STORM WATER MANHOLES

1. REFERENCE SPECIFICATIONS, CODES, AND STANDARDS
	1. AASHTO H-20 – Axial Loading.
	2. ASTM C581 – Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service.
	3. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
	4. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
	5. ASTM D785 – Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
	6. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
	7. ASTM D 2563 – Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.
	8. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastic by Means of a Barcol Impressor.
	9. ASTM D2584 – Standard Test Method for Ignition Loss of Cured Reinforced Resins.
	10. ASTM D3753 – Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells.
	11. All references shall be of the latest revision.
2. SUBMITTALS
	1. Units
		1. All submittals, specifications, drawings, brochures, installation instructions, descriptive literature, etc. shall have all units of measurement in both Imperial and SI units.
	2. Drawings
		1. Project specific drawings, showing:
			1. Overall structure length, width, and height.
			2. Critical elevations.
			3. Ladder, top, coupling, and storm water structure orientations.
			4. Joints, connections, fasteners.
			5. Sizes, spacing, and locations of structural members, ribs, anchoring clips, and dimensional bracing.
			6. Materials and thicknesses of construction.
		2. Generic layouts or check marked brochures shall be rejected without review.
	3. Specifications
		1. Project specific specifications.
		2. Generic or check marked specifications shall be rejected without review.
	4. Receiving, Handling, and Storage Instructions
	5. Installation Instructions
	6. Operation and Maintenance Instructions
	7. Product Warranty
	8. Test Data
		1. Manhole
			1. Test result data confirming full compliance with ASTM D3753 for manhole barrel and reducer structures as required under Section 11 of the standard.
		2. Storm water structure
			1. Test results confirming diversion structure material properties.
	9. Laminate Sample
		1. 6-inch [15.24 cm] square samples of representative manhole barrel and storm water structure laminates, upon request.
	10. Quality Assurance Data
		1. Fabricator’s Certificate of Compliance with fabrication requirements.
		2. Qualifications of fabricator’s Quality Assurance Supervisor.
		3. Copy of fabricator’s Quality Assurance Program.
		4. Quality Assurance Inspection with:
			1. In-production Quality Assurance Inspection report(s).
			2. Certificate of post-production Quality Assurance Inspection report(s).
3. RECEIVING, HANDLING, AND STORAGE
	1. Receiving
		1. Inspect for damage
			1. All parts should be inspected upon delivery to the site, noting any missing items or visible damage.
			2. The end connections, couplings, base mounting flange, and top should be inspected.
			3. For smaller boxed items make sure to verify that all packaging seals are in place and that there is no visible damage to the packaging.
		2. Investigate for order correctness and count
			1. Once the order has been received review the packing list against what has been received. Should any items not appear to be present or the configuration of the items does not match the description on the packing list, contact Openchannelflow immediately.
			2. Small connection hardware (nuts, bolts, etc.) not attached to the manholes ship inside the manhole in individual boxes – with those contents clearly marked. Special care should be taken to secure these and any other small items that can be misplaced on a job site.
	2. Handling
		1. When cranes, hoists, and other machinery are used to lift manholes or manhole sections, spreader bars and lifting straps should always be used. When performing any overhead lift, all lifting eyes must be used in conjunction with good rigging practices. Rigging and lifting sequences and schedules of equipment are solely the responsibility of the installing party.
		2. Taglines should be used to control the movement of the structure during lifting.
		3. Manholes must be lifted by using nylon or similar fabric slings or lifting lugs, if furnished on the unit. Chains, ropes, and the like should never be used to move or position any fiberglass item as they may serrate the fiberglass laminate or compromise the protective gel coat surfaces.
		4. Manholes should never be dropped, rolled, slid, or impacted.
	3. Storage
		1. Manholes not intended for immediate installation may be stored until the site is ready for their installation.
