



**CITY OF SEAFORD  
DELAWARE**

**STANDARD DESIGN SPECIFICATIONS**

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## SECTION 1 - GENERAL CONDITIONS

### 1.01 PURPOSE

- A. The following Standard Design Specifications and accompanying details have been developed by the City of Seaford in an effort to define the materials, equipment, machinery and other components used in the design, construction, renovation, repair or replacement of the Public Works facilities described herein & located within the incorporated area of the City of Seaford.
- B. These specifications are binding and shall be closely observed. Approvals for any exceptions or alterations must be obtained in writing from the City of Seaford at least four (4) weeks prior to commencement of the project.
- C. Whenever a specific reference is made to a manufacturer, model, type or style; the intention is to maintain uniformity throughout the City of Seaford.
- D. If any of these specifications conflict with any Federal, State or Local requirements, the more stringent requirement shall prevail.
- E. The City of Seaford reserves the right to amend these specifications at its discretion.
- F. In addition to the following specifications, all Public Works facilities must be constructed in accordance with the most current edition of the following documents where applicable:
  - (1) The Code of the City of Seaford
  - (2) The City of Seaford Subdivision Regulations
  - (3) Seaford Industrial Park Covenants
  - (4) Ross Business Park Covenants

### 1.02 DEFINITIONS

- A. Whenever, in the specifications and upon the drawings, the words DIRECTED, REQUIRED, PERMITTED, ORDERED, DESIGNATED, PRESCRIBED, and words of like importance are used, it shall be understood that the directions, requirements, permission, order, designation or prescription of the Engineer or Owner is intended and similarly the words APPROVED, ACCEPTABLE, SATISFACTORY, and words of like importance shall mean "approved by, or acceptable or satisfactory to the Engineer or Owner unless otherwise expressly stated."
- B. Whenever in these specifications, bond, and other construction documents, the following terms or pronouns in place of them are used; the intent and meaning shall be interpreted as follows:

- (1) **Approved, “as required”** and similar expressions shall mean “as approved by the Engineer” or “as approved by the Owner” or “as required by the Engineer” or “as required by the Owner”. The Engineer and Owner shall have the right of approval.
- (2) **Contract, Contract Documents or Construction Documents** shall mean all things contained in the specifications, drawings, proposals, agreement and bond, therein referred to, are to be considered as one instrument forming the contract, also any and all supplementary agreements which could reasonably be required to complete the construction contemplated.
- (3) **Contractor** shall mean the party responsible for constructing the utility, acting directly or through his agents or employees.
- (4) **Developer** shall mean Party(s), where applicable, ultimately responsible for the satisfactory completion of all improvements shown on the construction documents approved by the City of Seaford. The term “Developer” shall be applicable whenever such party(s) are the owner of record on which the proposed improvements are being made. Wherever “Contractor” is used throughout this document, “Developer” is assumed, where applicable.
- (5) **Drawings** shall mean all drawings or reproduction of drawings, pertaining to the work under contract, which are furnished or approved by the Engineer.
- (6) **Engineer** shall mean consultant Engineer for the City of Seaford or his duly authorized representative. Wherever the word Engineer is referred to in these specifications it can be substituted with word “Owner” and he can at all times assume the responsibilities of the Engineer.
- (7) **Furnish** shall mean a direction to the contractor to supply and make payment for materials and equipment but not necessarily to install or pay workman to install, or both of these items.
- (8) **General Conditions** shall mean to establish and to pertain to the legal responsibilities between the parties involved in the work, namely Owner, Engineer and Contractor.
- (9) **Material(s)** shall mean the equipment, unless the context otherwise requires.
- (10) **Owner** or “City of Seaford” shall mean City of Seaford, Sussex County, Seaford, Delaware.
- (11) **Operation & Maintenance Manuals (O&M Manuals)** shall mean documents required by the Engineer or Owner to maintain and or operate the

dedicated infrastructure including but not limited to Water and Sanitary Sewer Systems and appurtenances.

- (12) **Provide** shall mean a direction to the Contractor to furnish all materials, equipment and labor and make payment for all these necessary to complete the contract.
- (13) **Resident Project Representative** shall mean an authorized representative of the Owner or Engineer assigned to make any and all necessary observations of the work performed and materials and/or equipment furnished by the Contractor.
- (14) **Shop Drawings** shall mean drawings, illustrations schedules, performance charts, brochures and other data which are prepared by the Contractor, or any Subcontractor, Manufacturer, Supplier or Distributor and which illustrate some portion of the work.
- (15) **Specifications** shall mean the definitions, descriptions, directions, provisions and requirements, contained herein, and all written supplements thereto, made or to be made, pertaining to the contract, and the materials, equipment and workmanship to be furnished under the contract.
- (16) **Subcontractor(s)** shall mean any individual, firm or corporation who contracts with a Contractor to perform part or all of the latter's contract.
- (17) **Work** shall mean any and all things agreed to be furnished or done by or on the part of the Contractor, and which are required in the construction and completion of the project herein contemplated. Includes also labor, material and equipment.

### 1.03 PRE-CONSTRUCTION AND PROGRESS MEETINGS

- A. The Developer/Contractor shall provide written verification that a pre-construction meeting was held with the Soil Conservation District, if the project required District approval, prior to beginning any construction.
- B. The Developer/Contractor shall contact the City for the purpose of scheduling a preconstruction meeting prior to beginning construction. The City will decide if the project warrants a pre-construction meeting and inform the Developer/Contractor accordingly. The City will instruct the Developer/Contractor as to who should attend the meeting and the Developer/Contractor shall schedule the meeting. The Developer/Contractor shall record and distribute the minutes from the meeting.
- C. The City shall, at the time of the pre-construction meeting, or at any time during construction, inform the Developer/Contractor of the City's determination that a

progress meeting will be necessary. The City may also deem that progress meetings will be required on a regular basis. The Developer/Contractor shall schedule all progress meetings and shall also record and distribute the minutes from the progress meetings.

#### **1.04 PERMITS, FEES, AND NOTICES**

- A.** The Developer/Contractor is responsible for all City costs related to Engineering services, studies, reviews or other related expenses inclusive of the costs for preliminary engineering through final acceptance and dedication.
- B.** The Contractor shall pay all taxes, royalties, and fees and secure licenses and permits that are required, during the time of the contract, by local, county, state and federal laws, ordinances, rules, codes, and regulations for the legal performance of the contract.
- C.** The Contractor shall perform the work in accordance with notices issued by any and all public authorities and agencies having jurisdiction over the work.
- D.** If the Contractor performs work, knowingly or ignorantly, contrary to requirements of local, county, state and federal laws, ordinances, rules, codes and regulations, he shall assume full responsibility therefore and shall bear all costs of suites, actions, and damages resulting from this illegal work performance.

#### **1.05 INDEMNIFICATION OF THE OWNER**

- A.** The Contractor shall indemnify and hold harmless the Owner and the Engineer, and all who represent them, from and against claims, damages, losses and expenses arising out of the Contractor's performance of the work, provided such claim damage, loss and expense are attributable to:
  - (1)** Bodily injury, sickness, disease or death, or to injury to tangible property, including the loss of use resulting there from, and
  - (2)** Negligence of the contractor or his subcontractors and others directly related to the project or both.

#### **1.06 COOPERATION OF THE CONTRACTOR AND REPRESENTATIVE**

- A.** The Contractor shall give the work his constant attention to facilitate the progress thereof and shall cooperate with the Engineer and Owner.
- B.** The Contractor shall have at all times a competent and reliable English-speaking representative on the work, authorized to receive orders and act for him.

### **1.07 COOPERATION WITH OTHER CONTRACTORS**

- A. The Contractor shall cooperate with and so conduct his operations as not to interfere with or injure the work of other Contractors or workman employed by the Owner.
- B. He shall promptly make good, at his own expense, any injury or damage which may be done by him or his employees or agents on the work.
- C. The contractor shall suspend such part of the work herein specified or shall carry on the same such manner, as may be ordered by the engineer.

### **1.08 AUTHORITY AND DUTIES OF THE RESIDENT PROJECT REPRESENTATIVE**

- A. Resident Project Representative (RPR) employed by the Owner or Engineer shall be authorized to observe all work done and materials furnished.
- B. Such observation may extend to all or any part of the work and to the preparation or manufacture of the materials to be used.
- C. An RPR may be stationed on the work for the purpose of reporting to the Engineer as to the progress of the work and the manner in which it is being performed; also to report whenever it appears that the materials furnished and work performed by the Contractor fail to fulfill the requirements of the specifications.
- D. No inspection, nor any failure to inspect, at anytime or place, however, shall relieve the Contractor from his obligation to perform all of the work strictly in accordance with the requirements of the specifications.
- E. The RPR shall perform such other duties as are assigned to him.
- F. He shall not be authorized to revoke, alter, enlarge, relax or release any requirements of these specifications, or to approve or accept any portion of work, or to issue instructions contrary to the drawings and specifications.
- G. The RPR shall in no case act as foreman or perform other duties for the Contractor nor interfere with the management of the work by the latter.

### **1.09 DEFECTIVE MATERIALS AND WORK**

- A. All materials not conforming to the requirements of these specifications shall be considered defective and all such materials whether in place or not, shall be rejected and shall be removed immediately from the work unless otherwise permitted.
- B. No material which has been rejected, the defects of which have been corrected or removed, shall be used until approval has been given.

- C. All work which has been rejected or condemned shall be remedied, or if necessary removed and replaced in an acceptable manner by the Contractor at their own expense.

#### **1.10 FAILURE TO REMOVE AND RENEW DEFECTIVE MATERIALS AND WORK**

- A. Should the Contractor fail or refuse to remove and renew defective materials used for work performed previously or to make any necessary repairs in an acceptable manner, and in accordance with the requirements of these specifications, within the time indicated in writing, the Engineer shall have the authority to cause the unacceptable or defective materials or work to be removed and renewed or such repairs to be made at the Contractor's expense.

#### **1.11 LAWS TO BE OBSERVED**

- A. The Contractor shall observe and comply with federal, state, county and local laws, ordinances, rules, regulations, decrees and orders that are in effect and applicable to the work during the time of construction; and he shall see that his Subcontractors likewise meet this requirement.
- B. He shall indemnify, and hold harmless, the Owner and his representatives against claims and liability arising from the Contractor and Subcontractors violations of such laws, ordinances, rules, regulations, decrees, and orders, whether such violations be by the Contractor or any Subcontractor, or any of their agents and/or employees.

#### **1.12 LINES, GRADES, AND ELEVATIONS**

- A. The Contractor shall be responsible for lay out of the lines, grades and elevations of the work and shall confirm his work thereto.
- B. The Contractor shall furnish the Engineer, at least five (5) days prior to the start of construction, two (2) record copies of line and grade stakeout data as well as cut sheets for approval.
- C. The furnishing of such record data shall in no way release the Contractor from his responsibility for the completeness and accuracy of stakeout work necessary for construction.
- D. All survey and stakeout work shall be done by a Licensed Delaware Professional Land Surveyor.
- E. All proposed manholes, catch basins, etc. shall be field located by the Contractor prior to the start of construction.

- F. Notice shall be given to the Engineer to observe the location and make any adjustment deemed necessary.

### **1.13 SANITARY PROVISIONS**

- A. The Contractor shall provide and maintain in a neat and sanitary condition such sanitary conveniences and accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the Department of Health or of other bodies or tribunals having jurisdiction thereof.
- B. He shall commit no public nuisance.

### **1.14 PUBLIC CONVENIENCE AND SAFETY**

- A. The Contractor shall conduct work in a manner that will minimize obstruction to traffic in the area.
- B. The safety and convenience of the general public and of the residents and occupants of property along and adjacent to the work shall be provided in an adequate and satisfactory manner.
- C. Footways and portions of highways and streams adjoining the work shall not be obstructed more than absolutely necessary.
- D. In no case shall any traveled thoroughfare be closed without permission of the owner.
- E. Fire hydrants on or adjacent to the work shall be kept accessible to fire apparatus at all times, and no obstructions shall be placed within fifteen (15) feet of any hydrant.
- F. Gutters and storm drain inlets shall be kept unobstructed at all times.
- G. The Contractor shall provide a traffic control plan to the City for approval prior to the commencement of any work in the City Right-of-Way.
- H. Any fire hydrant taken out of service, or not yet in service, must be bagged and indicated so by the Contractor.

### **1.15 BARRICADES, DANGER, WARNING, AND DETOUR SIGNS**

- A. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and provide a sufficient number of watchmen and take all necessary precautions for the protection of the work and safety of the public.

- B. Highways closed to traffic shall be protected by effective barricades, on which shall be placed acceptable warning signs.
- C. The contractor shall detour traffic and shall furnish and maintain all detour signs required to direct traffic over the entire route of the detour.
- D. Costs for maintaining traffic shall be the responsibility of the Contractor.

#### **1.16 WORK AFFECTING DELAWARE DEPARTMENT OF TRANSPORTATION JURISDICTION**

- A. All materials and construction methods for work affecting State of Delaware, Department of Transportation jurisdiction shall be done in complete accordance with permit and/or franchise stipulations or directives issued by same.
- B. All costs for such work shall be the responsibility of the Contractor.
- C. Maintenance of traffic shall be accomplished in full accordance with the Delaware Department of Transportation publication, "Traffic Controls for Street and Highway Construction and Maintenance Operations", latest edition.
- D. Work in Department of Transportation Right-of-Way shall not commence without an approved Maintenance of Traffic (MOT) plan.

#### **1.17 PRESERVATION AND RESTORATION OF PROPERTY**

- A. The Contractor shall not enter private property without permission.
- B. The Contractor shall take necessary measures to preserve public and private property, including paving and lawns outside the required excavation lines, adjacent to the property.
- C. He shall not permit monuments to be moved until an authorized agent has referenced their locations, and until directed to move them.
- D. The Contractor shall pay all expenses for replacing property markers disturbed.
- E. The Contractor shall be responsible for damages to property, whether caused by himself, his subcontractors, or as a result of negligent construction methods.
- F. The Contractor shall provide restoration of damaged property to its original condition, or better, at no additional cost to the Owner.
- G. If the Contractor fails to restore such property, the Owner may, upon 48-hour notice, have the property restored at the Contractor's expense.

**1.18 CONTRACTOR'S RESPONSIBILITY FOR WORK**

- A. Until the final acceptance of all the work shall be indicated in writing by the Engineer, the work shall be under the charge and care of the Contractor.
- B. He shall take every precaution against destruction of, injury, or damage to the work or to any part thereof from any other cause whatsoever.
- C. The Contractor shall rebuild, repair, restore, and make good, at his own expense, all destruction of, injuries, or damage to the work or any of the above causes before its final completion and acceptance shall be indicated in writing by the Engineer.

**1.19 TESTING OF SAMPLE MATERIALS**

- A. Tests of materials shall be made at the Contractor's expense, by a certified testing laboratory, in accordance with the officially approved methods as described or designated.
- B. The Owner reserves the right to conduct verification testing at his own expense.
- C. The Contractor shall cooperate with and assist the Owner in taking samples and packing them for shipment to a laboratory.

**1.20 STORAGE OF MATERIALS**

- A. Materials shall be stored so as to insure the preservation of their quality and fitness for work.
- B. When considered necessary, they shall be placed on wooden platforms or other hard clean surfaces, and not on the ground, and shall be placed under cover when directed.
- C. Stored materials shall be located so as to facilitate prompt inspection.
- D. Lawns, grass plots, or other private property shall not be used for storage purposes without written permission of the owner or lessee.

