SECTION 330563 - CONCRETE VAULTS AND CHAMBERS

This Section specifies precast concrete utility vaults and chambers, with frames and covers, used for subsurface drainage collection, sewage collection, and water distribution systems.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Precast concrete vaults and chambers.

Drainage system junction boxes.

Drainage system sedimentation chambers.

Knock-out boxes.

End walls.

Pipe ends.

Frames and covers.

Access hatches.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 031000 - Concrete Forming and Accessories: Erection and bracing of forms.

Section 032000 - Concrete Reinforcing: Reinforcing steel as required by this Section.

Section 033000 - Cast-in-Place Concrete: Concrete type for concrete vault or chamber construction.

Section 042000 - Unit Masonry: Product requirements for clay brick units for use in vault or chamber construction.

Section 310000 - Earthwork: Excavating for vaults or chambers, and foundation slabs.

Section 310001 – Earthwork Materials

Section 316219 - Timber Piles: Pile support systems.

Section 333100 - Sanitary Sewerage Piping: Piping connections to vaults or chambers.

Section 334200 - Stormwater Conveyance: Piping connections to vaults or chambers.

Section 334213 - Stormwater Culverts: Pipe culverts and concrete box sections.

Section 337119 - Electrical Underground Ducts, Ductbanks, and Manholes: Electrical and communications utility structures.

* + - 1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

LEED requires compliance with specific editions of referenced standards. Consider including publication dates for referenced standards in this Section to ensure that correct standard is used for LEED compliance.

* + - * 1. American Association of State Highway and Transportation Officials:

AASHTO HB-17 - Standard Specifications for Highway Bridges.

AASHTO M 306 - Standard Specification for Drainage, Sewer, Utility, and Related Castings.

* + - * 1. American Concrete Institute:

ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

ACI 318 - Building Code Requirements for Structural Concrete.

* + - * 1. American Welding Society:

AWS D1.1 - Structural Welding Code - Steel.

AWS D1.4 - Structural Welding Code - Reinforced Steel.

* + - * 1. ASTM International:

ASTM A36 - Standard Specification for Carbon Structural Steel.

ASTM A48 - Standard Specification for Gray Iron Castings.

ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

ASTM A775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

ASTM C877 - Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.

ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

ASTM A996 - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

ASTM C33 - Standard Specification for Concrete Aggregates.

ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.

ASTM C150 - Standard Specification for Portland Cement.

ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

ASTM C192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.

ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.

ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.

ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.

ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.

ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.

ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

ASTM C990M - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (Metric).

ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

ASTM C1433 - Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.

ASTM C1504 - Standard Specification for Manufacture of Precast Reinforced Concrete Three-Sided Structures for Culverts and Storm Drains.

* + - * 1. National Precast Concrete Association:

NPCA Plant Certification Program.

NPCA Quality Control Manual for Precast and Prestressed Concrete Plants.

* + - * 1. The Society for Protective Coatings:

SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

* + - 1. PREINSTALLATION MEETINGS
				1. Convene minimum [**one week**] [**<\_\_\_\_\_\_\_\_> weeks**] prior to commencing Work of this Section.
			2. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: Submit manufacturer information regarding frames and covers, [**steps,**] component construction, features, configuration, dimensions [**, and**] <**\_\_\_\_\_\_\_\_**>.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for each type of precast structure within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Shop Drawings:

Indicate vault or chamber locations, elevations, sections, [**equipment supports,**] [**piping,**] [**conduit,**] sizes and elevations of penetrations [**, and**] <**\_\_\_\_\_\_\_\_**>.

Include following subparagraph if custom fabrications are required.

Indicate design, construction and installation details, typical reinforcement and additional reinforcement at openings and <**\_\_\_\_\_\_\_\_**> [**for each type, size, and configuration**] [**for each custom type, size, and configuration**].

* + - * 1. Submit concrete mix design for each different mix.

Include following paragraph for submission of physical samples for selection of finish, color, texture, and other properties.

* + - * 1. Samples: Submit [**two**] <**\_\_\_\_\_\_\_\_**> precast concrete samples, <\_\_\_\_\_\_\_\_> by <\_\_\_\_\_\_\_\_> inches in size, illustrating finishes exposed to view.
				2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
				3. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

Include separate paragraphs for additional certifications.

Include following paragraph when Contractor is responsible for designing products or assemblies. List affected products when Section specifies more than one product.

