

APPENDIX A
TECHNICAL SPECIFICATIONS

SECTION 02050

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section. All work must meet the requirements of DeIDOT Specifications.

Section 607 – Removal of Existing Concrete and Masonry.

1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of selected site elements including but not limited to manholes and piping.
2. Clearing and grubbing
3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's / site manager's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Construction Manager of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Construction Manager and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.8 WARRANTY

1. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Existing septic tanks to be removed or abandoned in accordance with all DNREC requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

3.2 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.3 SELECTIVE DEMOLITION, GENERAL

1. General: Demolish and remove existing construction only to the extent required by new construction and as indicated.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Coordinate first subparagraph below with use of elevators, stairs, or building entries permitted by building manager.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.5 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.6 CLOSING ABANDONED SANITARY SEWER SYSTEMS

1. Abandoned Piping: Remove underground piping and backfill and compact trench or fill abandoned underground pipe with flowable fill.
- B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:
1. Remove manhole and close open ends of remaining piping.
 2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, sand, gravel, or compacted dirt. Fill to top with concrete.

END OF SECTION 02050

SECTION 02221

EXCAVATION AND BACKFILL FOR PIPELINES AND STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

- 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 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 and utilities 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 under this contract, whether such facility is or is not shown on the drawings.
- C. The Contractor shall verify the location, size and elevation of all existing utilities at the various points of connection and/or crossings prior to starting any work. Any discrepancies in locations or elevations shall be brought to the attention of the Engineer 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 requirements 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 may direct, and the cost shall be included in the price bid for pipeline and structures, unless otherwise defined in the proposal.
- 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.

PART 2 - PRODUCTS

2.1 MATERIALS

No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance

of the contract work, regardless of the type, character, composition, or condition thereof.

PART 3 - EXECUTION

3.1 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. The excavation shall be dry at all times without groundwater infiltration. No extra compensation will be allowed for hand excavation and backfill necessary to complete the work or required by the Engineer.
- B. Trenches shall be excavated to the necessary width and depth, as shown on the drawings and as required for the protective sheeting, pull boxes, etc. No extra compensation will be allowed for trenches wider than that detailed on the drawings.
- 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 workers, utilities, etc., and required for safety. Safety regulations shall be as required by state safety codes and OSHA.
- D. In non-paved areas strip surface vegetation and topsoil and place in stock piles which are separated from the trench excavated materials. Topsoil shall not be used for general trench refill.
- E. The excavation of all trenches shall be fully completed at least twenty (20) feet in advance of pipe laying, unless otherwise authorized or directed. The Engineer may require the backfilling of open trench, over completed pipelines, or ahead of the pipe laying operation, if in his judgement such action is necessary, and the Contractor shall have no claim for extra compensation.
- 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, by the Engineer or the DOH Inspector. He 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 forty-eight (48) hours or immediately if it poses a safety hazard after a proper notice, has been given by the Engineer or DOH Inspector the Owner shall be authorized to do the work. The resulting expenses shall be deducted from monies due the Contractor.
- G. The Contractor shall complete excavation as nearly as practicable to the lines of the pipeline 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 material found suitable will be required for backfilling, repaving or other purposes. Material classified as unsuitable shall be disposed of by the Contractor at a location approved by the Engineer. Hauling of excavated materials for any purpose shall not entitle the Contractor to additional compensation. Only those excavated materials designated by the Owner shall become property of the Contractor.
- I. All stockpiled materials shall be placed in such a way to prevent damage to the trench,

structures, drainage areas or private property. Excavated materials shall not be placed on private property unless a temporary easement agreement is obtained from the property Owner by the Contractor.

- J. The Contractor shall remove, relocate, change or protect all structures including but not limited to signs, mailboxes, overhead and buried utilities as required for construction whether shown on drawings or not. No extra compensation will be allowed for property damage, injury or loss of time due to obstructions encountered not shown on plans.
- K. The Contractor shall be responsible for any damage to curb, gutter, sidewalk, traffic control devices, pavement material and lawns. Any damage resulting directly or indirectly shall be replaced in kind by the Contractor without additional compensation. The reuse of disturbed curb, gutter or sidewalk is prohibited. New sections shall be installed to the nearest undisturbed control joint.