**1.21 QUALITY OF MATERIALS AND WORKMANSHIP**

- A. Materials and workmanship shall be of best possible quality and feasibility for the intended purpose, whether or not a brand name is specified.
- B. Materials shall be new and unused.
- C. Representative preliminary samples of materials may be requested by the Engineer for examination or testing, or both.

- D. Materials, for which samples are submitted to the Engineer, shall not be ordered by the Contractor until the Engineer furnishes written approval of said samples.
- E. Materials may be further inspected by the Engineer during preparation and construction of the work; and materials found to be substandard will be rejected.
- F. Mechanical equipment which is designed as part of the improvements, to service the general needs of the site, shall be screened from view. Screening may be architectural or by means of landscaping. The long-term maintenance of the screening shall be the responsibility of the Developer or the homeowners association.

## **1.22 CLEAN UP**

- A. The Contractor shall, at his own expense, keep the sites of his operations clean during construction and remove all rubbish as it accumulates.
- B. Upon failure of the Contractor to keep the sites of his operation clean to the satisfaction of the Owner, the Owner may, upon 24 hours notice to the Contractor, remove rubbish, as is deemed necessary, and charging the cost thereof to the Contractor.
- C. On or before the completion of the work, the Contractor shall, without charge therefore, tear down and remove all his buildings and temporary structures built by him, shall remove all rubbish or all kinds from any grounds which he has occupied and shall leave the site of the work in a clean and neat condition.
- D. The Contractor shall be responsible for keeping all areas of the property in a clean and orderly state at all times. All weeds, grass and overgrowth shall be cut on a regular basis. Grass and weeds shall at no time be taller than ten inches (10").

## **1.23 TEMPORARY SUSPENSION OF WORK**

- A. The Engineer shall have the authority to suspend the work, wholly or in part, for such period or periods as he may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the suitable execution of the work, or for such time as is necessarily due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract and or specifications.
- B. If it should become necessary to stop work for an indefinite period, the Contractor shall store all materials in such manner that they will not obstruct or impede the traveling public unnecessarily nor become damaged in any way, and he shall take every precaution to prevent destruction, damage or deterioration of the work

- performed, provide suitable drainage by opening ditches, shoulder drains, etc., and erect temporary structures where necessary.
- C. The Contractor shall not suspend the work without authorization.
  - D. Neither the failure of the Engineer to notify the Contractor to suspend the work on account of bad weather or other unfavorable conditions, nor permission by the Engineer to continue work during bad weather or other unfavorable conditions, shall be a cause for the acceptance of any work which does not comply in every respect with the contract and specifications.

#### **1.24 PARTIAL AND FINAL COMPLETION**

- A. The City shall consider a project to be at partial completion when the following conditions have been satisfied.
  - (1) All water and sewer infrastructure has been installed and tested to the satisfaction of the City. This shall include all sewer lateral and water meter pit frames and covers being set to the proper grade. In the case of a phased project, this shall include all of the above water and sewer infrastructure which has been installed and tested to the satisfaction of the City that is essential for the satisfactory operation of the water and sewer infrastructure within the current phase. An approval to operate the Water Main must be delivered to the City of Seaford. Refer to the specification sections regarding water and sewer for testing requirements.
  - (2) All stormwater pipe and associated structures have been installed to the satisfaction of the City and the Conservation District. This shall include any stormwater pond(s) and swale(s). In the case of a phased project, this shall include all of the above which are necessary for the operation of the infrastructure within the current phase.
  - (3) The installation of all curbing (if required) and base coat of hot mix asphalt to the satisfaction of the City. In the case of a phased project, this shall include all of the above within, and to the full extent of the current phase, as described on the approved construction documents.
  - (4) The installation of all street signage within the current phase.
  - (5) The City shall inspect each of the above items and generate a punch list. The Contractor shall contact the City when all the items on the punch list have been addressed. The City will then re-inspect the above items. After the reinspection, the City will either re-issue a punch list or declare that all of the above items have been satisfactorily complete.
  - (6) Submission and approval of the partial record (“as-built”) drawings as described within Item 38 of these General Conditions. In the case of a

phased project, the record drawings shall include all required items within the area being considered for partial completion and dedication.

- (7) The Owner shall submit a maintenance bond to the City after the project, or the current phase of the project has been partially accepted by the City. The bond shall be equivalent to twenty percent (20%) of the material and installation costs of all items included in number 1 through 4 above. The Owner shall substantiate the amount of the bonds by submitting an itemized breakdown, or invoices, provided by the Contractor. The term of the bond shall be two (2) years from the date of its acceptance by the City.
  - (8) No certificate of occupancy shall be issued until a project, or the current phase of a project, has been partially accepted by the City, and until a maintenance bond has been submitted.
- B.** The City shall consider a project to be at final completion when the project has previously been deemed partially complete and:
- (1) All top coat of hot mix asphalt has been installed to the satisfaction of the City. In the case of a phased project, this shall include all of the top coat of hot mix asphalt within and to the full extent of the current phase (or phases) as shown on the approved construction documents. No hot mix asphalt top coat shall be installed until seventy-five percent (75%) of the housing structures planned for the entire project have been completed.
  - (2) All utilities proposed for the project have been installed and the entire site has been graded and stabilized to the satisfaction of the City and the Conservation District. In the case of a phased project, this shall include all of the above within and to the full extent of the current phase (or phases).
  - (3) Submission and approval of the record (“as-built”) drawings as described within Item 38 of these General Conditions. In the case of a phased project, the record drawings shall include all required items within the area being considered for final completion and dedication. The O & M Manuals shall also be submitted by the Contractor.
  - (4) The City shall inspect the items above. The City shall generate a punch list which shall detail deficiencies in any of the above items, including any deficiencies which may exist in items associated with partial acceptance, provided the maintenance bond submitted at the time has not expired. The Owner/Contractor shall contact the City when all items on the punch list have been addressed. The City will then re-inspect the above items. After the re-inspection the City will either re-issue a punch list or deem that all of the above items have been satisfactorily completed.
  - (5) The Owner shall submit a maintenance bond to the City after the project, or current phase of the project has been fully accepted by the City. The

amount of the bond shall be twenty percent (20%) of the costs for the materials and installation of the top coat of asphalt. The Owner shall substantiate the amount of the bond by submitting an itemized cost breakdown, or invoices, provided by the Contractor. The term of the bond shall be two (2) years from the date of its acceptance by the City.

#### **1.25 TERMINATION OF MAINTENANCE PERIOD(S)**

- A. It shall be the Contractor's responsibility to notify the City prior to the termination of any two (2) year maintenance period.
- B. Upon being notified that any maintenance period is near the termination point, the City shall perform an inspection of the items for which the bond may apply. The City shall, if necessary, generate a punch list and provide a copy to the Contractor. When all items are acceptable to the City, the maintenance bond, or its unused portion, shall be surrendered to the Contractor by the City.

#### **1.26 UNLIMITED LIABILITY OF THE CONTRACTOR**

- A. It is understood and agreed that any and all of the duties, liabilities and/or obligations imposed upon or assumed by the Contractor by or under these specifications, shall be taken and construed to be cumulative, and that the mention of any specific duty, liability or obligation imposed upon or assumed by the Contractor under these specifications shall not be taken or construed as a limitation or restriction upon any or all of the other duties, liabilities and/or obligations imposed upon or assumed by the Contractor.

#### **1.27 WORK HOURS**

- A. Work is permitted between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturdays. Written permission from the City is required prior to performing work outside of these limits.

#### **1.28 LEGAL HOLIDAYS**

- A. The Contractor will not be permitted to work on Sundays or days which are legal holidays in the City of Seaford, except in cases of emergency. An emergency is defined as "any occurrence or set of circumstances involving actual or imminent physical trauma or property damage demanding immediate attention," as taken from the city code.
- B. In case he desires to work upon any Sunday or any such legal holidays, he shall notify the Engineer or Owner in writing at least two (2) days in advance of such Sunday or legal holiday that he desires to work, stating the place where the said work will be conducted.

## 1.29 GUARANTEE

- A. The Contractor hereby guarantees all of the work for a period of two (2) years after the date of completion and final acceptance thereof by the Owner as follows:
- (1) Against all faulty materials and against all imperfect, careless, and unskilled workmanship.
  - (2) That the entire equipment and each and every part thereof shall operate (with proper care and attention) in a satisfactory and efficient manner, and in accordance with the requirements of the construction documents and the specifications contained herein.
  - (3) That all structures shall be watertight and leak proof at every point and in every particular.
  - (4) The Contractor agrees to replace, with proper workmanship and materials, and to reconstruct, correct, or repair without cost to the Owner, work which is improper, imperfect, does not operate in a satisfactory manner, or fails to perform as specified, or all of these.
  - (5) The guarantee obligations assumed by the Contractor under these documents shall not be held or taken to be in any way impaired because of any specification errors, indication or approval by or on behalf of the Owner of articles, materials, means, combinations of things used in the construction, performance and completion of the work or any part thereof, or all of these.
  - (6) No use acceptance by the owner of the work or any part thereof, nor any failure to use the same, nor any repairs, adjustments, replacements or corrections made by the Owner due to the Contractor's failure to comply with his obligations under the contract documents, shall impair in any way the guarantee obligations assumed by the contractor.

## 1.30 SHOP DRAWINGS

- A. The Contractor shall submit six (6) copies of layout drawings for installation and erection of the work and shop drawings for all fabricated or manufactured articles required for the work unless otherwise directed by the Engineer.
- B. The Contractor shall not order materials until receiving shop drawing approval.
- C. Regardless of corrections made in or approval given to shop drawings by the Engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the plans and specifications, unless he

notifies the Engineer in writing of any deviation at the time he furnishes such drawings.

D. Only drawings bearing the approval stamp of the Engineer shall be used for ordering materials or for construction.

E. The Contractor shall sign or stamp each submittal stating the following:

Checked by \_\_\_\_\_ (Contractor's Name)

Signed by \_\_\_\_\_ (Checker's Name)

### 1.31 SCHEDULE OF CONSTRUCTION

A. The Contractor shall complete the installation of utilities according to a schedule of construction as submitted by the Contractor and approved by the Owner.

B. Submit six (6) copies for approval.

C. The Contractor shall provide a minimum three (3) different persons to contact in the event of an emergency. Twenty-four (24) hour telephone numbers shall be provided for each of these individuals.

D. The schedule and process for connecting to existing City of Seaford utilities shall be provided. It shall be noted that only City of Seaford Personnel are authorized to operate water valves.

### 1.32 ISSUANCE OF BUILDING PERMIT(S)

A. No building permit shall be issued until the curbing, where applicable, and stone sub-base have been installed within the project, or within the current phase of the project.

B. No building permit shall be issued until all utility easements have been recorded with the Sussex County Recorder of Deeds and a copy of said easement has been provided to the City of Seaford.

### 1.33 ISSUANCE OF CERTIFICATE(S) OF OCCUPANCY

A. No certificate(s) of occupancy (CO) shall be issued until the project or the current phase of a project has received acceptance of partial completion from the City.

B. The City shall also perform an inspection of the site at the time of the request for a CO. The Developer/Contractor shall be required to repair any damage to curb, sidewalk, sewer lateral cleanouts, water meter pits, and the frames and covers of the latter. The specific site grading shall be required to be complete and free of

any ponding areas. All utility pedestals, transformers, frames and covers shall be set to the proper grade.

### **1.35 PAYMENT FOR RESIDENT PROJECT REPRESENTATIVE**

- A. Fees for RPR inspection shall be paid by the Developer/Contractor. Contact the City for details concerning RPR inspection fees prior to commencing construction.

### **1.36 LOCATION OF EXISTING UTILITIES**

- A. The Contractor shall contact "Miss Utility" at 411 and the City of Seaford Public Works Department 302-629-8307 and Electric Department 302-629-9841 at least 72-hours prior to digging in the vicinity of existing underground utilities to have them located and marked.
- B. It shall then be the Contractor's responsibility to verify these utilities, by test pits, a minimum of fifteen (15) days in advance of actual construction operations in the vicinity of the utilities.
- C. The failure to show on the contract documents any existing utilities shall not relieve the Contractor of his responsibilities of determining the location of these utilities, and any damage to the utilities or interruption of service shall be repaired by the contractor according to the City or utility company specifications.
- D. The Owner shall be notified of any damage to any utilities.
- E. Only City of Seaford personnel are authorized to operate valves, pumps, etc.

### **1.37 WATER SUPPLY**

- A. The Contractor shall at his own cost provide such quantities of clean water as may be required for any and all purposes under the contract.
- B. He shall supply sufficient drinking water to all his employees.

### **1.38 RECORD ("AS-BUILT") DRAWINGS**

- A. The Contractor shall keep one copy of the contract documents at the site in good order, and provide mark-up to show all changes made during construction. These mark-up drawings shall be available to the Owner upon request. Upon completion of the project, the Contractor shall have the property surveyed by a Licensed Delaware Professional Land Surveyor. The survey shall contain any and all information below that is applicable. These record drawings must also be submitted as an electronic file. The electronic file shall be in AutoCAD format (version 2004 or older).
  - (1) A written and graphic scale. Scale shall be sufficient to show detail.

- (2) A prominent north arrow shall be drawn on every sheet.
- (3) A description of the bearing reference system shall be stated on the cover sheet. The North American Vertical Datum of 1988 (NAVD 88) shall be used for all vertical datums. The Delaware Coordinate System of 1983 (DCS 83) shall be used for all horizontal datums.
- (4) Indicate the location of the reference bench mark.
- (5) Indicate all Federal Emergency Management Agency (FEMA) elevation reference points within three-thousand (3,000) feet of the site.
- (6) Indicate all State of Delaware Wetlands or Army Corp of Engineers 404 Wetlands on or adjacent to the site.
- (7) Indicate all floodplain lines on the site.
- (8) Indicate all Wellhead Protection Areas and Excellent Recharge Areas on the site.
- (9) All monuments, found or set shall be shown and described on the plan.
- (10) All physical evidence along a boundary line, including fences, walls or buildings.
- (11) Identify all public and private right-of-ways, including widths.
- (12) Locate all permanent improvements including, but not limited to:
  - a. Water mains, valves, bends, fire hydrants, meter pits, pipe and valve sizes, capped stubs, and blow-off valves.
  - b. Sewer mains, manholes, cleanouts, air release valves, manhole invert elevations, manhole rim elevations, and pipe sizes (including laterals).
  - c. Storm sewer pipe and size, catch basins, manholes, invert elevations, and grate and/or manhole rim elevations.
  - d. Sanitary sewer force main bores shall be surveyed at twenty-five (25) foot intervals and shall indicate the depth and location.
- (13) Location of all signage on the property.
- (14) Location of all sidewalks and curb cuts.

- (15) Location of all dumpster pads, including information on screening.
  - (16) Location of any satellite and/or tower equipment.
  - (17) Location of any electric transformers.
  - (18) Location of any meter boxes.
  - (19) Location of any secondary electric boxes.
  - (20) Location of any utility poles on site.
  - (21) Location of any underground equipment, including private irrigation service.
  - (22) Location of any free standing lighting.
  - (23) Location of any gas lines.
  - (24) Location and as-built survey of all storm water management ponds and structures, including swales and direction of flow.
  - (25) Location of turn-off valve for gas line.
  - (26) Location of bus shelter(s), including proposed advertising located on structure wall(s).
  - (27) Identify all utility and/or drainage easements provided to the City.
  - (28) Identify the location of all landscaping in the area of City utilities.
  - (29) Label all open space, including any recreation equipment.
  - (30) Location of any telephone utility improvements.
  - (31) Location of any cable utility improvements.
- B.** The record drawings shall be reviewed by the City and the Contractor shall be informed as to whether they are acceptable.

