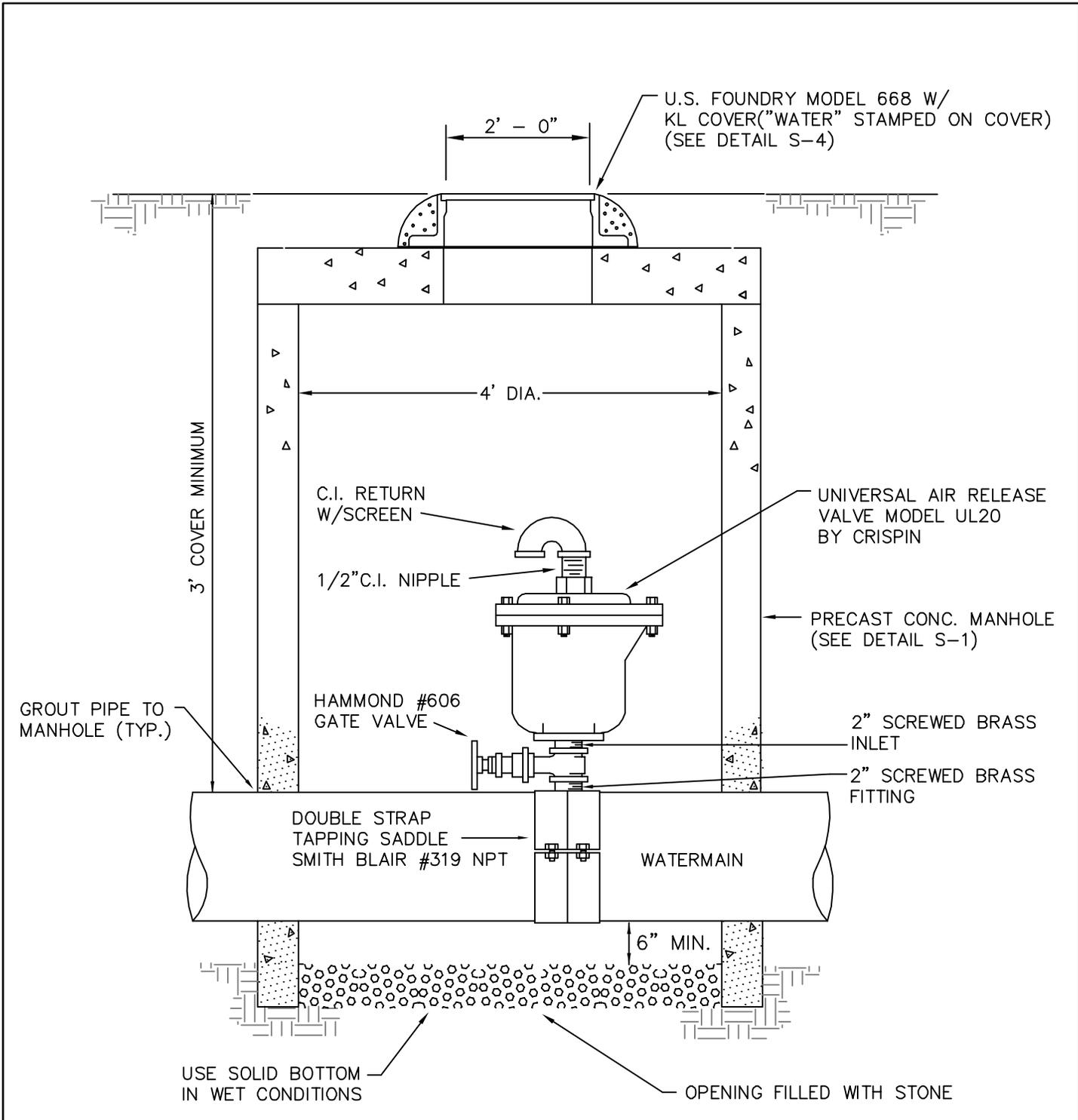
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-9





GROUT PIPE TO MANHOLE (TYP.)

3' COVER MINIMUM

2' - 0"

U.S. FOUNDRY MODEL 668 W/ KL COVER ("WATER" STAMPED ON COVER) (SEE DETAIL S-4)

C.I. RETURN W/SCREEN

1/2" C.I. NIPPLE

UNIVERSAL AIR RELEASE VALVE MODEL UL20 BY CRISPIN

PRECAST CONC. MANHOLE (SEE DETAIL S-1)

HAMMOND #606 GATE VALVE

2" SCREWED BRASS INLET

2" SCREWED BRASS FITTING

DOUBLE STRAP TAPPING SADDLE SMITH BLAIR #319 NPT

WATERMAIN

6" MIN.

USE SOLID BOTTOM IN WET CONDITIONS

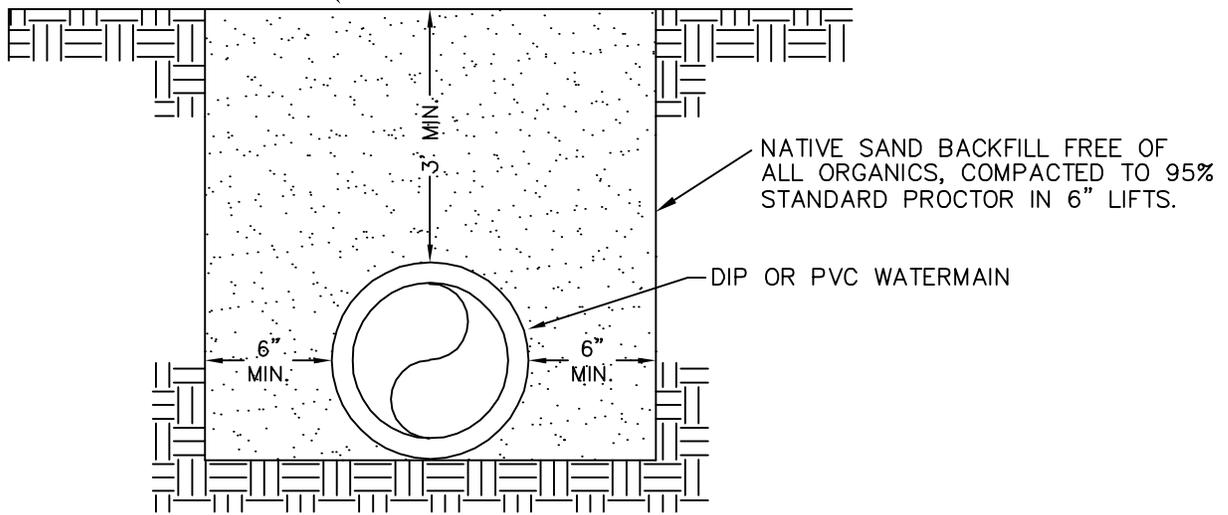
OPENING FILLED WITH STONE

NOTE
DISCHARGE DRAIN SHALL NOT BE DIRECTLY CONNECTED TO STORM DRAIN OR SANITARY SEWER.

NOTE
DO NOT INSTALL AT LOCATIONS WHERE VALVE MAY BE SUBJECT TO GROUND WATER RISE OR WHERE MANHOLE MAY BECOME FLOODED.

AIR RELEASE VALVE & MANHOLE	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 7/30/07	
	APPROVED BY: KDB DRAWN BY: KJG	SHEET NO. W-10	

BACKFILL COMPACTED TO MATCH EXISTING GRADE



NOTE: IN PAVEMENT AREAS, COMPACTION WILL BE INCREASED TO 98% STANDARD PROCTOR

CLASS 2 PIPE BEDDING

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

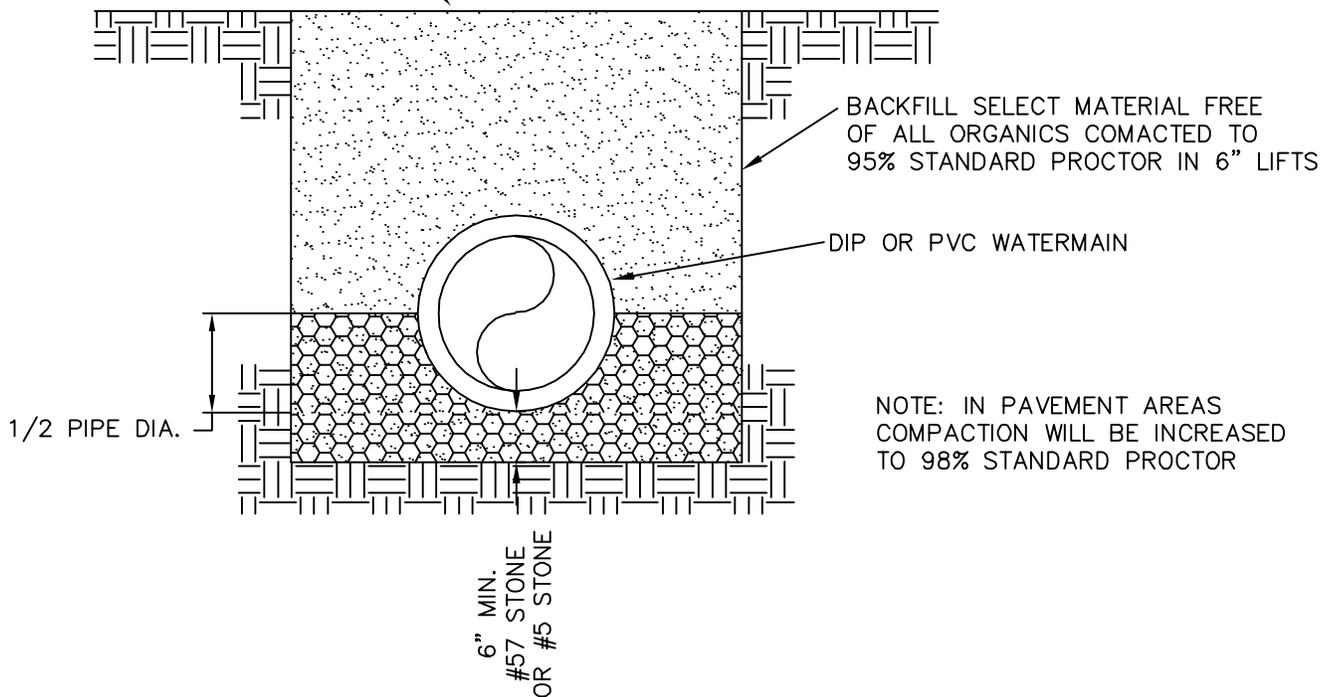
APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-11



BACKFILL COMPACTED TO MATCH EXISTING GRADE



NOTE: IN PAVEMENT AREAS
COMPACTION WILL BE INCREASED
TO 98% STANDARD PROCTOR

NOTE: CLASS 4 BEDDING WILL BE USED IN THOSE AREAS
DEEMED NECESSARY BY THE ENGINEER BASED ON
SUBSURFACE CONDITIONS.

CLASS 4 PIPE BEDDING

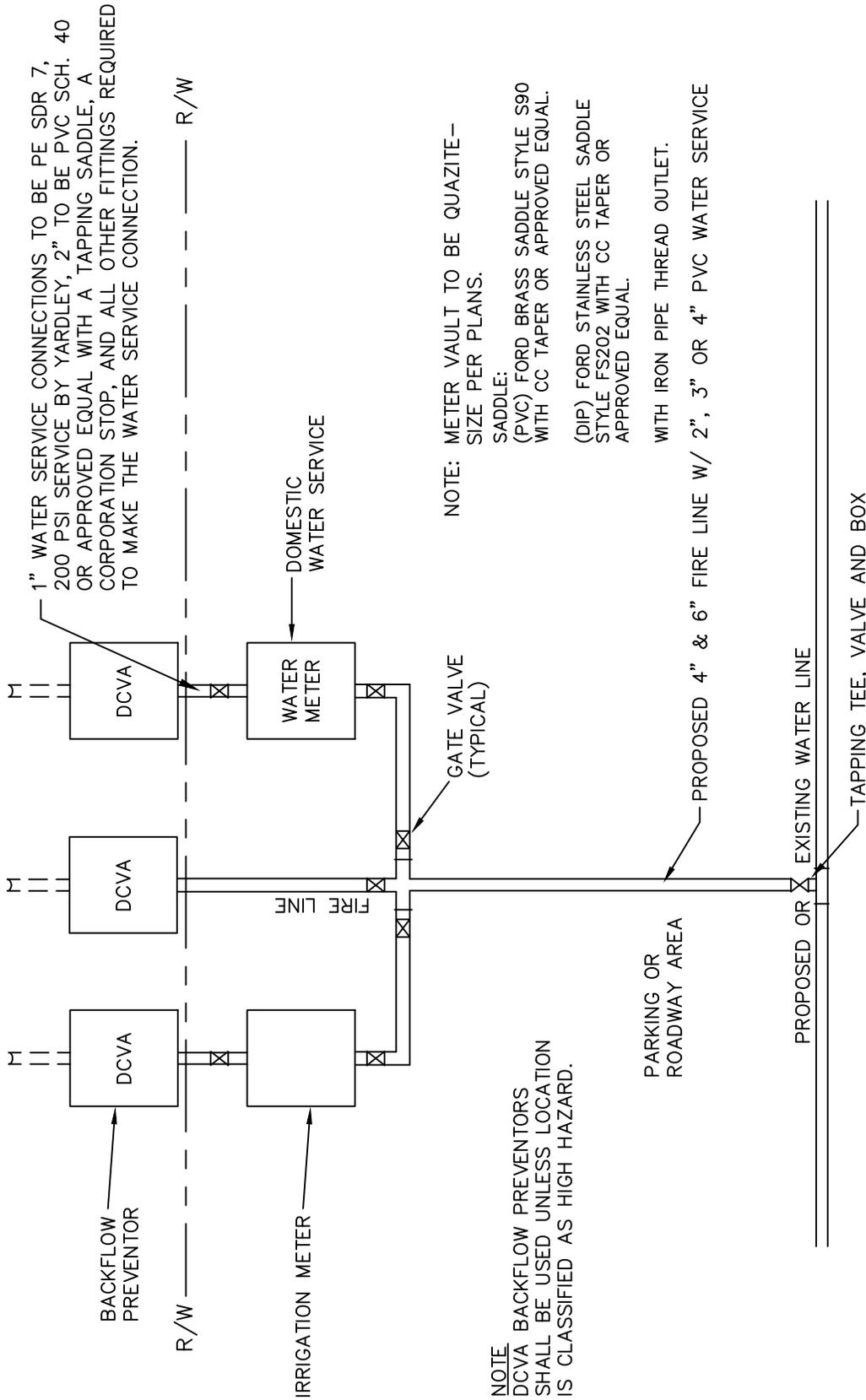
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-12





1" WATER SERVICE CONNECTIONS TO BE PE SDR 7, 200 PSI SERVICE BY YARDLEY, 2" TO BE PVC SCH. 40 OR APPROVED EQUAL WITH A TAPPING SADDLE, A CORPORATION STOP, AND ALL OTHER FITTINGS REQUIRED TO MAKE THE WATER SERVICE CONNECTION.

