4.01 GENERAL

A. This section covers storm sewer pipe, precast manholes, and precast catch basins.

B. The Contractor shall furnish and install all storm drains and appurtenances as specified herein and as defined on the drawings or as directed by the Engineer.

C. The Contractor shall submit certifications to the Engineer that all pipes, fittings and joints are as specified herein.

4.02 REINFORCED CONCRETE PIPE

A. Pipe manufactured shall meet the applicable strength requirements contained in ASTM Designation: C-76, Reinforced Concrete Culvert, Storm Drain and Sewer Pipe, minimum circumferential reinforcement shall be as prescribed for Class III. Class IV shall be required when cover is less than 12 inches.

B. In addition to the applicable ASTM Requirements for steel reinforcing, the joints shall be provided with circumferential reinforcement equipment at least to the area of a single line in the barrel of the pipe to insure against possible overstresses or damage to the pipe during jointing operations. The circumferential reinforcing members in the tongue and groove ends shall be spaced not greater than two (2)-inch on center.

C. Pipe shall be manufactured without lifting holes and shall be handled at all times by means of slings or other methods approved prior to start of construction.

D. All pipe joints shall be water tight.

4.03 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

A. HDPE pipe shall be smooth interior, AASHTO designation M252 and M294, with a maximum diameter of 48 inches.

B. Pipe joints and fittings shall conform to AASHTO M252 and M294.

C. HDPE pipe shall be manufactured by Advanced Drainage Systems, Inc., (ADS –N12), Hancor, Inc., (Hi-Q), or approved equal and shall be installed per manufacturer's guidelines.

D. All pipe joints shall be watertight.

4.04 PIPE AND FITTINGS

A. Pipe laying shall not begin until all stakeout and cut sheets have been approved by the Engineer.

B. The Contractor shall utilize proper and suitable tools and equipment for the safe handling and laying of the pipe and fittings in accordance with the manufacturer's standards. Pipe and fittings shall be carefully handled and lowered into the trench.

C. Should the pipe require cutting to fit in the line or to bring it to the required location, the work shall be done without extra compensation, in a satisfactory manner so as to leave a smooth end, perpendicular to the axis of the pipe.

D. Before making joints, each pipe shall be well bedded on a solid foundation and no pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. No pipe shall be laid in wet trench conditions that preclude proper bedding or on a frozen trench or when weather conditions are unsuitable for proper installation.

E. In laying pipe, special care shall be taken to insure that each length shall abut against the next in such a manner that there shall be no shoulder or unevenness of any kind along the inside of the pipeline.

F. No wedging or blocking will be permitted in laying any pipe; unless by written order from the Engineer.

G. Pipe and appurtenances shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. The open end shall be kept closed with a plug until the next length is laid. At the close of work each day, the end of the pipeline shall be tightly closed with an expansion stopper so that no dirt or other foreign substances may enter the line, and this stopper shall be kept in place until pipe laying is again resumed.

H. Manholes shall be installed as pipe laying progresses.

4.05 PRECAST CONCRETE MANHOLES AND INLETS

A. The Contractor shall construct structures of precast reinforced concrete risers and base sections. All catch basins and junction boxes shall be constructed as per most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Details.

Storm sewer manholes shall be constructed as per City of Milford manhole details.

B. Structures shall be built at such points on the pipelines and of such form and dimensions, as are shown on the drawings or as may be directed. Structures shall be installed as pipe laying progresses and the Owner may stop work entirely on laying pipe if manhole and inlet construction is delayed to such an extent as to be hazardous to construction or the public.

C. Precast reinforced concrete base riser sections shall be as manufactured by Atlantic Concrete Company, Virginia Precast Corporation, or equal.

D. Interior and exterior joint spaces of all structure risers shall be filled prior to application of the exterior waterproofing. The interior and exterior joint shall be mortared.

E. Lifting holes in the walls of precast reinforced concrete risers will be allowed, but shall be plugged with rubber stoppers and grouted flush with face of manhole and inlet wall after installation of manhole and inlets riser sections. Not more than two (2) holes shall be cast in the walls of each riser section for the purpose of handling.

F. The exterior surface of all precast manholes and inlets shall receive a minimum two (2) coat application of 68% solid coal tar type protective coating. The total average dry film thickness shall measure 24 mils with no single measurement to be less than 20 mils. Surfaces shall be prepared in accordance with the manufacturer's instructions and coatings applied in the field in an acceptable manner.

G. Inlet flow channels and benches shall be constructed of brick with care taken to secure smooth and even surfaces. Channel sections shall be built up to true line and radius, and curved sections shall provide a uniform transition in the flow direction. Materials and construction of flow channels shall be in accordance with appropriate sections for materials so used, as hereinbefore specified.

4.06 CASTINGS

A. Frames and covers or grates for structures shall be set by the Contractor as the work progresses.

B. Material and sizes and types of frames and covers shall be as per current DelDOT Standard Construction Details and of the sizes and types specified on the plans.

C. All catch basin grates shall be DelDOT Type 3.

4. 07 BRICK AND MORTAR FOR INLET FLOW CHANNELS

A. All brick shall conform to the "Standard Specifications for Sewer Brick", ASTM C-32, Grade SS.

B. Mortar shall be in accordance with the "Standard Specifications for Portland Cement," ASTM C-150 for Type II.

4. 08 MANHOLE AND INLET STEPS

A. Steps in structures shall be made of (3/8) three-eights inch diameter (No.3) steel bars, ASTM Designation A-615, Grade 60, encased in polypropylene plastic. Manhole steps shall have tread ridge with retainer lug on each side.

B. Steps in structures shall be cast in place during manufacture of precast reinforced concrete risers and eccentric top sections, or embedded during construction of brick manholes. Embedment length shall be suitable for minimum five (5)-inch thick, precast reinforced concrete riser walls.

C. Steps in structures shall be OSHA approved and as manufactured by; M.A. Industries, Inc., Peachtree City, Georgia; ICM, Inc., Jacksonville, Arkansas, or equal.

D. Steps in structures shall be spaced twelve (12)-inches apart. The maximum spacing from top of manhole to the first step shall not exceed sixteen (16)-inches.

END OF SECTION