**END OF SECTION**

## SECTION CONTENTS

### SECTION 2: EXCAVATION AND BACKFILL

- 2.01 General Provisions
- 2.02 Pipeline Trench Excavation
- 2.03 Pipeline Trench Backfill
- 2.04 Excavation below Subgrade and Gravel Refill
- 2.05 Dewatering
- 2.06 Sheet piling, Shoring, and Bracing
- 2.07 Select Backfill
- 2.08 Temporary Repaving

## SECTION 2 – EXCAVATION AND BACKFILL

### 2.01 GENERAL PROVISIONS

- A. The Contractor shall perform all excavation, backfilling, grubbing and grading required for construction and installation of pipelines, structures and appurtenances. Excavation shall include removal of pavement, concrete, rock, earth and debris, regardless of character. Trenches and excavations shall be sheeted, shored and braced by the Contractor, as necessary to allow construction and provide safe working conditions. Additionally, the contractor shall be responsible for maintaining a dry excavation by dewatering. He shall also locate, support and protect existing utilities and structures encountered in the work, provide traffic control, dispose of surplus and unsuitable excavated materials and restore backfilled areas to original condition or as required by the respective contract drawings and specifications. All backfilled and restored areas shall be maintained by the Contractor, in a proper condition, for the duration of the project.
- B. The Contractor is responsible for direct or indirect damage to existing structures, pipelines, conduits, poles, wires of every description in the vicinity of his work whether above or below ground, or that may be encountered in trench or structure excavation. This responsibility shall include the cost of protection by sheeting, bracing, hand excavation, when warranted, and the expense to repair or replace any existing facility damaged directly or indirectly by construction activities, whether such facility is or is not shown on the drawings.
- C. The Contractor shall verify the location, size and inverts of all existing utilities at the various points of connection and/or crossings prior to starting any work. Any discrepancies in locations or inverts shall be brought to the attention of the Engineer or the Owner in order that the designs may be adjusted accordingly. Damages suffered or additional costs incurred by the Contractor as a result of his failure to conform to the requirement of this paragraph shall be the sole responsibility of the Contractor. Connections to existing utilities shall be made by the Contractor at such a time and in such a manner as the Engineer or Owner may direct.
- D. Excavation and backfill, within an area where a State agency has jurisdiction, shall be done in accordance with requirements and provisions of the permits issued by the agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these specifications.

### 2.02 PIPELINE TRENCH EXCAVATION

- A. The Contractor shall excavate, maintain and backfill all excavation necessary for completing the work under the contract. Unless otherwise specified or approved, excavation shall be open cut.

- B. Trenches shall be excavated to the necessary width and depth, as shown on the drawings and as required for the safe installation of the utility, etc.
- C. The sides of the trenches shall be practically plumb and shall not be sloped unless approved in writing by the Engineer. Trench sides shall be supported or sheeted as required to protect pavement surfaces, curbing, utilities, etc., and required for safety. Safety regulations shall be as required by State codes and OSHA.
- D. In paved areas, the Contractor shall remove the paving only as necessary for the excavation of the trench or as detailed. Pavement edges at the trench shall be saw cut neat and straight prior to the start of any excavation. Should the pavement damage result from cave-ins, settlement, etc., he shall replace such paving at his own expense.
- E. The excavation of all trenches shall be fully completed at least 20 feet in advance of pipe being laid, unless otherwise authorized or directed. The Engineer or Owner may require the backfilling of open trench, over completed pipelines, or ahead of the pipe laying operation, if in his judgment such action is necessary.
- F. Should work be stopped for any reason and any excavation is left open for an unreasonable length of time, the Contractor shall refill the excavation at his own expense if so directed, and shall not reopen the excavation until he is ready to complete the facility. Should the Contractor refuse or fail to refill any excavation completely within 8 hours after a proper notice, the Owner shall be authorized to do the work and expenses resulting shall be paid by the Contractor.
- G. The Contractor shall complete excavation as nearly as practicable to the lines of the utility to be installed as detailed. All cavities in the bottom of the trench shall be filled to the required level with compacted crushed stone or gravel.
- H. Excavated materials shall be graded; hauled, stored and protected as such materials found suitable will be required for backfilling, repaving or other purposes. Material classified as unsuitable shall be disposed of by the Contractor.
- I. Excavated materials shall not be placed on private property, unless written permission is obtained from the property owner.
- J. The Contractor shall be responsible for any damage to curb, gutter, sidewalk, traffic control devices, pavement material. Any damage resulting directly or indirectly shall be replaced in kind by the Contractor. The reuse of disturbed curb, gutter, or sidewalk is prohibited. New sections shall be installed to the nearest undisturbed control joint.

### 2.03 PIPELINE TRENCH BACKFILL

- A. Materials excavated from the trench shall be used for trench backfill, provided that, in the opinion of the Engineer or Owner, the excavated materials is suitable for this purpose. Backfill material shall be free from large lumps and stones having any dimension greater than two (2) inches.
- B. Suitable material, as approved by the Engineer, shall be carefully deposited in the trench by methods which will not damage or disturb the pipeline or structure, and shall be solidly tamped around the pipe or structure. Backfill material shall be placed in eight (8) inch loose layers. Care shall be taken in the use of mechanical tampers not to injure or move the pipe or to cause the pipe to be supported unevenly
- C. All backfill material shall be compacted to ninety five percent (95%) of maximum density between minus two percent (-2%) to plus two percent (+2%) optimum moisture content as determined by the Modified Proctor Test, ASTM D1557. Materials containing an excess of moisture shall be permitted to dry until the moisture content is within the specified range. Materials too dry shall be wetted uniformly until the moisture content is in the specified range.
- D. No compacting shall be done when the material is too wet to be compacted properly. At such times the work shall be suspended until the backfill materials have dried out sufficiently to permit proper compaction or such other precautions shall be taken as may be necessary to obtain proper compaction. The Contractor is responsible for hauling, storing and drying of excavated material to be used in backfill operations.
- E. The Engineer may request compaction tests of the backfilled trenches at any time during construction or upon completion of the backfill operations. Such testing shall be arranged by the Contractor and performed by an independent testing agency approved by the Engineer. The Contractor shall pay the testing laboratory for all tests performed inclusive of sample collection, preparation and transportation. If the results of any tests show that backfills do not meet the specified compaction, the Contractor shall, at his own expense, correct the condition as directed by the Engineer.
- F. The Contractor shall, at his own expense, maintain all refilled excavations in proper condition. Trench surfaces shall be reshaped when necessary. If the Contractor fails to make repairs within 48 hours after receipt of written notice from the Owner, the Owner may refill said depression wherever necessary and the cost of so doing will be paid by the Contractor. The Contractor shall be responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at anytime prior to final acceptance.

- G. All unauthorized excavations made by the Contractor shall be immediately backfilled in accordance with the requirements of the specifications for trench backfill at the Contractor's expense.
- H. After completion of backfilling, all material not used shall be disposed of and all places on the line of work shall be left clean and in good condition. This cleaning up shall be done by the Contractor. If he fails to do this work within a reasonable time after receipt of notice, it will be performed by the Owner and the cost will be assessed to the Contractor.
- I. No backfill shall be placed against new concrete or masonry structures until properly cured. In the case of concrete, test reports must indicate that a two thousand five hundred (2,500) psi or higher, if required, compressive strength exists.
- J. The Contractor shall exercise caution in backfill and compaction to prevent damage to structures.

#### **2.04 EXCAVATION BELOW SUBGRADE AND GRAVEL REFILL**

- A. Materials below the excavation limit for pipelines and structures (below subgrade), which in the judgment of the Engineer or Owner should be removed, shall be removed as directed. All spaces created by the removal of unsuitable material below subgrade shall be refilled and compacted with crushed stone or gravel.

#### **2.05 DEWATERING**

- A. All excavations, below the subgrade of the work, must be kept free of water while work is in progress. This may be accomplished by ordinary pumping methods or by well points, whichever will produce the required results. Upon removal of dewatering equipment, the Contractor shall backfill all holes and restore disturbed areas to their original condition.
- B. Dewatering for the structures and pipelines shall commence when ground water is first encountered and shall be continued until such time as backfill has been completed. No concrete footings shall be laid in water nor shall water be allowed to rise over them until the concrete or mortar has set at least each eight (8) hours. Groundwater shall not be allowed to rise around the pipe until the trench is backfilled.
- C. The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be disposed of in such a manner as not to be a menace to the public health.

- D. The Contractor shall remove any siltation deposits in storm sewer systems resulting from his dewatering or construction operations. He shall also be responsible for conveyance of dewatering flows and for erosion and sediment control.

## **2.06 SHEETING, SHORING, AND BRACING**

- A. The Contractor shall furnish and install all sheeting, shoring and bracing necessary to insure safe working conditions and to prevent damage to public and private property and structures. If, in the opinion of the Engineer, the sheeting, shoring, or bracing is not of proper quality or is not properly placed to insure safe working conditions and to prevent property damage, the Contractor shall remedy such inadequacy at his own expense as may be directed by the Engineer. Sheeting, shoring and bracing shall be removed as backfilling progresses, except at such locations as the Engineer may direct or approve it to be left in place.
- B. The Contractor shall cut off any sheeting left in place, at least 18 inches below finished grade, and shall remove the material cut off without compensation.
- C. Where necessary for the protection of any structure or property, sheeting shall be driven to such depth below the bottom of the trench as may be required to protect all existing and/or proposed work.
- D. A trench box is an acceptable alternative to sheeting, shoring or bracing providing such boxes conform to safety codes in effect for the project.

## **2.07 SELECT BACKFILL**

- A. Should the Contractor encounter unsuitable material during excavation, he shall remove and dispose of such material.
- B. Should sufficient suitable material from excavations on the project not be available for backfill, the Contractor shall furnish Select backfill upon approval of the Engineer. Special backfill shall conform to Delaware Department of Transportation Type "C" borrow.
- C. The Contractor shall furnish certification that his borrow is from a Delaware Department of Transportation approved source.

## **2.08 TEMPORARY REPAVING**

- A. The Contractor shall furnish, place and compact 2 inches of cold patch as temporary pavement surface over all backfill areas created for pipelines and structure installation located in roadways or driveways. This surface shall be maintained by the contractor until permanent surface restoration has been performed.

- B. Should the Contractor remove existing pavement beyond the width specified or detailed on the plans, or should pavement be disturbed from settlement, slides or other construction activities, he shall saw cut back the pavement and provide temporary paving in these areas.
- C. On State of Delaware highways and all other areas over which the Delaware Department of Transportation exercises jurisdiction, all pavement restoration shall be done in accordance with the permit requirements of the Division of Highways.

**END OF SECTION**

## SECTION CONTENTS

### SECTION 3: SANITARY SEWER GRAVITY MAINS, FORCE MAINS, AND APPURTENANCES

- 3.01 General Provisions
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- 3.04 High Density Polyethylene (HDPE) Pipe and Fittings (Force Main By Horizontal Directional Drill)
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- 3.10 Horizontal Directional Drill (Force Main Only)
- 3.11 Sanitary Sewer Manholes
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## SECTION 3 – SANITARY SEWER GRAVITY MAINS, FORCE MAINS AND APPURTENANCES

### 3.01 GENERAL PROVISIONS

- A. The Contractor shall furnish all material and shall construct pipe lines and all required appurtenances at the locations and to the lines, slopes and elevations shown on the drawings or designated by the Engineer.
- B. All sanitary sewer pipe shall be polyvinyl chloride (PVC) pipe, unless otherwise noted herein.
- C. The Contractor shall submit certification to the Engineer that all pipe, fittings and joints are as specified herein.

### 3.02 POLYVINYL CHLORIDE SEWER PIPE AND FITTINGS (GRAVITY MAIN)

- A. Polyvinyl chloride (PVC) pipe, used for sewer construction of 6" diameter and larger, shall equal or exceed the requirements of ASTM D-3034 and shall have a minimum standard dimension ratio (SDR) of thirty-five (35) and the minimum pipe stiffness, as tested in accordance with ASTM D-2412, shall be forty-five (45) psi when measured below five percent (5%) deflection at seventy-three degrees (73°) Fahrenheit. Pipe shall be manufactured with integral wall bell and spigot joints in standard lengths not exceeding twenty (20) feet. Sewer construction less than 6" diameter shall equal or exceed the requirements of Schedule forty (40).
- B. All PVC sewer pipe shall be located a minimum of 36" below grade.
- C. All polyvinyl chloride (PVC) pipe and fittings shall utilize an elastomeric O-ring gasket joint, assembled in accordance with the manufacturer's recommendations. Gaskets shall have a minimum cross sectional area of 0.20 square inches and conform to ASTM F-477 specification.
- D. Polyvinyl chloride wye branches, pipe stoppers and other fittings shall be manufactured in accordance with the same specifications and shall have the same thickness, depth of socket, and annular space as the pipe. Tee fittings will not be permitted for use. Wye branches shall be complete pipe sections. **Saddles will not be permitted for use.**
- E. Polyvinyl chloride pipe shall be delivered and stockpiled in unit pallets. Stacking of pallets above five (5) feet in height will not be allowed. If pipe is stockpiled for more than thirty (30) days prior to installation in the trench, it must be suitably covered with reflective material to protect the pipe from ultraviolet rays emanating from sunlight. Do not use plastic sheets. Allow for air circulations under covering.
- F. Bowed sections of pipe will be unacceptable and installation of pipe which has bowed, whether or not the bow has been corrected, will not be allowed.

### 3.03 POLYVINYL CHLORIDE SEWER PIPE AND FITTINGS (FORCE MAIN)

- A. PVC Pipe shall be SDR21 and shall be manufactured to meet or exceed the requirements of ASTM D-2241. All fittings shall be schedule eighty (80). Pipe shall be manufactured in lengths not exceeding twenty (20) feet. Pipe shall be integral bell by plain end design.
- B. Pipe Joints:  
All pipes to be connected by solvent welding shall be installed by experienced pipe layers, to the satisfaction of the Engineer. Jointing shall be done in the manner recommended by the manufactures. The PVC compound shall meet ASTM D-1784 requirements.
- C. Pour concrete thrust blocks according to the details on all horizontal or vertical pipe bends.
- D. The force mains shall be filled with water, supplied by the Contractor, as directed by the Engineer and the pressure raised to obtain a minimum test pressure of seventy-five (75) psi or two (2) times the operating pressure, whichever is greater, measured at the highest point of the section of pipeline under test. Particular care shall be taken to eliminate all air from the pipeline. The force mains shall be subject to a leakage test at the specified test pressure, measured at the highest point of the section of pipeline under test. This test shall be a minimum of four (4) hours duration, during which time the leakage shall not exceed twenty-five (25) gallons per one (1) inch of diameter per mile in twenty-four (24) hours, and this is not to include any visible leaks. All visible leaks shall be repaired by the Contractor at no expense to the Owner. The Contractor shall make any and all repairs at his expense that may be necessary until the leakage test requirements have been met.