BACKFLOW PREVENTOR

R/W

IRRIGATION METER

FIRE LINE

WATER METER

DOMESTIC WATER SERVICE

NOTE: METER VAULT TO BE QUAZITE— SIZE PER PLANS.

NOTE:

DCVA BACKFLOW PREVENTORS SHALL BE USED UNLESS LOCATION IS CLASSIFIED AS HIGH HAZARD.

SADDLE:

(PVC) FORD BRASS SADDLE STYLE S90 WITH CC TAPER OR APPROVED EQUAL.

(DIP) FORD STAINLESS STEEL SADDLE STYLE FS202 WITH CC TAPER OR APPROVED EQUAL.

WITH IRON PIPE THREAD OUTLET.

PROPOSED 4" & 6" FIRE LINE W/ 2", 3" OR 4" PVC WATER SERVICE

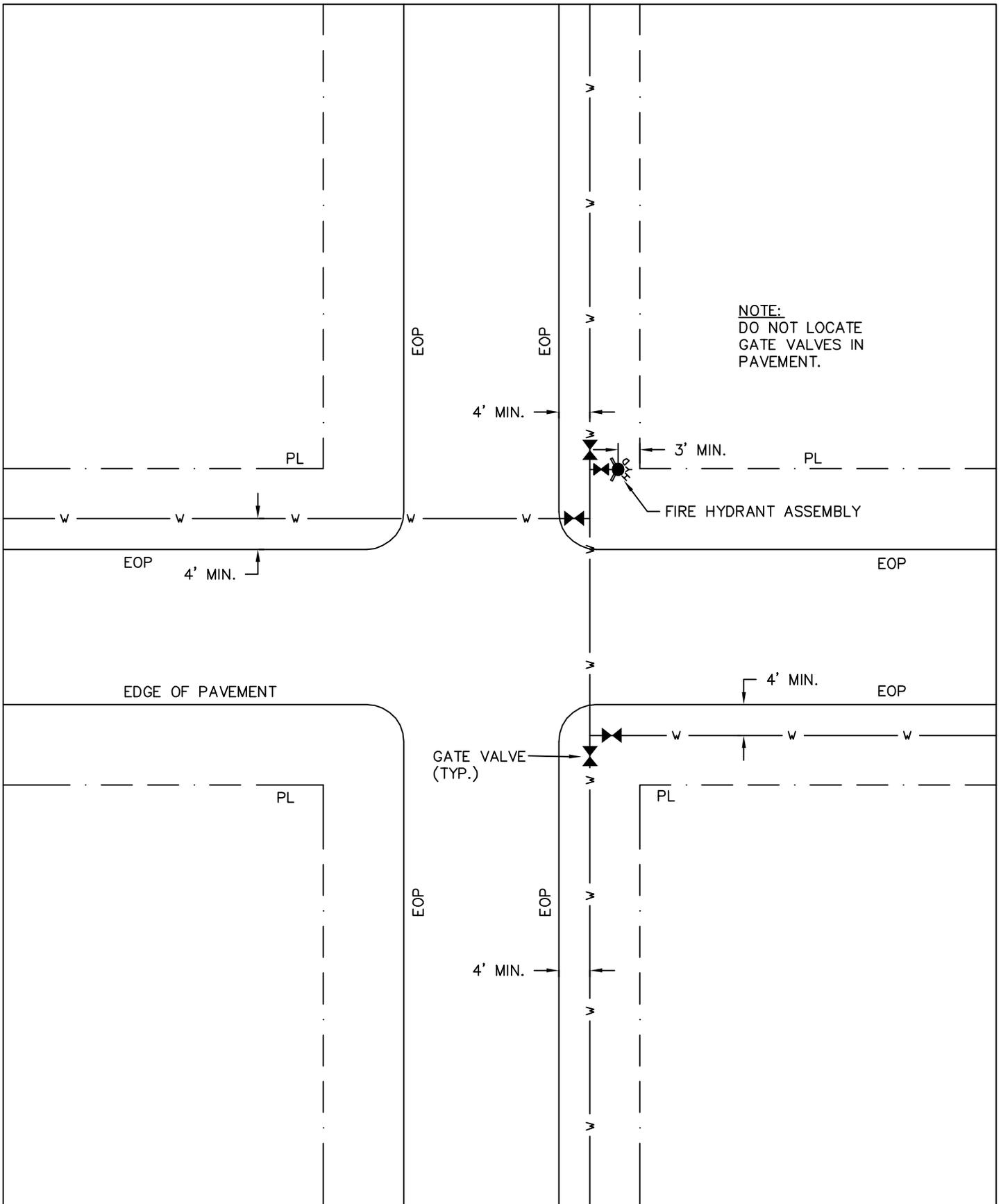
PROPOSED OR EXISTING WATER LINE

TAPPING TEE, VALVE AND BOX

NOTE: METERS TO BE INSTALLED AT THE PROPERTY LINE BEHIND THE SIDEWALK OR CURB.

TYPICAL 2", 3", 4" WATER SERVICE WITH 4" OR 6" FIRE LINE

	DATE:	12/6/10
	SHEET NO.	W-13
CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION		APPROVED BY: KDB DRAWN BY: KJG



FIRE HYDRANT AND
GATE VALVE LOCATIONS

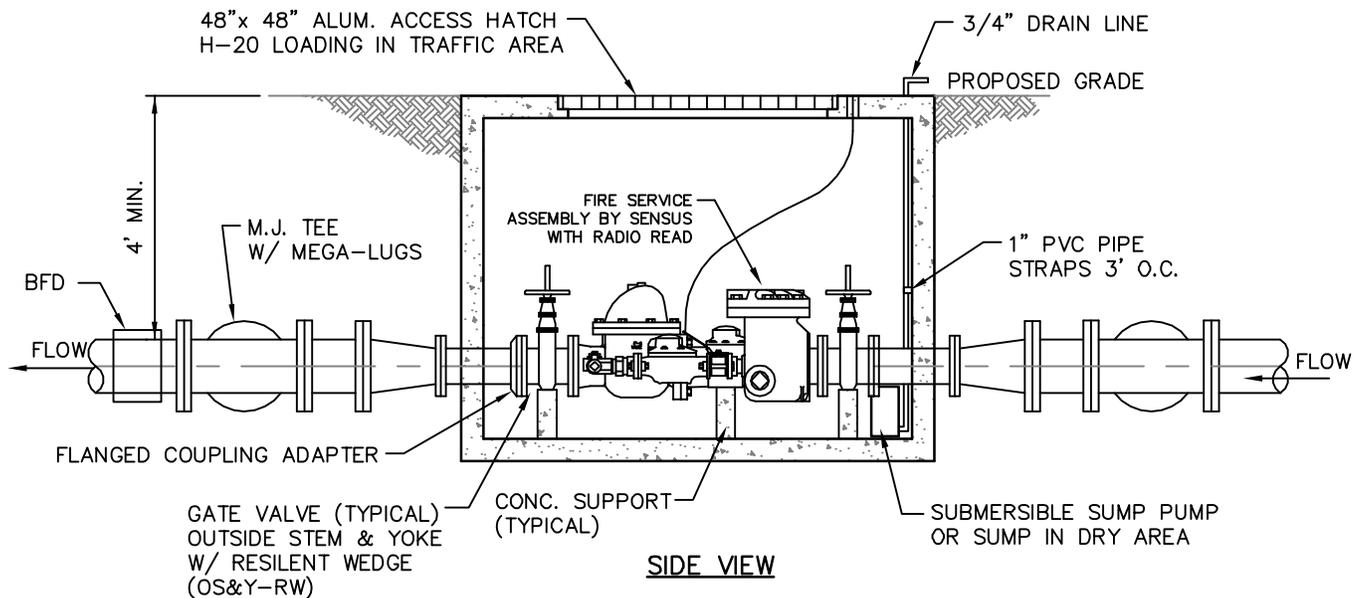
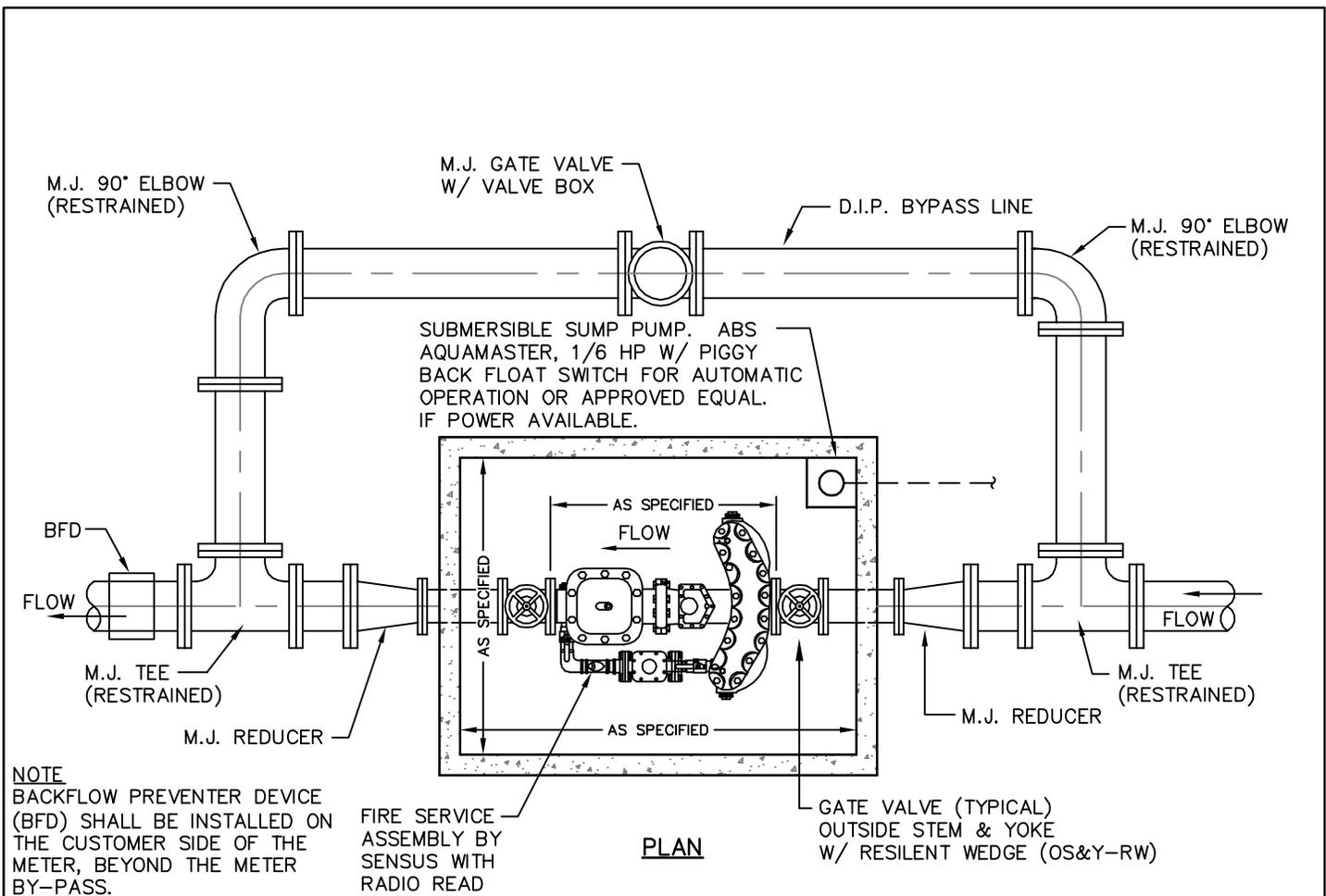
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