* + - * 1. Delegated Design Submittals: Submit Shop Drawings with design calculations and assumptions for custom fabrications. Shop drawings shall be signed and sealed by a professional engineered licensed in New York State.
				2. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
				3. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
				4. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
				5. Qualifications Statements:

Coordinate following subparagraphs with requirements specified in QUALIFICATIONS Article. Design professional qualifications are required for design of custom fabrications.

Submit qualifications for manufacturer, installer [**, and**] [NYS **licensed professional**].

Submit manufacturer's approval of installer.

Welders: Qualify procedures and personnel according to AWS D1.1.

Remove paragraph if not LEED project.

* + - 1. SUSTAINABLE DESIGN SUBMITTALS
				1. Section 018113 - LEED Documentation Requirements: Requirements for sustainable design submittals.
				2. Manufacturer's Certificate:

Certify that products meet or exceed specified sustainable design requirements.

Insert material certifications list below to suit products specified in this Section and Project sustainable design requirements. Specific certificate submittal and supporting data requirements are specified in Section 018113.

Materials Resources Certificates:

Certify source and origin for [**salvaged**] [**and**] [**reused**] products.

Certify recycled material content for recycled content products.

Certify source for regional materials and distance from Project Site.

Certify that lumber is harvested from Forest Stewardship Council (FSC)-Certified well-managed forest.

* + - * 1. Product Cost Data:

Submit cost of products to verify compliance with Project sustainable design requirements.

Exclude cost of labor and equipment to install products.

Provide cost data for following products:

Edit list of material cost data below to suit products specified in this Section and Project sustainable design requirements. Specific cost data requirements are specified in Section 018113.

Salvaged, refurbished, and reused products.

Products with recycled material content.

Regional products.

Certified wood products.

<**\_\_\_\_\_\_\_\_**>.

* + - 1. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

* + - * 1. Obtain precast concrete vaults and chambers from single source.
				2. Perform structural design according to ACI 318.
				3. Perform Work according to NPCA Quality Control Manual for Precast and Prestressed Concrete Plants.
				4. Material and Fabrication:

Single-Cell Box Culverts: Comply with ASTM C1433.

Multiple-Cell Box Culverts: Comply with <**\_\_\_\_\_\_\_\_**>.

Three-Sided Structures: Comply with ASTM C1504.

Other Structures: Comply with ASTM C913.

* + - * 1. Welding:

Structural Steel: Comply with AWS D1.1.

Reinforcing Steel: Comply with AWS D1.4.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
			1. QUALIFICATIONS

Coordinate following paragraphs with requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Certified by NPCA Plant Certification Program prior to, and during Work of, this Section.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
				2. Installer: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience [**and approved by manufacturer**].
				3. Welders: AWS qualified within previous 12 months for employed weld types.
				4. Licensed Professional: [**Professional engineer**] <**\_\_\_\_\_\_\_\_**> experienced in design of specified Work and licensed [**in the State of New York**].
			1. DELIVERY, STORAGE, AND HANDLING
				1. Concrete Products: Do not deliver products until concrete has cured [**five**] <**\_\_\_\_\_\_\_\_**> days or has attained minimum [**75**] <**\_\_\_\_\_\_\_\_**> percent of specified 28-day compressive strength.
				2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
				3. Handling:

Comply with manufacturer instructions for unloading, storing, and moving vaults or chambers.

Lift vaults or chambers from designated lifting points.

* + - * 1. Storage:

Store materials according to manufacturer instructions.

Store vaults and chambers to prevent damage to Director’s Representative property or other public or private property.

Repair property damaged from materials storage.

* + - * 1. Protection:

Protect materials in clean location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

* + - 1. EXISTING CONDITIONS
				1. Field Measurements:

Verify field measurements prior to fabrication.

Indicate field measurements on Shop Drawings.

* + - 1. WARRANTY
				1. Furnish [**one**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for concrete vaults, chambers, and appurtenances.
1. PRODUCTS
	* + 1. PERFORMANCE AND DESIGN CRITERIA

Restrict statements to identify system design requirements only.

* + - * 1. Minimum Loading: Comply with [**ASTM C857**] [**and**] [**ASTM C890**].
				2. Roof Live Load, with Impact Loading:

Heavy Traffic:

Comply with [**ASTM C857; A-16**] [**AASHTO HB-17; HS20-44**].

Maximum Each Wheel: 16,000 lbf.