3.2 PIPELINE TRENCH BACKFILL

- A. Materials excavated from the trench except topsoil shall be used for trench backfill, provided that, in the opinion of the Engineer, the excavated material is suitable for this purpose. Backfill material shall be free from large lumps, pavement, pieces of concrete and stones.
- 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 8-inch layers. Compaction shall be accomplished by mechanical tampers. 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. Each layer shall be mechanically tamped for the full trench width unless an alternative method is approved in writing by the Engineer.
- C. Every backfill layer shall be compacted to 95% of maximum density at optimum moisture content as determined by the Modified Proctor Test, ASTM D1557 Method C. 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. Backfilled trench sections which fail to meet density requirements three consecutive times shall be excavated and properly disposed of by the Contractor.
- 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 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 within the prices bid.
- E. Field density testing shall be performed at a rate of 1 test per 50 linear feet of trench, at a depth specified by the Engineer. 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.

Whenever test results indicate compaction densities less than specified, the Contractor shall, at his own expense, secure the specified compaction using methods approved by the Engineer. The testing agency, so employed by the Contractor, shall submit a copy of all testing reports directly to the Engineer. Each report shall contain the project identification name and

number, name of Contractor, name of testing agency, and location of sample tested by station, street and depth, as a minimum.

- 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 forty eight (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 retained from any monies due or to become due the Contractor under the Contract. The Contractor shall be fully responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at any time 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 as approved by the Engineer, and all places on the line of the work shall be left clean and in good condition. This cleaning up shall be done by the Contractor without extra compensation. 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 retained from the monies due the Contractor under the contract.
- I. No backfilling of pipelines will be allowed until measurements of pipe and an inspection has been performed by the Owner's representative, and until the Engineer has authorized the backfill. Any unauthorized backfill of pipelines shall be uncovered by the Contractor at his expense if required by the Engineer.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate for structures, walls, foundations, footings, etc., to the depth and width required for construction and stripping of forms. Structural excavation shall consist of the excavation of all earth, rock boulders, existing concrete and masonry foundations and walls, and all other materials encountered regardless of type, which the Contractor may encounter.
- B. Excavated materials shall be segregated as they are excavated, with the suitable and unsuitable material and topsoil being piled separately. All suitable material shall be used for backfill. All unsuitable material shall be removed, at the Contractor's expense, and disposed of at a location approved by the Engineer. No excavated material shall be deposited at any time so as to endanger partly finished structures either by direct pressure, or indirectly by overloading banks contiguous to the operation.
- C. The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.
- D. All provisions of the sub-section "Pipeline Trench Excavation" which apply to "Excavation for Structures" shall be included under this section.

3.4 BACKFILL FOR STRUCTURES

- A. Backfill around structures with suitable material from the excavation to the original surface grades or the finished grades shown on the plans or defined by the Engineer.

- B. No backfill shall be placed against new concrete or masonry structures until properly cured.
- C. Backfill shall be placed in six (6) inch layers and compacted by mechanical tampers. Compaction shall conform with the requirements for compaction already set forth in this specification.
- D. The Contractor shall exercise caution in backfill and compaction to prevent damage to structures.

3.5 DEWATERING

- A. All excavations must be kept free of water below the subgrade of the work while work is in progress. This must be accomplished by well points producing 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 groundwater is first encountered and shall be continued until such time as backfill has been completed. No concrete or pipe shall be laid in water nor shall water be allowed to rise over them until the concrete or mortar has set at least 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 damage property or be a menace to the Public Health.
- D. In the event the Contractor's dewatering operations affect any water supplies within the project area, the Contractor shall take whatever steps that are required to provide uninterrupted water service.
- E. 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.