DATE:
10/23/03

APPROVED BY: KDB
DRAWN BY: KJG

SHEET NO.
W-14



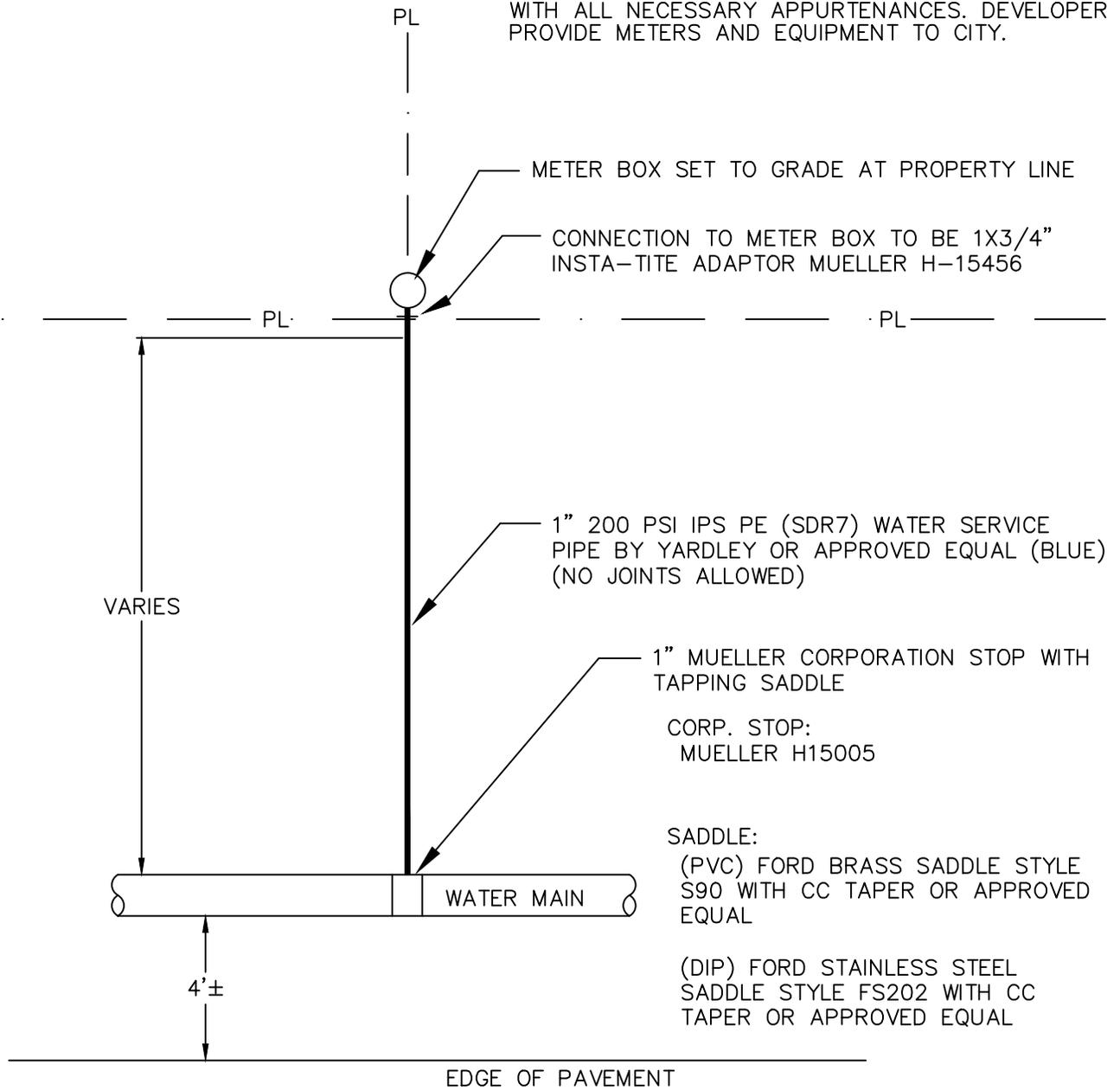


NOTE: MEGA LUG ALL JOINTS WITHIN 60'

NOTE: METER VAULT TO BE QUAZITE-SIZE PER PLANS.

TYP. 4" & LARGER METER VAULT	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 7/30/07	
	APPROVED BY: KDB DRAWN BY: KJG	SHEET NO. W-15	

NOTE: 1" SERVICE LINE TO EACH METER.
 MUELLER/McCULLOUGH EZ SETTER RIGID SINGLE METER BOX REQUIRED. APPROVED DCVA BY SCDHEC REQUIRED ON IRRIGATION SIDE. RADIO READ SENSUS METERS REQUIRED WITH ALL NECESSARY APPURTENANCES. DEVELOPER MAY PROVIDE METERS AND EQUIPMENT TO CITY.



NOTE:
 SERVICE LINE TO BE WITHIN 30" (24" TO 36") OF FINISHED GRADE.
 METER WILL ONLY BE SET AFTER FINISHED GRADE IS ACHIEVED.

TYPICAL SINGLE WATER SERVICE

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION

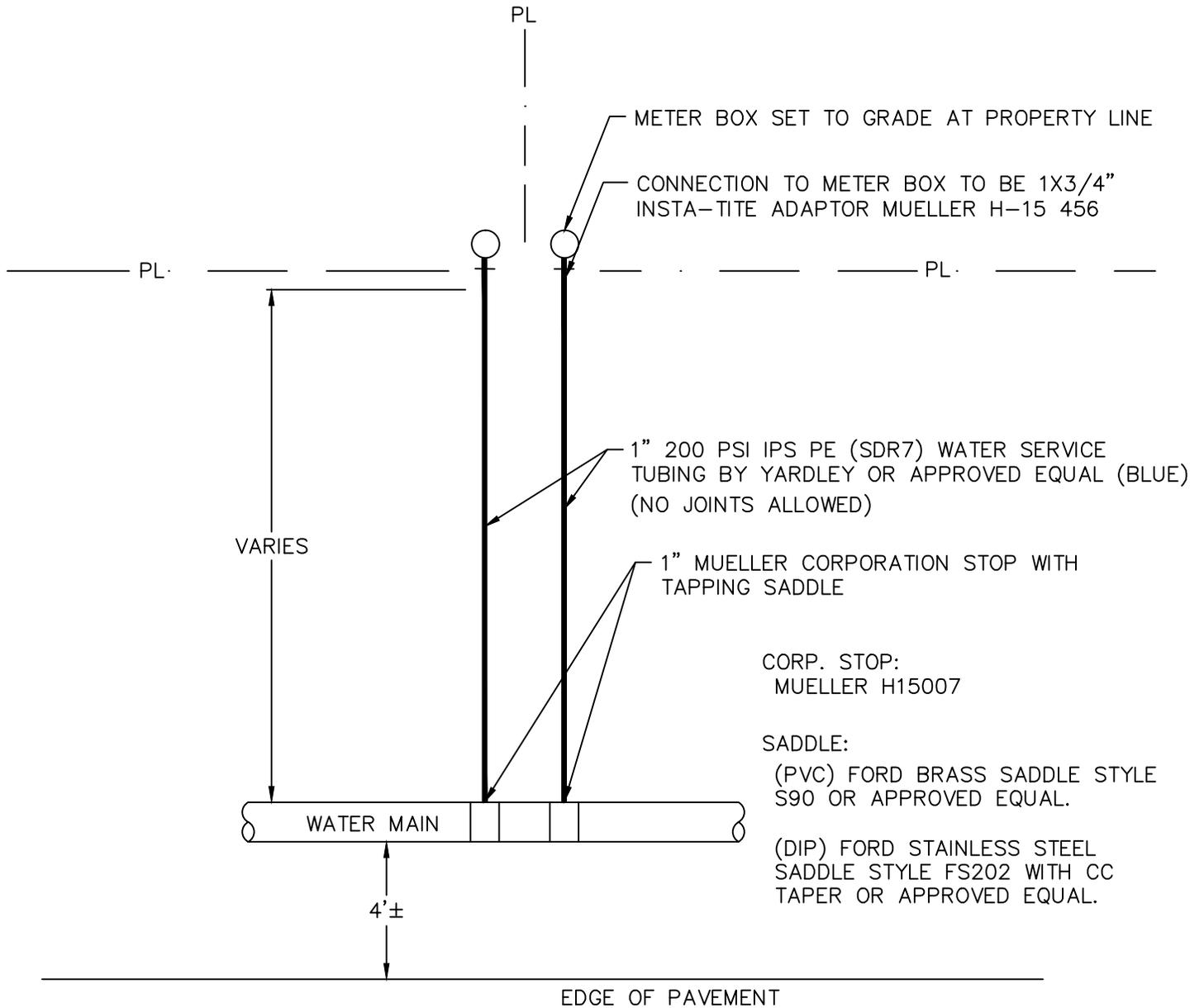
APPROVED BY: KDB
 DRAWN BY: HRT

DATE:
 12/6/10

SHEET NO.
 W-16

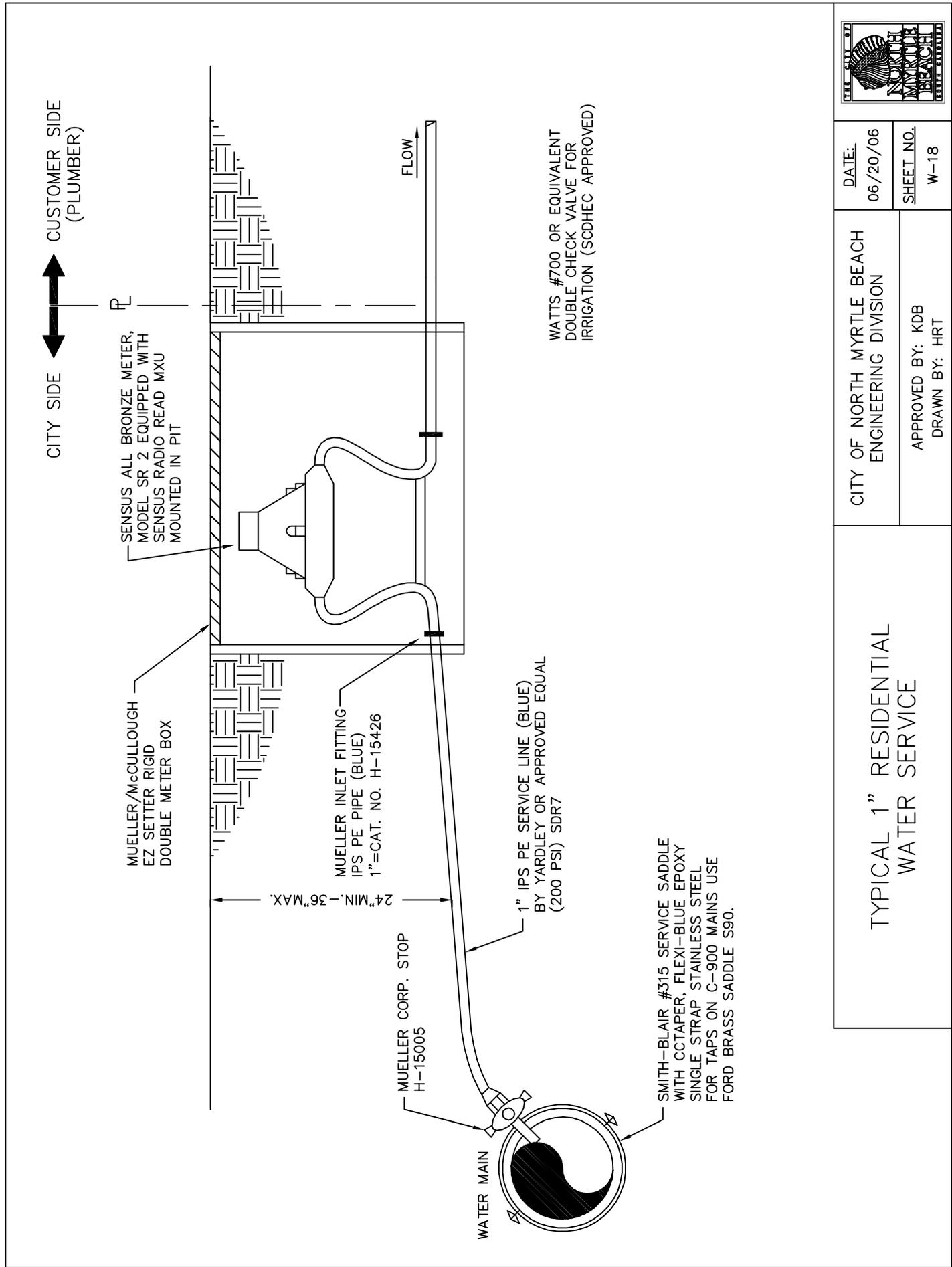


NOTE: 1" SERVICE LINE TO EACH METER.
 MUELLER/McCULLOUGH EZ SETTER RIGID DOUBLE METER BOX REQUIRED, APPROVED DCVA BY SCDHEC REQUIRED ON IRRIGATION SIDE. RADIO READ SENSUS METERS REQUIRED WITH ALL NECESSARY APPURTENANCES. DEVELOPER MAY PROVIDE METERS AND EQUIPMENT TO CITY.