### 3.04 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS (FORCE MAIN BY HORIZONTAL DIRECTIONAL DRILL)

- A. HDPE pipe shall be SDR11 plain end for fusion welding conforming to ASTM F 714 and ASTM D 3035. Minimum pressure rating shall be 160 psi.
- B. Molded fittings will conform to ASTM F 714. End sections of HDPE piping in directional bore shall have an AWWA C-207 Class D flanged end butt. Fusion welded to HDPE main. Flange shall be drilled to standard 125 pound tensile.
- C. Terminal end of PC pipe shall be connected to continuing ductile iron, PVC or HDPE pipe with a flanged expansion joint. The flanged expansion joint shall be a "FlexTend" flexible expansion joint as manufactured by EBAA, or approved equal.

### 3.05 PIPE INSTALLATION

- A. Pipe and fittings shall be carefully handled and lowered into the trench. 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 pipe.
- B. Before pipe is placed, the bottom of the trench shall be carefully shaped to fit the lower part of the pipe exterior with reasonable closeness for width of least sixty percent (60%) of the pipe width. Bell holes shall be dug sufficiently large enough to insure the making of proper joints and so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. **Any defects due to settlement shall be made good by the Contractor.**
- C. Minimum Pipe Slopes:

Assuming an “n-value” of 0.010 for PVC, the table below provides the minimum allowed pipe slopes.

Sewer Size	Minimum Slope in Feet/100 Feet
8 inch	0.28
10 inch	0.22
12 inch	0.17
15 inch	0.12
18 inch	0.10
21 inch	0.08
24 inch	0.06

- D. Proper and suitable tools and appliances for the sale and convenient handling and lying of pipe shall be used.
- E. Whenever a pipe requires cutting to fit into the line or to bring it to the required location, the work shall be done in a satisfactory manner so as to leave a smooth end.
- F. The pipes shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. **The open ends of all pipe lines shall be provided with a stopper carefully fitted so as to keep dirt and other substances**

- from entering.** This stopper shall be kept in the end of the pipeline at all times when lying is not in actual progress.
- G. All concrete required to support and reinforce wye branches, bends and other fittings shall be placed as directed, and the cost thereof shall be included and covered within the price bid.
  - H. Backfill materials shall be hand placed and mechanically tamped in six (6) inch layers placed uniformly on both sides of the pipe, to a point at least one (1) foot above the pipe crown. **Each layer shall be thoroughly compacted for the full trench width and under around and over the pipe.**
  - I. All sewer lines shall have a tracer wire of a grade THNN#12 solid coated, installed continuously along all sewer mains attached to the top of the main at intervals of every five (5) feet with tape to anchor in place until backfill is placed. Wire must extend the entire length of the pipe between manholes.
  - J. Pipeline detectable tape shall be installed twelve (12) inches from the ground surface. The tape shall be Lineguard Type III Detectable Tape as manufactured by Lineguard, Inc. of Wheaton, Illinois or equal. The tape shall be a minimum of six inches wide, imprinted with the words "CAUTION-SEWER LINE BELOW" and be capable of being detected with inductive methods.
  - K. For refill of the remaining trench depth, refer to the "Excavation and Backfill" section of these specifications.

### 3.06 LAYING PIPE IN FREEZING WEATHER

- A. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Engineer shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation, unless all required precautions as to the minimum length of open trench and promptness of backfilling are observed.

### 3.07 ARTIFICIAL FOUNDATION

- A. Whenever directed, the Contractor shall lay pipe upon an artificial foundation which he shall construct. Such foundation may consist of gravels or of concrete; all to be of the form and dimensions and placed according to the detail or in the manner required by the Engineer.

### 3.08 TESTING

- A. Gravity sewer to be tested in accordance with the following:
  - (1) Contractor shall furnish all labor, tools, materials and equipment including water, pumps, compressors, stopwatch, gauges, and meters, subject to

the approval of the Engineer for testing in accordance with these specifications.

- (2) The Engineer shall be notified in advance of all tests, and all tests shall be conducted to his entire satisfaction.
- (3) The gravity sewer shall be tested as follows:

- a. MIRROR TEST:

Upon completion of pipe laying and backfilling to a point at least two (2) feet above the crown of the pipe, the Engineer will conduct a mirror test to check for defects, excess deflection, leaking and for horizontal or vertical misalignment. Mirror testing shall consist of reflecting sunlight or artificial light via mirrors through the completed section of pipeline, which, **in order to be accepted, shall be true and straight in horizontal and vertical alignment to allow for the full passage of the reflected light.**

- b. MANDREL TEST:

Sanitary sewer pipe shall be deflection tested not less than thirty (30) days after the trench backfill and compaction has been completed. The test shall be conducted by pulling an approved solid pointed mandrel through the completed pipeline. The diameter of the mandrel shall be ninety-five percent (95%) of the inside diameter of the pipe. The mandrel shall be a rigid, non-adjustable mandrel having an effective length of not less than its nominal diameter.

Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely cleaned and flushed. Any portion of the sewer which fails to pass the test shall be excavated, repaired or realigned and retested with both air and deflection tests.

- c. LEAK TESTING USING AIR:

1. Sewers shall be tested in sections or not more than four-hundred (400) foot lengths unless otherwise approved by the Engineer. Each section shall be tested immediately upon completion thereof. Each section shall meet the air pressure drop limitations specified herein.
2. All materials and labor required for leakage tests shall be furnished by the Contractor.
3. Sewers shall be tested using the low-pressure air method in accordance with the requirements of ASTM C-828 and the Uni-Bell

Plastic Pipe Association recommendations, based upon the Ramseier test time criteria. Procedural and equipment details shall be submitted to the Engineer prior to acceptance of its use for testing.

4. If the test time for the designated size and length, elapses before the test pressure drops 0.5 psig, the section undergoing the test shall have passed.
5. If the pressure drops 0.5 psig before the appropriate test time has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test. The Contractor shall determine at this own expense the source or sources of leakage and he shall repair or replace all defective materials and/or workmanship to the satisfaction of the Engineer. The completed pipe installation shall then be retested and required to meet the requirements of this test.

### **3.09 BORING AND JACKING OF SANITARY SEWER**

- A. Where possible, an approach trench shall be excavated far enough to provide a jacking face of at least three (3) feet from a pavement surface. This open face shall be shored securely to prevent slipping or raveling of the face.
- B. Boring pits shall be large enough to contain all necessary equipment and tools. Adequate provisions shall be made for the removal of excavated material.
- C. A substantial backstop of heavy timber or steel beams shall be provided to take the thrust of the jack or boring equipment.
- D. As material is excavated or bored ahead of the pipe, the pipe shall be jacked in to follow this excavation. The distance dug ahead of the pipe shall not exceed six (6) inches.
- E. The installation of casing pipe and the boring or excavation shall be done simultaneously.
- F. Voids between the sleeve and excavation shall be filled by pressure grouting.
- G. Cement grout shall be used to seal the pipe ends between the carrier pipe and sleeve.
- H. A one (1) inch PVC pipe shall be installed in the downgrade seal to permit drainage.
- I. Steel pipe sleeve shall be furnished in random lengths of the diameter shown on the plans and noted in the proposal and shall conform to the requirements of

AWWA C-200; Grade B pipe shall be used. The pipe, including field connections, shall be coated with bitumastic compound, inside and outside. Pipe wall thickness for sleeves shall be standard thickness. All joints for casing pipe shall be made by continuous weld completely around the perimeter of the pipe in accordance with AWWA C-206.

- J. Carrier pipe shall be as required by the plans.
- K. Use Stainless Steel and Teflon coated runners or cradles to support the pipe in the casing. A minimum of two (2) supports are needed per joint of pipe providing a maximum span of six and one-quarter ( $6 \frac{1}{4}$ ) feet for PVC pipe lengths of twelve and one-half (12.5) feet or less. The maximum span between supports for pipe lengths of nineteen (19) to twenty (20) feet must not exceed seven and one-half (7.5) feet.
- L. Casing pipe (sleeve pipe) shall be a minimum of two times (2x) the diameter of the carrier pipe.

### 3.10 HORIZONTAL DIRECTIONAL DRILL (FORCE MAIN ONLY)

- A. All directional force mains shall utilize High Density Polyethylene SDR11 pipe as described in this specification.
- B. The design, submitted for approval, must include a profile of the proposed bore and show any existing utilities in the area.
- C. The system must be remotely steerable and permit electronic monitoring of tunnel depth and location. The system must be able to control the depth and direction of the pipe and must be accurate to a window of plus or minus two inches (+/- 2").
- D. The system must be capable of turning ninety degrees ( $90^\circ$ ) in a thirty-five (35) foot radius.
- E. The system shall utilize a fluid-cutting process, using a liquid clay such as bentonite. This clay must be totally inert and contain no risk to the environment.
- F. Liquid clay shall remain in the tunnel to increase stability of the tunnel and provide a lubricant to reduce frictional drag when the pipe is installed.
- G. Spoils shall be recovered by use of a vacuum system mounted on a vehicle for removal of spoils to an approved spoils site. Spoils shall not be discharged into sewers or storm drains.
- H. The equipment must be capable of completing the boring in a single bore.

- I. Equipment must be fitted with a permanent alarm system capable of detecting an electrical current. The system will have an audible alarm to warn the operator when the drill head nears electrified cables.
- J. As built drawings, as required by this specification, shall indicate the depth and location of the bore at twenty-five (25) foot intervals.

### **3.11 SANITARY SEWER MANHOLES**

#### **A. General**

- (1) The Contractor shall have the option of constructing shallow (4' or less) manholes of precast reinforced concrete or "SS" sewer brick as indicated on the drawings. Manholes deeper than four (4) feet will be precast reinforced concrete.
- (2) Manholes 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. Manholes shall be built as pipe laying progresses and the Engineer may stop work entirely of the pipe laying if manhole construction is delayed to such an extent as to be hazardous to construction or the public
- (3) Manholes shall be spaced no more than four-hundred (400) feet apart and at all bends in gravity sewer mains.

#### **B. Precast Reinforced Concrete Manholes**

- (1) Precast reinforced concrete risers, eccentric cones and bases shall be in conformance with ASTM Designation C-478. Joints between riser sections shall be fitted with an O-ring rubber gasket, meeting the requirements of ASTM Designation C-443. Installation of risers shall be in accordance with manufacturer's recommendations under the supervision of the Engineer.
- (2) Precast reinforced concrete base and riser sections shall be as manufactured by Atlantic Concrete Products Company, Virginia Precast Corporation or approved equal.
- (3) Interior and exterior joint spaces of all manhole risers shall be filled prior to application of the exterior waterproofing. The interior joint shall be mortared. The exterior joint may be mortared or filled with a joint filler compound. Said compound shall be Pioneer 301 as manufactured by Daubert Chemical Company, Oakbrook, Illinois, or equal.
- (4) Lifting holes in the walls of precast reinforced concrete risers will be allowed but shall be plugged with rubber stoppers and grouted flush with the face or manhole wall after installation of manhole riser sections. Not

more than two holes shall be cast in the walls of each riser section for the purpose of handling.

- (5) The exterior surface of all precast manholes shall receive a minimum two coat application of a sixty-eight percent (68%) solids coal tar type protective coating. The total average dry film thickness shall measure twenty-four (24) mils with no single measurement less than twenty (20) mils. Surfaces shall be prepared in accordance with the manufacturer's instructions and coatings applied in the field in a manner acceptable to the Engineer. The coating material shall be Bitumastic Super Service Black manufactured by Koppers Company, Inc., Pittsburgh, Pennsylvania; Tar-Jet Supper Black XX-32-B-22, manufactured by Pennsbury Coatings Corporation, New Britain, Pennsylvania, or approved equal.
- (6) All pipe-to-manhole connections in the precast manhole shall be made by means of an integrally cast flexible manhole sleeve, as manufactured by Interpace Corporation, Parsippany, New Jersey, or A-Lok flexible manhole gasket as manufactured by A-Lok Corporation, Trenton, New Jersey, or approved equal.

#### C. Flow Channels

- (1) Manhole flow channels and benches shall be constructed of "SS" sewer brick with care taken to secure smooth and even surfaces with full special mortar joints. Channel sections shall be built up to true line and radius, and curved sections shall provide a uniform transition in the flow direction.
- (2) Materials and construction of flow channels shall be in accordance with appropriate sections for materials so used, as hereinafter specified.
- (3) Precast concrete flow channels shall be allowed when if prior approval is given by the Engineer.

#### D. Concrete

- (1) All concrete for manhole base slabs and cradles, encasements, blocking, etc. shall have a minimum compressive strength of three-thousand (3,000) psi at twenty-eight (28) days.

#### E. Brick

- (1) All brick shall conform to the "Standard Specifications for Sewer Brick," ASTM Designation C 32, Grade SS, except that the maximum absorption for the average of five (5) bricks shall not exceed ten percent (10%); and the individual brick maximum shall not exceed fourteen percent (14%).

**F. Mortar**

- (1) Cement shall be in accordance with "Standard Specifications for Portland Cement", ASTM Designation C 150 for Type II.
- (2) Sand shall be composed of sharp, angular, silicious grains, coarse, or graded from fine to coarse, with the coarsest grains predominating, and sensibly free from clay, loam, dirt, mica, organic matter, or other impurities. Sand containing more than five percent (5%) by weight of foreign material shall not be used. This limit may be changed for special classes of work, if hereinafter specified. Sand exhibiting more than an acceptable amount of fine matter or impurities may be required to be washed after delivery on the work or shall be rejected altogether. Sand for mortar shall be screened to reject all particles of a greater diameter than one-quarter inch (1/4") and shall not contain more than five percent (5%) by weight of a very fine material.
- (3) Unless hereinafter specified otherwise, all mortar shall be composed of cement and sand of the character above specified. The proportion of volume shall be one (1) part of cement to two (2) of sand. One (1) volume of cement shall be ninety-four (94) pounds net. One (1) volume of sand shall be 0.9 cubic feet, the sand not being packed more closely than by throwing it into a box in the usual way. Mortar shall be fresh mixed in small batches for the work in hand. Tight boxes or platforms made for the purposes shall be used. The sand and cement shall be thoroughly mixed dry, in the proper proportions, until uniform color has been produced, whereupon a moderate dose of water shall be added, so as to produce a stiff paste of the proper consistency.
- (4) Sand obtained from the excavation shall not be used.

**G. Laying Brick**

- (1) All brickwork shall be laid by competent professionals.
- (2) All brick shall be laid in a full bed of mortar with all vertical and horizontal joints filled solid with mortar.
- (3) Joints shall be not less than three-eighths (3/8) inch or more than one-half (1/2) inch wide except as otherwise specified below.
- (4) No brickwork shall be laid when the temperature is below forty degrees (40°) Fahrenheit or when the indications are for lower temperatures within twenty-four (24) hours. The contractor shall take such measures as may be approved to prevent brickwork from being exposed to freezing temperatures for a period of not less than five (5) days after laying.

- (5) Special care shall be taken in laying brick in inverts of manholes to insure uniform flow of water through the sections. In such locations, joints shall not exceed one-sixteenth (1/16) inch in thickness and each brick shall be laid in full mortar bed with joints on bottom side and end made in one operation. No grouting or working in of mortar after laying the brick will be permitted.

