DESCRIPTION
This work shall consist of excavating a trench to the dimensions and limits designated in the Contract Documents, retaining the trench walls by replacing excavated earth with a slurry, backfilling the trench to the required elevation with concrete to create a diaphragm wall, and backfilling the remainder of the excavation with suitable excavated material.

Submit proof of projects on which the Contractor or Subcontractor performing the work described in this specification has constructed cast-in-place concrete diaphragm walls. Submit proof of the foreman for this work having experience in the construction of cast-in-place concrete diaphragm walls.

MATERIALS

A. Mineral Slurry. Provide a mineral (bentonite) slurry that will remain in suspension, and with sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Provide a slurry with the percentage and specific gravity of the material used to make the suspension sufficient to maintain the stability of the excavation and to allow proper concrete placement.

The acceptable range of values for mineral slurry is as follows:

<table>
<thead>
<tr>
<th>Property (Units)</th>
<th>At Time of Slurry Introduction</th>
<th>At Time of Concreting (In hole)</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (lb/ft³)</td>
<td>64.3 to 69.1</td>
<td>64.3 to 75.0</td>
<td>Density Balance</td>
</tr>
<tr>
<td>Viscosity (seconds/quart)</td>
<td>28 to 45</td>
<td>28 to 45</td>
<td>Marsh Cone</td>
</tr>
<tr>
<td>pH</td>
<td>8 to 11</td>
<td>8 to 11</td>
<td>pH paper or meter</td>
</tr>
</tbody>
</table>

Increase density range values by 2 lb/ft³ in salt water.

Desand the slurry so that the sand content does not exceed 4 percent (by volume) prior to concrete placement, as determined by the American Petroleum Institute sand content test.

B. Polymer Slurry. Provide a polymer slurry with sufficient viscosity and gel characteristics to hold the hole open, and transport excavated material to a suitable screening system.

Polymer slurry may be made from PHPA (emulsified), vinyl (dry), or natural polymers.

Desand the polymer slurry so that the sand content is less than 1 percent (by volume) prior to concrete placement, as determined by the American Petroleum Institute sand content test.

C. Water. Provide water conforming to the requirements of §712-01 Water, except with a pH conforming to the slurry requirements listed above.
D. Concrete. Provide Class G Concrete conforming to the requirements of §555 - Structural Concrete and §501 - Portland Cement Concrete - General.

E. Premoulded Resilient Joint Filler. Provide joint filler used in the installation of the storm sewer conforming to the requirements of §705-07 Premoulded Resilient Joint Filler.

CONSTRUCTION DETAILS

A. Previous Experience. Submit proof and details of:

1. Two projects in the past 2 years where the Contractor or Subcontractor performing the work has successfully installed a cast-in-place concrete diaphragm wall.

2. The foreman for this work having at least 1 year of experience in the construction of cast-in-place concrete diaphragm walls.

Submit this information to the Deputy Chief Engineer Technical Services (DCETS) for review, evaluation, and approval. The DCETS will render a decision within 15 working days. A Contractor or Subcontractor will not be permitted to install cast-in-place concrete diaphragm wall without this approval.

B. General. Submit a Sequence of Operations for approval by the Geotechnical Engineering Bureau. Allow 15 working days upon receipt for review.

Carry out all excavation operations in a safe and prudent manner so that the workmen and the public will be protected from hazard. Observe all applicable local, State and Federal safety requirements.

Meet the requirements of §107-05 F. Restricted Areas, to protect the public from trenches left open overnight or on non-working days.

Maintain stability of the open trench with a mineral or polymer slurry having a composition as described in the MATERIALS section of this specification. Modify the properties of the slurry, as necessary, to support the sides of the trench.

Excavate and concrete each panel one at a time. Do not excavate immediately adjacent to a completed panel until the concrete has reached initial set.

C. Mixing of Slurry. Mix the bentonite or polymer with water until the slurry fluid is smooth, free of clods, and uniform in consistency. Do not mix the slurry in the trench. Do not add water or dry bentonite to the slurry in the trench. If modifications are made to the slurry, recirculate all the slurry within the trench until the slurry is modified. Thinners, dispersants, deflocculants, or any materials which reduce the viscosity of the slurry are not permitted.

D. Excavation. Excavate the Diaphragm Wall at the location and to the dimensions shown in the plans. Excavate the sides so they are parallel and vertical to insure continuity of the barrier.
Maintain the slurry level at the levels described in the table below. The minimum panel length is 7 feet. The maximum panel length is 30 feet.

<table>
<thead>
<tr>
<th>Depth from Existing Ground Surface to Water Table (Feet)</th>
<th>Minimum Slurry Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5.0</td>
<td>Existing Ground Surface</td>
</tr>
<tr>
<td>5.0 to 6.5</td>
<td>5.0 feet above the water table</td>
</tr>
<tr>
<td>6.5 +</td>
<td>1.5 feet below the Existing Ground Surface</td>
</tr>
</tbody>
</table>

**E. Concrete Placement.** Insert stop-ends, which are clean and have a smooth surface, prior to placing concrete in a panel. Restrain the stop-ends to prevent horizontal movement during concreting. Clean the trench bottom of any sloughing material as directed by the Engineer.

Concrete the excavation such that no more than one panel remains unconcreted before commencing excavation on another panel.

Place the concrete within the structure lines shown in the plans by the tremie method according to §555-3.05 Depositing Structural Concrete Under Water.

Do not allow the utility forms to float, or move them from the design location.

Extract the stop-ends such as to avoid damage to the concrete placed against them.

**METHOD OF MEASUREMENT**
This work will be measured as the number of cubic yards of completed wall computed from the lines of the structure as shown in the Contract Documents. No payment will be made beyond these lines unless the Engineer specifically states, in writing prior to the performance of the work, that payment will be made to revised payment lines. Deductions will be made for volumes of pipes and any other volume paid for under other payment lines.

**BASIS OF PAYMENT**
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including the cost of excavation, furnishing bentonite or polymer slurry and water, mixing and placing the slurry, designing and furnishing stop-ends, furnishing and placing the concrete backfill material, backfilling the excavation remaining after construction of the diaphragm wall, furnishing the necessary test equipment, clean-up including disposal of slurry and excavated material, and providing required protection.

The unit price bid also includes the cost of designing, furnishing, and installing utility forms for subsequent installation of pipes, and the cost of furnishing and installing Premoulded Resilient Joint Filler, as indicated in the plans.