3.6 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 condition of all excavations made by the Contractor shall be the responsibility of the Contractor. No extra compensation will be allowed for property damage, injury or loss of time, due to excavation slides or cave-ins at any time under any circumstances.
- C. The Contractor shall cut off any sheeting left in place, at least eighteen (18) inches below finished grade, and shall remove the material cut off without compensation.

- D. Where necessary, in quicksand, soft ground, or 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.
- E. The cost for furnishing, placing and removal of sheeting, shoring or bracing shall be included in the prices bid.
- F. A trench box is an acceptable alternative to sheeting, shoring or bracing providing such boxes conform to safety codes.

3.7 SELECT BACKFILL

- A. Should the Contractor encounter unsuitable material during excavation, he shall remove and dispose of such material at a location approved by the Engineer. The cost of such disposal shall be included in the prices bid for pipe and structures.
- 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 Standard Specifications.

END OF SECTION

SECTION 02722

SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish all materials and shall construct the 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. The Contractor shall submit certifications to the Engineer that all pipe, fittings and joints are as specified herein.

1.2 PERMITS AND FEES

Comply with requirements regarding permits, construction methods, inspection, approval, etc. of governing jurisdiction.

1.3 SUBMITTAL

- A. Submit 6 copies of certification for pipe, fittings, casings, manholes and bypass pumps.
- B. A bypass operation plan shall be provided with the project submittals for review and approval by Kent County Public Works Department.
- C. Shop drawings for manholes, include plans, elevations, sections, details, and frames and covers.

1.4 JOB CONDITIONS

- A. Existing Utilities: Locate existing underground utilities in the areas of work. Call "Miss Utility" (1-800-282-8555) and the Kent County Department of Public Works for assistance in locating existing utilities. If utilities are to remain in place, provide adequate means of protection during construction of sanitary sewer system.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during work, consult Owner immediately for directions as to procedure. Repair damaged utilities that are to remain in service to satisfaction of the associated jurisdiction.

1.5 SUMMARY

- A. Section Includes
 - 1. Ductile Iron Pipe
 - 2. Steel Casing
 - 3. Temporary Bypass Pump
 - 4. HDPE Pipe
 - 5. Manhole

PART 2 - PRODUCTS

2.1 DUCTILE IRON GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, for push-on joints.
 - 1. Ductile iron pipe shall conform to AWWA C150 and AWWA C151 and shall be thickness class 52 or class 56, as specified on the contract drawings.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.
- D. Gaskets: AWWA C111, rubber.
- E. All ductile iron pipe and fittings shall receive an outside bituminous seal coat and an interior coating of Protecto 401 minimum thickness 40 mils, Ceramapure PL90 or approved thermoplastic liner unless otherwise specified.
- F. All ductile iron castings for pipe and fittings shall be of domestic manufacture.

2.2 STEEL CASING PIPE

- A. Steel casing pipe shall be furnished in uniform lengths of the diameter shown on the plans and shall conform to the requirements of AWWA C-200; ASTM A-36 steel standard wall thickness schedule shall be used. The pipe, including field connections, shall be coated with bitumastic compound, inside and outside. All joints for casing shall be made by continuous weld completely around the perimeter of the pipe in accordance with AWWA C-206.

2.3 TEMPORARY BYPASS PUMPS

- A. A minimum of two pumping units are required during gravity interceptor bypass operations, each pump shall be sufficient of equal or greater capacity to handle the peak flow of 350 gallons per minute. Each pump rate shall not exceed 500 gallons per minute.
- B. The lead pump shall be critically silenced enclosed unit.
- C. A bypass operation plan shall be provided with the project submittals for review and approval by Kent County Public Works Department.
- D. Each bypass pump shall be controlled by floats.