NOTE:
 SERVICE LINE TO BE WITHIN 30" (24" TO 36") OF FINISHED GRADE.
 METER WILL ONLY BE SET AFTER FINISHED GRADE IS ACHIEVED.

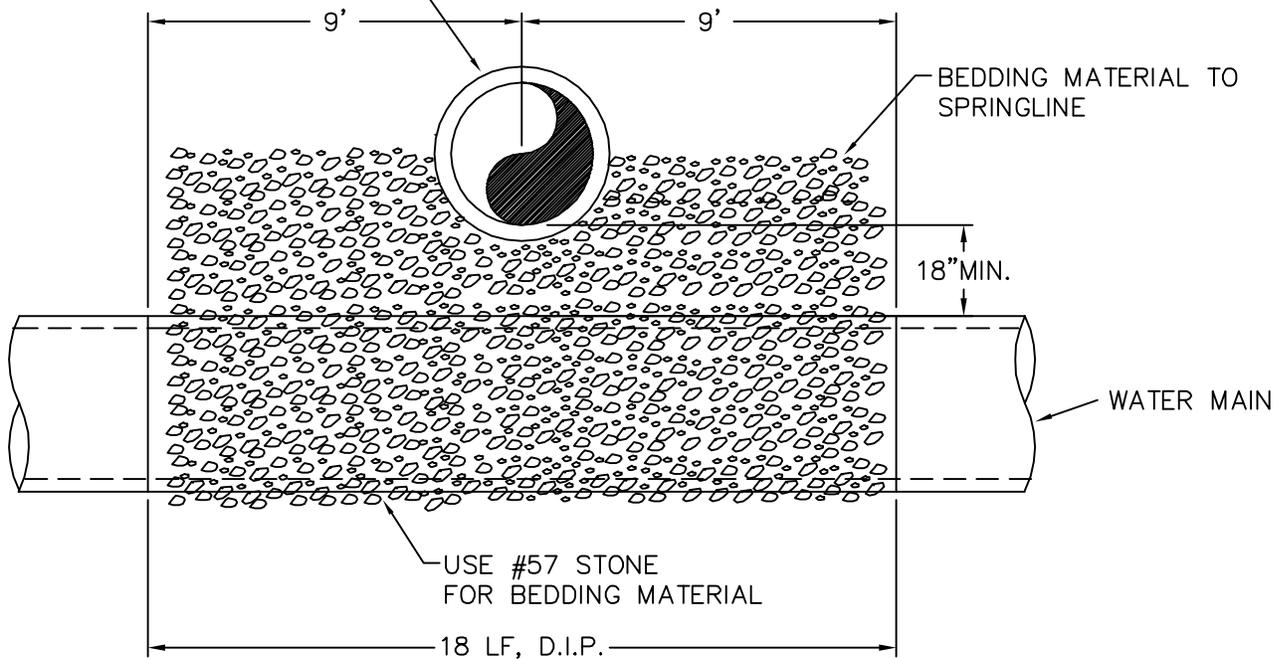
TYPICAL DOUBLE WATER SERVICE	CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION	DATE: 9/21/06	
	APPROVED BY: KDB DRAWN BY: KJG	SHEET NO. W-17	



	DATE:	06/20/06
	SHEET NO.	W-18
CITY OF NORTH MYRTLE BEACH ENGINEERING DIVISION		APPROVED BY: KDB DRAWN BY: HRT

TYPICAL 1" RESIDENTIAL WATER SERVICE

DRAINAGE PIPE OR 18LF OF
DIP SANITARY SEWER PIPE



STORM DRAINAGE PIPE
OR SANITARY SEWER PIPE
CROSSING WATER MAIN

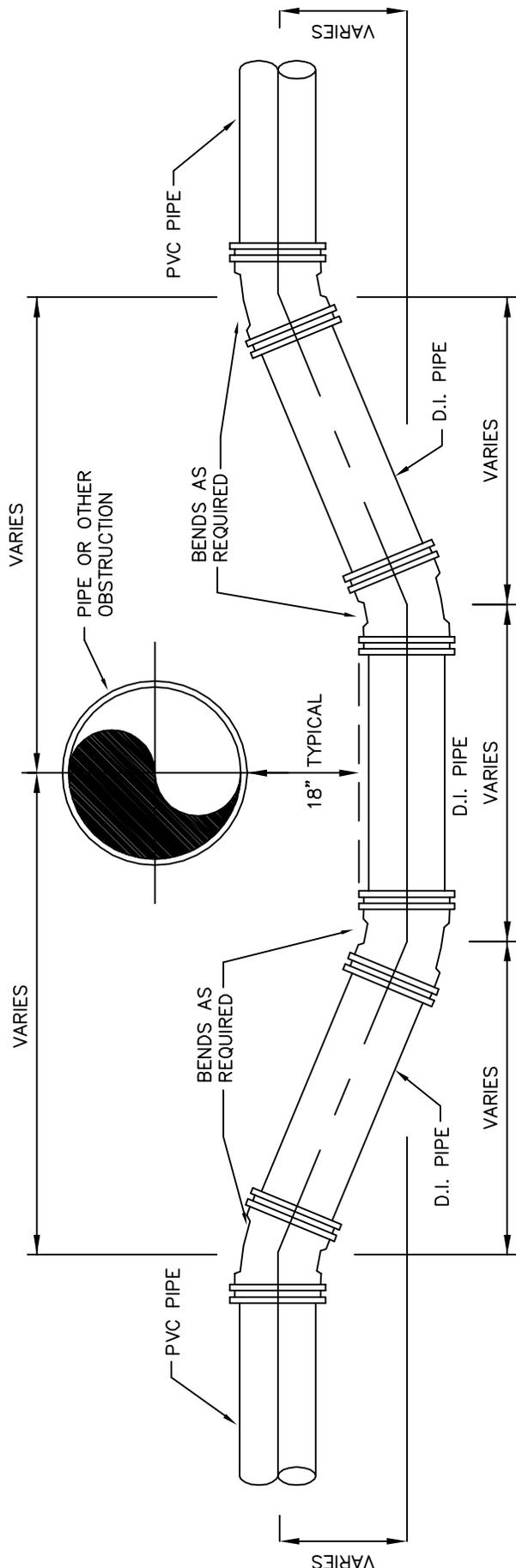
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-19





NOTE: ALL FITTINGS SHALL BE DUCTILE IRON, RESTRAINED MECHANICAL JOINTS.

NOTE: SEE DETAIL W-19 FOR BEDDING REQUIREMENTS

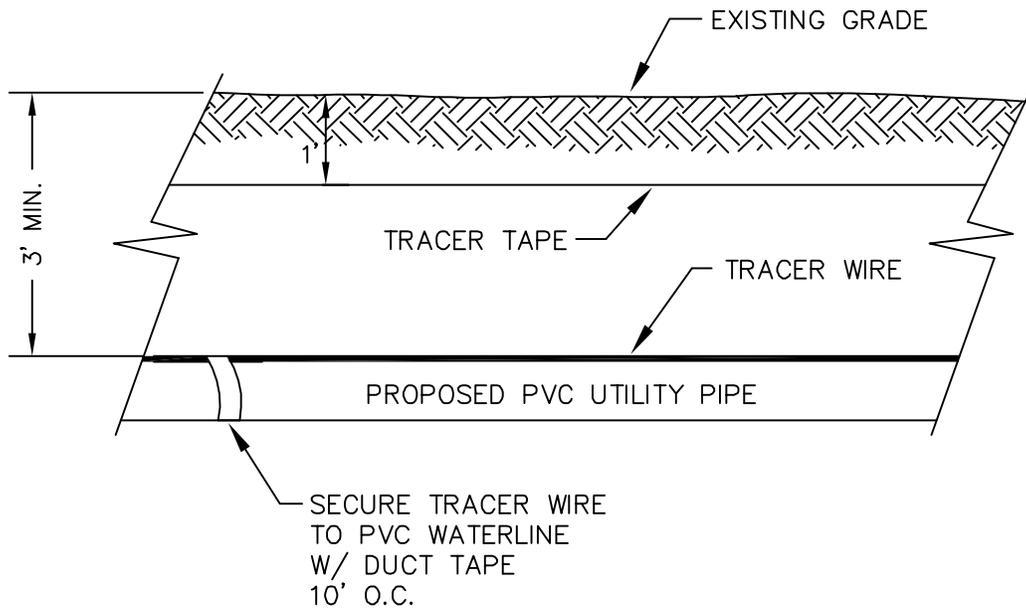
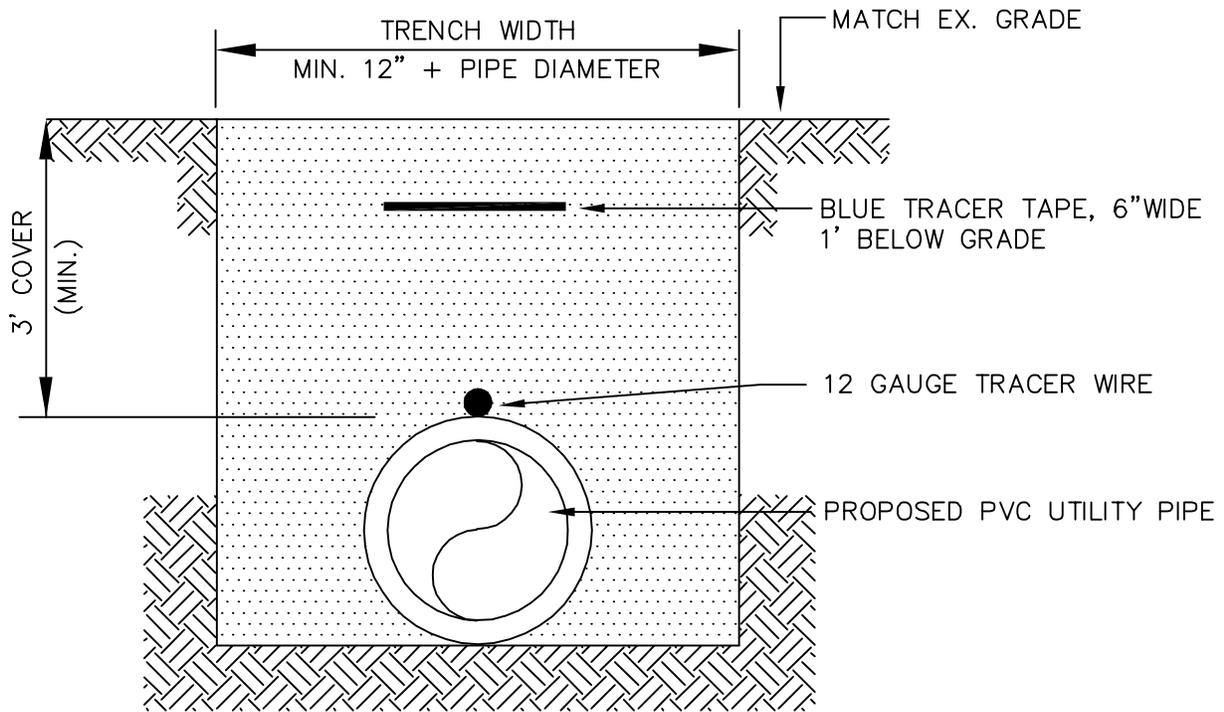


DATE: 10/23/03
 SHEET NO. W-20

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION

APPROVED BY: KDB
 DRAWN BY: KJG

OBSTRUCTION BYPASS



TYPICAL PVC PIPE
WITH TRACER WIRE

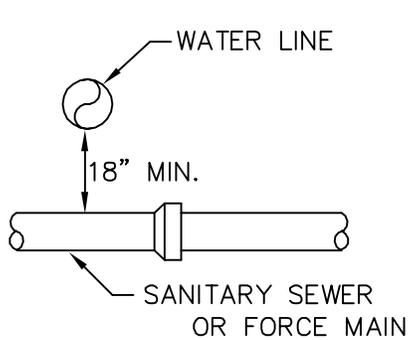
CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: KJG

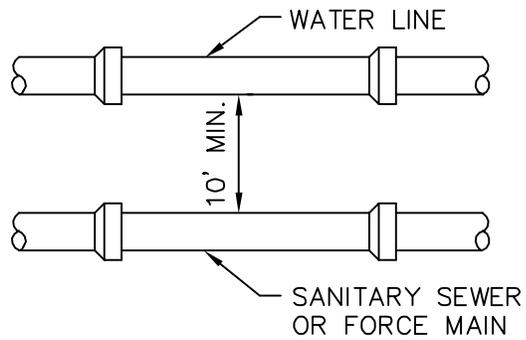
DATE:
10/23/03

SHEET NO.
W-21





VERTICAL



HORIZONTAL

NOTE:
 D.I.P. IS REQUIRED FOR BOTH WATER AND SEWER MAINS
 WHERE MINIMUM SEPARATION IS NOT MAINTAINED.

