

SECTION 03 40 00 PRECAST CONCRETE

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Precast concrete structures, including but not limited to wet wells, valve vaults, metering vaults, etc.
 - 2. Precast concrete liners (HDPE).
 - 3. Joint wrap
 - 4. Accessories required for precast structures.

1.02 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM C-33, Standard Specifications for Concrete Aggregate
 - 2. ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 3. ASTM A497, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - 4. ASTM C890, Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structure.
 - 5. ASTM C913-08, Standard Specification for Precast Concrete Water and Wastewater Structures.

1.03 SYSTEM DESCRIPTION

- A. Concrete Compressive Strength (ASTM C39): 5,000 psi minimum at 28 days.
- B. Water Resistant: No water intrusion through wall, base or top sections.
- C. Concrete shall be designed to be resistant to sulfate.
- D. Design standard precast concrete units to withstand design load conditions in accordance with applicable industry standards. Design must consider stresses induced during handling, shipping, and installation to avoid cracking or other handling damage.

1.04 SUBMITTALS

- A. Comply with Section 01 33 00.
- B. Product Data:
 - 1. Manufacturer's data
 - 2. Manufacturer's standard storage, handling, and installation instructions
- C. Shop Drawings: Shop drawings shall be sealed by a Professional Engineer registered with the Pennsylvania State Registration Board and shall illustrate:
 - 1. Plans, elevations, sections, and details of base, wall and top components.
 - 2. Joint details illustrating sealant and external wrap material.
 - 3. Pipe penetration details illustrating size, location and type of seal.
 - 4. Liner details illustrating embedment, field welding, joint coverage and interfacing with penetrations.
 - 5. Hatch frame details.
- D. Calculations: Calculations shall be sealed by a Professional Engineer registered with the Pennsylvania State Registration Board and shall include.
 - 1. Buoyancy calculations assuming ground water elevation is equal to the top of concrete elevation provided on the Contract Drawings.
 - 2. Structural calculations.
- E. Quality Assurance/Control Submittals
 - 1. Design date
 - 2. Test Reports
 - a. Upon request, the precast concrete producer shall supply copies of material certifications and/or laboratory test reports, including mill tests and all other test data, for Portland cement, blended cement, pozzolans, ground granulated blast-furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.
 - b. Upon request, the precast concrete producer shall submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the project conditions. Such tests may include compressive strength, plastic air content, temperature of freshly mixed concrete, and slump of freshly mixed concrete.
 - c. Concrete Testing
 - i. Slump: A slump test shall be performed at least once per day per mix design used. Slump tests shall be performed in accordance with ASTM C 1611 for self-consolidating concrete.

- ii. Temperature: The temperature of fresh concrete shall be measured each time a slump, air content, or compressive strength tests are made. Temperature shall be measured in accordance with ASTM C 1064.
 - ii. Compressive Strength: At least four compressive strength specimens shall be made each day for each mix design unless otherwise specified. In accordance with ASTM C 31, C 39, C 192.
3. Qualification Statements
- a. Upon request, the precast concrete producer shall supply copies of in-plant QA/QC inspection reports.

1.05 QUALITY ASSURANCE

- A. Qualifications: Manufacturer's standard product listing shall include wastewater products. The precast concerted producer shall have a quality control program which is audited for compliance.
- B. Certifications: Manufacturer shall be certified by the National Precast Concrete Association (NPCA) and shall have been for a minimum of five (5) years.
- C. Quality Control
 - 1. The precast concrete producer shall show that the following quality control tests are performed as required and in accordance with ASTM International standards:
 - a. Concrete Testing
 - 1. Slump: A slump test shall be performed at least once per day per mix design used. Slump tests shall be performed in accordance with ASTM C 1611 for self-consolidating concrete.
 - 2. Temperature: The temperature of fresh concrete shall be measured each time a slump, air content, or compressive strength tests are made. Temperature shall be measured in accordance with ASTM C1064.
 - 3. Compressive Strength: At least four compressive strength specimens shall be made each day for each mix design unless otherwise specified. In accordance with ASTM C 31, C 39, C 192.
 - 4. Air Content: Tests for air content shall be performed if the mix design specifies air entrainment. The air content will be measured in accordance with ASTM C 231. The Air Content shall be measured once per day per mix design.
 - 5. Density (Unit Weight): Tests for Density (Unit Weight) shall be performed monthly for each mix design used at a minimum. Tests shall be in accordance with ASTM C 138
 - b. Aggregate Testing
 - 1. A full set of aggregate tests shall be performed on each aggregate at least annually by an independent testing agency or

an in house test lab. These tests will include gradations (ASTM C136), Soundness (ASTM C 88), Organic Impurities (ASTM C 40), Sand Equivalent for fine aggregates only (ASTM D 2419).