2.4 HDPE-HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

- A. HDPE SANITARY SEWER FORCE MAIN:
 - 1. Pipe: Pipe shall be high performance, high molecular weight, high density polyethylene pipe as manufactured by Phillips Drisco pipe, ISCO Industries or approved equal. The material shall be PE 3608 formerly 3408 conforming to ASTM D 1248, meeting cell

classification ASTM 345464C for black or 345464E for stripes of per ASTM D 3350. Polyethylene pipe shall be manufactured in accordance with AWWA C901-02 for sizes 1-1/4" thru 3" IPS diameters and to the requirements of ASTM D3035. Pipe 4" and above DIPS and IPS sized shall be manufactured to the requirements of ASTM F714 and AWWA C906-07.3

- a. HDPE piping shall be DR 21 Ductile Iron Pipe Size (DIPS).
2. Fittings: Molded polyethylene fittings shall be supplied by the pipe manufacturer. Fabricated fittings shall be supplied by an approved pipe manufacturer. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked.
 - a. Mechanical Joint adapters shall be provided for transitioning to other pipe materials and of a pressure rating equal to the high of the joining materials
 - b. Transition nipples shall be provided for mating pipes or fittings with a different wall thickness greater than one Standard DR rating.
 3. Joints: Joints between plain pipe ends and fittings shall be made by butt fusion joining. The butt fusion procedures used shall be procedures that are in accordance with ASTM F2620. The Contractor shall ensure that persons making heat fusion joints have received training in the recommended procedure.
 - a. Electrofusion Couplings will not be permitted.

2.5 MANHOLES

A. STANDARD PRECAST CONCRETE MANHOLES:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation. Provide anti-floatation calculations and corrective measures.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 5-inch minimum thickness, of length in 1, 2, 3, or 4 feet to provide depth indicated.
6. Top Section: Eccentric-cone type unless flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 443, Rubber o-ring gasket.
8. Resilient Connectors wherever gravity sewer penetrates concrete - ASTM C-923
9. Steps: Slip resistant polypropylene plastic steps manufactured in accordance with ASTM C478-7AA. Steps shall be OSHA approved. Cast or anchor steps into sidewalls at 12 inch intervals. The maximum spacing from top of manhole to the first step shall not exceed 16-inches. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.

10. Coatings:

- a. Manholes shall be provided with a waterproof exterior bituminous coating.

B. MANHOLE FRAME AND COVERS:

1. Description: 25-inch ID by 7-inch riser, with 4-inch-minimum-width flange and 27-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "KENT COUNTY SANITARY SEWER."
 - a. Material: Class No. 35B cast iron in accordance with ASTM A48 standard specifications for gray iron castings.
 - b. Outer Frame and cover, machined on the bearing surface
 - c. Heavy duty and suitable for H-20 loading.
 - d. Casting shall receive one coat of asphalt paint.
 - e. EJIW Inc., model 2080 with solid cover, Neenah Foundry model R-1960 with solid cover or approved equal.
2. Grade Adjustment: Brick masonry or reinforced-concrete rings, 6- to 12-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope, set in type II portland cement mortar.

C. MANHOLE-COVER INSERTS:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.
3. Description; Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.
4. Type: Solid.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. All pipe installation shall conform to the Kent County Public Works current standards and specifications.
- B. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream, unless indicated otherwise. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

- D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- G. Install gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
 - 2. Install piping with 36-inch minimum cover, unless otherwise directed in the contract drawings.
 - 3. Provide stone bedding at up to the spring line of the pipe in accordance to the County standards. Provide additional stone as necessary for wet, poor soil conditions, deep excavations or encasements at other utility crossings.
 - 4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
 - 5. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
- H. Install force-main, pressure piping according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
 - 2. Install HDPE according to ASTM D 2774-04 Standard Practice for Underground Installation of Thermoplastic Pressure Piping, ASTM F 1962 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings, and ANSI/AWWA C 906-2006 Polyethylene Pipe and Fittings.
- I. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.2 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
 - 2. Join PVC cellular-core sewer piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
 - 3. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
 - 4. Join dissimilar pipe materials with nonpressure-type, flexible couplings.
- B. Join force-main, pressure piping according to the following:
 - 1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.