#### H. Manhole Steps

- (1) Manhole steps shall be made of three-eighths (3/8) inch diameter (No. 3) steel reinforcing bars, ASTM Designation A-615, Grade 60, encased in polypropylene plastic. Manhole steps shall have notched tread ridge with retainer lug on each side.
- (2) Manhole steps shall be cast in place during manufacture of precast reinforced concrete manholes or placed in brick manholes during construction. Embedment length shall be suitable for minimum five (5) inches thick, precast reinforced concrete riser walls.
- (3) Manhole steps shall be OSHA approved and as manufactured by; M.A. Industries, Inc., Peachtree City, Georgia; ICM, Inc., Jacksonville, Arkansas, or approved equal.
- (4) Manhole steps shall be spaced twelve (12) inches apart. The maximum spacing from top of manhole to the **first step** shall not exceed sixteen (16) inches.

#### I. Manhole Frames and Covers

- (1) Frames and covers for manholes shall be set by the contractor as the work progresses. The frame shall be well bedded in mortar.
- (2) Frames and covers shall be East Jordon Iron Works Hinged Manhole Assembly, product number 00104007L01. Frames shall be manufactured in accordance with standard specifications for gray iron castings ASTM Designation A 48 for Class No. 35 B. Covers shall be shall be manufactured in accordance with standard specifications for ductile iron castings ASTM Designation A 536.
- (3) The maximum allowable vertical adjustment of manhole cover frames shall be twelve (12) inches. Adjustments shall be made with brick and mortar or precast adjustment rings.
- (4) Manhole stubs shall be extended four (4) feet outside of the manhole wall unless otherwise detailed. The stub end shall be plugged.

- (5) All sanitary sewer manhole covers shall be cast with the words "CITY OF SEAFORD" "SANITARY SEWER".
- (6) All frames and covers shall be of the size and types detailed on the plans.
- (7) All sewer manholes shall watertight inserts provided.

#### J. Tests

- (1) If inspection reveals any visible leakage or seepage in any manhole, the Contractor will be required to accomplish such remedial measure as may be directed by the Engineer. Caulking or patching of interior manhole surfaces will not be acceptable.

### 3.12 SANITARY SEWER HOUSE CONNECTIONS

#### A. General

- (1) In all house connections, each property shall be separately and independently connected with the sanitary sewer, and for the purpose of this regulation, each side of a so-called double house shall be considered as a separate property and each side must have a separate house connection located entirely within its boundaries.
- (2) The City must be given ample notice (48 hours) in order to examine the work before ordering the backfilling to begin.
- (3) Any part of the work which may have to be covered without previously obtaining the consent of the City, shall be uncovered for examination if so ordered by City.
- (4) The backfilling around a house connection shall be so executed as not to injure the joints of the pipes.
- (5) All sewer laterals for house connections shall connect directly to the gravity main using a Wye-branch connection. No laterals shall be allowed to connect to a manhole.

#### B. House Connection Construction

- (1) Cleanouts
  - a. At least one cleanout must be provided on every house connection.
  - b. Location(s) of cleanout(s) shall be governed by the following consideration:

1. Maximum pipe run between cleanout(s) shall be seventy-five (75) feet.
  2. A cleanout brought to grade shall be placed immediately upstream from deviation from straight horizontal alignment of more than twenty-two and one-half degrees ( $22\frac{1}{2}^\circ$ ) (1/16 bend).
  3. Only one (1) twenty-two and one-half degree ( $22\frac{1}{2}^\circ$ ) bend will be permitted per one hundred feet (100') without a cleanout.
- c. A sanitary lateral cleanout shall be placed on the lateral in the Right-of-Way.
  - d. A cleanout brought to grade shall be placed immediately upstream from each deviation from straight grade.
  - e. The cast iron cleanout cover, with the letter "S" imprinted in it, shall be installed to match finished grade and shall be supported with compacted earth or a cement base as needed to maintain cover at finished grade.
  - f. Cleanouts shall be connected to the house line with "wye" fittings with the cleanout leg pointing upstream.
  - g. All cleanouts shall be plugged to prevent infiltration of ground or surface water.

#### C. Pipe Size

- (1) No gravity type house connection shall be less than four inches (4") internal diameter from the main to the house.
- (2) Each house connection shall be laid on an even grade and straight line, where feasible.
- (3) The grade of a house connection wherever possible shall not be less than two percent (2%) nor greater than ten percent (10%); but in every case shall be subject to the judgement of the City.

#### D. Grease Traps

- (1) A properly designed ventilated grease trap shall be interposed between the house connection and the kitchen and pantry sinks of every hotel, eating house, restaurant, cooking establishment or gasoline service station.

- (2) No trade wastes, such as those from factories, laundries, dairies, etc., shall be discharged into the sanitary sewer except by special permission from the City of Seaford.
- (3) Carwash facilities are required to install grit & sand/oil separators.
- (4) Grease trap design and installation shall be as per the plumbing code adopted by the City of Seaford.

#### E. Inspections

- (1) Sewer inspection is available from 8:30 A.M. to 4:00 P.M., Monday through Friday except for holidays.
- (2) Requests for sewer inspection shall be made at least 48 hours in advance by calling 302-629-9173.

#### F. Pipe Classification and Pipe Requirements

- (1) The pipe used for either house connections or sewer extensions must meet the requirements of most recent ASTM specifications and good engineering practice.

#### G. Sewer Connections (Laterals)

- (1) Polyvinyl Chloride - PVC Schedule 40 with cemented coupling joints, rubber compression joints or SDR-35 pipe shall be used for sewer house connections.
- (2) Sewer laterals located within a roadway, which are less than 48" below grade, shall be made of cast iron pipe or ductile iron pipe.
- (3) Taps and sewer laterals shall be situated to maintain a minimum of ten feet (10') of separation from any water service or water supply.

#### H. Stream Crossing

- (1) The pipe used for stream crossing shall be ductile iron encased in concrete within the limits of the stream and to a point ten feet (10') from each bank. All pipe located within ten feet of a stream shall be ductile iron. Wherever possible, the line shall be located three (3) feet below the stream bed at stream crossing.

#### I. Backwater Valves

- (1) All sewer laterals serving a structure located in an area which may be subject to sewer backups shall have a back flow prevention valve installed

by the Contractor. This includes all structures with plumbing fixtures within a basement level.

- (2) The backwater valve shall be located in an accessible location within the structure for routine service by the property owner.

**END OF SECTION**

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## SECTION 4 - WATER MAINS AND APPURTENANCES

### 4.01 GENERAL PROVISIONS

- A. The Contractor shall furnish and install all water mains, valves, hydrants, fittings, corporation stops, house service piping and appurtenances as specified herein and as defined on the drawings or as directed by the Engineer. Provide all necessary adaptors for connections to existing mains. The Contractor is given the option of using ductile iron or PVC pipe. PVC pipe shall not be permitted for hydrant leads or inside of railroad or highway steel crossing sleeves.
- B. All proposed expansions of the City of Seaford public water system shall have the approval of the State of Delaware Office of Public Drinking Water.
- C. The design of any proposed expansion of the public water system shall include sufficient evidence to the City of Seaford that the expansion does not adversely affect any portion of the existing water system.

### 4.02 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51, latest edition, and shall be thickness Class 50 in streets and inside highway sleeves and Class 56 under railroads unless otherwise noted. The Contractor shall have the option of furnishing mechanical or push-on joints conforming to latest edition of ANSI/AWWA C111/A21.11.
- B. Pipe fittings shall have an external standard asphaltic coating approximately one (1) mil. thick.
- C. Pipe and fittings shall have an internal cement lining in accordance with latest revision of ANSI/AWWA C104/A21.4. No bituminous coating shall be used on the inside of pipe and fittings unless prior written approval is obtained from the Delaware Division of Public Health.
- D. All fittings and specials shall be gray-iron or ductile-iron with mechanical joint having a two-hundred fifty (250) psi pressure rating for gray iron and three-hundred fifty (350) psi in the case of ductile iron. They shall be marked and manufactured in conformance with ANSI/AWWA C110/A21.10, latest edition. Compact ductile iron fittings will be an acceptable alternate. They shall be mechanically joined with a three-hundred fifty (350) psi pressure rating conforming to ANSI/AWWA C153/A21.53 and C111/A21.11.

### 4.03 POLYVINYL CHLORIDE (PVC) PLASTIC PIPE AND FITTINGS

- A. Polyvinyl chloride pipe shall meet the requirements of AWWA C-900 or C-909 latest edition. It shall be manufactured in standard length not exceeding twenty (20) feet and have an outside diameter equal to cast iron pipe. PVC pipe shall

- have standard dimension ratio (SDR) of eighteen (18.0) or less. The pipe shall be rated for a working pressure of at least one-hundred fifty (150) psi plus a surge allowance of at least 35 psi and shall have a minimum hydrostatic strength of 600 psi.
- B. Polyvinyl chloride (PVC) pipe shall be manufactured with an elastomeric gasket joint conforming to ASTM D-3139. Pipe ends shall be beveled.
  - C. Fittings for PVC water mains shall be cast iron or ductile iron as specified in 4.02.
  - D. Each pipe section including bell or coupling shall be subjected to a hydrostatic test of not less than 500 psi for at least 10 seconds. Pipe shall be tested in accordance with conditions specified in ASTM D 618. Any pipe that leaks or is unable to withstand the test pressure shall be rejected. The test shall be conducted at the factory and certification stating that the test has been conducted as specified and the pipe meets all conditions of this specification shall be submitted to the Engineer.
  - E. Polyvinyl chloride pipe specified herein is manufactured to cast iron pipe size. However, if adapters for connecting polyvinyl chloride pipe to cast iron fittings and valves are necessary, they shall be of the type recommended by the pipe manufacturer. Adapters must be manufactured of material specified herein or approved by the Engineer. Furnishing and installing adapters shall be included in the unit prices bid for the pipe.
  - F. The Contractor shall provide all necessary adapters for connecting PVC pipe to cast iron fittings and valves or other pipelines. Adapters shall be as recommended by the pipe manufacturer.
  - G. Polyvinyl chloride pipe shall be delivered and stockpiled in unit pallets. Store pipe on a flat surface. No stacking of pallets of random lengths above five feet in height will be allowed. If pipe is stock piled for more than thirty (30) days prior to installation in the trench, it must be suitably covered with reflective materials to protect the pipe from ultra-violet rays emanating from sunlight. Do not use plastic sheets. Allow to for air circulation under covering.
  - H. Bowed sections of pipe will not be acceptable and will not be allowed to be installed on this project.

#### **4.04 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS (HORIZONTAL DIRECTIONAL DRILL)**

- A. PE pipe shall be SDR11 plain end for fusion welding conforming to ASTM F 714 and ASTM D 3035. Minimum pressure rating shall be 160 psi.
- B. Molded fittings will conform to ASTM F 714. End sections of HDPE piping in directional drilling shall have an AWWA C-207 Class D flanged end butt. Fusion

welded to PE main. Flange shall be drilled to standard one-hundred twenty-five (125) pound tensile.

- C. Terminal end of HDPE pipe shall be connected to continuing ductile iron or PVC pipe with a flanged expansion joint. The flanged expansion joint shall be a "FlexTend" flexible expansion joint as manufactured by EBAA, or approved equal.

#### 4.05 BORING AND JACKING OF WATER MAINS

- A. Where possible, an approach trench shall be excavated far enough to provide a jacking face of at least 3 feet from a pavement surface. This open face shall be shored securely to prevent slipping or raveling of the face.
- B. Boring pits shall be large enough to contain all necessary equipment and tools. Adequate provision shall be made for the removal of excavated material.
- C. A substantial backstop of heavy timber or steel beams shall be provided to take the thrust of the jack or boring equipment.
- D. As material is excavated or bored ahead of the pipe, the pipe shall be jacked in to follow this excavation. The distance dug ahead of the pipe shall not exceed six (6) inches.
- E. The installation of casing pipe and the boring or excavation shall be done simultaneously.
- F. Voids between the sleeve and excavation shall be filled by pressure grouting.
- G. Cement grout shall be used to seal the pipe ends between the carrier pipe and sleeve.
- H. A one (1) inch PVC pipe shall be installed in the downgrade seal to permit drainage.
- I. Steel pipe sleeve shall be furnished in random lengths of the diameter shown on the plans and noted in the proposal and shall conform to the requirements of AWWA C-200; Grade B pipe shall be used. The pipe, including field connections, shall be coated with bit mastic compound, inside and outside. Pipe thickness for eighteen (18) inch diameter sleeve shall be 0.313 inches. Twelve (12) inch diameter sleeves shall be one-quarter (0.25) inches thick. All joints for casing pipe shall be made by continuous weld completely around the perimeter of the pipe in accordance with AWWA-C-206.
- J. Carrier pipe shall be Class fifty (50) ductile iron at each location as required by the plans except at railroad crossing use Class fifty-six (56).

#### 4.06 HORIZONTAL DIRECTIONAL DRILLING (HDD) OF WATER MAINS

- A. A complete detailed design procedure and method shall be submitted for each such installation and shall contain as a minimum: layout sketches indicating pit dimensions and locations, proposed line and grade of the drilling, complete details and specifications of the materials and equipment to be used to complete the drilled installation, size and type of drill pipe, drilling fluid information, drilling fluid disposal plan, frac-out plan, and a sequence of operations.
- B. It is suggested that the Contractor retain the services of a horizontal directional drilling specialist in an effort to preclude the necessity for a restart at a second location due to inadequacies that could be foreseen through the use of such specialist.
- C. If an obstruction is encountered that prohibits the forward action of the drilling operation or pipe installation, and it becomes evident that it will be impossible to advance the drill head or the pipe, operations shall cease and the pipe will be abandoned in place and filled completely with grout. Drilling shall restart at a second location.
- D. The horizontal directional drilling (HDD) operation, once commenced, shall be continuous until such time as the HDD is completed.
- E. The rig shall be capable of the push/pull capacity, rotational speed, torque, and horsepower requirements, including size and capacity of the drilling fluid pump, to successfully complete the HDD.
- F. The mud motor shall be capable of delivering sufficient amount of drilling fluid to maintain the borehole integrity. The Contractor shall be responsible for providing the right mixture of drilling fluid to fit the characteristics of the soil conditions. The Contractor shall be responsible for the disposal of the drilling fluid.
- G. The Contractor shall keep drilling logs. These logs shall include specific dates, times and locations (x,y,z positioning), soil conditions, drilling data such as depth, angle, rate of penetration, and utility crossings. Drilling logs shall be accurate to facilitate the production of as-built drawings, with "x,y,z" locations no further than 30' apart. Six (6) copies of the drilling logs shall be provided to the Engineer.
- H. The minimum radius of curvature of any drilling operation shall be limited to 100 times the diameter of the drill pipe, or the diameter of the product line, whichever is larger.
- I. All drilling operations shall include reaming of the pilot hole prior to installation of the product line. The pilot hole shall be reamed to a minimum size of 1.5 times the outside diameter of the product line. Reamers shall be chosen to match the soil conditions encountered.