Medium Traffic:

Comply with [**ASTM C857; A-12**] [**AASHTO HB-17; HS15-44**].

Maximum Each Wheel: 12,000 lbf.

Light Traffic:

Comply with [**ASTM C857; A-8**] [**AASHTO HB-17; HS10**].

Maximum Each Wheel: 8,000 lbf.

Walkway Traffic:

Comply with ASTM C857; A-0.3.

Maximum Loading: 300 psf.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Box Culvert Roof Live Load:

[**AASHTO HB-17; HS20.**]

[**Interstate live loads**] and impact load.

Wall Live Load: Accommodate surcharge from roof live load.

Base Live Load: Accommodate roof and wall live loads transferred to base.

Identify equipment loads supported by vault or chamber. Coordinate with Drawings to show location and direction of applied loads.

Equipment Loads: [**<\_\_\_\_\_\_\_\_> lbf. at each support**] [**As indicated on Drawings**].

Dead Loads: Actual weight of materials producing static load.

* + - 1. PRECAST CONCRETE VAULTS AND CHAMBERS
				1. Fabricator List:

Fort Miller Co., Inc., (518) 695-5000, PO Box 98, Schuylerville, NY 12871

Model <\_\_\_\_\_>

Binghamton Precast & Supply Corp., 18 Phelps St., Binghamton, NY 13901.

Model <**\_\_\_\_\_**>

Monarch Products, (717) 938-8303, 385 Sipe Road, York Haven, PA 17370.

Model <**\_\_\_\_\_**>

Approved equivalent.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Material of Construction: Reinforced precast concrete.
				2. Foundation Slab:

[**Cast-in-place**] [**Precast**] concrete of type as specified in Section [**033000 - Cast-in-Place Concrete**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>.

Top Surface: Leveled.

* + - 1. FRAMES AND COVERS
				1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=13269&mf=04&src=wd):

Neenah Foundry Company, P. O. Box 729, Neenah, WI 54957, (414) 729-3661.

East Jordan Iron Works, P.O. Box 190, South Bay Rd., Cicero, NY 13039, (315) 699-2601.

Approved equivalent.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

* + - * 1. Description:

Select class of casting representing tensile strength and test bar size representing control section of casting. Tensile strengths range from 20 to 60 ksi in 5-ksi increments. Test bar sizes range from 0.25 to more than 2 inches and are indicated by letter designations A, B, C, or S.

Materials of Construction:

Cast iron.

Comply with [**ASTM A48; Class 30B**] [**ASTM A48; Class <\_\_\_\_\_\_\_\_>**] [**AASHTO M 306**].

Lid:

Size: [**<\_\_\_\_\_\_\_\_> by <\_\_\_\_\_\_\_\_> inches**] [**As indicated on Drawings**].

Surface: Machined flat bearing.

Type: Removable.

Security: [**Lockable**] [**Boltable**].

Cover:

Design: [**Closed**] [**Open checkerboard grille**] <**\_\_\_\_\_\_\_\_**>.

Fabrication: Molded.

Identification: Cast with [**municipality**] <**\_\_\_\_\_\_\_\_**> name [**and logo**].

[**Furnish sealing gasket.**]

Delete following subparagraph if no grate is required.

Grate:

Configuration: [**Diagonal**] [**Bicycle safe**] <**\_\_\_\_\_\_\_\_**>.

Size: [**<\_\_\_\_\_\_\_\_> by <\_\_\_\_\_\_\_\_> inches**] [**As indicated on Drawings**].

* + - 1. ACCESS HATCHES
				1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8751&mf=04&src=wd):

The BILCO Company, PO Box 1203, New Haven, CT 06505, (800) 366-6530.

East Jordan Iron Works, P.O. Box 190, South Bay Rd., Cicero, NY 13039, (315) 699-2601.

Approved equivalent.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Verify access hatch size, configuration, and materials of construction permitted for loading conditions. Steel and aluminum hatches are available for AASHTO HB-17; HS20 loads.

* + - * 1. Description:

Materials of Construction: [**Steel**] [**Aluminum**]; welded.

Size: [**<\_\_\_\_\_\_\_\_> by <\_\_\_\_\_\_\_\_> inches**] [**As indicated on Drawings**].

Door Configuration: [**Single**] [**Double**].

Cover:

Fabrication: [**Diamond plate**] <**\_\_\_\_\_\_\_\_**>.