2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
 3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
 4. Join dissimilar pipe materials with pressure-type couplings.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 1. Shielded flexible couplings for pipes of same or slightly different OD.
 2. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 3. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure pipe couplings for force-main joints.

3.3 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Form continuous concrete channels and benches between inlets and outlet.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.
- E. Install manhole-cover inserts in frame and immediately below cover.

3.4 BYPASS PUMP AND PIPING INSTALLATION AND OPERATION

- A. A bypass operation plan shall be provided with the project submittals for review and approval by Kent County Public Works Department.
- B. A minimum of two pumping units are required during gravity interceptor bypass operations, each pump shall be sufficient of equal or greater capacity to handle the peak flow of 350 gallons per minute. Each pump rate shall not exceed 500 gallons per minute.
- C. Install above ground 6" HDPE DR-21 force main as indicated on contract drawings, anchored down every 50 ft, at a minimum, or as necessary to prevent movement.
- D. Pipe shall be inserted at least 10 ft into receiving manhole with a tight fitting cover and straps as to prevent movement.
- E. Insert plugs per approved bypass operation plan.

F. Contract shall be responsible for the operation of bypass pumps.

G. Floats shall be controlled by floats, alarms shall be provided for high level to prevent overflows.

3.5 LAYING PIPE IN FREEZING WEATHER

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.

3.6 PIPE TESTING

A. GENERAL

Contractor shall furnish all labor, tools, materials, and equipment, including mirrors, flashlights or other artificial lighting, pump, compressors, stopwatch, gauges, and meters, subject to the approval of the Engineer for testing in accordance with these specifications.

B. MIRROR TESTING OF SANITARY SEWERS

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, leakage, 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.

C. LEAK TESTING USING AIR

1. Sewers shall be tested in sections not exceeding 400 feet 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 material and labor required for leakage tests shall be furnished by the Contractor within the price bid.
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. Contractor shall determine at his 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.

D. MANDREL TESTING OF SANITARY SEWERS

1. Sanitary sewer pipe shall be deflection tested not less than 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 95 percent 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.
2. 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.

3.7 MANHOLE TESTING

- A. Air pressure test according to ASTM C1244 - 11 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
- B. General: Test using air whenever possible prior to backfilling to assist in locating leaks. Make joint repairs on both outside and inside of joint to ensure permanent seal. Test manholes with manhole frame set in place.
- C. Vacuum Test as follows:
 1. Plug pipe openings, securely brace plugs and pipe.
 2. Inflate compression band to affect seal between vacuum base and structure; connect vacuum pump to outlet port with valve open; draw vacuum to 10 inches of Hg; close valve; start test. If backfilled and groundwater present adjust pressure accordingly so as not to exceed the pressure range of the manhole and pipe seals.
 3. Test:
 - a. Determine test duration for manhole from the following table:

VACUUM TEST TABLE

<u>Manhole Diameter</u>	<u>Test Period</u>
4 feet	60 seconds
5 feet	75 seconds
6 feet	90 seconds

- b. Record the vacuum drop during test period; when vacuum drop is greater than 1 inch of Hg during test period, repair and retest manhole; when vacuum drop of 1 inch of Hg does not occur during the test period, discontinue test and accept manhole.
 - c. When vacuum test fails to meet 1 inch Hg drop in the specified time after repair; repair and retest manhole.
 4. When unsatisfactory test results are achieved, repair manhole and retest until result meets criteria; repair visible leaks regardless of quantity of leakage.

3.8 DEFECTS TO BE MADE GOOD

If, at any time before the expiration of the guarantee period under this contract, any broken pipe, or any other defects are found in any of the lines or in any of the appurtenances, the Contractor shall cause the same to be removed and replaced by the proper material and workmanship, without extra compensation for the labor and material required, even though such injury or damage may not have been due to any act, default, or negligence on the part of the Contractor. All materials shall be carefully examined by the Contractor for defects prior to installation, and any found defective shall be rejected for use.

