WEIR BOX

1. REFERENCE SPECIFICATIONS, CODES, AND STANDARDS
	1. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
	2. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
	3. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
	4. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
	5. ISO 1482 – Hydrometry – Open Channel Flow Measurement Using Thin-Plate Weirs.
	6. 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. Critical dimensions.
			2. Joints, connections, fasteners.
			3. Sizes, spacing, and locations of structural members, ribs, and base anchoring clips.
			4. Materials and thicknesses of construction.
			5. Minimum and maximum flow rates.
		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. Discharge Tables
		1. Level-to-flow discharge tables, showing:
			1. Flow equations.
			2. Submergence transition, where published.
			3. Accuracy, where published.
			4. Plan view layout showing critical dimensions and primary point of measurement (Ha).
			5. Discharge table source.
	5. Receiving, Handling, and Storage Instructions
	6. Installation Instructions
	7. Operation and Maintenance Instructions
	8. Product Warranty
	9. Test Data
		1. Independent certified test results confirming material properties.
			1. Test results are to be performed on specimens representative of the resins and reinforcements submitted upon with such resins and reinforcements listed by the certifying party.
			2. Data shall be no more than three (3) years old.
	10. Laminate Sample
		1. 6-inch [15.24 cm] square sample of representative laminate, upon request.
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. Verify that the weir plate has not been damaged, loosened, or otherwise compromised during transit.
			3. Flanges, anchor clips, and dimensional bracing should also be inspected.
			4. 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.com immediately.
			2. Small connection hardware (nuts, bolts, etc.) not attached to the weir box ship 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. Weir boxes are specialty items and are fabricated to strict dimensional tolerances. While rugged and designed for a long service life, they must be handled with care. The weir plate and its nappe are particularly important and in handling weir boxes this should always be kept in mind.
		2. When cranes, hoists, and other machinery are used to lift weir boxes, 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.
		3. Chains, ropes, and the like should never be used to move or position any weir box as they may serrate the fiberglass laminate or compromise the protective gel coat surfaces.
	3. Storage
		1. Weir boxes not intended for immediate installation may be stored until the site is ready for their installation.
		2. Weir boxes should only be stored in a location that is clean, level, and protected from construction traffic.
		3. When shipped on pallets, the weir boxes should be left on those pallets until such time as they are needed. Otherwise weir boxes should be stored upside down so that the weir plate and weir nappe are protected. Weir boxes should then be covered as an additional protection.

1. MANUFACTURER
	1. Supply Weir boxes as manufactured by Openchannelflow, 950 West Bannock Street, Suite 1100, Boise, ID 83702 (phone: 855.481.1118 / fax: 855.3316475 / www.openchannelflow.com).
2. 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. Manufacturing alone shall not be deemed sufficient. The majority of the Manufacturer’s operations must consist of the control, conditioning, or measurement of open channel flow.
	7. To ensure strict quality control, the Manufacturer may incorporate raw materials from outside vendors, but the Manufacturer must fabricate the final product.  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.
3. WARRANTY
	1. Weir boxes 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.
4. SYSTEM DESCRIPTION
	1. Configuration
		1. Size
			1. Length: \_\_\_\_\_ feet \_\_\_\_\_ inches [\_\_\_\_\_ cm].
			2. Width: \_\_\_\_\_ feet \_\_\_\_\_ inches [\_\_\_\_\_ cm].
			3. Height: \_\_\_\_\_ feet \_\_\_\_\_ inches [\_\_\_\_\_ cm].
		2. Baffle Plate
			1. Fixed 1/4 inch [0.635 cm] thick pultruded fiberglass.
		3. Weir Plate
			1. Fixed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ weir plate.
			2. 1/4 inch [0.635 cm] thick pultruded fiberglass.
			3. Downstream weir face beveled at a 45° angle.
			4. Reinforced downstream to withstand the force of the anticipated maximum flow rate.
			5. Sized to handle:
				1. Minimum flow rate: \_\_\_\_\_\_\_\_\_\_ gpm [\_\_\_\_\_\_\_\_\_\_ l/s].
				2. Maximum flow rate: \_\_\_\_\_\_\_\_\_\_ gpm [\_\_\_\_\_\_\_\_\_\_ l/s].
	2. Materials of Construction
		1. Fiberglass reinforced plastic laminate
			1. ISO certified polyester laminating resin:
				1. Styrene free.
				2. Low VOC.
				3. Typical cast (unreinforced) resin properties shall meet or exceed:

Tensile Strength (ASTM D638) 11,600 psi [80 MPa].

Tensile Modulus (ASTM D638) 490,000 psi [3.4 GPa].

Tensile Elongation (ASTM D638) 3.5%.

Flexural Strength (ASTM D790) 16,300 psi [112 MPa].

Flexural Modulus (ASTM D790) 500,000 psi [3.4 GPa].