		2. Manholes should only be stored in a location that is clean, level, free of sharp objects and protected from construction traffic.
		3. When shipped on pallets, manholes should be left on those pallets until such time as they are needed. Care should be taken to ensure that the base flange and end connections are protected from damage. Tarp or cover any manhole to be stored for an extended period of time before installation.
		4. Chocks and / or tie downs should be used to prevent rolling or movement due to wind.
4. MANUFACTURER
	1. Supply Storm Water manholes as manufactured by:
		1. Openchannelflow (phone: 855.481.1118 / fax: 855.3316475 / www.openchannelflow.com).
			1. Locally represented by:
				1. XX.
5. SUBSTITUTIONS
	1. Manufacturers wishing consideration as acceptable substitutes must follow the steps outlined below.
	2. Include a copy of this specification section with all applicable plans sheets / details, addendum updates, and all referenced / applicable sections.
	3. Each paragraph must be check marked to indicate complete compliance with the specification or clearly marked to indicate a request for deviation from the specification requirements.
		1. Use check marks (✔) to denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore requested, underline each deviation and denote by a number in the margin to the right of the identified paragraph.
		2. The remaining portions of the paragraph not underlined will signify compliance on the part of the Manufacturer with the specifications.
		3. Include a detailed, written justification for each numbered deviation.
		4. Failure to comply with the above is sufficient cause to summarily reject the entire request for substitution.
	4. Requests for substitution must be made in writing and be received by the engineer’s office a minimum of ten (10) business days before the bid opening.
	5. Manufacturers not pre-approved shall not be given consideration.
	6. Manufacturers requesting pre-approval must have been regularly engaged in the application, design, and manufacturing of open channel primary devices for at least ten (10) years.
	7. To ensure strict quality control, the Manufacturer may incorporate raw materials from outside vendors, but the Manufacturer must fabricate the final product.
		1. Job shopping or outside fabrication / sourcing shall not be acceptable.
	8. In addition, the request for substitution must provide information regarding a minimum of ten (10) comparable North American installations, including:
		1. Owner’s name, location, and contact information.
		2. Application and performance specifications.
		3. Date of installation.
		4. Operational history.
		5. Equipment arrangement, including configuration and materials of construction.
6. WARRANTY
	1. Storm Water Manholes shall be warranted to be free of defects in workmanship and materials for five (5) years with a completed warranty registration.
	2. The warranty period shall begin from the date of shipment.
7. SYSTEM DESCRIPTION
	1. Configuration
		1. Storm Water Manholes shall be monolithic, watertight, corrosion resistant units consisting of (as a minimum): manhole barrel, top, confined space entry warning sign, coupling, ladder, storm water structure (debris basket / coalescing media), platform, end connections (pipe stubs / flanges / caulking collars), base, and mounting flange.
		2. Diameter
			1. 60-inches [1.52 m] I.D.
			2. 72-inches [1.83 m] I.D.
			3. 96-inches [2.44 m] I.D.
			4. Inside diameter tolerance: +/- 1%.
		3. Domed Fiberglass Top
			* 1. A full diameter, fully opening reinforced domed fiberglass cover with stainless steel hardware (hinge, padlockable hasp, and cover support gas struts), fiberglass hinge block, and a neoprene sealing gasket applied to the manhole barrel lip.
				2. The cover shall be designed and tested to withstand a minimum 1,000 lb. [453.6 kg] static load.
				3. For operator safety, the cover support gas strut shall be sized and mounted so that cover opens at any position unless locked.
		4. Height
			1. The manhole shall be \_\_\_\_\_-feet \_\_\_\_\_-inches [\_\_\_\_\_ cm] high as measured from the inlet invert to the surface grade plus 12-inches [30.48 cm].
		5. Construction
			1. One-piece construction.
		6. Storm Water Structures
			1. Wet well
				1. The Storm Water Manhole shall be sized so that there shall be an area below the inlet pipe invert capable of holding \_\_\_\_\_ gallons [\_\_\_\_\_ liters] of screened / treated water.
				2. Removal structure