#### 4.07 GATE VALVES AND BOXES

- A. Gate valves shall be resilient seat type, in accordance with AWWA C509, latest edition. Valve bodies and bonnets shall be cast iron epoxy coated on the inside per AWWA C-550.
- B. Stem and edge nuts shall be bronze. Stems shall be sealed by at least two O-rings. Seals shall be replaceable with the valve fully open and while subject to the rated pressure.
- C. Wedge shall be constructed of ductile iron fully encapsulated in synthetic rubber except for guide and wedge nut areas or it shall have a replaceable internally reinforced, contoured molded rubber disc seat ring attached to the face of the wedge with self-locking stainless steel screws. Wedge rubber shall be molded in place and bonded to the ductile iron portion. Wedge shall seat against accurately formed seating surfaces in the valve body.
- D. Waterway shall be smooth and shall have no depression or cavities in the seat area where foreign material can lodge and prevent closure or seating.
- E. Gate valves shall be manufactured by Mueller, 2300 series, or approved equal.
- F. Provide each gate valve with a five and one-quarter (5 ¼) inch diameter Buffalo screw type valve box with the word "Water" cast in the lid. All boxes for four (4), six (6), and eight (8) inch valves shall be equipped with #6 round bases. Ten (10) inch valves shall be used with #8 valve box base. Valve boxes shall be adjustable between 2' - 4" and 3' - 4" except when deeper settings are required. Lids shall be extra deep and have two (2) holes for removal of the lid. Valve boxes shall be as manufactured by Mueller or approved equal.
- G. Provide socket valve operating wrenches.
- H. Provide a twelve (12) inch square, cast in place, concrete support below valve box cast lids in unpaved areas only.

#### 4.08 TAPPING SLEEVE AND VALVE

- A. Tapping sleeves shall be of all stainless steel construction including sleeve, bolts and nuts. Sleeves shall wrap 360 degrees around the pipe with gridded full circumference gasket. Units shall be Mueller H-304 tapping sleeve or approved equal.
- B. Tapping valves shall be cast iron Mueller resilient wedge tapping valve T-2300 series.
- C. Install tapping sleeve and valve per manufacturer's recommendation.

#### 4.09 FIRE HYDRANTS

- A. Hydrants shall be compression type with a five and one-quarter (5 ¼) inch main valve opening, two (2) two and one-half (2 ½) inch hose nozzles, one (1) four and one-half (4 ½) inch pumper nozzle, and one (1) six (6) inch mechanical joint hub base. Hydrant seats shall be provided with bronze to bronze threaded connections.
- B. All nozzle and steamer threads shall conform to City of Seaford standard. Hydrants shall be of proper length for a four (4) foot trench depth or as required by field conditions and be American Darling Model B-62-B. They shall meet the requirements of AWWA Standard C-502.
- C. A sworn certificate of inspection and testing shall be furnished by the manufacturer. Install hydrants with restraint system as detailed on the drawings.
- D. All hydrants to be furnished with non-kinking chains on the 2 ½ inch nozzles.
- E. Hydrants shall open by turning the operating nut counterclockwise.
- F. Fire hydrants to receive one (1) coat of primer and two (2) coats of silver paint in accordance with Federal Standard 595A. The final coat shall be field applied after the hydrant has been installed. The top of the hydrant shall be painted with a color specified by the City of Seaford after installation.
- G. Provide hydrant operating wrenches and repair kits.

#### 4.10 LAYING WATER MAINS, FITTINGS, AND APPURTENANCES

- A. Water main pipe, fittings and valves shall be installed per manufacturer's printed instructions. Care shall be taken to insure that no joints are made with unevenness or rough edges. Pipeline deflections must be kept below the manufacturer's limitations.
- B. All pipes shall be bedded on a solid foundation prior to backfilling. Defects due to settlement shall be corrected by the Contractor at his own expense. Bell holes shall be dug sufficiently large to receive same.
- C. Pipe and fittings shall be kept clean until final acceptance of the work. All open pipe ends shall be provided with plugs to keep dirt, water and other materials from entering. This plug shall be kept in place when actual pipe laying is not in progress.
- D. Excavation and backfill for water mains and appurtenances shall be per section 2 of these specifications.
- E. All water lines to have a 3' - 0" minimum cover unless otherwise noted.

- F. Contractor shall encase new water lines in concrete where crossing of sanitary sewer lines have less than 1' – 6" clearance. At each location, one full length of pipe shall be located so that both joints will be as far from the sewer as possible.
- G. Water lines shall be laid at least 10' – 0" horizontally from any existing or proposed sewer. In cases where it is not practical to maintain this horizontal separation, a 10' – 0" total spacing shall be required and shall be computed according to the square root of the sum of the vertical and horizontal distances squared. All distances shall be measured edge to edge.
- H. PVC pipe shall be beveled before making pipe joints.
- I. Install no pipe on frozen or frost penetrated sub grade. When directed, the Contractor shall install pipe on artificial foundations. Such foundation may consist of gravel or concrete and shall be to the dimensions and in the manner directed by the Engineer.
- J. All water lines shall have a tracer wire of a grade THNN#12 solid coated, installed continuously along all water mains attached to the top of the main at intervals of every five (5) feet with tape to anchor in place until backfill is placed. Wire must extend up into any valve box with a three (3) foot excess above finished grade, supplied by the Contractor.
- K. Pipeline detectable tape shall be installed twelve (12") inches from the ground surface. The tape shall be Lineguard Type III Detectable Tape as manufactured by Lineguard, Inc., of Wheaton, Illinois, or equal. The tape shall be a minimum of six inches wide, blue in color, imprinted with the words, "CAUTION—WATER LINE BELOW", and be capable of being detected with inductive methods.
- L. All concrete required to construct buttresses behind plugs, tees, bends, and other fittings and anchorages beneath vertical bends shall be placed as directed and/or as shown on the details.

#### **4.11 INSTALLING FITTINGS, HYDRANTS, GATE VALVES, AND VALVE BOXES**

- A. Fittings, hydrant, gate valves, and valve boxes shall be placed along the water mains at the locations indicated on the drawings or where other wise designated by the Engineer.
- B. A valve box shall be carefully placed over the bonnet of each gate valve with the top at the finished surface of the street, sidewalk, or at such other elevations as the engineer shall direct. It shall be set exactly plumb. In tamping the backfill around the box, special care shall be taken to keep the box plumb and to have it firmly supported on two 4 inch thick solid concrete blocks so as to avoid settlement. Any box which is found out of plumb, or which is not firmly supported,

shall be excavated and reset in a satisfactory manner at the contractor's expense. Place gravel in and around the valve box bases to provide for drainage.

- C. Ductile iron pipe with cast iron or ductile iron fittings shall be used exclusively throughout the hydrant assembly. The use of polyvinyl chloride pipe will not be permitted in construction of any portion of the hydrant leads. Hydrants shall be installed with mega-lug restraints or a concrete buttress behind them.

#### 4.12 DISINFECTION OF WATER MAINS

- A. Upon completion of water main construction, disinfect main and appurtenances. Disinfection shall be done in accordance and ANSI/AWWA C-601, latest addition. Contractor shall submit a plan of disinfection for approval by the Engineer.
- B. After the applicable retention period, the heavily chlorinated water shall be flushed from the main. This water shall be discharged to the sanitary sewer system. Only after water leaving the main is no higher in chlorine concentration than normal drinking water, will a discharge to storm drains be allowed. Convey flushed water to a discharge point in a closed system.
- C. Affidavits of compliance certifying the water sampled from the water mains to be free of coliform bacteria, shall be submitted to the Engineer. The Contractor is responsible for requesting tests from the Delaware Department of Public Health or an approved independent testing laboratory. The Contractor shall obtain written documentation from the Delaware Department of Public Health when a section of mains can be placed in service.
- D. The Contractor shall place in each length a pipe, hydrants, hydrant branches and other appurtenances, a sufficient amount of HTH tablets to insure adequate disinfection treatment of the main after its completion. Tablets shall be fastened to the inside top of every length of pipe as laid, using gasket cement known as "Permatex No. 2."
- E. The Contractor will be held entirely responsible for securing a minimum residual chlorine content of five (5) p.p.m. at the extremities of mains after twenty-four (24) hours or more contact with the full water pressure of the main.
- F. Water for filling the mains shall be introduced at a velocity of less than one (1) foot per second in order to permit the HTH or Perchloron to completely dissolve and have a reasonable uniform distribution throughout the mains. It is the intent of this specification to require a sufficient amount of chemical to be equivalent to a dosage of five (5) p.p.m. of chlorine.
- G. After the chlorine has been in contact with the mains or storage units for twenty-four (24) hours or longer, samples collected from the extremities of the mains shall indicate residual chlorine content of five (5) p.p.m. or more.

- H. If less than five (5) p.p.m. residual chlorine is indicated, the system shall be drained and the disinfection treatment repeated.
- I. If samples collected at the extremities indicate a residual chlorine of five (5) p.p.m. or more, the system shall be flushed until there is only a normal chlorine residual (1.0 p.p.m. or less) present, as determined by the DPD Method Test. Samples of water shall be collected from various points along the lines, by the State Board of Health or approved independent testing laboratory for bacteriological analysis. If satisfactory bacteriological results are obtained, the lines may then be allowed to be placed in service only after an approval to operate has been obtained from the State of Delaware and submitted to the City of Seaford. A copy of all test results shall be submitted to the Engineer or Owner.

#### 4.13 WATER MAIN TESTING

- A. The Contractor shall furnish all equipment, labor, and materials, including water, pumps, compressors, stopwatch, gauges, and meters as approved by the Engineer for testing. The Engineer shall determine the amount of main to be tested at any one time and reserves the right to separate the installation into several test sections. All tests must be witnessed by the Engineer or Owner.

#### B. Pressure Test

After the pipe has been laid, all new laid pipes or any valve section thereof shall be subjected to a hydrostatic pressure of one-hundred (100) psi.

(1) Test Pressure shall:

- a. Be of at least a two (2) hour duration
- b. Not vary more than plus or minus five (+/- 5) psi.

(2) Pressurization:

Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under the test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Owner.

(3) Air Removal:

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points, so that the air can be expelled as the line is filled with water. After all of the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure

test all corporation cocks shall be removed and plugged, or left in place at the discretion of the Owner.

- (4) Examination:  
All exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves or hydrants that are discovered following the pressure test shall be repaired or replaced with same material and the test shall be repeated until it is satisfactory to the Owner.

### C. Leakage Test

A leakage test shall be conducted concurrently with the pressure test.

- (1) Leakage:  
Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or at any valved section thereof, to maintain pressure within five (5) psi of the specified test pressure after the air in the pipelines has been expelled and the pipe has been filled with water.
- (2) Allowable Leakage:  
No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND \text{ square root of } P}{7400}$$

L - is the allowable leakage, in gallons per hour; N - is the number of joints in the length of pipeline tested; D - is the nominal diameter of the pipe in inches; and P - is the average test pressure during the leakage test in pounds per square inch gauge.

Allowable leakage, at various pressures, is shown on Table I (appearing after this subsection).

- (3) When hydrants are in the test section, the test shall be made against the closed hydrant.
- D. Should the tests show the main to be defective, the Contractor shall remedy such defects and retest the main as specified above. This procedure shall be repeated until the test requirements are met.

TABLE I

Allowable Leakage per 1000 feet of pipeline\* - gph

Average Test Pressure PSI	Nominal Pipe Diameter in Inches					
	2	3	4	6	8	10
150	0.19	0.28	0.37	0.55	0.74	0.92
125	0.17	0.25	0.34	0.50	0.67	0.84
100	0.15	0.23	0.30	0.45	0.60	0.75

\* For pipe within eighteen (18) feet nominal lengths. To obtain the recommended allowable leakage for pipe with twenty (20) feet nominal lengths, multiply the leakage calculated from the table by 0.9. If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

#### 4.14 SERVICE PIPE AND APPURTENANCES

##### A. General

- (1) For all new residential or commercial developments currently not served by the City of Seaford, the Contractor is responsible for furnishing and installing all corporation stops, house service pipe, curb stops, curb boxes, meter setters, prefabricated meter setters, covers, valves and appurtenances as indicated on the drawings.

The City of Seaford will provide a main tap, up to and including 2", complete with corporation stop for all new residential services in areas already served by the City of Seaford. The service will be stubbed out to the R.O.W. line where a curb stop will be placed; from there it becomes the Contractor's responsibility.

All new or replacement commercial water services, domestic or irrigation, shall include an outdoor underground meter pit and meter as specified herein.

All new or replacement residential water services, domestic or irrigation, shall include an outdoor underground meter pit as specified herein.

Each individual residential or commercial unit shall have an individual water service.

The meter setters installed by the contractor shall accommodate the following meters:

- Single-Family Residential Hook-Ups – 5/8" X 3/4" Model 430 with ITRON 60w ERT.
  - Multi-Family, Apartment, Light Commercial Hook-Up = Hersey Compact 1" Meter Model 452 with ITRON 60w ERT.
  - Commercial Hook-Up – 2" Meter Flanged Hersey Model 572 with ITRON 60w ERT.
  - Contact the Director of Public Works for specifications regarding meters or pits larger than 2".
- (2) The Contractor shall provide all tools, equipment and accessories required for tapping ductile iron and polyvinyl chloride water mains and installing water services. All underground service lines, valves and fittings shall conform to ANSI/AWWA C800-84.
- (3) All water lines shall have a tracer wire of a grade THNN#12 solid coated, installed continuously along all water mains attached to the top of the main at intervals of every five (5) feet with tape to anchor in place until backfill is placed. Wire must extend up into any valve box with a three (3) foot excess above finished grade, supplied by the Contractor.

#### B. House Services (Domestic)

- (1) Standard water service lines shall be polyethylene, **1 inch diameter SDR-9 copper tube size**. Service lines shall conform to AWWA C901 and ASTM D-2737.
- (2) Corporation stops shall be 1 inch, Mueller Model H-15008. Install stainless steel inserts at connection to service lines. Inserts shall be Mueller Part No. 504385. The contractor shall furnish and install inserts wherever a compression connection is used on plastic service lines. Curb stops shall be 1" Mueller Model H-15209 and installed before all meter pits. Curb boxes shall be manufactured by Bingham & Taylor, Model P205 and installed over the curb stop. For tapping ductile iron pipe and PVC pipe use Mueller, series DR25 steel tapping sleeve with one (1) inch CC thread. Use Teflon tape for threaded service connections. **Do not torque saddles or sleeves, without water pressure, in main.**
- (3) Cutting tools shall be of the hollow, shell bit type for removal of pipe plug. For tapping PVC mains use only Mueller plastic cutting tool. On closely spaced taps for townhouse developments, place corporation stops as recommended by pipe manufacturer. Furnish saddles with standard

AWWA C800 corporation stop inlet thread, double strapped for tapping 6 inch PVC and smaller. Saddles shall be Mueller stainless steel double strapped type DR25 or approved equal.

- (4) Prefabricated 18"x30: PVC meter box assemblies shall be Model #203RCS1830FBBN as manufactured by Mueller or approved equal. Assemblies shall include double check valve and ball valve with locking wing. Couplings for connection shall be 3/4" F.I.P. x 1" P/J C.T.S Mueller H-15451 with stainless inserts or approved equal. Contractor shall verify fit and compatibility of assembly components prior to ordering. All assemblies shall be suitable for 5/8" x 3/4 Hersey radio read model 430 meters compatible with the City of Seaford ITRON system.
- (5) Cover and frames shall be installed in non-traffic areas only. Lids shall be poly lids as manufactured by DFW Plastics, model DFW\*12SFDW-LID, to facilitate electronic readings. Lids shall have the word "Water Meter" cast into the cover and include lifter worm locks. Supply meter box lid wrenches, meter box frames to be Mueller model 700098 or approved equal.
- (6) Meter pits shall be located on the front property line, as close as possible to the center of the lot in new construction. A minimum separation distance of ten (10') feet shall be maintained between meter pits and sewer cleanouts and also water service lines and sewer laterals.