Reinforce with structural stiffeners as required to support indicated loads.

Frame:

Type: [**Angle**] [**Channel**] [**Gutter**].

[**Furnish integral seat to support cover stiffeners.**]

Anchor [**flange**] [**straps**] around frame perimeter.

Hinge Material: [**Stainless**] steel.

Lift Handle:

Type: Flush drop; non-removable.

Mounting: In cover.

Lifting Mechanism:

Compression Springs: [**Stainless**] steel.

Furnish automatic hold-open and dead stop to retain cover in open position.

Cover springs to prevent contact by personnel entering vault or chamber.

Latch Mechanism:

Lock: Stainless steel.

Furnish [**removable**] external handle and permanent internal release mechanism.

Hardware: [**Stainless**] steel.

Finishes: [**Factory prime paint with rust-inhibitive primer**] [**Galvanized after fabrication**] [**Unfinished**].

Remove paragraph below if not a LEED project.

* + - 1. SUSTAINABILITY CHARACTERISTICS

Insert sustainable design characteristics in this Article to suit content of this Section and Project sustainable design requirements as specified in Section 018113.

* + - * 1. Section 018113 - LEED Documentation Requirements: Requirements for sustainable design compliance.
				2. Material and Resource Characteristics:

Recycled Content Materials: Furnish materials with maximum available recycled content [**including:**] [**.**]

Insert list of materials specified in this Section required to have recycled content.

<**\_\_\_\_\_\_\_\_**>.

Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project Site [**including:**] [**.**]

Insert list of materials specified in this Section required to be regional materials.

<**\_\_\_\_\_\_\_\_**>.

Certified Wood Materials: Furnish wood materials certified according to FSC standards [**including:**] [**.**]

Insert list of materials specified in this Section required to be certified wood.

<**\_\_\_\_\_\_\_\_**>.

* + - 1. MATERIALS
				1. Concrete:

Portland Cement:

Comply with ASTM C150.

Type: [**I - Normal**] [**II - Moderate**] [**III - High Early Strength**] [**V - Sulfate Resistant**].

Fine and Coarse Aggregates: Comply with ASTM C33, except that gradation requirements do not apply.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Lightweight Aggregate: Comply with ASTM C330, except that gradation requirements do not apply.

Water: Clean and not detrimental to concrete.

* + - * 1. Admixtures:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=7810&mf=04&src=wd):

Cortec Corporation, 4119 White Bear Parkway, St. Paul, MN 55110.

The Euclid Chemical Company, 19215 Redwood Rd., Cleveland, OH 44110.

GCP Applied Technologies, Inc., 62 Whittemore Ave., Cambridge, MA 02140.

Sika Corporation, 201 Polito Ave., Lyndhurst, NJ 07071.

Approved equivalent.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Air Entrainment: Comply with ASTM C260.

Chemical Admixtures:

Comply with ASTM C494.

Select admixtures that are permitted, or delete subparagraphs to allow manufacturer to select admixtures.

Type: [**A - Water Reducing**] [**B - Retarding**] [**C - Accelerating**] [**D - Water Reducing and Retarding**] [**E - Water Reducing and Accelerating**] [**F - Water Reducing, High Range**] [**G - Water Reducing, High Range and Retarding**].

Fly ash and pozzolans are classified as follows:

- Class N: Raw or calcined natural pozzolans.

- Class F: Fly ash with pozzolanic properties produced from burning anthracite or bituminous coal.

- Class C: Fly ash with pozzolanic and cementitious properties from lignite or subbituminous coal.

[**Fly Ash**] [**Calcined Pozzolan**]: Comply with ASTM C618, Class <**\_\_\_\_\_\_\_\_**>.

Slag grades indicate activity index with portland cement. Higher grade has higher activity index.

Blast Furnace Slag: Comply with ASTM C989, Grade [**80**] [**100**] [**120**].

Pigments:

Description: Mineral oxide; nonfading; lime resistant.

Color: <**\_\_\_\_\_\_\_\_**> [**as selected**].

<**\_\_\_\_\_\_\_\_**>, as manufactured by <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Concrete Reinforcement:

Verify reinforcing steel type and requirements prior to editing this Article. Reinforcing steel conforming to ASTM A615 with yield strength of 60 ksi is most commonly used.

Reinforcing Steel:

Comply with ASTM A615.