END OF SECTION

SECTION 03400

PRECAST STRUCTURAL CONCRETE

PART 1 - SCOPE OF WORK

- 1.1 Furnish all engineering, supervision, labor, equipment and materials to complete all precast concrete construction as shown on the drawings. This shall include but not be limited to valve vaults. Anchorage plates, lifting devices, sheathing, couplings, gaskets, grout, sealants and all work directly related to precast work shall be included.

PART 2 - REQUIREMENTS

- 2.1 The manufacture of the precast concrete box sections shall be in accordance with ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections and in accordance with the drawings.
- 2.2 The precast manufacturer and erector must have been regularly engaged for a period of at least two years in the manufacture and erection of precast concrete sections similar to the requirements of this project.
- 2.3 Deviations to precast concrete sections will be allowed upon approval by the engineer. Deviations shall be certified by a registered professional engineer.
- 2.4 Shop drawings shall be submitted to the Engineer for approval and manufacture shall not proceed prior to receiving approval of the Engineer.
- 2.5 All concrete work shall conform to "Building Code Requirements for Reinforced Concrete", ACI 318.

PART 3 - MATERIALS

- 3.1 Portland Cement - ASTM C-150.
- 3.2 Aggregates - ASTM C-33.
- 3.3 Water - Clean, fresh, free from oil, acid, organic matter, or other substances harmful to concrete and embedded steel.
- 3.4 Reinforcing Bars - ASTM A-615.
- 3.5 Welded Wire Fabric - ASTM A-185.
- 3.6 Joint Sealant - AASHTO M-198 and Federal Specification SS-S-210-A
- 3.7 Resilient Connectors wherever gravity sewer penetrates concrete - ASTM C-923
- 3.8 Hydrostatic Seal wherever force main penetrates concrete - ASTM D-2000
- 3.9 Grout - Grout materials shall be non-metallic, non-shrinking, high strength grout.

PART 4 - CONCRETE MIX

- 4.1 Concrete shall have a minimum 28-day compressive strength of 4000 PSI.
- 4.2 Use of calcium chloride, chloride ions, or other salts is not permitted.

PART 5 - MANUFACTURER

- 5.1 Manufacturing procedures shall be in general compliance with ASTM C-478.
- 5.2 Manufacturer shall provide all openings as required and as detailed on the drawings.
- 5.3 Manufacturer shall cast all inserts as required and as detailed on the drawings.

PART 6 - ERECTION

- 6.1 General Contractor shall be responsible for supplying and placing embedded anchorage plates and hardware in the base slab as detailed by the precast manufacturer's erection drawings.
- 6.2 Installation of precast concrete shall be performed by a competent erector. Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Temporary shoring and bracing, if necessary, shall comply with manufacturer's recommendations.
- 6.3 Members shall be properly aligned and leveled as required by the approved shop drawings.
- 6.4 Contractor shall apply joint sealant system. Joint surfaces shall be clean and dry. Place butt ends of preformed sealant together. Do not overlap.
- 6.6 The interior surface of the force main doghouse manhole shall receive three coats of modified polyamide epoxy as manufactured by TNEMEC or Duraplate (100) Liner System (min. thickness of 140 mils) or equal.
- 6.7 Final inspection and acceptance of erected precast concrete shall be made by the Engineer. Any work not meeting the requirements of this and/or related sections shall be corrected at no cost to the Owner.

END OF SECTION

SECTION 07400

SUPPLEMENTAL CONDITIONS

Schedule of Duties, Responsibilities, and Limitations of Authority of Resident Project Representative