#### C. Commercial Services (Domestic)

- (1) All service lines larger than 1 inch diameter shall be 2 inch diameter, SDR-9 copper tube size polyethylene tubing.
- (2) Corporation stops shall be 2 inch, Mueller Model H-15013. Install stainless steel inserts at connection to service lines. Inserts shall be Mueller Part No. 504385. The contractor shall furnish and install inserts wherever a compression connection is used on plastic service lines. Curb boxes shall be 5 1/4 inch Mueller Buffalo screw type box with "water" cast in the lid.
- (3) For tapping ductile iron pipe and PVC use Mueller, double strap, iron, service clamp with 2 inch CC threads. Use Teflon tape for threaded service connections. **Do not torque saddles or sleeves without water pressure in main.**
- (4) Prefabricated 27"x 30" PVC meter box assemblies shall be model 550VB2730FBB as manufactured by Mueller or approved equal. Assemblies shall include double check valve, ball valve with lock wing, and meter bypass. Contractor shall verify fit and compatibility of assembly components prior to ordering. All assemblies shall be suitable for two (2)

inch Hersey radio read model 572 meters compatible with the City of Seaford ITRON system.

#### D. Irrigation Services

- (1) Standard water service lines shall be polyethylene, **1 inch diameter SDR-9 copper tube size**. Service lines shall conform to AWWA C901 and ASTM D-2737.
- (2) Irrigation services shall tee into new or existing service lines between the curb stop valve and the domestic meter pit.
- (3) If an irrigation service is needed and a meter and or pit does not exist on the existing domestic service, a meter pit shall be installed for both services in accordance with this specification.
- (4) Prefabricated 18"x30: PVC meter box assemblies shall be Model #203RCS1830FBBN as manufactured by Mueller or approved equal. Assemblies shall include double check valve and ball valve with locking wing. Couplings for connection shall be ¾" F.I.P. x 1" P/J C.T.S Mueller H-15451 with stainless inserts or approved equal. Contractor shall verify fit and compatibility of assembly components prior to ordering. All assemblies shall be suitable for 5/8" x 3/4 Hersey radio read model 430 meters compatible with the City of Seaford ITRON system.
- (5) Cover and frames shall be installed in non-traffic areas only. Lids shall be poly lids as manufactured by DFW Plastics, model DFW\*12SFDW-LID, to facilitate electronic readings. Lids shall have the word "Water Meter" cast into the cover and include lifter worm locks. Supply meter box lid wrenches, meter box frames to be Mueller model 700098 or approved equal.
- (6) Meter pits shall be located on the front property line, as close as possible to the center of the lot in new construction. A minimum separation distance of ten (10') feet shall be maintained between meter pits and sewer cleanouts and also water service lines and sewer laterals.

#### E. Gang Meter Pits (Up to five (5) meters)

- (1) All service lines connecting gang meter pits to water mains shall be two (2) inch diameter, SDR-9 copper tube size polyethylene tubing. The manifold in the pit shall be schedule 80 PVC pipe. The service pipe downstream of the pit shall be P.E. SDR 9, 1 inch diameter.
- (2) The gang meter shall be installed in a precast concrete meter pit by Penn-Cast Products, Inc., Model #448 top section only, or approved equal. The service pipe or tubing has to be installed in a sleeve.

- (3) For tapping ductile iron pipe and PVC use Mueller, double strap, iron, service clamp with 2 inch CC threads. Use Teflon tape for threaded service connections. **Do not torque saddles or sleeves without water pressure in main.**
  - (4) Curb valve shall be Mueller 2 inch oriseal H-15209 or approved equal. The valve box shall be 5 1/4 inch Mueller Buffalo screw type box with "water" cast in the lid.
  - (5) The setting shall be as detailed on the plans. Use for each meter at the pit Ford yoke 502P, Ford straight yoke ball valve B91-324, Ford straight yoke check valve HS91-323 and a Ford expansion connection EC-23W. Couplings for connecting to service tubing shall be 3/4" F.I.P. X 1" P/J C.T.S., Mueller #15451.
  - (6) Cover shall be Ford MC-36 with twenty (20)-inch lid and thirty-six (36) inch inside diameter.
- F. Gang Meter Pits (Larger than five (5) meters)
- (1) Must be submitted to the City of Seaford for review and approval.
- G. Laying service pipe and appurtenances.
- (1) All service pipes shall be carefully inspected for damaged areas. All damaged pipe shall be cut out and re-coupled. Pipe installed during hot weather shall be allowed to contract to normal length before backfilling. Pipes and fittings shall be bedded on a solid foundation.
  - (2) Fittings and valves shall be kept clean, handled carefully and installed according to manufacturer's recommendations.
  - (3) All new service lines shall be installed in the center of vacant lots with meter in the right-of-way and not driveways, unless otherwise directed by the Engineer.
  - (4) Service lines in streets shall be installed by open cutting or with an underground piercing tool such as an ACCU-punch or equal. Maximum diameter of piercing tool to be two and one-half (2 1/2) inches. Based on bids received the Owner may adjust the quantity of the various types of service installation or eliminate the use of the piercing tool as is in his best interest.
  - (5) Installation of services by piercing tool shall be performed with all necessary devises to assure alignment accuracy. Such devices shall include a magnetic level launcher, and aiming frame. The Contractor shall

demonstrate installation procedures to the Engineer and the D.O.T. for approval prior to use.

- (6) Service connections and meter boxes shall be installed immediately after the construction of the adjacent main. Postponement of construction of service lines will be not allowed.
- (7) Requirements for sterilization and pressure testing of service connections shall be the same as specified for mains in this specification.
- (8) The Contractor is responsible for locating existing services, cutting and reconnection with all necessary adaptors or sleeves within the unit price bid for service lines. The Contractor shall obtain and pay for the services of a Licensed Plumber as required by code. A plumber, licensed in the City of Seaford, must obtain a plumbing permit for all plumbing work related to the water and sewer installation.

**END OF SECTION**

## SECTION CONTENTS

### SECTION 5: STORMWATER SEWER PIPES AND APPURTENANCES

- 5.01 General Provisions
- 5.02 Reinforced Concrete Pipe
- 5.03 Steel (Corrugated Metal) Pipe
- 5.04 Aluminum (Corrugated Metal) Pipe
- 5.05 High Density Polyethylene Pipe (HDPE)
- 5.06 Pipe and Fittings
- 5.07 Precast Concrete Manholes and Inlets
- 5.08 Castings
- 5.09 Brick and Mortar for Inlet Flow Channels
- 5.10 Manhole and Inlets Steps
- 5.11 Detection Tape

## SECTION 5 - STORMWATER SEWER PIPES AND APPURTENANCES

### 5.01 GENERAL PROVISIONS

- A. This section covers stormwater sewer pipe, precast manholes, and precast catch basins.
- B. The Contractor shall furnish and install all stormwater sewer pipes and appurtenances as specified herein and as defined on the drawings or as directed by the Engineer.
- C. The City of Seaford shall not be responsible for the maintenance or repair of stormwater systems located on private property.
- D. The Contractor shall submit certification to the Engineer that all pipe, fittings, and joints are as specified herein.

### 5.02 REINFORCED CONCRETE PIPE (RCP)

- 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 twelve (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 of the tongue and groove ends shall be spaced not greater than one (1) 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. Only RCP shall be placed within City Right-of-Ways.

### 5.03 STEEL (CORRUGATED METAL) PIPE

- A. Steel (corrugated metal) pipe shall be galvanized bituminous coated corrugated steel pipe conforming to the most recent Delaware Department of Transportation Standard Specifications for road and bridge construction. It shall be suitable for H-20 Live loading.

### 5.04 ALUMINUM (CORRUGATED METAL) PIPE

- A. Aluminum (corrugated metal) pipe shall be galvanized bituminous coated corrugated aluminum pipe conforming to the most recent Delaware Department

of Transportation Standard Specifications for road and bridge construction. It shall be suitable for H-20 Live loading.

#### **5.05 HIGH DENSITY POLYETHYLENE PIPE (HDPE)**

- A. HDPE pipe shall be smooth interior, AASHTO designation M252 and M294, with a maximum diameter of forty-eight (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 manufacture's guidelines.
- D. All pipe joints shall be watertight.

#### **5.06 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 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 bottom, or when, in the opinion of the Engineer, the trench or 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 or 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 each work 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 built as pipe laying progresses.
- I. Coupling bands for steel and aluminum corrugated metal pipes shall be of the one piece lap-type coupling. No single band couplers will be allowed.

#### 5.07 PRECAST CONCRETE MANHOLES AND INLETS

- A. The Contractor shall construct structures of precast reinforced concrete risers and base sections as indicated on the plans. All catch basins, manholes, junction boxes, inlets and other precast structures shall be constructed in accordance with the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.
- B. Structures shall be built as 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 built 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 to the public.
- C. Precast reinforced concrete risers, eccentric cones and bases shall be as detailed on the plans and in conformance with ASTM Designation C0478. Joints between riser sections shall be fitted with an "O" ring rubber gasket, meeting the risers shall be in accordance with manufacturer's recommendations.
- D. Precast reinforced concrete base riser sections shall be as manufactured by Atlantic Concrete Company, Virginia Precast Corporation, or approved equal.
- E. Interior and exterior joint spaces of all structures shall be filled prior to application of the exterior waterproofing. The interior and exterior joint shall be mortared.
- F. 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 inlet riser sections. Not more than two holes shall be cast in the walls of each riser section for the purpose of handling.
- G. The exterior surface of all precast manholes and inlets shall receive a minimum two coat application of 68% solid coal tar type protective coating. The total average dry film thickness shall measure twenty-four (24) mils with no single measurement to be less than twenty (20) mils. Surfaces shall be prepared in accordance with the manufacturer's instructions and coatings applied in the field in an acceptable manner.

- H. 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.

#### 5.08 CASTINGS

- A. Manhole frames and covers for manholes shall be set by the Contractor as the work progresses. The frame shall be well bedded in mortar.
- B. Frames and covers shall be East Jordon Iron Works Hinged Manhole Assembly, product number 00104007L01. Frames shall be manufactured in accordance with standard specifications for gray iron castings ASTM Designation A 48 for Class No. 35 B. Covers shall be shall be manufactured in accordance with standard specifications for ductile iron castings ASTM Designation A 536.
- C. All frames and covers shall be of the size and types detailed on the plans.
- D. All stormwater manhole covers shall be cast with the words "CITY OF SEAFORD" "STORMWATER".
- E. Inlet gratings shall conform to the detail shown on the plans and/or for the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.
- F. All catch basin grates shall be DeIDOT Type 3.

#### 5.09 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.

#### 5.10 MANHOLES AND INLET STEPS

- A. Steps in structures shall be made of three-eighths inch (3/8") diameter (No. 3) steel bars, ASTM Designation A-615, Grade 60, encased in polypropylene plastic. Manhole steps shall be 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 or 8 inch thick brick manhole 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 approved equal.
- D. Steps in structures shall be spaced twelve (12) inches apart. The maximum spacing from the top of the manhole to the **first step** shall not exceed sixteen (16) inches.

#### 5.11 DETECTION TAPE

- A. Pipeline detectable tape shall be installed continuously along all storm drains. The tape shall be installed directly along all storm drains. The tape shall be installed directly above drain and 6 inches from the ground surface.
- B. The tape shall be Lineguard Type II Detectable Tape as manufactured by Lineguard, Inc., of Wheaton, Illinois, or equal. The tape shall be a minimum of two (2) inches wide, white in color, imprinted with the words, "CAUTION-STORM DRAIN BELOW", and be capable of being detected with inductive methods.

**END OF SECTION**

## SECTION CONTENTS

### SECTION 6: SURFACE RESTORATION

- 6.01 General Provisions
- 6.02 Maintenance of Refilled Excavations
- 6.03 Base Courses
- 6.04 Bituminous Concrete Pavement
- 6.05 Concrete Pavement
- 6.06 Topsoil and Seeding

## SECTION 6 - SURFACE RESTORATION

### 6.01 GENERAL PROVISIONS

- A. The Contractor shall restore all surfaces damaged by his operations to the widths and extent detailed or noted on the plans or specified herein.
- B. Surface restoration in streets and roads maintained by the State of Delaware Department of Transportation (DeIDOT) shall be accomplished in accordance with applicable utility construction permits.
- C. Various conditions and types of surface restoration are shown on the details. Materials and construction methods to be in accordance with the following specification and the most recent DeIDOT Specifications for Road and Bridge Construction.
- D. Existing pavement to be trimmed to secure a straight clean edge for repaving. Saw cut pavement as shown on the drawings and as directed to obtain a clean pavement edge.
- E. No staggered or irregular longitudinal trench repair widths shall be allowed in each block of work. Repair shall be of a uniform width and in a straight line.
- F. Minimum pavement restoration width is four (4) feet, including edge of roads. Actual width shall be as detailed or noted on the plans. Payment is limited to these widths. Should the Contractor damage or disturb larger areas, he shall replace the additional area at his cost.
- G. Surface course and concrete sections shall be lifted out, not broken out.
- H. Undermined areas shall be grout filled or cut back.
- I. A temporary two (2) inch layer of cold patch shall be placed on all utility trenches at the end of every workday.
- J. Metal plating **may** be used at the end point of the utility laying operation and **must** be used to protect the integrity of concrete patches.
- K. All adjustments to existing utilities shall be made prior to overlay operations and have to be repeated if there is any damage due to rolling and compacting operations. Adjustment rings shall only be permitted on a case by case basis and must be reviewed and approved by the Engineer prior to installation.
- L. Manhole or catch basin adjustments can be made with pre-cast manhole adjustment rings, brick course or mortar layers. Valve boxes shall be adjusted to the proper elevation using the screw adjustment.

- M. Pavement adjacent to all trenches shall be cut back by one (1) foot on each side.
- N. Skewed patches will not be permitted. All patches shall be boxed square.
- O. Paving operations can be performed with the minimum temperatures, material types, and thicknesses as specified in the most recent DeIDOT Specifications for Road and Bridge Construction.
- P. Catch basins, inlets, curbs, and all other appurtenances shall be adequately covered and protected prior to application of bituminous materials. No earth or bituminous materials shall be allowed to enter any storm drainage system and suitable containment provisions shall be employed to prevent surface runoff of bituminous materials.
- Q. The final surface, except on overlays, shall match grades existing prior to construction and shall be such that a smooth transition free of abrupt changes in grade is made with adjacent pavements and/or sidewalks. No depressions or other misalignment shall obstruct, trap or otherwise misdirect the flow of surface water drainage.

## 6.02 MAINTENANCE OF REFILLED EXCAVATIONS

- A. The Contractor shall maintain, at his own expense, all refilled excavations and surfacing in proper condition as specified herein. All depressions appearing in the refilled excavation, stabilized base and temporary paving shall be properly refilled. If the Contractor fails to make repairs within forty-eight (48) hours after receipt of written notice from the Engineer, the Owner may refill said depressions and the cost thereof shall be billed to the Contractor. In case of emergency, the Owner may refill any depression or protect with barricades without giving previous notice to the Contractor, and the cost of so doing shall be billed to the Contractor.
- B. The Contractor shall be responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at any time.
- C. The Contractor shall submit a detail for all temporary and final repairs.

## 6.03 BASE COURSES

- A. Crusher Run:
  - (1) Crusher run base course shall be spread on prepared and compacted refilled excavations to the compacted depth shown on the drawing details.
  - (2) Materials and methods of construction shall meet the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.