Yield Grade: [**40**] [**60**] [**75**] ksi.

Billet Bars: [**Plain**] [**Deformed**].

Finish: [**Galvanized**] [**Uncoated**] [**Epoxy coated**].

\*\*\*\*\* [OR] \*\*\*\*\*

ASTM A706 reinforcing steel is intended for applications where controlled tensile properties or chemical composition restrictions to enhance weldability, or both, are required.

Reinforcing Steel:

Comply with ASTM A706.

Yield Strength: 60 ksi.

Bars: [**Deformed**] [**Plain**]; low-alloy steel.

Finish: [**Unfinished**] [**Galvanized**] [**Epoxy coated**].

\*\*\*\*\* [OR] \*\*\*\*\*

Reinforcing Steel:

Comply with ASTM A996.

Yield Strength: [**50**] [**60**] ksi.

Bars: Deformed rail steel.

Finish: [**Unfinished**] [**Galvanized**] [**Epoxy coated**].

\*\*\*\*\* [OR] \*\*\*\*\*

Reinforcing Steel:

Comply with ASTM A996.

Yield Strength: [**40**] [**60**] ksi.

Bars: Deformed axle steel.

Finish: [**Unfinished**] [**Galvanized**] [**Epoxy coated**].

Reinforcing Wire:

Plain Wire:

Comply with ASTM A1064.

Finish: [**Unfinished**] [**Epoxy coated**].

Deformed Wire:

Comply with ASTM A1064.

Finish: [**Unfinished**] [**Epoxy coated**].

Welded Steel Wire Fabric:

Plain Wire:

Comply with ASTM A1064.

Finish: [**Unfinished**] [**Epoxy coated**].

Deformed Wire:

Comply with ASTM A1064.

Finish: [**Unfinished**] [**Epoxy coated**].

* + - 1. FABRICATION
				1. Comply with ACI 318 and NPCA Quality Control Manual for Precast and Prestressed Concrete Plants.
				2. Fabricate vaults, chambers [**, knock-out panels**], and openings to size and configuration as [**indicated on Drawings**] [**as scheduled following END OF SECTION**].
				3. Forms:

Fabricate to provide uniform precast concrete units with consistent dimensions.

Clean after each use.

* + - * 1. Reinforcing:

Install reinforcement by tying or welding to make rigid assemblies.

Position reinforcement to maintain minimum [**1/2**] <\_\_\_\_\_\_\_\_>-inch cover.

Secure reinforcement to prevent displacement while placing concrete.

* + - * 1. Position and secure embedded items to prevent displacement while placing concrete.
				2. Deposit concrete in forms and consolidate concrete without segregating aggregate.
				3. Provide initial curing by retaining moisture using one of following methods:

Cover with PE sheets.

Cover with burlap or other absorptive material and keep continually moist.

Apply curing compound according to manufacturer instructions.

* + - * 1. Provide final curing according to manufacturer's standard.
				2. Remove forms without damaging concrete.
			1. MIXES
				1. Concrete:

Normal Weight: Select proportions according to ACI 2111.1 and 318.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Lightweight: Select aggregate proportions according to ACI 211.1 and 318.

Edit following subparagraph as applicable to Project requirements. If more than one strength of concrete is required, repeat following subparagraph, listing locations for various strengths, or include schedule following END OF SECTION.

Concrete Criteria:

Compressive Strength: [4,000] <\_\_\_\_\_\_\_\_> psi at 28 days.

Water-Cement Ratio:

Select water-cement ratio based on Project conditions.

Concrete Exposed to Freezing and Thawing: Maximum [**0.45**] <**\_\_\_\_\_\_\_\_**> percent by mass.

Watertight Concrete Not Exposed to Freezing and Thawing: Maximum [**0.45**] [**0.48**] percent by mass.

Concrete Exposed to Corrosive Conditions: [**0.40**] <**\_\_\_\_\_\_\_\_**> percent by mass.

Air Content:

Following air contents are NPCA-recommended limits. Coordinate with referenced ASTM material standards that specify air content as 3.5 to 6.5 percent without regard to exposure or aggregate size.

Maximum Aggregate Size of 3/8 Inch:

Severe Exposure: 6.0 to 9.0 percent.

Moderate Exposure: 4.5 to 7.5 percent.

Maximum Aggregate Size of 1/2 Inch:

Severe Exposure: 5.5 to 8.5 percent.