2. Potential reactivity shall be performed once per each aggregate source, and when aggregate sources change (ASTM C 1260 or C1293).
3. Monthly, at a minimum, gradations shall be performed per ASTM C33.
4. Aggregate Moisture tests: Moisture tests on aggregates shall be performed in accordance with ASTM C 70 or ASTM C 566. Fine aggregate moisture content tests shall be performed at least once per day if there are no moisture meters, otherwise it shall be performed once per month. Alternatively the speedy moisture test is acceptable (ASTM D 4944).

c. Preplacement Check

1. All products shall be inspected for accuracy prior to placing concrete. Checks shall include, but not be limited to, form condition and cleanliness, form dimensions, joints, release agent, blockouts, inserts and locations, lifting devices, reinforcing steel size, spacing, clearances and proper placement.
2. Preplacement checks shall be documented and initialed by the inspector. A drawing with verifications of the above criteria can be used as documentation.

d. Postplacement Check

1. All products shall be inspected for accuracy after the concrete forms have been removed. Checks shall include, but not be limited to, dimensional checks, finishing, insert locations, squareness, honeycombing, cracking, marking, coatings, racking, hole size and location. Postplacement checks may require a corrective action report.
2. Postplacement checks shall be documented and initialed by the inspector. A drawing with verifications of the above criteria can be used as documentation.

D. Outside Inspection

1. The customer or customer's agent (specifier) may place an inspector in the plant when the units covered by this specification are being manufactured. The precast concrete producer shall give notice of 3 days prior to the time the precast concrete units will be available for plant inspection

E. Pre-installation Meeting

1. Contractor shall coordinate a project site meeting prior to delivery and installation with representatives of Authority, precast manufacturer, and installer to review site conditions, access to site, requirements of related of prerequisite work (i.e.

excavation, subgrade preparation, etc.), storage and hauling procedures, and protective measures.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Ship and handle precast sections in a manner as recommended by the manufacturer that will prevent damage. Units shall not be shipped until they have reached at least 70% of their specified 28-day design strength, unless damage will result.
- B. Acceptance at Site: Contractor shall be available at the site to take acceptance of all deliveries. Authority shall not be responsible for acceptance of deliveries. All deliveries attempted to be made without a Contractor's representative will be refused.
- C. Storage and Protection: Store precast concrete units in a manner that will minimize potential damage.

PART 2 – PRODUCTS

2.01 PRECAST REINFORCED WET WELLS

- A. Manufacturers
 - 1. Terre Hill Concrete Products
 - 2. By-Crete
 - 3. Monarch Precast Concrete Corporation
- B. Concrete: Comply with Section 03 30 00.
- C. Pre-cast Concrete Sections:
 - 1. Pre-cast wet wells shall conform to specifications for ASTM C 478 "Pre-cast Reinforced Concrete Manhole Sections".
 - 2. The minimum wall thickness shall be eight inches. Pre-cast wet-wells shall be constructed with a pre-cast monolithic base structure having a minimum base thickness of eight inches.
 - 3. All sections shall have tongue and groove or otherwise overlapping joints. Joints shall be self-sealing utilizing a double layer of bituminous, butyl rubber sealant meeting or exceeding the requirements of ASTM C-990-91.
 - 4. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.
 - 5. Pre-cast concrete top slabs shall be used.

6. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the sections.
 7. The wet well joints shall be encapsulated with a heat shrink-wrap with a minimum thickness of 0.100". The wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap should effectively bond to the substrate via primer provided by the manufacturer, providing corrosion and moisture protection. Joint wrap shall be ConWrap CS-212 by ConSeal conforming to ASTM E-1745, C-877, C-990 Specifications, or equal.
- D. Pipe Openings: Custom preformed during manufacturing to accommodate type of pipe and pipe opening seal specified.
1. Modular Mechanical Type Pipe Opening Seals: Sleeves shall be cast into the concrete with water stop collar. Seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolute watertight seal between the pipe and the wall opening. The seal shall be constructed so as to provide electric insulation between the pipe and wall to reduce the occurrence of cathodic reaction between the two members. Wall penetration closures shall be "Link-Seal" as manufactured by Thunderline Corp., or equal.
- E. HDPE Liner: All interior wall and top surfaces of the wet wall shall have a protective liner.
1. The HDPE embedment sheeting shall be mechanically bonded to the concrete by integral studs. The liner shall be cast in place by the precast manufacturer and all joints shall be fielded welded by a qualified and trained representative. Minimum thickness of the liner shall be 5 mm. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections.
- F. Exterior walls shall receive two coats of coal tar coating.
- G. Access Hatches shall be integrally cast into the concrete top to maximize the opening dimensions based on the wet well diameter and top configuration in accordance with Section 08 31 13.

2.02 PRECAST REINFORCED VAULTS

- A. Manufacturers
1. Terre Hill Concrete Products
 2. By-Crete

3. Monarch Precast Concrete Corporation
- B. Concrete: Comply with Section 03 30 00.
- C. Pre-cast Concrete Sections:
1. Pre-cast vaults shall conform to specifications for ASTM C 478 “Pre-cast Reinforced Concrete Manhole Sections”.
 2. The minimum wall thickness shall be six inches. Pre-cast vaults shall be constructed with a pre-cast monolithic base structure having a minimum base thickness of eight inches.
 3. All sections shall have tongue and groove or otherwise overlapping joints. Joints shall be self-sealing utilizing a double layer of bituminous, butyl rubber sealant meeting or exceeding the requirements of ASTM C-990-91.
 4. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.
 5. Pre-cast concrete top slabs shall be used.
 6. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the sections.
 7. Vault joints shall be encapsulated with a heat shrink-wrap with a minimum thickness of 0.100”. The wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap should effectively bond to the substrate via primer provided by the manufacturer, providing corrosion and moisture protection. Joint wrap shall be ConWrap CS-212 by ConSeal conforming to ASTM E-1745, C-877, C-990 Specifications, or equal.
- D. Pipe Openings: Custom preformed during manufacturing to accommodate type of pipe and pipe opening seal specified.
1. Modular Mechanical Type Pipe Opening Seals: Sleeves shall be cast into the concrete with water stop collar. Seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolute watertight seal between the pipe and the wall opening. The seal shall be constructed so as to provide electric insulation between the pipe and wall to reduce the occurrence of cathodic reaction between the two members. Wall penetration closures shall be “Link-Seal” as manufactured by Thunderline Corp., or equal.
- E. Exterior walls shall receive two coats of coal tar coating.

- F. Access Hatches shall be integrally cast into the concrete top and located to facilitate removal of internal equipment, valves, piping, etc. Opening shall be a minimum of 30" square. Refer to Section 08 31 13.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Prepare subgrade as specified in Division 31.
- B. Place base unit, wall sections and top unit. Insure that gaskets for water tightness are properly installed between successive units.
- C. Remove or conceal lifting devices or inserts, and protect from rust or corrosion.
- D. Backfill structures in accordance with Division 31.

3.02 FIELD QUALITY CONTROL

- A. Field Test: Leak resistance testing is required for all precast concrete structures. Contractor shall utilize one or both of the of the following methods
 - 1. Vacuum Testing
 - a. Prior to backfill, vacuum test system according to ASTM C 1244 for manholes and ASTM C 1227 for septic tanks.
 - 2. Hydrostatic Testing
 - a. First Backfill the structure, then fill to the high water level, let stand for 24 hours. Refill to the original water line and measure the water level change over a 24 hour period. Loss due to leakage shall not exceed 1% of volume.
- B. Inspection
 - 1. Final field elevations and compaction properties shall be verified and documented.

END OF SECTION