HORIZONTAL AND VERTICAL
 PIPE SEPARATION

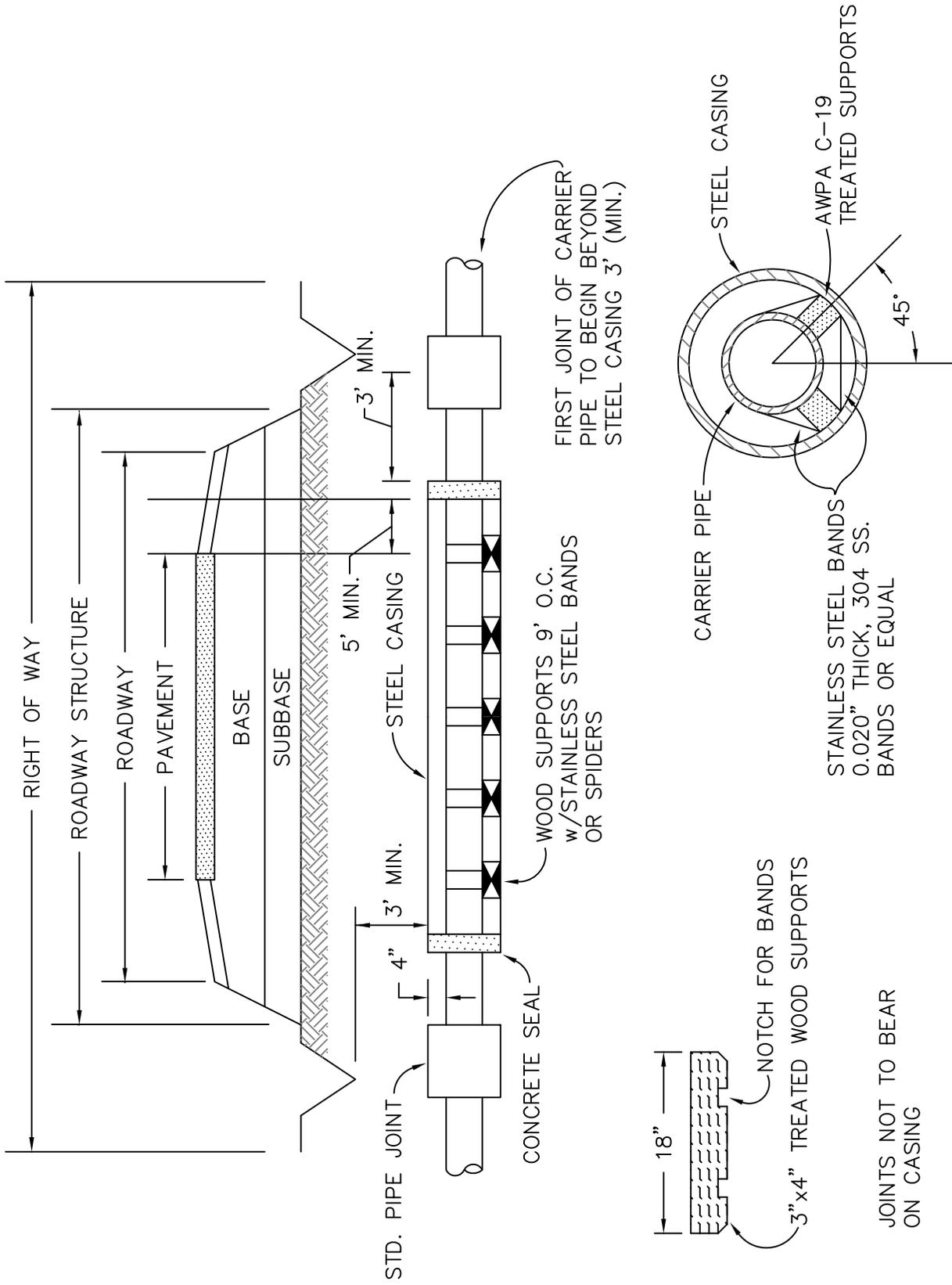
CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION

APPROVED BY: KDB
 DRAWN BY: KJG

DATE:
 10/23/03

SHEET NO.
 W-22

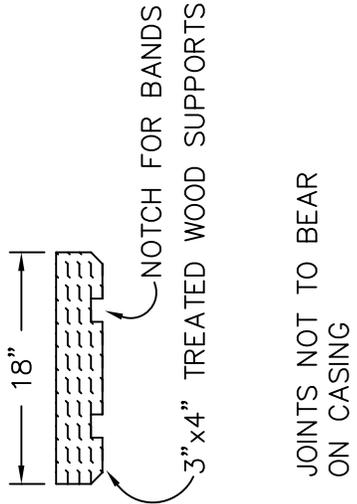




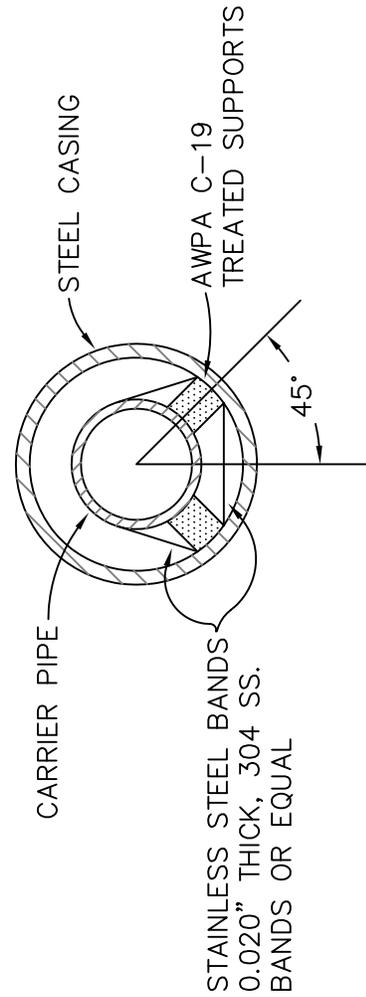
DATE: 1/27/09
 SHEET NO. W-23

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KDB
 DRAWN BY: KJG

HIGHWAY BORE CASING



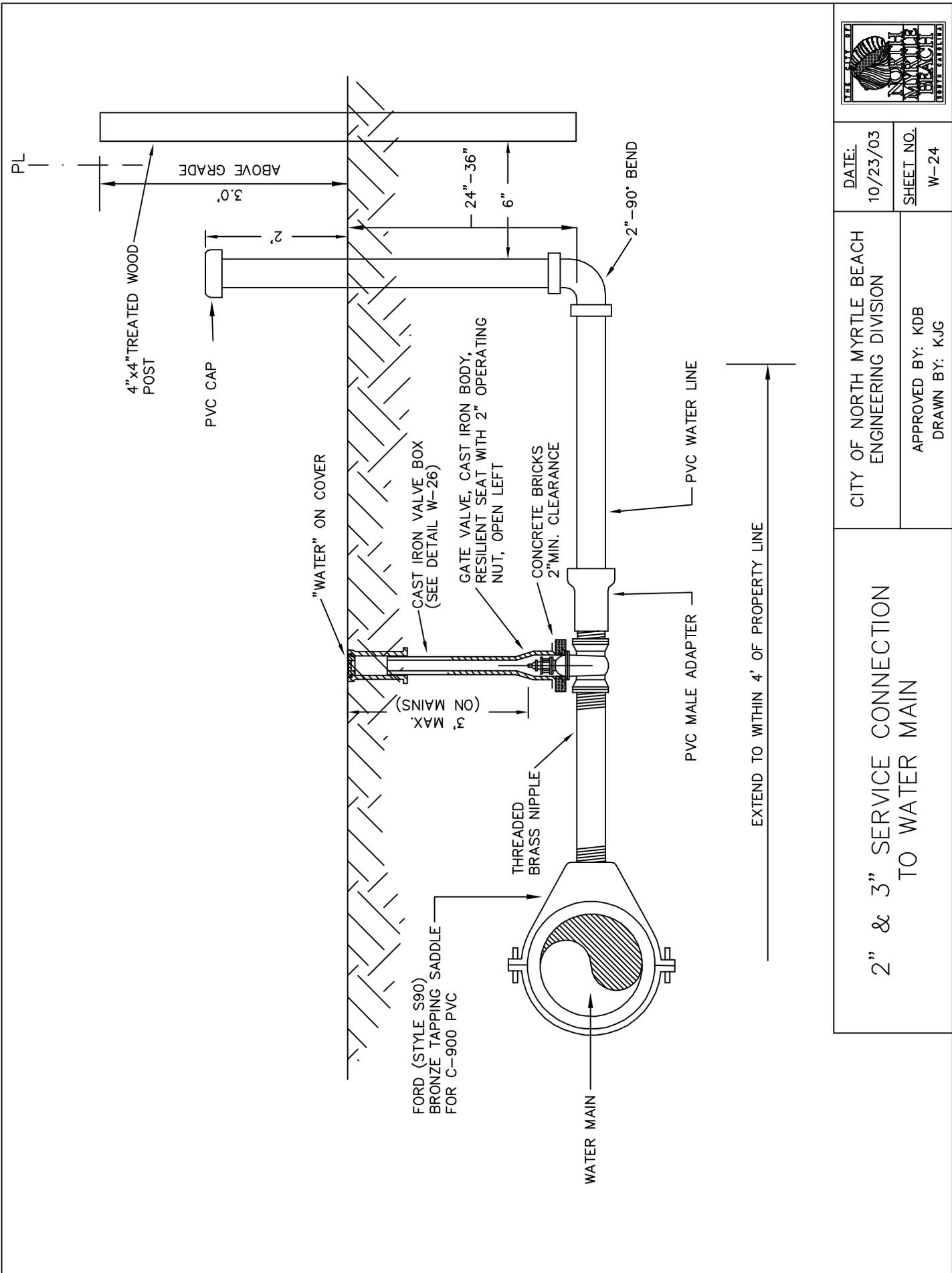
JOINTS NOT TO BEAR ON CASING



CARRIER PIPE
 STEEL CASING
 AWPA C-19 TREATED SUPPORTS
 45°
 STAINLESS STEEL BANDS 0.020" THICK, 304 SS. BANDS OR EQUAL

FIRST JOINT OF CARRIER PIPE TO BEGIN BEYOND STEEL CASING 3' (MIN.)

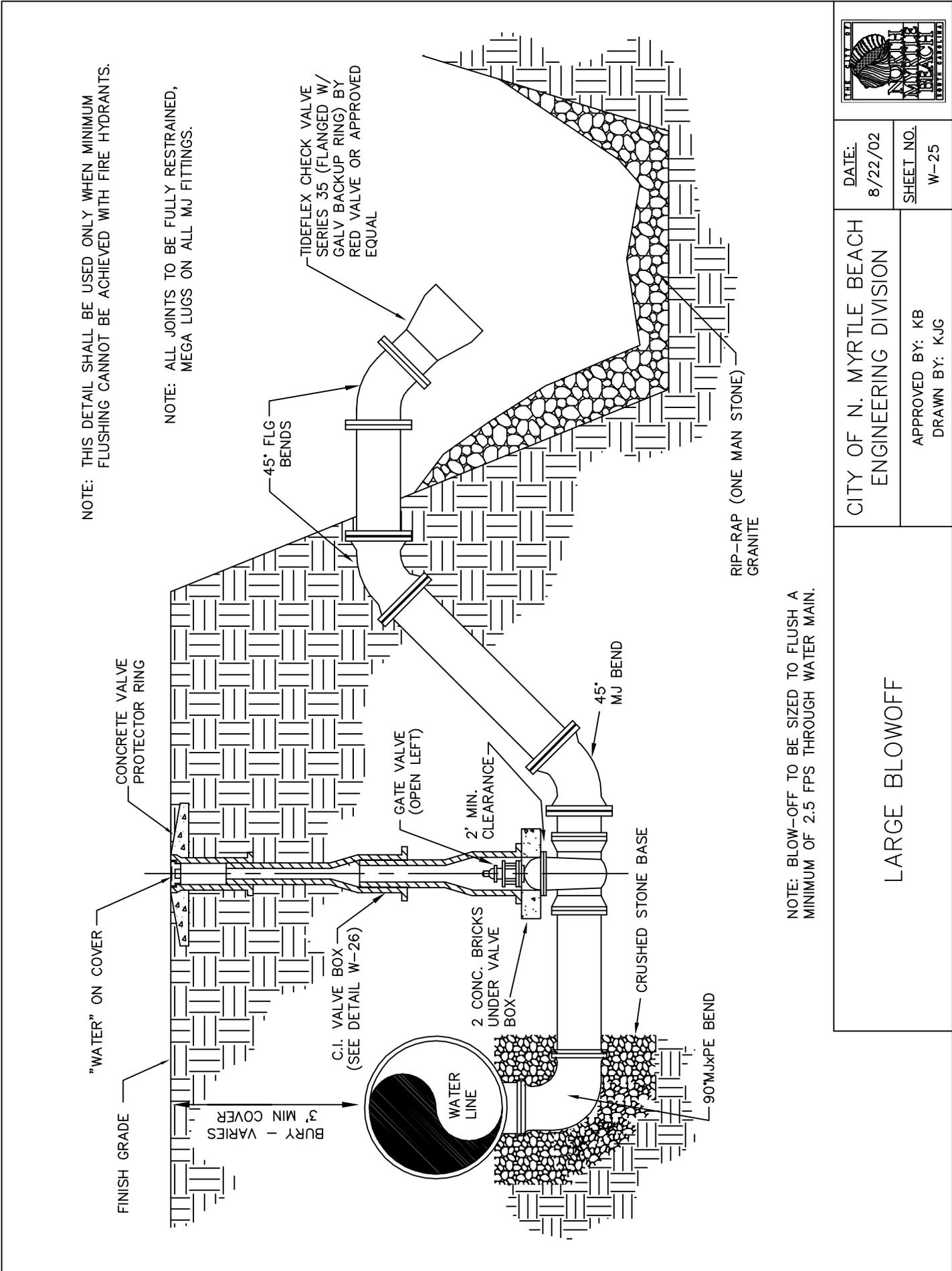
WOOD SUPPORTS 9' O.C. w/STAINLESS STEEL BANDS OR SPIDERS