Moderate Exposure: 4.7 to 7.0 percent.

Maximum Aggregate Size of 3/4 Inch:

Severe Exposure: 4.5 to 7.5 percent.

Moderate Exposure: 3.5 to 6.5 percent.

Maximum Aggregate Size of 1 Inch:

Severe Exposure: 4.5 to 7.5 percent.

Moderate Exposure: 3.0 to 6.0 percent.

Maximum Aggregate Size of 1-1/2 Inches:

Severe Exposure: 4.5 to 7.0 percent.

Moderate Exposure: 3.0 to 6.0 percent.

Admixtures:

Include admixture types and quantities indicated in concrete mix designs approved through submittal process.

Do not use calcium chloride.

* + - 1. FINISHES
				1. Reinforcing Steel:

Class I requires heavier zinc coating than Class II.

Galvanized Finish: Comply with ASTM A767, Class [**I**] [**II**].

Epoxy-Coated Finish: Comply with ASTM A775.

* + - * 1. Wire and Wire Fabric:

Class B requires heavier zinc coating than Class A.

Epoxy-Coated Finish: Comply with ASTM A884, [**Class A**] [**Class B**].

* + - * 1. Concrete:

Formed Surfaces Not Exposed to View: As formed.

Unformed Surfaces:

Finish with vibrating screed or hand float.

Items Permitted: Color variations, minor indentations, chips, and spalls.

Items Not Permitted: Major imperfections, honeycomb, or other such defects.

List surfaces requiring special finishes.

Exposed-to-View Finishes:

<**\_\_\_\_\_\_\_\_**> Surfaces: [**Trowel**] [**Light broom**] [**Medium broom**] [**Heavy broom**].

* + - * 1. Steel:

ASTM A123 includes minimum coating thickness grade based on type of material and steel thickness of component.

Galvanizing:

Comply with ASTM A123.

Hot-dip galvanize after fabrication.

* + - 1. ACCESSORIES

ASTM C309 type and class are as follows:

- Type I: Clear or translucent without dye.

- Type ID: Clear or translucent with dye.

- Type 2: White pigmented.

- Class A: No restrictions on vehicle solids material.

- Class B: Vehicle solids restricted to all resin material.

* + - * 1. Membrane Curing Compound: Comply with ASTM C309, Type [**I**] [**I-D**] [**2**], Class [**A**] [**B**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

ASTM C1315 type and class are as follows:

- Type I: Clear or translucent.

- Type II: White pigmented.

- Class A: Non-yellowing.

- Class B: Moderate yellowing.

- Class C: Unrestricted color change permitted.

* + - * 1. Membrane Curing Compound: Comply with ASTM C1315, Type [**I**] [**II**], Class [**A**] [**B**] [**C**].
				2. Step Rungs:

Material: Formed [**PP**] [**steel-reinforced PP**] [**galvanized steel**] [**aluminum**] <**\_\_\_\_\_\_\_\_**>.

Diameter: [3/4] <\_\_\_\_\_\_\_\_> inch.

Width: [12] <\_\_\_\_\_\_\_\_> inches.

Spacing: [**16 inches o.c. vertically**] [**<\_\_\_\_\_\_\_\_> inches o.c. vertically**] [**As indicated on Drawings**].

* + - * 1. Inserted and Embedded Items:

Structural-Steel Sections:

Comply with ASTM A36.

Finish: [**Galvanized**] <**\_\_\_\_\_\_\_\_**>.

<**\_\_\_\_\_\_\_\_**>.

* + - * 1. Joint Sealants and Joint Gaskets:

Gasket Joints for Circular Concrete Pipe:

Comply with ASTM C443.

Gaskets: [**Standard**] [**Oil-resistant**] rubber.

External Sealing Bands:

Comply with ASTM C877.

Material: [**Type I, rubber and mastic**] [**Type II, plastic film, mesh-reinforced**] [**Type III, chemically bonded adhesive butyl**].

Preformed Joint Sealants for Concrete Pipe and Box Sections: Comply with ASTM C990.

Elastomeric Joint Sealants:

Comply with ASTM C920.

Material: [**Silicone**] [**Polyurethane**] [**Polysulfide**].

Grade NS, Class 25.

<**\_\_\_\_\_\_\_\_**>, as manufactured by <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Pipe Entry Connectors: Comply with ASTM C923.
				2. Grout:

Cement Type: Portland cement, sand, and water mixture with stiff consistency to suit intended purpose.