* + - * 1. Orthophthalic resins shall not be allowed.
			1. E-glass:
				1. Minimum of 30% of laminate content by weight.
				2. Silane coupling agent.
				3. C-glass shall not be allowed.
			2. Laminate thickness:
				1. 1/4 inch [0.635 cm].
		1. Gel coat:
			1. Interior surfaces: white gloss.
			2. Exterior surfaces: gray.
			3. 15 mil cured thickness.
			4. U.V. inhibitors in all gel coat formulations.
			5. CCP Armorcote 991, without exception.
		2. Flange:
			1. Integral top stiffening flange, 2 inches [5.08 cm] wide.
		3. Stiffening ribs:
			1. Encapsulated stiffening ribs to provide sufficient strength and rigidity to allow the weir box to be self-supporting and capable of holding the rated maximum head of water without visible distortion.
		4. Base anchoring clips:
			1. Minimum of (2) pultruded fiberglass anchoring clips per side laminated to the exterior of the weir box.
			2. Pre-drilled with Ø5/8 inch [1.59 cm] hole.
1. ACCESSORIES
	1. End Connections
		1. Inlet
			1. Fiberglass pipe stub and elastomeric polyvinyl chloride coupling with stainless steel bands to connection to \_\_\_\_\_ inch [\_\_\_\_\_ cm] O.D. pipe.
			2. ANSI 150 lb. pattern, flat faced fiberglass flange to connect to \_\_\_\_\_ inch [\_\_\_\_\_ cm] flange.
			3. Fiberglass caulking collar with internal Ø\_\_\_\_\_ inches [\_\_\_\_\_ cm].
		2. Outlet
			1. Fiberglass pipe stub and elastomeric polyvinyl chloride coupling with stainless steel bands to connection to \_\_\_\_\_ inch [\_\_\_\_\_ cm] O.D. pipe.
			2. ANSI 150 lb. pattern, flat faced fiberglass flange to connect to \_\_\_\_\_ inch [\_\_\_\_ cm] flange.
			3. Fiberglass caulking collar with internal Ø\_\_\_\_\_ inches [\_\_\_\_\_ cm].
	2. Flow / Level Options
		1. Bubbler tube
			1. Field removable / replaceable T-304 stainless steel bubbler tube and secured through the use of (2) wing nuts on the top flange of the weir box.
			2. Single piece 1/4 inch [6.35 mm] tube swaged at the top to accept standard 1/8 inch [3.175 mm] vinyl bubble line. Compression couplings shall be not allowed.
		2. Probe well
			1. Ø2 inch [5.08 cm] diameter tube with Ø2 inch [5.08 cm] opening laminated to the weir box sidewall (for the installation of a submerged probe).
		3. Staff / level gauge
			1. High visibility, direct read level gauge with 3/4 inch [1.095 cm] black letters / numerals on a high visibility yellow-green background.
			2. Dual scale gradated in 2 mm, cm, 1/100-foot, and 1/10-foot increments.
		4. Stilling well
			1. Attached, with Ø2 inch [5.08 cm] opening in weir box sidewall.
				1. Ø6 inch [15.24 cm].
				2. Ø8 inch [20.32 cm].
				3. Ø12 inch [30.48 cm].
				4. Ø16 inch [40.64 cm].
			2. Detached, with Ø2 inch [5.08 cm] coupling in weir box sidewall (interconnection tubing by others).
				1. Ø6 inch [15.24 cm].
				2. Ø8 inch [20.32 cm].
				3. Ø12 inch [30.48 cm].
				4. Ø16 inch [40.64 cm].
		5. Ultrasonic mounting bracket
			1. Horizontally and vertically adjustable T-304 stainless steel ultrasonic mounting bracket for transducers up to Ø1 inch [2.54 cm] NPT.
	3. Parameter Monitoring Options
		1. Probe holder
			1. Field removable / replaceable T-304 stainless steel probe holder (for pH, DO, conductivity, etc. probes) secured through the use of (2) wing nuts on the top flange of the weir box.
			2. Holder to extend 1 inch [2.54 cm] below the weir crest to aid in keeping the probe wetted.
		2. Probe well
			1. Ø2 inch [5.08 cm] diameter tube with Ø2 inch [5.08 cm] opening laminated to the weir box sidewall.
		3. Sampler tube
			1. Field removable / replaceable T-304 stainless steel sampler tube secured through the use of (2) wing nuts on the top flange of the weir box.
			2. 3/8 inch [9.525 mm] tube to accept standard 3/8 inch [9.525 mm] suction line.
	4. Customization
		1. Bolt down cover
			1. Removable flat bolt down fiberglass cover over weir box, with free (non-encapsulated) T-304 stainless steel hardware. U.V. inhibited gel coat on all covers surfaces.
			2. Removable clear, U.V. stable polycarbonate (Lexan) flat cover over weir box, with free (non-encapsulated) T-304 stainless steel hardware.
			3. Removable tinted, U.V. stable polycarbonate (Lexan) flat cover over weir box, with free (non-encapsulated) T-304 stainless steel hardware.
		2. Custom gel coat color
			1. Gel coat color other than standard white / gray, with U.V. inhibitors, from manufacturer supplied color chart.
				1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
				2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		3. Cleanout
			1. Ø2 inch [5.08 cm] fiberglass coupling laminated to the weir box sidewall upstream of the weir plate to add in the cleaning of the weir pool.
		4. Recessed grating
			1. Removable, recessed open cell fiberglass grating with slip resistant top surface.
2. EXECUTION
	1. Examination
		1. Verify that the weir box 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 weir box 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 weir box. The slab should extend a minimum of 12 inches [30.48 cm] on all sides beyond the weir box, base anchoring clips, connecting pipes / flanges, and any portion of the structure integrated into the weir box.
		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 weir box.
		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. The bevel in the weir plate should be set downstream.
		7. It is important to brace the weir box internally (plywood and lumber are typically used) during installation to ensure that distortion does not occur.
		8. Lower the weir box onto the concrete slab – taking particular care to secure the weir box from overturning during movement and lowering.
		9. Weir boxes supplied with end adapters and 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.
		10. Place the flexible couplings (when provided) on the weir box pipe stubs.
		11. Loosely secure the weir box to the concrete slab with anchor bolts (by others – wedge style recommended).
		12. Level the weir box so that the weir plate is level from front-to-back and from side-to-side (using a level on the weir plate – not the top of the weir box).
		13. Once the level has been verified, complete the tightening of the anchor bolts to secure the weir box to the concrete slab.
		14. Complete the connection of the weir box to the inlet / outlet piping.
	3. Backfilling
		1. Backfill should be placed evenly around the weir box 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.