DATE: 10/23/03
 SHEET NO. W-24

CITY OF NORTH MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KDB
 DRAWN BY: KJG

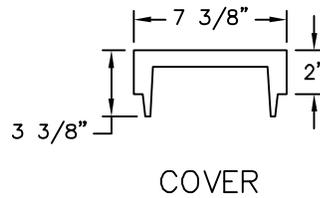
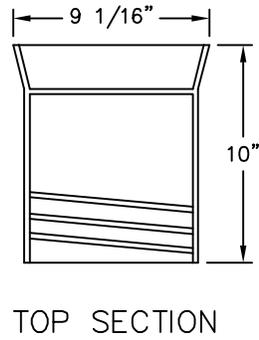
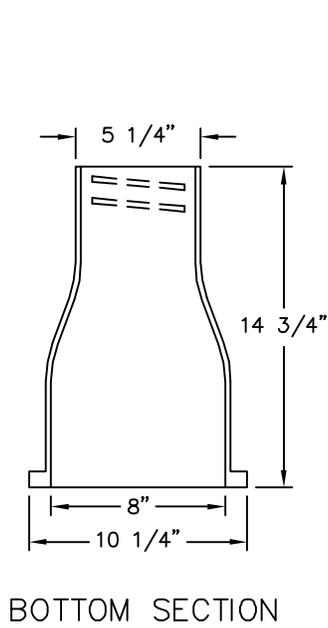
2" & 3" SERVICE CONNECTION
 TO WATER MAIN



DATE: 8/22/02
 SHEET NO. W-25

CITY OF N. MYRTLE BEACH
 ENGINEERING DIVISION
 APPROVED BY: KB
 DRAWN BY: KJG

LARGE BLOWOFF



- NOTES:
1. COVER MARKED "WATER".
 2. 18" TO 24" ADJUSTMENT.
 3. PENETRATING PICKHOLE.
 4. MINIMUM OF 2" CLEARANCE BETWEEN VALVE BOX COVER AND BOTTOM SECTION OF VALVE BOX, CUT LOWER SECTION IF NECESSARY.
 5. CAST IRON BOX SHALL HAVE A HEAVY COAT OF BITUMINOUS PAINT.

ADJUSTABLE VALVE BOX

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

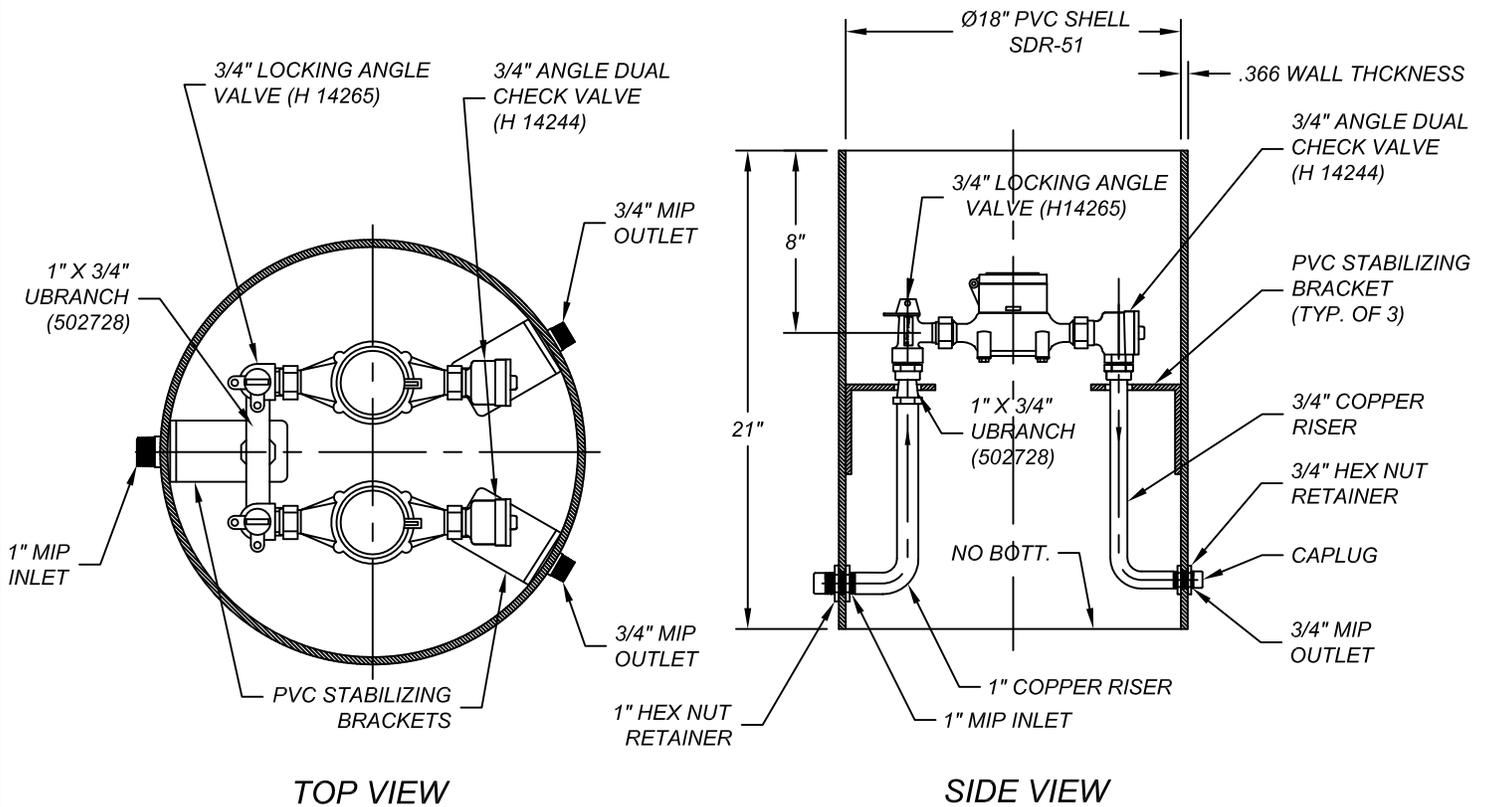
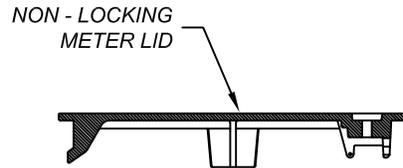
APPROVED BY: KDB
DRAWN BY: KJG

DATE:
10/23/03

SHEET NO.
W-26



MUELLER/ McCULLOUGH EZ SETTER RIGID DOUBLE METER BOX



TYPICAL DOUBLE WATER METER

CITY OF NORTH MYRTLE BEACH
ENGINEERING DIVISION

APPROVED BY: KDB
DRAWN BY: HRT

DATE:
2/25/14

SHEET NO.
W-27



SECTION 02800

EROSION CONTROL, SEEDING, & SODDING

GENERAL

1.01 WORK INCLUDED

- A. Preparation of subsoil.
- B. Fertilizing.
- C. Seeding.

1.02 RELATED WORK

- A. Section 02100 - Excavation
- B. Section 02200 - Backfilling
- C. Section 02300 - Trenching

1.03 REFERENCES

- A. SCDOT Standard Specifications.
- B. South Carolina General Permit for Stormwater Discharges from SMS4s, SCR03000 and NPDES Stormwater Discharge permit for the City of North Myrtle Beach, SCR 035106
- C. City of North Myrtle Beach Standard Detail Drawings: SD11 – SD19.

1.04 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

1.05 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer.

1.06 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, new weight, date of packaging and location of packaging.

- B. Before acceptance of the seeding performed for the establishment of permanent vegetation, the Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and the winter weather and be capable of reestablishment in the spring.
- C. Sod: Minimum age of 18 months, with root development that will support its own weight, without tearing, when suspended vertically.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.
- C. Store seed and fertilizer in a manner to prevent wetting and deterioration.
- D. Deliver sod on palettes. Do not deliver more sod than can be laid in 24 hours.

1.08 PROJECT CONDITIONS

- A. Protect existing utilities, paving, and other facilities from damage caused by seeding and sodding operations.
- B. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as necessary.

1.09 WARRANTY

- A. Provide a uniform stand of grass by mowing and maintaining seeded and sodded areas until final acceptance. Areas, which fail to provide a uniform stand of grass, shall be re-seeded or re-sodded with specified materials until Owner accepts all affected areas.

PRODUCTS

2.01 SEED MIXTURE

- A. Hydro-seeding - Mix per acre

1200 lb.	Wood Fiber Mulch
400 lb.	10-10-10
150 lb.	Rye Grass Seed
20 lb.	Carpet Grass Seed
10 lb.	Centipede Seed
- B. Seeding - Mix per acre: Use seed mixture above and hay straw mulch.

2.02 SOD

- A. Nursery grown, pasture sod. Provide well-rooted healthy sod, free of diseases, nematodes, and soil borne insects. Provide sod uniform in color, leaf texture, free from weeds, undesirable grasses, stones, roots, thatch, and other extraneous matter, viable and capable of growth and development when planted. Furnish sod machine stripped and of supplier's standard width, length and thickness, uniformly 1 ½" thick with clean-cut edges. Mow sod before stripping.
- B. Grass Type: Centipede and Bermuda.

2.03 SOIL MATERIALS

- A. Topsoil: Excavated from site and free of weeds.

2.04 ACCESSORIES

- A. Fertilizer: FS O-F-241, Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies in the topsoil, to the following proportions: Nitrogen 10 percent, phosphoric acid 10 percent, soluble potash 10 percent or as directed by the Owner/Engineer. Application rate should be 1,000 pounds per acre (25 pounds per 1,000 square feet).
- B. Water: Clean, fresh and free of substances or matter, which could inhibit vigorous growth of grass.
- C. Lime: Lime shall be applied at the rate of 3,000 pounds per acre (69 lbs. per 1,000 square foot) and shall be ground limestone containing not less than 85% of total carbonate. Lime shall be ground such that at least 50% will pass through a #20 sieve.
- D. Straw Mulch: Clean oat or wheat straw, well seasoned before bailing, free from mature seed-bearing stalks or roots.

EXECUTION

3.01 GENERAL

- A. All graded areas except those to be occupied by pavement, walks, buildings, gravel, rip-rap or other surface shall be grassed.
- B. All disturbed areas shall be grassed.
- C. All slopes steeper than 2:1 shall be hydro-seeded.

3.02 INSPECTION

- A. Verify that prepared soil base is ready to receive the work of this Section.
- B. Beginning of installation means acceptance of existing site conditions.

3.03 PREPARATION

- A. Ensure that fine grading is completed.
- B. Scarify topsoil of lawn area to be seeded to a minimum depth of 4". Remove all stones, sticks, roots, rubbish, and extraneous vegetable and foreign non-organic materials.
- C. Grade to eliminate rough, low, or soft areas, to ensure positive drainage and to create a smooth, even surface free of stones or soil clods over 1-1/2" in diameter.

3.04 FERTILIZING AND LIMING

- A. Apply lime at a rate of 3,000 lbs/acre.
- B. Apply fertilizer at a rate of 1,000 lbs/acre.
- C. Apply after smooth raking of topsoil.
- D. Apply fertilizers by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil, to a depth of two to four inches.
- E. Restore prepared area to a fine grade prior to applying seed.

3.05 SEEDING

- A. Seed immediately after preparation of bed.
- B. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.
- C. Seed when soil is dry and when winds do not exceed five miles per hour velocity.
- D. Acceptable application methods:
 - 1. Apply seed with rotary or drop type distributor. Install evenly by sowing equal quantities in two (2) directions, at right angles to each other.
 - 2. Apply with hydro-seeding machine.
- E. Sow grass seed at a rate of 5 lbs/1000 square feet.
- F. After seeding, lightly rake and roll seed into top 1/4 inch of topsoil, if applied by rotary or drop spreader.

3.06 MULCHING

- A. Place straw mulch on seeded areas within twenty-four hours after seeding.
- B. Place straw mulch uniformly in a continuous blanket at the rate of one and one-half tons per acre, where hydro-seeding method is not used.
- C. Tack: All seeded slopes exceeding 3:1 to have asphalt tack applied at the rate of 225 gallons/acre.

3.07 SEED PROTECTION

- A. Cover seeded slopes in drainage swales with erosion fabric where required to prevent wash out of seed. Roll fabric onto slopes without stretching or pulling.
- B. Lay fabric smoothly on surface. Provide 12-inch overlap of adjacent rolls.
- C. Secure outside edges and overlaps at 36-inch intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

3.08 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod within 24 hours after harvesting to prevent deterioration.
- C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints twelve (12) inches minimum. Do not stretch or overlap sod pieces. Install in straight rows, except when lining adjacent plant beds.
- D. Lay smooth. Place top elevation of sod flush with adjoining paving or curbing.
- E. Securely anchor in place with sod anchors when slopes are greater than 3:1 or in areas of swales or drainage ditches, which are prone to runoff.
- F. Water sodded areas immediately after installation. Saturate sod to four (4) inches.
- G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

3.09 MAINTENANCE

- A. Maintain seeded and sodded lawns until completion and acceptance of the lawn areas by the Owner.
- B. Maintain seeded areas included watering, spot weeding, application of herbicides, fungicides, insecticides, and re-seeding until a full, uniform stand of grass, free from weeds, undesirable grass species, diseases and insects is achieved and

accepted by the Owner.