Nonshrink Type:

Description: Premixed compound consisting of nonmetallic aggregate, cement, and water-reducing and plasticizing agents.

Comply with ASTM C1107.

Minimum Compressive Strength: [2,400] <\_\_\_\_\_\_\_\_> psi in 48 hours, and [7,000] <\_\_\_\_\_\_\_\_> psi in 28 days.

<**\_\_\_\_\_\_\_\_**>, as manufactured by <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Bituminous Coating:

[Manufacturers](http://www.specagent.com/LookUp/?ulid=8752&mf=04&src=wd):

C.R. Laurence Co., Inc., 2503 E. Vernon Ave., Los Angeles, CA 90058.

Carboline Company, 2150 Schuetz Rd., St. Louis, MO 63146.

Approved equivalent.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above.

Description: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Touch-Up Primer for Galvanized Surfaces:

Both organic and inorganic zinc-rich paints are available from major coatings manufacturers. Inorganic (zinc-silicate) zinc-rich primers offer marginally better corrosion protection (as a single layer), but manufacturers caution that painters must be especially qualified for this task and that proper surface preparation and ambient application conditions are important considerations.

Organic (zinc-rich epoxy) primers have the advantage of being easier to apply and are less likely to experience curing problems, especially in cold, dry conditions. They also have improved resistance under high humidity and chemical environments, better top-coatability, and less possibility of adhesion and blistering problems.

Caution: Inorganic zinc-rich primers should not be used to touch up galvanized metal or previously coated metals having shop-primed organic and inorganic primers.

[**SSPC Paint 20, Type I Inorganic**] [**SSPC Paint 20, Type II Organic**] <**\_\_\_\_\_\_\_\_**>.

Comply with ASTM A780.

* + - 1. SOURCE QUALITY CONTROL
				1. Testing:

Perform following tests for each 150 cu. yd. of concrete placed with minimum one set of tests each week:

Slump: Comply with ASTM C143.

Compressive Strength: [**ASTM C31**] [**ASTM C192**] and ASTM C39.

Air Content: Comply with [**ASTM C231**] [**or**] [**ASTM C173**].

Unit Weight: Comply with ASTM C138.

Make test results available to Director’s Representative <**\_\_\_\_\_\_\_\_**> upon request.

* + - * 1. Inspection:

Visually inspect completed vaults and chambers for defects.

Repair defects on surfaces exposed to view to achieve uniform appearance.

Repair honeycomb by removing loose material and applying grout to produce smooth surface flush with adjacent surface.

Repair major defects only if permitted by Director’s Representative <**\_\_\_\_\_\_\_\_**>.

Include one or both of following paragraphs to require Director’s inspection or witnessing of test at factory.

* + - * 1. Director’s Inspection:

Make completed <**product name**> available for inspection at manufacturer's factory prior to packaging for shipment.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.

* + - * 1. Director’s Witnessing:

Allow witnessing of factory inspections and tests at manufacturer's test facility.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspections and tests are scheduled.

Include following paragraph if reliance on manufacturer's approved quality-control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance:

If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

Specified shop tests are not required for Work performed by approved manufacturer.

1. EXECUTION
	* + 1. EXAMINATION
				1. Verify that items provided by other Sections of Work are properly sized and located.
				2. Verify correct size and elevation of excavation.
				3. Verify that subgrade [**and bedding are**] [**is**] properly prepared, [**compacted,**] and ready to receive Work of this Section.
			2. PREPARATION
				1. Mark each vault or chamber by indentation or using waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.
				2. Coordinate placement of inlet and outlet pipe or duct sleeves required by other Sections.
				3. Do not install vault or chamber if Site conditions induce loads exceeding weight capacity of vault or chamber.
				4. Inspect vaults and chambers immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.
			3. INSTALLATION
				1. According to ASTM C891.
				2. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.
				3. While lowering vaults or chambers into excavations and joining pipe to units, take precautions to ensure that interiors of pipeline and structure remain clean.
				4. Install vaults and chambers to elevation and alignment as indicated on Drawings.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install cast-in-place concrete foundation slab as specified in Section [**033000 - Cast-in-Place Concrete**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>, and install and anchor structure to base slab.
				2. Excavating:

As specified in Section [**310000 - Earthwork**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_**> and in indicated locations and depths.