- A. Owner shall furnish a Resident Project Representative ("RPR"), assistants, and other field staff to assist Owner in observing progress and quality of the Work. The RPR, assistants, and other field staff may provide full time representation or may provide representation to a lesser degree.
- B. Through such additional observations of Contractor's work in progress and field checks of materials and equipment by the RPR and assistants, Owner shall endeavor to provide further protection against defects and deficiencies in the Work. However, Owner shall not, during such visits or as a result of such observations of Contractor's work in progress, supervise, direct, or have control over Contractor's work nor shall PRP have authority over or responsibility for the means, methods, techniques, sequences, or procedures selected or used by Contractor, for security or safety at the Site, for safety precautions and programs incident to Contractor's work in progress, for any failure of Contractor to comply with Laws and Regulations applicable to Contractor's performing and furnishing the Work, or responsibility for Contractor's failure to furnish and perform the Work in accordance with the Contract Documents. In addition, the specific limitations set forth in Paragraph A.1.05 of Exhibit A as incorporated in the Task Order are applicable.
- C. The duties and responsibilities of the RPR are described as follows:
1. *General.* RPR is Owner's agent at the Site, will act as directed by and under the supervision of Owner, and will confer with Owner regarding RPR's actions.
 - RPR's dealings in matters pertaining to a Contractor's work in progress shall in general be with Owner and Contractor.
 - RPR's dealings with subcontractors shall only be through or with the full knowledge and approval of Contractor.
 2. *Schedules.* Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by a Contractor and consult with Owner concerning acceptability.
 3. *Conferences and Meetings.* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.
 4. *Liaison*

- a. Serve as Owner's liaison with Contractor, working principally through Contractor's superintendent, and assist in providing information regarding the intent of the Contract Documents.
 - b. Assist Owner in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
5. *Interpretation of Contract Documents.* Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
6. *Shop Drawings and Samples*
- a. Record date of receipt of Samples and approved Shop Drawings.
 - b. Receive Samples which are furnished at the Specific Project Site by Contractor, and notify Owner of availability of Samples for examination.
 - c. Advise Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Owner.
7. *Modifications.* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Owner and Engineer. Transmit to Contractor in writing decisions as issued by Owner.
8. *Review of Work and Rejection of Defective Work*
- a. Conduct on-Site observations of Contractor's work in progress to assist Owner in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Owner whenever RPR believes that any part of Contractor's work in progress will not produce a completed project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Specific Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Owner of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
9. *Inspections, Tests, and System Start-ups*
- a. Consult with Owner in advance of scheduled major inspections, tests, and systems start-ups of important phases of the Work.

- b. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
- c. Observe, record, and report to Owner appropriate details relative to the test procedures and systems start-ups.
- d. Accompany visiting inspectors representing public or other agencies having jurisdiction over a Specific Project, record the results of these inspections, and report to Owner.

10. *Records*

- a. Maintain at the Site orderly files for correspondence, reports of job conferences, reproductions of original Contract Documents including all Change Orders, Field Orders, Work Change Directives, Addenda, additional Drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress reports, Shop Drawing and Sample submittals received from and delivered to Contractor, and other Specific Project-related documents.
- b. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Owner.
- c. Record names, addresses, fax numbers, e-mail addresses, web site locations and telephone numbers of all Contractors, subcontractors, and major suppliers of materials and equipment.
- d. Maintain records for use in preparing project documentation.
- e. Upon completion of the Work, furnish original set of all RPR Specific Project documentation to Owner.

11. *Reports*

- a. Furnish to Owner periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.
- b. Draft and recommend to Owner proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
- c. Furnish to Owner copies of all inspection, test, and system startup reports.
- d. Immediately notify Owner of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Constituent of Concern..

12. *Payment Requests*

- a. Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Owner, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. *Certificates, Operation and Maintenance Manuals*

- a. During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by a Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. *Completion*

- a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
- b. Participate in a final inspection in the company of Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.
- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Owner concerning acceptance and issuance of the Notice of Acceptability of the Work.

D. Resident Project Representative shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
2. Undertake any of the responsibilities of a Contractor, subcontractors, suppliers, or a Contractor's superintendent.
3. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of the Contractor's work unless such advice or directions are specifically required by the Contract Documents.
4. Advise on, issue directions regarding, or assume control over safety practices, precautions and programs in connection with the activities or operations of Owner or Contractor.
5. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Owner.
6. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
7. Authorize Owner to occupy a Specific Project in whole or in part.

END OF EXHIBIT