Debris removal

Small rectangular shaped T-304 stainless steel trash basket with lifting bail, 18-inches [45.72 cm] wide x 8-inches [20.32 cm] deep x 28-inches [71.12 cm] high.

T-304 stainless steel angle guides.

Perforated T-304 14 gauge screen with Ø2-inch [5.08 cm] holes on 3-inch [7.62 cm] centers.

Medium trapezoidal shaped T-304 stainless steel trash basket, 19 1/8-inches [48.58 cm] wide x 10-inches [25.4 cm] deep – base / 20 3/8-inches [51.75 cm] deep – top x 18-inches [45.72 cm] high.

T-304 stainless steel axels mounting phenolic wheels.

T-304 stainless steel lift point welded to top of basket.

Pultruded fiberglass guides bolted and laminated to the manhole barrel.

Oil removal

(2) racks of removable coalescing media packs.

Fabricated from:

Polyvinyl chloride (up to 140° F [60° C).

High temperature polyvinyl chloride (up to 150° F [65.56° C).

Polypropylene (up to 185° F [85° C).

Stainless steel (above 185° F [85° C).

Sized for flows up to \_\_\_\_\_ gpm [\_\_\_\_\_ l/s].

Outlet Elbow

The outlet pipe shall be elbowed down to trap surface oil and grease.

The inlet to the elbow shall be \_\_\_\_\_-inches [\_\_\_\_\_ cm] below the outlet invert.

* + 1. End Connections
			1. Inlet
				1. \_\_\_\_\_-inch [\_\_\_\_\_ cm] O.D. pipe stub

Elastomeric polyvinyl chloride coupling with stainless steel bands to connection to \_\_\_\_\_-inch [\_\_\_\_\_ cm] O.D. pipe.

* + - * 1. ANSI 150 lb. pattern, flat faced fiberglass flange to connect to \_\_\_\_\_-inch [\_\_\_\_\_ cm] flange.
				2. Fiberglass caulking collar with internal Ø\_\_\_\_\_-inches [\_\_\_\_\_ cm].
			1. Outlet
				1. \_\_\_\_\_-inch [\_\_\_\_\_ cm] O.D. pipe stub

Elastomeric polyvinyl chloride coupling with stainless steel bands to connection to \_\_\_\_\_-inch [\_\_\_\_\_ cm] O.D. pipe.

* + - * 1. ANSI 150 lb. pattern, flat faced fiberglass flange to connect to \_\_\_\_\_-inch [\_\_\_\_\_ cm] flange.
				2. Fiberglass caulking collar with internal Ø\_\_\_\_\_-inches [\_\_\_\_\_ cm].
	1. Materials of Construction
		1. Manhole
			1. Fiberglass reinforced plastic laminate composed of:
				1. Unsaturated, single lot, isophthalic polyester resin with U.V. inhibitors
				2. E-glass reinforcement.
				3. Chemically enhanced silica for improved corrosion resistance, strength, and overall performance.
				4. Wall thickness shall be sufficient to meet or exceed ASTM D3753 and shall be a minimum of 1/2-inch [1.27 cm] thick.
			2. Interior
				1. Smooth, resin rich, corrosion resistant to minimize sludge build-up.
				2. Naturally light tan with no added pigments to aid in the visual inspection of the manhole barrel laminate for resin odd-lotting and the inclusion of any voids, contaminants, etc.
				3. Free of exposed fibers, crazing, delamination, blisters larger than Ø1/2-inch [1.27 cm], and wrinkles with a depth of 1/8-inch [0.3175 cm] or greater.
				4. Pigments or gel coating of the interior manhole surface violated ASTM D3753 and are not allowed for any reason.
			3. Exterior
				1. Gray 15 mil (cured) gel coat with U.V. inhibitors on all exterior surfaces.
				2. Patterned / rolled glass exterior surface with no exposed fibers, sharp projections, or blisters larger than Ø1/2-inch [1.27 cm].
			4. Sign
				1. Self-adhesive polyester “Confined Space Entry” sign on the manhole interior, at or above the first ladder rung.
				2. Sign to comply with ANSI Z535.2 and OSHA 1910.145.
			5. Coupling
				1. Ø2-inch [5.08 cm] thru-wall fiberglass coupling for power, sampling, sensor, or other cabling laminated to the manhole barrel.
			6. Ladder
				1. Fiberglass ladder thru-bolted and laminated to the manhole barrel.
				2. Ladder rungs

Pultruded fiberglass 18-inches [45.72 cm] wide x Ø1 1/2-inches [3.81 cm] x 1/4-inch [0.635 cm] thick.

Reinforced with Ø1/4-inch [0.635 cm] threaded stainless steel rod secured by solid pultruded fiberglass spacers.

Spaced no more than 12-inches [30.48 cm] on center.

Each rung shall have either an integrally molded non-slip surface or a full width, factory applied, coarse grit surface with a minimum dry coefficient of friction of 1.0.

At the first ladder rung there shall be a fixed open cell grating platform to aid in entering / exiting the manhole.