Provide clearance around sidewalls of manhole or structure for construction operations [**, granular backfill,**] [**and**] [**placement of geotextile filter fabric**].

If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.

Remove large stones or other hard matter impeding consistent backfilling or compaction.

Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Director’s Representative.

Type of correcting materials (fine aggregate, coarse aggregate, or lean concrete) depends on type of subsoil, percolation characteristics, and compaction requirements.

Correct over-excavation with [**fine aggregate**] [**coarse aggregate**] [**lean concrete**] [**as indicated in Section 310001 – Earthwork Materials**].

* + - * 1. Base and Alignment:

Place foundation slab and trowel top surface level.

Grout base of shaft to achieve slope to drain, trowel smooth, and contoured [**as indicated on Drawings**].

Place sections plumb and level, trim to correct elevations, and anchor to foundation slab.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Base and Alignment:

Install vaults and chambers supported at proper grade and alignment [**on compacted crushed-stone bedding**] <**\_\_\_\_\_\_\_\_**> [**support system as indicated on Drawings**].

Grout base of shaft to achieve slope to drain, trowel smooth, and contoured [**as indicated on Drawings**].

* + - * 1. Assembly of Multisection Structures:

Lower each section into excavation.

Clean joint surfaces.

Install watertight joint seals according to manufacturer instructions using [**gasket joints**] [**, external sealing bands**] [**, preformed joint sealants**] [**, elastomeric joint sealants**] [**, grout**] [**, or**] <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Knock-out Boxes:

Remove knock outs or cut structure to receive piping without creating openings larger than required to fit pipe.

Fill annular space with grout.

* + - * 1. Connections:

Connect [**pipe**] <**\_\_\_\_\_\_\_\_**> to structure and seal watertight.

Cut [**pipe**] <**\_\_\_\_\_\_\_\_**> flush with interior of structure.

* + - * 1. Paint interior with two coats of bituminous interior coating at rate of [120] <\_\_\_\_\_\_\_\_> sq. ft./gal. for each coat.
				2. [**Frame and Cover**] [**and**] [**Access Hatch**]:

Set level, without tipping, to elevations as indicated on Drawings.

Set [**cover**] [**and**] [**access hatch**] [2] <\_\_\_\_\_\_\_\_> inches above finished grade for structures located within unpaved areas to allow area to be graded away from cover beginning [1] <\_\_\_\_\_\_\_\_> inch below top surface of frame.

Connect drain from access hatch frame to storm drainage system.

Touch up damaged galvanized coatings.

* + - * 1. Backfill excavations for vaults and chambers as specified in Section [**310000 - Earthwork**].
			1. FIELD QUALITY CONTROL
				1. Testing:

As specified in Section [**330505.33 - Infiltration and Exfiltration Testing**] [**330505.36 - Vacuum Testing**].

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Testing:

Vacuum Test: Comply with ASTM C1244.

Hydrostatic Exfiltration Test: [**According to manufacturer instructions**] <**\_\_\_\_\_\_\_\_**>.

* + - 1. ATTACHMENTS

When relying on separate schedules, tables, illustrations, or forms to specify product requirements, include list of each attachment. Include identical list of attachments in Project Manual table of contents.

Consider including schedule if differing types, sizes, or configurations of vaults or chambers are required. Repeat paragraphs to specify each different configuration.

Insert attachments following END OF SECTION. Consider following examples when developing Project schedule.

* + - * 1. Drainage System Sedimentation Chambers, Type 2:

Capacity: 25,000 gal.

Base and Riser Sections:

Clear Inside Dimensions: 15 by 25 feet.

Height: As indicated on Drawings.

Provide integral baffles.

Roof: Provide access openings to sediment collection and water discharge chambers.

Frame and Lid:

Type: Round, non-rocking.

Size: 24 inches.

Mounting: Flush.

Manufacturer: Neenah Foundry.

* + - * 1. Grease Interceptor, Type 1:

Capacity: 600 gal.

Clear Inside Dimensions: 4 by 4 feet.

Height: As indicated on Drawings.

Roof: Access openings to grease collection and water discharge chambers.

Frame and Lid:

Type: Round, non-rocking.

Size: 24 inches.

Mounting: Flush.

Manufacturer: Neenah Foundry.

* + - * 1. End Walls, Type 2:

Configuration: Battered along height.

Height: 42 inches.

Length: 6 feet.

END OF SECTION 330563