1. Repair, re-work, and re-seed all areas that have washed out, are eroded or do not germinate.
 2. Mow seeded areas as soon as top growth reaches three inches in height. Cut back to two inches in height.
 3. After first mowing of grass, and substantial coverage is achieved (at least 85%), responsibility for mowing shall become the Owner's. However, mowing by Owner does not indicate acceptance and seeded areas shall not be accepted until coverage requirements are met.
 4. Temporary seeding for erosion control during early stages of construction shall be maintained entirely by contractor.
- C. Maintain sodded areas including watering, spot weeding mowing, application of herbicides, fungicides, insecticides, and re-sodding until a full uniform stand of grass, free of weeds, undesirable grass species, diseases and insects is achieved and accepted by Owner.
1. Water sod thoroughly every two to three days to establish proper rooting.
 2. Repair, re-work, and re-sod all areas that have washed out or are eroded, or show deterioration or bare spots.
 3. Mow sodded areas as soon as top growth reaches three inches. Cut back to two inches and maintain.
 4. Mow grass at regular intervals to maintain at a maximum height of 2-1/2". Do not cut more than 1/3 of grass at one mowing.

3.10 RECONDITIONING EXISTING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations including storage of materials and equipment and movement of vehicles. Also recondition existing lawn areas where minor re-grading is required.
- B. Provide fertilizer, seed or sod, and soil amendments as specified for new lawns, and as required, to provide satisfactorily reconditioned lawn.
- C. Provide new topsoil, as required, to fill low spots and meet new finish grades.
- D. Cultivate bare and compacted areas thoroughly to provide a satisfactory planting bed.
- E. Remove diseased and unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, stone, gravel, and other loose building materials.

- F. Where substantial lawn remains, but is thin, mow, rake, aerate if compacted, fill low spots, remove humps, and cultivate soil, fertilize, and seed. Remove weeds before seeding, or if extensive, apply selective chemical weed killers as required. Apply a seedbed and mulch, if required, to maintain moist condition.

3.11 CLEANING

- A. Perform cleaning during installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from the site.

END OF SECTION

SECTION 03250

CAST-IN-PLACE CONCRETE

GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete for utilities, storm drainage, paving, curb & gutter, driveways, and sidewalks.
- B. Reinforcing Steel.
- C. Concrete Curing.
- D. Concrete Repair.

1.02 RELATED SECTIONS

- A. Section 02600 - Sanitary Sewer Gravity Systems
- B. Section 02690 - Sewage Pumping Stations

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ASTM C 33 - Concrete Aggregates.
- C. ASTM C 94 - Ready-Mixed Concrete.
- D. ASTM C 150 - Portland Cement.
- E. ASTM C 260 - Air-Entraining Admixtures for Concrete.
- F. ASTM C 494 - Chemical Admixtures for Concrete.
- G. ACI 315 - Details and Detailing of Concrete Reinforcement.
- H. ASTM A 82 - Cold Drawn Steel Wire for Concrete Reinforcement.
- I. ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- J. ANSI/AWS D1.4 - Structural Welding Code Reinforcing Steel.
- K. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- L. CRSI - Manual of Practice.

- M. ASTM C 309 - Liquid Membrane - Forming Compounds for Curing Concrete.
- N. ASTM D 2103 - Polyethylene Film and Sheeting.
- O. FS TT-C-800 - Curing Compound, Concrete for New and Existing Surfaces.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout.

1.05 TESTS

- A. Testing and analysis of concrete will be performed under provisions of Section 00800.
- B. Submit proposed mix design of each class of concrete to Engineer for review and approval prior to commencement of work.
- C. Test of cement and aggregates will be performed to ensure conformance with requirements stated herein.

1.06 PRODUCT DATA

- A. Submit mill test certificates of supplied concrete reinforcing indicating physical and chemical analysis.
- B. Provide product data for specified products.
- C. Submit all manufacturer's installation instructions.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete in temperatures less than 40 degrees F without Engineer's approval.
- B. Maintain ambient temperature at 70 degrees F (minimum) for three days for curing.

PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150, normal - Type 1, air entraining - Type 1A moderate, high early strength Type III, air entraining - Type III Portland Type; gray color.
- B. Fine and Coarse Aggregates: ASTM C 33.

- C. Water: Clean and not detrimental to concrete.

2.02 ADMIXTURES

- A. Air Entrainment: ASTM C 260.
- B. Chemical Admixture: ASTM C 494 Type A - water reducing. Type B - retarding. Type C - accelerating. Type D - water reducing and retarding. Type E - water reducing and accelerating.

2.03 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C 94.
- B. Provide concrete for all wing-wall, footing and slab construction of the following characteristics:
 - Compressive Strength (7 days): 3200 psi
 - Compressive Strength (28 days): 4000 psi
- C. Provide concrete for All Other Concrete Construction of the following characteristics:
 - Compressive Strength (7 days): 2400 psi
 - Compressive Strength (28 days): 3000 psi
- D. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.
- E. Use set-retarding admixtures during hot weather only when approved by Engineer.
- F. Add air entraining agent to all concrete mixes for concrete work.

2.04 REINFORCING STEEL MATERIALS

- A. Reinforcing Bars: ASTM A 615, 60 KSI yield grade, billet-steel deformed bars with uncoated finish as specified on the plans.
- B. Welded Steel Wire Fabric: ASTM A 185 (unless otherwise specified) plain type, coiled rolls, uncoated finish 6" x 6" mesh of 0.135" diameter.
- C. Stirrup Steel - ASTM A 82.
- D. Tie Wire: Minimum 16 gage annealed type - acceptable patented system.
- E. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and

support of reinforcement during installation and placement of concrete.

2.05 CURING MATERIALS

- A. Water: Clean and not detrimental to concrete.
- B. Membrane Curing Compound: ASTM C 309, FSTT-C-800.
- C. Chem-trete curing compound by Trocal or equivalent.

EXECUTION

3.01 INSPECTION

- A. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.
- B. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Before placing concrete, clean reinforcement of foreign particles or coating and remove any foreign material in forms by sweeping, blowing or washing.

3.03 PLACING CONCRETE

- A. Notify Engineer minimum 24 hours prior to commencement of concrete pour.
- B. Place concrete in accordance with ACI 301.
- C. Hot Weather Placement: ACI 301.
- D. Cold Weather Placement: ACI 301.
- E. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- F. Maintain 2-inch minimum concrete cover around reinforcing.
- G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify

Engineer upon discovery.

3.04 FINISHING

- A. Provide concrete surfaces to be left exposed, concrete walls with rubbed sack rubbed finish or as directed by the Engineer.

3.05 PATCHING

- A. Notify Engineer immediately upon removal of forms.
- B. Patch imperfections.

3.06 DEFECTIVE CONCRETE

- A. Replace concrete not conforming to required strength, levels, lines, details and elevations.
- B. Replace concrete not properly placed or of the specified type.

3.07 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature and test samples taken.

3.08 PROTECTION

- A. Protect all finished work.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

SECTION 03260
FLOWABLE FILL

GENERAL

1.01 SECTION INCLUDES

- A. Abandonment of existing structures and utilities
- B. Structural Backfill

1.02 RELATED SECTIONS

- A. Section 03250 - Concrete

1.03 REFERENCES: The following standards are included in these specifications by reference.

- A. ASTM C 33 - Concrete Aggregates.
- B. ASTM C 94 - Ready-Mixed Concrete.
- C. ASTM C 150 - Portland Cement.
- D. ASTM C 260 - Air Entraining Admixtures for Concrete
- E. ASTM C 494 - Chemical Admixtures for Concrete
- F. SCDOT Standard Specifications - Current Edition

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete in temperatures less than 40 degrees F without Engineer's approval.

1.05 QUALITY ASSURANCE

- A. Obtain materials from the same source throughout.

PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150, normal - Type 1
- B. Fine and Coarse Aggregates: ASTM C 33.

- C. Fly Ash: Shall conform to the requirements of ASTM C 618
- D. Water: Clean and not detrimental to concrete.

2.02 MIX DESIGN

- A. The mix falls into the categories of ‘very flowable’ and ‘less flowable’, which is controlled by the amount of water added to the mixture.
- B. Mix must contain sand from an approved source with sufficient cement and fly ash to obtain maximum density at optimal moisture with load-bearing capacity and stability characteristics as good as or better than a well-compacted granular base material.
- C. The ultimate unconfined strength should be less than 200 psi to maintain the ability to re-excavate, all voids will be filled with no “honeycombs”, and the hardened flowable fill will not shrink.

2.02 ADMIXTURES

- A. Air Entrainment: ASTM C 260.

2.03 CONCRETE MIX

- A. Less Flowable Mix:

<u>Weight</u>	<u>Volume (cubic feet)</u>
2500 lbs of Sand	.25
50 lbs of Cement	4.24
600 lbs of Fly Ash	15.17
<u>55 gal of Water</u>	<u>7.34</u>
Total Cubic Feet:	27.00
- B. Very Flowable Mix:

<u>Weight</u>	<u>Volume (cubic feet)</u>
2500 lbs of Sand	.25
50 lbs of Cement	4.24
600 lbs of Fly Ash	15.17
<u>65 gal of Water</u>	<u>8.68</u>
Total Cubic Feet:	28.34

*Note: one cubic yard of very flowable fill will be mixed to contain more than 27 cubic feet due to the additional water. The extra water will be displaced during the consolidation process.

EXECUTION

3.01 PREPARATION

- A. Very flowable fill is used to fill abandoned pipelines and other structures. Less

flowable mix is preferred for use as structural backfill, where a short setup time along with minimal shrinkage is desired.

- B. The flowable fill shall be discharged directly from the truck into the space to be filled. The mix may be placed part depth or full depth as conditions at the site dictate. Flowable fill can be placed to the appropriate depth without compaction of thin layers.
- C. To abandon existing pipeline facilities, clean the ends of existing pipe, grout and plug one end of line and fill line with flowable fill from the open end.
- D. When using flowable fill as structural backfill, formed walls or other bulkheads shall be constructed to withstand the hydrostatic pressure exerted by the flowable fill. Trench ends outside the roadway should be blocked with sandbags or mounded soil rather than wood or metal forms.
- E. The flowable fill is self-consolidating and there is no need to use vibrators, even when placed in a less-flowable state. Nor field testing is needed when using flowable fill. The less flowable mix can be placed in the rain or in standing water and still obtain the desired uniform density.
- F. Once the flowable fill is in the trench, the self-consolidating material displaces the extra water not needed for maximum density. Provision shall be made for this “bleed water” to run off and away from the surface of the hardening flowable fill. The use of vapor barriers such as plastic sheeting is not allowed.
- G. The material will usually support foot traffic within an hour after the bleeding ends. Traffic can be allowed on the hardened flowable fill 8 to 20 hours, depending on the mix used, site conditions, volume to be backfilled, etc., without damage to the fill or any structure below. If it is necessary to return traffic in less than 8 hours, steel plates shall be used to bridge over the hardening flowable fill.
- H. As the extra water is displaced from the consolidating flowable fill, there will be an initial subsidence of about one-eighth of an inch per vertical foot. Once the flowable fill hardens there will be no future settlement. The hardened flowable fill can be shaped to grade the next day to allow the patch thickness required by the Engineer. The patch may be applied directly on top of the flowable fill.

END OF SECTION

SECTION 03300
CONCRETE CURING

GENERAL

1.01 WORK INCLUDED

- A. Concrete curing materials and methods.

1.02 RELATED WORK

- A. Section 03250 - Concrete.

1.03 REFERENCES: The following standards are included in these specifications by reference.

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ASTM C 309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- C. ASTM D 2103 - Polyethylene Film and Sheeting.
- D. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of ACI 301.

1.05 PRODUCT DATA

- A. Submit all product data.
- B. Provide product data for specified products.
- C. Submit all manufacturers' installation instructions.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature at 70 degrees F for three days.

PRODUCTS

2.01 MATERIALS

- A. Water: Clean and not detrimental to concrete.

- B. Absorptive Mat: Cotton fabric of 10-oz/sq. yd., clean, rolls goods.
- C. Absorptive Mat: Burlap fabric of 10-oz/sq. yd., clean, roll goods.
- D. Membrane Curing Compound: ASTM C 309, FS TT-C-800.
- E. Polyethylene Film: ASTM D 2103, 6 mil thick; clear color.
- F. Chem-trete curing compound by Trocal or approved equal.

EXECUTION

3.01 INSPECTION

- A. Verify concrete surfaces are ready for curing.

3.02 MEMBRANE CURING COMPOUND

- A. Apply curing compound in two coats.
- B. Apply in accordance with manufacturers' instructions.

3.03 ABSORPTIVE MAT

- A. Spread polyethylene film over slab areas. Lap edges and ends 3 inches and seal with pressure sensitive polyester tape.
- B. Maintain in place with plywood sheets for three days.

3.05 CURING

- A. Cure concrete.
- B. Remove absorptive mat, sheeting and ballast after curing.