* + - * 1. Ladders shall meet or exceed OHSA 1910.27 for fixed ladders.
			1. Platform
				1. Narrow opening fiberglass grating with slip resistant top surface mechanically attached to a fiberglass support base thru-wall bolted and laminated to the manhole barrel with access to debris basket or coalescing media.
			2. Base
				1. The manhole base shall be not less than 1/2-inch [1.27 cm] thick.
			3. Mounting flange
				1. 4-inch [10.16 cm] wide x 3/4-inch [1.905 cm] thick integrally molded around the circumference of the manhole barrel for anchoring the manhole to the concrete pad.
			4. Pad
				1. 3/4-inch [1.905 cm] thick expanded polystyrene bead board for placement between the base of the manhole and the concrete slab.
1. MANHOLE ACCESSORIES
	1. Customization
		1. Custom gel coat color
			1. Manhole exterior gel coat color other than standard gray, with U.V. inhibitors, from manufacturer supplied color chart.
				1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. Hoist
		1. Portable, collapsible, T-304 stainless steel equipment hoist, with:
			1. Dutton-Lainson stainless steel gear / brake winch.
			2. 500 lb. [226.8 kg] load capacity.
			3. 30-feet [0.9144 m] of Ø1/4-inch [0.635 cm] of stainless steel cable.
			4. Stainless steel safety hook.
			5. Both in-use and storage wall sockets.
	3. Equipment Mounting / Access Options
		1. Panel
			1. 18-inches [45.72 cm] wide x 18-inches [45.72 cm] high fiberglass equipment mounting panel secured to the manhole interior for mounting flow meters, wireless transmission modules, or other small equipment.
		2. Shelf
			1. 18-inches [45.72 cm] x 12-inches [30.48 cm] deep fiberglass equipment shelf secured to the manhole interior.
	4. Ventilation
		1. Passive Ø4-inch [10.16 cm] vent
			1. Ø4-inch [10.16 cm] duct extending to within 24-inches [60.96 cm] of the manhole platform and secured with T-304 stainless steel pipe brackets.
			2. Integral insect screen.
2. FIELD ASSISTANCE
	1. Qualified factory representative shall provide on-site assistance, consisting of:
		1. (\_\_\_) days of installation observation.
			1. Factory representative shall complete a Certification of Installation Observation.
			2. Installation observation shall not alleviate installing party from proper installation liability.
		2. (\_\_\_) days of operator training.
3. EXECUTION
	1. Examination
		1. Verify that the manhole dimensions are correct and that the site conditions are suitable for installing the structure.
	2. Installation
		1. The site must be of adequate size to accommodate the manhole and provide safe working room for the installing personnel.
		2. Do not allow groundwater or surface water runoff to accumulate in the open excavation.
		3. Provide a concrete foundation slab on which to mount / secure the manhole. The slab should extend a minimum of 12-inches [30.48 cm] on all sides beyond the manhole, base mounting flange, connecting pipes / flanges, and any structure integrated into the manhole.
		4. The thickness of the slab should be a minimum of 6-inches [15.24 cm], but as local soil conditions may vary, the final design of the slab and anchoring details are the responsibility of the installing party and must be sized so as to prevent shifting and flotation of the manhole structure.
		5. The concrete foundation slab must have a smooth, troweled surface to provide uniform support over the entire base structure. The slab must be level in both directions to within 1/8-inch [0.3175 cm] and free from exposed aggregate and debris.
		6. Place the foam pad on the concrete slab where the manhole barrel will rest.
		7. Lower the manhole onto the concrete slab – taking particular care to secure the manhole from overturning during movement and lowering.
		8. Manholes supplied with pipe stubs may also be supplied with flexible couplings and stainless steel bands. Considerable force must be exerted by the coupling sealing surfaces during installation, if the coupling installs with little effort or appears loose, stop and contact the coupling manufacturer.
		9. Place the flexible couplings (when provided) on the manhole pipe stubs.
		10. Loosely secure the manhole to the concrete slab with anchor bolts (by others – wedge style recommended).
		11. Level the manhole.
		12. Once the level has been verified, complete the tightening of the anchor bolts to secure the manhole to the concrete slab.
		13. Complete the connection of the manhole to the inlet / outlet piping.
	3. Backfilling
		1. Backfill should be placed evenly around the manhole in lifts of no more than 12-inches [30.48 cm]. Care should be taken to ensure that no void area exist between the concrete slab and any portion of the structure (i.e. under the pipe connections).
		2. Fill material should be imported sand or pea gravel material (naturally round aggregate 1/4-3/8-inch [0.635-0.9525 cm] in size).
		3. If backfilling with another material avoid rocks, concrete, or soil lumps larger than 1-inch [2.54 cm] in size.
	4. Adjust and Clean
		1. Verify that the complete installation meets the criteria above and any additional criteria supplied by the Engineer.
		2. Clean the flow surfaces in accordance with the manufacturer’s operation and maintenance instructions.
		3. Remove all trash and debris, leaving the site in a clean condition.