**B. Bituminous Concrete Base Course (Deeplift)**

- (1) Bituminous concrete base course shall be spread on prepared and compacted refilled excavations to the compacted depth shown on the drawing details.
- (2) Materials and methods of construction shall meet the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.

**6.04 BITUMINOUS CONCRETE PAVEMENT**

- A. Hot-mix, hot laid bituminous concrete shall consist of placing bituminous concrete base and/or wearing course on a prepared base to the minimum compacted thickness shown on the drawings.
- B. Hot-mix, hot laid bituminous concrete shall meet the provisions of the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details. All thicknesses detailed shall be compacted thicknesses.

**6.05 CONCRETE PAVEMENT**

- A. Concrete used in the restoration of streets and roads shall be placed to the minimum thickness shown on the drawings. Concrete may be a base course with a bituminous concrete overlay or a finished surface course as shown on the drawings.
- B. Concrete pavement shall meet the provisions of the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.
- C. Concrete sidewalk, curb, gutter, and driveway restoration shall meet the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.

**6.06 TOPSOIL AND SEEDING**

- A. Topsoil shall be placed in areas where grass has been disturbed by the Contractor's operations. Depth of topsoil shall be four (4) inches minimum. Topsoil salvaged and stockpiled during trench and structure excavation may be used for this purpose. When top soiling, all material and methods of construction shall meet the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.
- B. Seeding shall consist of furnishing and placing seed and soil supplements on top soiled areas and at any other locations as directed by the Engineer. When seeding, all materials and methods of construction shall meet the most recent

- State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.
- C. Fertilizer shall be a recognized commercial fertilizer containing minimum 5% nitrogen, 10% available phosphoric acid and 10% soluble potash by weight. It shall be applied in sufficient amounts to provide sixty (60) pounds of nitrogen per acre.
  - D. Fertilizing and seeding application rates shall be in conformance with the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details. Seed shall be applied at a rate of four (4) to five (5) pounds per one-thousand (1,000) square feet.
  - E. No mulch shall be required unless the area to be seeded rest upon a slope greater than 3 to 1. Mulch for these areas shall consist of straw mulch as specified in the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.

**END OF SECTION**

## SECTION CONTENTS

### SECTION 7: SOILS INVESTIGATION AND SUBDIVISION PAVEMENT DESIGN

7.01 Soils Investigation

7.02 Subdivision Pavement Design

## SECTION 7 - SOILS INVESTIGATION AND SUBDIVISION PAVEMENT DESIGN

### 7.01 SOILS INVESTIGATION

- A. The Owner or Developer shall employ the services of a Geotechnical Engineering firm to perform a subsurface investigation for the purpose of obtaining information needed to design the proper pavement section.
- B. The Geotechnical Engineering firm used must have on staff an Engineer registered in the State of Delaware who is qualified and experienced in the field of Geotechnical Engineering and who is actually engaged in the practice of soils mechanics and foundation engineering.
- C. Borings shall be made for all proposed streets within the project area. The following guidelines and methods will be followed when performing the field work:
- (1) Borings shall be accomplished by using hollow stem augers and/or other equipment necessary to obtain soil samples of each stratum encountered.
  - (2) Boring locations shall be placed along the center line of the street no more than three-hundred (300) feet apart, with a minimum of two (2) borings per street.
  - (3) Borings shall be performed to a depth of six (6) feet below the sub-grade of the proposed pavement system.
  - (4) Soil shall be sampled by stratum. At each soil composition change, a sample, sufficient in size to perform the required laboratory testing shall be obtained.
  - (5) When water is encountered, borings should be left open until water level stabilizes and then depth to water should be recorded.
  - (6) A log of each boring should be performed by the geotechnical field personnel. The following information should be recorded on the boring log:
    - a. Name of street
    - b. Location of boring – station and offset
    - c. Surface elevation
    - d. Date boring was performed
    - e. Depth, vertical arrangement, and thickness of each stratum
    - f. Sample number
    - g. Visual soil classification of each stratum
    - h. Depth of water (if encountered)
- D. The following laboratory tests shall be performed on the material and sampled from each stratum encountered in individual borings:

- (1) Practices for dry preparation of soil samples for particle size analysis and determination of soil contents (ASTM Designation D421).
  - (2) Method of particle size analysis of soils (ASTM Designation D422).
  - (3) Amount of material in soils finer than the number 200 sieve (ASTM Designation D1140).
  - (4) Method of laboratory determination of water content of soils (ASTM Designation D2216).
  - (5) Classification of soils for engineering purposes (ASTM Designation D2487).
  - (6) Test method for liquid limit, plastic limit, and plasticity index of soils (ASTM Designation D4318).
- E. Methods which deviate from any of the above procedures must be submitted to the City of Seaford for approval.
- F. Results of the soil investigation submitted to the City of Seaford should contain the following information:
- (1) A plan view of the proposed streets showing boring locations.
  - (2) Logs containing the required data for all borings made.
  - (3) Test results of all laboratory tests performed.
  - (4) A profile view of each street with borings plotted to scale showing the ASTM classification of soils encountered.
- G. The City of Seaford reserves the right to check soil survey borings and inspect testing laboratories as part of their review of the investigation work.

## 7.02 SUB-DIVISION PAVEMENT DESIGN

- A. Sub-division streets shall be designed based on the following standards and practices.
- B. Refer to the Subdivision Regulations for the minimum street widths required.
- C. The design of pavement sections for subdivision streets shall be based on the type of soils as determined by the soils investigation, the anticipated number of units utilizing the streets and utilization of streets by construction traffic.
- D. The required structural numbers as shown in the attached tabulations.

- E. For streets serving more than 50 units, Private Parking Lots, Commercial and Industrial Facilities, a minimum of three (3") inches of hot mix surface and base course and eight (8") inches of compacted graded aggregate shall be used.
- F. The final wearing course of hot mix on collector streets shall not be placed until seventy-five percent (75%) of the houses are completed.
- G. Prior to placing the pavement section, the subgrade shall be prepared and test rolled as detailed in the most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Specifications and Details. If the test rolling shows the subgrade to be unstable, the Contractor shall scarify, disc, aerate or add moisture and recompact the subgrade to the extent that when retested it will be stable. If, in the opinion of the Engineer, there are areas to be removed or undercut, they may be ordered, excavated, and replaced with approved material.
- H. The total minimum required structural number based on the number of units using the street are as follows:

Required Structural Number

No. of Units	Good Soil	Poor Soil
1-50	1.70	2.70
51-100	2.00	2.90
101-200	2.50	3.30
201-300	2.90	3.70
Over 300	3.30	4.10

See the most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Specifications and Details for specific material thicknesses.

Note: Good soils – all soils within the A-1, A-2, and A-3 AASHTO soil classifications.

Poor soils – all soils within the A-4, A-5, A-6 and A-7 AASHTO soil classifications.

- I. The pavement section of streets built to serve a future area of development shall be increased in strength to serve both the present and future traffic loads. If such a street must also serve construction traffic of future development, the pavement section shall again be increased in strength as follows:

No. of Units Proposed for Future Development Area	Increase in Structural Number
1-100	0.48
101-300	0.80

- J. Following is the list of structural numbers used to obtain a pavement section thickness which will meet or exceed the minimum required structural number shown above:

Use	Material	Structural
Surface Course	Type C Hot-Mix	0.40
Base Course	Type A Hot-Mix	0.35
	Type B Hot-Mix	0.40
	Bituminous Concrete (Deep Lift)	0.32
Sub-Base Course	Select Borrow	0.08
	Quarry Waste	0.11
	Crusher Run	0.14
	Pre-Mixed (CR-1)	0.20
	Soil Cement (6% Cement +/- 1%)	0.20

**END OF SECTION**

## SECTION CONTENTS

### SECTION 8: CONCRETE SIDEWALKS, CURB, GUTTER, AND DRIVEWAYS

- 8.01 General Provisions
- 8.02 Methods and Materials
- 8.03 Subbase
- 8.04 Reconstruction of Private Driveways
- 8.05 Sidewalk Construction

## SECTION 8 - CONCRETE SIDEWALKS, CURB, GUTTER, AND DRIVEWAYS

### 8.01 GENERAL PROVISIONS

- A. The Contractor shall provide all labor, materials and appurtenances for construction of concrete sidewalk, curb, and gutter where indicated on the drawings and as specified.
- B. The Contractor shall furnish and install PVC pipe sleeves in sidewalk area designated by the Owner for street signs.
- C. All sidewalks curb and gutter abutting a property are to be installed and maintained by the property owner in accordance with the City of Seaford Municipal Code.

### 8.02 METHODS AND MATERIALS

- A. All materials and construction methods shall be in accordance with the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details.
- B. All concrete used shall be in accordance with the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details. The concrete shall have a minimum ultimate compressive strength of three-thousand (3,000) psi at the end of twenty-eight (28) days. Submit mix design for approval. All concrete shall be air entrained.
- C. The Contractor shall retain the services of an independent testing agency to perform concrete testing. He shall schedule one (1) set of test cylinders for every 20 cubic yards of concrete placed as curb and gutter or sidewalk. The testing agency shall be responsible for sample preparation, transportation, testing and submission of testing reports. Testing shall include slump test, air content, ambient temperature, concrete temperature and 7-day and 28-day compression tests. Test results shall be submitted, in duplicate, direct by the testing agency, to the Engineer. The cost of all concrete testing shall be included in the prices bid for sidewalk, curb and gutter.
- D. Curbs shall be depressed at all existing driveway locations in accordance with the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details, including proper preparation of subgrade and proper placing and spacing of joints and joint materials.
- E. The Contractor shall permanently repair or relay all curbs, sidewalks and driveways that have been removed broken, or otherwise injured in executing any of the work under the contract or injured by settlement of any backfilled excavation at any time prior to termination of the contract and guarantee period.

The minimum allowable length for replacement of damaged curb shall be ten (10) feet.

- F. New sidewalk, curb, gutters or ramps or replacement of areas damaged during construction shall be installed in accordance with the most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Specifications and Details.
- G. Install accessible curb ramps at all street corners constructed. Ramps shall be installed in accordance with most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Specifications and Details.

### 8.03 SUBBASE

- A. Subbase for concrete sidewalk and integral curb and gutter shall be clean, well graded select material. Select material shall be well graded sand or bank-run sand-gravel per the most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Specifications and Details. Compact to at least ninety-five percent (95%) of maximum density at optimum moisture content as determined by the Modified Proctor Test ASTM D1557.

### 8.04. RECONSTRUCTION OF PRIVATE DRIVEWAYS

- A. Saw cut existing driveways if sections are acceptable for reuse. Prior to replacement of driveways, the Contractor, Engineer and Owner shall review field conditions.
- B. Driveway aprons shall be constructed of concrete between the curb and sidewalk.
- C. The Owner will designate the extent of additional removal and replacement. Upon completion of utility construction, the Contractor shall reconstruct private driveways in kind except as follows:
  - (1) Concrete Driveways:
    - a. Concrete driveways shall be replaced and reconstructed upon a properly prepared, graded and compacted subgrade and in compliance with the most recent State of Delaware Department of Transportation (DelDOT) Standard Construction Specifications and Details.
    - b. Driveways shall be constructed to a minimum thickness of six (6) inches and shall be reinforced with six (6) inch by six (6) inch, w1.4 xw1.4 WWF.
    - c. Restoration shall provide a smooth transition from back of sidewalk or driveway construction to undisturbed areas which shall be free of all localized depressions or abrupt changes in grade that may trap or

otherwise misdirect surface drainage or represent possible damage to vehicular travel.

**D. Bituminous Concrete Driveways**

- (1) Bituminous driveways and parking areas disturbed through the Contractor's construction operations shall be restored by a minimum of three (3) inches of hot mix bituminous concrete pavement placed in a single lift onto a base course consisting of four (4) inches of properly prepared and compacted crushed stone or quarry waste. Commercial and residential entrances on State of Delaware maintained streets shall be in accordance with the plan details. Match existing thickness where condition exceeds minimum restoration.
- (2) The hot mix bituminous concrete surface shall conform to the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details for Type C.
- (3) The sub grade shall be properly prepared, graded and compacted in accordance with Section 2 of these specifications.

**8.05 SIDEWALK CONSTRUCTION**

- A. Concrete sidewalks shall be replaced as required, or as directed, in accordance with the most recent State of Delaware Department of Transportation (DeIDOT) Standard Construction Specifications and Details. Handicapped ramps shall be installed in all areas defined herein.
- B. All new or replacement sidewalks shall be constructed of concrete as detailed herein.
- C. Sidewalks in areas not subject to vehicular loading shall have a minimum thickness of four (4) inches placed upon a properly prepared, graded and compacted subgrade.
- D. Sidewalks in vehicular loading areas shall be a minimum thickness of six (6) inches reinforced with six (6) inch by six (6) inch w1.4 xw1.4 WWF. Subgrade shall be prepared as stated for non-load areas.
- E. Sidewalks which cross a driveway shall maintain the requirements for a handicap accessible path.
- F. Replacement of partial sections of concrete sidewalk, where so directed, shall be extended to the nearest existing joint in each direction.

- G. Sidewalks shall be replaced to a width of five (5) feet. The width for installation for new sidewalk shall be five feet. Transitions between existing adjacent sidewalks of lesser width shall be as directed by the City of Seaford.
- H. All sidewalks shall have a maximum cross slope of 1:50 and a maximum running slope of 1:21.
- I. A broom finish shall be applied perpendicular to the direction of traffic.

**END OF SECTION**

**SECTION CONTENTS**

SECTION 9: GENERAL CONDITIONS

- 9.01 CITY ELECTRIC UTILITY INSTALLATION
- 9.02 ELECTRIC UTILITY CONDUIT CROSSINGS

### 9.01 CITY ELECTRIC UTILITY INSTALLATION

- A. The City Electric Department will install the electric utilities, except that all conduit for street crossings shall be installed by the Developer. The cost of the electric utility installation shall be paid by the Developer.
- B. The electric utilities shall not be installed until the following have been completed:
  - (1) The site has been graded to within six (6) inches of final grade ten (10) feet beyond and including the right-of-way and in all other locations where electric utilities may be installed.
  - (2) All property corners and proposed locations of electric utility equipment shall be staked out by the Developer.

### 9.02 ELECTRIC UTILITY CONDUIT CROSSINGS

- A. Where required, electric utility conduit crossings under roadways shall be installed by the Contractor. Conduit materials for road crossings will be provided to the Contractor by the Owner.
- B. Excavation and backfill for conduit crossings shall be in accordance with the provisions of Section 2, EXCAVATION AND BACKFILL of these STANDARD DESIGN SPECIFICATIONS.
- C. All conduits shall be installed and connected in accordance with the manufacturer's instructions.
- D. Pull strings shall be installed in all vacant conduits. Conduit ends shall be capped prior to backfilling to prevent entry of soil and other foreign materials.
- E. Conduit shall not be located above water or sewer lines unless approved by the Engineer. Minimum burial depth and separation from other facilities shall be in accordance with all applicable codes.
- F. Red metallic marking tape shall be placed during backfill in accordance with all applicable codes.
- G. Conduit ends shall extend into the utility easement for later access by the electric utility. Each end of the buried conduit shall be accurately located at the surface with a properly marked stake or other suitable device.
- H. Conduit location and depth shall be accurately indicated on the construction drawings and record drawings.

**END OF SECTION**