

SECTION 15899
DIRECT BURIED PROCESS EXHAUST – DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions, apply to this section.

1.2 SUMMARY

- A. General requirements for the fabrication and installation of polyethylene piping (fusion welded) to serve as the direct buried process exhaust ductwork system for:
1. Primary Confinement Exhaust (PCE).
 1. Secondary Confinement Exhaust (SCE).
 2. Beam Dump Confinement Exhaust (BDCE).
 3. Hot Off-Gas (HOG).
 4. Tunnel exhaust (LINAC & RTBT).
 5. RING make-up air HVAC system supply & return ductwork.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
1. Section 02222, Excavation for Utilities.
 2. Section 15074, Identification and Labeling.
 3. Section 18100, General Welding Requirements.

1.3 REFERENCES

- A. National Fire Protection Association (NFPA).
1. NFPA 90A-93, Standard for the Installation of Air Conditioning and Ventilation Systems.
- B. American Society for Testing and Materials (ASTM).
1. ASTM D3350, Polyethylene Plastics Pipe and Fitting Materials.
 2. ASTM F714, Standard Specification for Polyethylene Plastic Pipe (SDR-PR) based on outside diameter.
 3. ASTM D3035, Standard Specification for Polyethylene Plastic Pipe (DR-PR) based on Controlled Outside Diameter.
- C. PLASTIC PIPE INSTITUTE (PPI).
1. PPI TR-31/9-79 Underground installation of Polyolefin Piping.

1.4 SUBMITTALS

- A. Submit the following Test and Inspection Reports for information.
1. A leak test report summary prior to concealment of ductwork.
- B. Submit the following for information:
1. Redlined as-built drawings.
 2. Leakage test procedures prior to leak testing.
 3. Complete design submittal as outlined in PART 2.

1.5 SCHEDULING

- A. Notify Construction Manager (CM) prior to the actual fabrication start date. The CM will have the option to inspect prior to, during, and upon completion of fabrication and installation and witness tests and inspections.

PART 2 - PRODUCTS

2.1 MATERIALS: HIGH DENSITY POLY-ETHYLENE PIPING

- A. Direct buried process exhaust ductwork shall be High Density Poly-Ethylene (HDPE) piping, ASTM D3350, capable of withstanding vacuum conditions up to (-) 60 inches maximum water column, for a service life of 40 years. Materials used for the manufacturer of polyethylene pipe and fittings shall be extra high molecular weight, High Density PE 3408 polyethylene resin.
- B. Pipe supplied under this specification shall have a nominal IPS (Iron Pipe Size) unless otherwise specified. The DR (Dimension Ratio) and the pressure rating of the pipe supplied shall be as shown on the drawings.
- C. The pipe shall be produced from approved HDPE pipe grade resin with a minimum cell classification of PE 345464C. Pipe having a diameter 3" and larger will be made to the dimensions and tolerances specified in ASTM F714. Pipe with diameters less than or equal to 3" will be made to the dimensions and tolerances set forth in ASTM D3035.
- D. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.
- E. HDPE fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor.
- F. The fittings shall be manufactured from the same resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.
- G. At the job site sections of polyethylene pipe shall be joined to form continuous lengths by means of the "Butt-Fusion" process. Such "Heat-Fusion" method shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedure shall be capable of meeting all conditions recommended by the pipe manufacturer. Provide services of vendor representative for assembly and fusion welding training prior to installation.
- H. Extrusion welding or hot gas welding of HDPE shall not be used. Mechanical joint adapters, flanges, and transition fittings may be used to mechanically connect HDPE pipe where shown on drawings. Refer to the manufacturer's recommendations.
- I. The pipe and fitting manufacturer's production facilities shall be open for inspection by the owner or his designated agents with a reasonable advanced notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and fittings to standards required by this specification.

- J. Pipe, which has been tested by the manufacturer and falls outside of the appropriate limits set forth in this specification, will be cause for rejection.
- K. QA/QC records shall be maintained intact for a minimum of one year from the date of production, and shall be made available to the owner through the Construction Manager.
- L. During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following information.
 - 1. Nominal Size.
 - 2. Dimension Ratio.
 - 3. Manufacturer Name and Product Series.
 - 4. Cell Class.
 - 5. ASTM Basis.
 - 6. Pipe Test Category.
 - 7. Plant Identification.
 - 8. Production Date.
 - 9. Operator Number.
 - 10. Resin Supplier Code.

2.2 MANUFACTURERS

- A. HDPE pipe and fittings.
 - 1. Performance pipe (formerly Phillips Driscopipe).
 - 2. CFR-poly pipe.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing contractor shall verify that openings and routing for the installation of the duct system are of the size and in the location shown on the drawings, that openings are clear of obstructions, which might interfere with the installation of the ductwork or accessories, and no other interferences exist in the routing of ductwork. Notify the CM of conflicts. The CM will review to determine a resolution.

3.2 HDPE PIPE INSTALLATION

- A. Installing contractor shall procure the services of pipe manufacturer field service engineer to train, and assist in the proper installation of piping systems.
- B. Trenching shall be done in accordance with ASTM D2321, and/or ASTM D2774.
- C. Embedment materials shall be Class I, Class II, or Class III materials as defined by ASTM D2321, Section 5. The use of Class IV and Class V materials for embedment is not recommended. Class I crushed stone and Class II well-graded gravels are preferred. The embedment material shall have an installed density of at least 85% Standard Proctor Density through compaction or consolidation.
- D. The pipe bedding should be constructed in accordance with ASTM D2321, Section 5, Table 2.
- E. Haunching and initial backfill shall be as specified in ASTM D2321, Section 5, Table 2 using Class I, Class II, or Class III materials.

3.3 GENERAL

- A. Support and anchor HDPE pipe per manufacturers recommendations.
- B. On-site fusion welding activities are to be in accordance HDPE pipe manufacturers recommendations.
- C. Factory representatives of the piping supplier shall provide technical field support and assembly and fusion welding training prior to piping installation.
- D. The manufacturer shall supply a complete design submittal, including layout drawings, catalog sheets, material data, and pipe stress and load calculations.
- E. The calculations shall be produced and sealed by a Registered Professional Engineer, registered in the state of Tennessee.
- F. The manufacturer shall design and specify all anchors and guides as required to account for system expansion.
- G. Installing contractor shall furnish and install mylar-encased aluminum foil detector tape, colored per Section 15074, with "CAUTION: BURIED PROCESS EXHAUST DUCTWORK BELOW" printed thereon.

3.4 FIELD QUALITY CONTROL

- A. Weld inspection
 - 1. Examine welds per HDPE pipe manufacturers recommendations.
- B. Ductwork Leakage Tests:
 - 1. Leak test the ductwork system as follows: The maximum leak rate to be in accordance with Table B-3 of Appendix B of ANSI/ASME N509. The ductwork shall be an Engineered Safety Feature Unit, Leakage Class 1.
 - 2. Perform duct leakage testing in accordance with ANSI/ASME N510 using either the Direct Measurement Method or the Pressure Decay Method.
 - 3. The ductwork leakage test report to be in accordance with ANSI/ASME N510.
 - 4. If ductwork leakage fails to pass the leakage test, repair it to bring it into compliance and retest it until acceptable leakage is demonstrated.
 - 5. Notify CM for inspection prior to concealment of ductwork.
- C. After the ductwork system is installed, verify by inspection and document that:
 - 1. Duct interiors are free of construction debris.
 - 2. Leakage test report completed.

END OF SECTION 15899