END OF SECTION

SECTION 03500

PRECAST SEWER STRUCTURES

GENERAL

1.01 SECTION INCLUDES

- A. Round and rectangular pre-cast Concrete Structures including structure components, sub-grade structure components, frames, covers, and accessories.

1.02 RELATED SECTIONS

- A. Section 02100 - Excavation.
- B. Section 02200 - Backfilling.
- C. Section 02600 - Sanitary Sewer Gravity Systems
- D. Section 02625 - Sewer Force Main Systems
- E. Section 02650 – Sewer Pumping Stations

1.03 REFERENCES

- A. Pre-stressed Concrete Institute: Manual for Quality Control for Plants and Production of Pre-cast and Pre-stressed Concrete Products.
- B. National Pre-cast Concrete Association: Quality Control Manual for Pre-cast Concrete Plants.
- C. American Society for testing and Materials:
 - 1. ASTM C478 - Standard Specification for Pre-cast Reinforced Concrete Manhole Sections.
 - 2. ASTM C890 - Standard Practice for Minimum Structural design Loading for Monolithic or Sectional Pre-cast Concrete Water and Wastewater Structures.
 - 3. ASTM C891 - Standard Practice for Installation of Underground Pre-cast Concrete Utility Structures.
 - 4. ASTM C913 - Standard Specification for Pre-cast Concrete Water and Wastewater Structures.
- D. American Concrete Institute: Building Code Requirements for Reinforced Concrete (ACI 318 - latest revision).

- E. Occupational Safety and Health Administration: Standard 1926.704 - Requirements for Pre-cast Concrete.

1.04 SUBMITTALS SHALL BE AS FOLLOWS:

- A. Completed Certificate from this Specification Section sealed by a Registered Professional Engineer on the staff of the Pre-cast Concrete Manufacturer.
- B. Copy of Certificate or Report showing that the Pre-cast Concrete Manufacturer conforms to Article 1.05 of this Specification Section.
- C. Schedule of the Drainage Structure Components to be provided on the project, charting the following:
 - 1. Sheet number where the structure plan and profile are shown.
 - 2. Line number when applicable.
 - 3. Station number.
 - 4. Invert Elevation as shown on the plans.
 - 5. Total height required from top of base slab to top of structure.
 - 6. Total height of the individual and assembled Structure Components.
 - 7. Top and bottom elevation of the Structure as calculated.
 - 8. Manufacturer's Part of Catalogue No. and number required of each component.
 - 9. Pipe size, type, and hole size and its distance from top of base slab.
 - 10. Pipe location in degrees clockwise from step centerline on round structures.
 - 11. Pipe location on rectangular structures by wall and intersecting angle relative to wall.
 - 12. Minimum round inside diameter or rectangular inside dimensions required.
- D. Detail of each pre-cast concrete component to be provided, sealed by the Registered Professional Engineer employed by the manufacturer showing or charting the following:
 - 1. Manufacturer's Part No. or Catalogue No.
 - 2. Inside Diameter or dimensions and lay length.
 - 3. Wall thickness and base or top thickness where applicable.
 - 4. Handling Weight and lift hole or insert or loop description and location.
 - 5. Wire Size, Spacing and area provided per vertical foot (when applicable).
 - 6. Reinforcing bar size and spacing or location.
 - 7. Design loads for all rectangular components and round top slab components.
 - 8. Step Locations on round structures.
 - 9. Concrete design strength and Manufacturer's mix number.
 - 10. Height, width, slope and annular space of the tongue & groove for products requiring tongue and groove joints.
- E. Step Detail and Material Specifications.

- F. Joint Material Detail, material Specifications and calculations showing that the joint material cross section is greater than the joint's annular space times its height.
- G. Lifting Device and Hole Detail including design loads.
- H. At the request of the Engineer or Owner, submit the following:
 - 1. Structural analysis and design calculations for pre-cast rectangular components and round top slab components, performed in accordance with applicable codes and standards, showing that allowable stresses will not be exceeded. A Registered Professional Engineer employed by the Pre-cast Concrete Manufacturer must seal all calculations.
 - 2. Calculations or test results verifying that the lifting device components and holes are designed in accordance with OSHA Standard 1926.704.
 - 3. Concrete 28 day compression strength results for every day production of Pre-cast Components for the project was performed, showing the required strength according to the guidelines established in ACI 318.
 - 4. Reinforcing and Cement mill reports for materials used in the manufacture of Pre-cast Components for this project.
 - 5. The above test reports for similar Pre-cast Components recently produced, submitted prior to production of Pre-cast Components for this project.

1.05 QUALIFICATIONS

- A. The Pre-cast Manufacturer shall comply with one of the following requirements:
 - 1. Manufacture Pre-cast Components for the project in a plant certified in the Pre-stressed Concrete Institute's (PCI) Plant Certification Program.
 - 2. Manufacture Pre-cast Components for the project in a plant certified in the National Pre-cast Concrete Association's (NPCA) Plant Certification Program.
 - 3. Retain an independent testing or consulting engineering firm approved by the Engineer for Pre-cast plant inspection. The basis for plant inspection shall be the National Pre-cast Concrete Association Quality Control Manual or the Manual for quality Control for Plants and Production of Pre-cast and Pre-stressed Concrete Products. The above firm shall inspect the pre-cast plant 2 weeks prior to and at 1-week intervals during production of materials for this project and issue a report, certified by a Registered Engineer that materials, methods, products, and quality control meet the requirements of the above quality control manuals.
- B. The Pre-cast Manufacturer shall have a recognized Quality Improvement Process

installed at the manufacturing facility.

- C. The Pre-cast Manufacturer shall employ at least one Registered Professional Engineer at the manufacturing facility through the life of the project.
- D. Concrete compressive strength testing shall be performed in a laboratory inspected by the CCRL of the National Bureau of Standards. Testing shall be performed by Grade I ACI Certified Laboratory Technicians or by Level I PCI Certified Technicians.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry, grouting or concrete work.

PRODUCTS

2.01 MATERIALS

- A. Concrete shall conform to ASTM C478 and as follows:
 - 1. Compressive strength: 5000-psi minimum at 28 days.
 - 2. Air Content: 4 percent minimum
 - 3. Cementitious Materials: Minimum of 564 pounds per c.y.
 - 4. Coarse Aggregates: ASTM C33. Sound, Crushed, Angular Granitic Stone only. Smooth or rounded stone shall not be used.
 - 5. Fine Aggregates: ASTM C33. Free from organic impurities.
 - 6. Chemical Admixtures: ASTM C494. Calcium Chloride or admixtures containing calcium chloride shall not be used.
 - 7. Air Entraining Admixtures: ASTM C260.
- B. Reinforcing steel shall be ASTM A615 grade 60 deformed bar, ASTM A82 wire or ASTM A185 welded wire fabric.
- C. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars shall not be allowed.
- D. Flexible Joint Sealants shall be butyl rubber based conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B - Butyl Rubber and as follows: Maximum of 1% volatile matter and suitable for application temperatures between 10 and 100 degrees F.
- E. Epoxy Gels shall be a 2-component, solvent-free, moisture-insensitive, high modulus, high-strength, structural epoxy paste adhesive meeting ASTM C-881, Type I and II, Grade 3, Class B and C, Epoxy Resin Adhesive.

2.02 COMPONENTS

- A. Pre-cast Components shall be designed and manufactured as described in this paragraph and in the following paragraphs for the specific components.
1. Lifting Inserts, Holes and Devices shall comply with OSHA Standard 1926.704. Lift holes and inserts shall be sized for a precision fit with the lift devices and shall not penetrate through the structure wall. The Pre-cast Manufacturer shall provide lifting Devices.
 2. Joints shall be sealed internally between the tongue and the groove and additionally around the external perimeter of the joint as follows:
 - a. External Seals shall consist of a polyethylene backed flat butyl rubber sheet no less than 1/16-inch thick and 6 inches wide applied to the outside perimeter of the joint.
 - b. Internal Seals shall consist of a plastic or paper-backed butyl rubber rope no less than 14 feet long and having a cross-sectional area no less than the annular space times the height of the joint.
 - c. At the option of the Contractor, Internal Seals on round joints may consist of an O-Ring Gasket conforming to ASTM C443, installed according to the Pre-cast Manufacturer's recommendation.
 3. Rings, Covers, and Frames shall be Class 30 gray cast iron and shall be designed for 1600 lb wheel loads when located in roadways.
 4. Pre-cast Base Sections shall be cast monolithically without construction joints or with an approved galvanized or PVC water-stop cast in the cold joint between the base slab and the walls. The minimum size of the base section shall be as specified in the schedules.
 5. Wall and inside slab finishes resulting from casting against forms standard for the industry shall be acceptable. Form ties through the wall are not allowed. Exterior slab surfaces below grade level shall have a float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spills will be tolerated. Dimensional tolerances shall be as set forth in the appropriate References. Exposed components shall have a form finish or a light broom finish on their exposed surfaces. Fins, voids, chips, or fractures over 3/8 inch in diameter shall be filled with thin cement paste and finished to a color and texture reasonably consistent with that of formed finish. Rings and covers cast in exposed tops shall be free from cement paste build up.
 6. Provisions for pipe entrances in the structures shall be cast or cored openings or knockout panels.
 - a. Pipe openings in round structures shall remain 6 inches clear of

other pipe openings.

- b. Pipe openings in rectangular structures shall not extend into the corners and may extend across a joint only when structural analysis shows stresses to be within the allowable.
 - c. Knockout Panel dimensions shall be as required by structural design at their maximum burial depth using the design loads specified herein.
7. Components shall be designed in accordance with ACI, ASTM C890 and the following loads:
- a. Horizontal Load on Walls and Knockout Panels = an earth load of 80 psf per foot of burial depth plus a live lateral surcharge due to HS20 traffic loads of 80 psf.
 - b. Vertical Load on below grade adaptor slabs and tops = an earth load of 120 psf per foot of overburden plus a live HS20 traffic load.
 - c. Vertical Load on Exposed Inlet Tops = a live 300 psf load.
 - d. Vertical Load on Cast Iron Covers and Grates supported around perimeter = a live HS20 traffic load.
- B. Round Sub-grade Components for air release valve vaults shall be designed and manufactured in conformance with ASTM C478 and as follows:
1. Riser Sections shall have a minimum lay length of 16 inches.
 2. Pre-cast Top Sections shall be used for vault structures.
 3. Provide Steps in Bases, Risers, Cones, sections aligned vertically on 16 inch centers with the bottom step no more than 26 inches from the base slab. Secure steps to the wall with compression fit in cast or drilled holes or cast in place. Steps shall not be vibrated or driven into freshly cast concrete or grouted in place. The steps shall be Copolymer Polypropylene Plastic reinforced with a ½ inch diameter grade 60 bar and have serrated tread and tall end lugs. Pullout strength shall be a minimum of 2000 lbs when tested according to ASTM C497.
 4. Joints of Bases and Risers shall be manufactured to the joint surface design and tolerance requirements of ASTM C361. The maximum slope of the vertical surface shall be 2 degrees. The maximum annular space at the base of the joint shall be 0.10". The minimum joint height shall be 4".
 5. Cast iron frames and covers shall be furnished for each vault in accordance with the detail provided in the Drawings.

- C. Rectangular Sub-grade Components for meter and/or valve vaults shall be in accordance with the dimensions indicated in the Drawings, designed and manufactured in conformance with ASTM C913 and as follows:
 - 1. Riser lay length shall be a minimum of 12 inches.
 - 2. Pre-cast Top Sections shall be used for all vault structures.
 - 3. Joints between pre-cast components shall be keyways or tongue and groove.
 - 4. Aluminum access hatches shall be furnished for each vault in accordance with the details provided in the Drawings.

EXECUTION

3.01 EXAMINATION

- A. Inspect structure components prior to unloading from the delivery truck.

3.02 PREPARATION

- A. The Contractor shall coordinate delivery of the structure components to the jobsite with the Manufacturer. Handling of materials shall be done in accordance with ASTM C891 and the manufacturer's recommendations. Components should be handled and stored on the jobsite using methods that will prevent damage.

3.03 PLACING STRUCTURES

- A. Excavate to the required depth and remove materials that are unstable or unsuitable for a good foundation. Prepare a level, compacted foundation extending 6" beyond the base.
- B. Set base plumb and level, aligning pipes in pipe openings 1 to 6 inches larger than the pipe OD.
- C. Thoroughly clean bells and spigots to remove dirt and other foreign materials that may prevent sealing. Unroll the Butyl Sealant rope directly against spigot or keyway. Leave protective wrapper attached until sealant is entirely unrolled. Do not stretch. Overlap from side to side - not top to bottom.
- D. Set risers, tops and cones for round structures so that steps align, taking particular care to clean, repair and seal joints.
- E. When recommended by the manufacturer, fill the void between horizontal joint surfaces with a sand cement grout around the outside perimeter.
- F. After joining sections, apply the butyl sealant sheet around the outside perimeter

of the joint.

- G. Lift Holes leaving less than 2" of wall thickness shall be plugged from the outside using a sand cement mortar then covered with butyl rubber sheet. Lift Holes penetrating the wall shall be additionally sealed with epoxy gel on the interior.
- H. Set the frames or tops to the required elevation sealing joints with butyl sealant rope and sheet.
- I. Clean foreign matter from the structure interior and perform touch up to exposed top surfaces as described in Paragraph 2.02 A.5 of this Specification.

END OF SECTION