<table>
<thead>
<tr>
<th>Revision</th>
<th>Description of Change – Replace, Add, and Delete Pages</th>
</tr>
</thead>
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<tr>
<td>0</td>
<td>Initial Release for CHPRC LLE</td>
</tr>
<tr>
<td>1</td>
<td>Incorporated information from Addendum #1, Addendum #2, and Addendum #3, and updated information from the addendum to specifications table.</td>
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</table>

(3) Revision
(4) Description of Change – Replace, Add, and Delete Pages

Authorized for Release
(5) DA/TA Date
PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section covers the Work necessary to design, detail, manufacture, deliver to the jobsite, complete and ready for operation, fiberglass reinforced plastic tanks as defined herein. This Specification defines the requirements for the following tanks:

<table>
<thead>
<tr>
<th>No.</th>
<th>Tag Number</th>
<th>Name</th>
<th>Service</th>
<th>Location</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>EFT-Y80</td>
<td>Effluent Tank</td>
<td>Finished Water</td>
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<td>2</td>
<td>RCYT-Y40</td>
<td>Recycle Tank</td>
<td>Recycled Water</td>
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<td>3</td>
<td>ET-Y30</td>
<td>Equalization Tank</td>
<td>Water</td>
<td>289T</td>
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<tr>
<td>4</td>
<td>ITT-Y90</td>
<td>Injection Transfer Storage Tank 1</td>
<td>Finished Water</td>
<td>289TD</td>
</tr>
<tr>
<td>5</td>
<td>ITT-Y91</td>
<td>Injection Transfer Storage Tank 2</td>
<td>Finished Water</td>
<td>289TE</td>
</tr>
<tr>
<td>6</td>
<td>ETT-Y1</td>
<td>Extraction Transfer Storage Tank 1</td>
<td>Groundwater</td>
<td>289TB</td>
</tr>
<tr>
<td>7</td>
<td>ETT-Y2</td>
<td>Extraction Transfer Storage Tank 2</td>
<td>Groundwater</td>
<td>289TC</td>
</tr>
<tr>
<td>8</td>
<td>ETT-Y3</td>
<td>Extraction Transfer Storage Tank 3</td>
<td>Groundwater</td>
<td>289TC</td>
</tr>
<tr>
<td>9</td>
<td>ASHT-Y71A</td>
<td>Aerated Sludge Holding Tank A</td>
<td>Sludge</td>
<td>289T</td>
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<tr>
<td>10</td>
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<td>289T</td>
</tr>
<tr>
<td>11</td>
<td>ASHT-Y71C</td>
<td>Aerated Sludge Holding Tank C</td>
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<td>289T</td>
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<tr>
<td>12</td>
<td>ACHT-Y95A</td>
<td>Aerated Centrate Tank A</td>
<td>Centrate</td>
<td>289T</td>
</tr>
<tr>
<td>13</td>
<td>ACHT-Y95B</td>
<td>Aerated Centrate Tank B</td>
<td>Centrate</td>
<td>289T</td>
</tr>
<tr>
<td>14</td>
<td>ACHT-Y95C</td>
<td>Aerated Centrate Tank C</td>
<td>Centrate</td>
<td>289T</td>
</tr>
<tr>
<td>15</td>
<td>TCSIT-Y20</td>
<td>TC-99 System Inlet Tank</td>
<td>Groundwater</td>
<td>289TA</td>
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<td>16</td>
<td>RHT-Y87</td>
<td>Resin Holding Tank</td>
<td>Resin</td>
<td>289TA</td>
</tr>
<tr>
<td>17</td>
<td>TWT-Y81</td>
<td>Treated Water Supply Tank</td>
<td>Finished Water</td>
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<td>18</td>
<td>CST-Y44A</td>
<td>Carbon Substrate Tank A</td>
<td>Carbon Substrate</td>
<td>289T</td>
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<tr>
<td>19</td>
<td>CST-Y44B</td>
<td>Carbon Substrate Tank B</td>
<td>Carbon Substrate</td>
<td>289T</td>
</tr>
<tr>
<td>20</td>
<td>CST-Y44C</td>
<td>Carbon Substrate Tank C</td>
<td>Carbon Substrate</td>
<td>289T</td>
</tr>
</tbody>
</table>
B. The following tanks will be provided as part of a separate equipment package, UBRS forms will be provided by the equipment manufacturers:

<table>
<thead>
<tr>
<th>Tag Number</th>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT-Y41A</td>
<td>Fluidized Bed Reactor A</td>
<td>289T</td>
</tr>
<tr>
<td>FT-Y41B</td>
<td>Fluidized Bed Reactor B</td>
<td>289T</td>
</tr>
<tr>
<td>CT-Y41A</td>
<td>Carbon Separator Tank A No. 1</td>
<td>289T</td>
</tr>
<tr>
<td>CT-Y41B</td>
<td>Carbon Separator Tank B</td>
<td>289T</td>
</tr>
<tr>
<td>AST-Y63A</td>
<td>Air Stripper Tank A</td>
<td>289T</td>
</tr>
<tr>
<td>AST-Y63B</td>
<td>Air Stripper Tank B</td>
<td>289T</td>
</tr>
</tbody>
</table>

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Mechanical Engineers (ASME):
   b. RTP-1, Reinforced Thermoset Plastic Corrosion Resistant Equipment.

2. ASTM International (ASTM):

1.03 DEFINITIONS


B. RTP: Reinforced Thermoset Plastic.

C. RTD: Resistance Temperature Detector.

1.04 DESIGN REQUIREMENTS

A. The FRP tank fabricator shall be a Certified ASME RTP Fabricator.

B. Design Loads: In accordance with Section 01 61 00.LLE, Common Product Requirements.

C. Tanks specified to be fabricated to ASME RTP-1 requirements shall be designed, fabricated, and code stamped. ASME RTP-1 shall be all inclusive for tanks so specified.
D. The User’s Basic Requirements Specification (UBRS) for RTP-1 tanks is a part of this Specification.

E. Design tank, including resin selection (unless specified), wall thickness, methods and locations of support, and stiffener requirements. Design shall be prepared and sealed by designer meeting requirements of Article Quality Assurance.

1.05 SUBMITTALS

A. All submittal information shall be provided in English.

B. Submittals Required With Proposal (For Information Only):

1. Shop Drawings:
   a. Fabricators catalog information, descriptive literature, specifications, and identification of materials of construction, including complete resin system information to meet ASME RTP-1 requirements.
   b. Letter from resin manufacturer stating that selected resin is suitable for intended service.
   c. Detailed fabrication drawings in AutoCAD format.
   d. Tank data indicating equipment number, pressure rating, diameter, straight shell lengths, overall lengths, wall thickness, corrosion barrier thickness, and details of nozzle designs.
   e. Description of insulation and exterior weather barriers.
   f. Complete catalog information, selection criteria, and calculations for the pad-type tank heaters.
   g. Tank capacity chart indicating gallons for each foot of depth and cumulative total from bottom.
   h. Fabricator’s detailed requirements for tank foundations.
   i. Recommended bolt torque for bolted FRP connections.
   j. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Seismic Anchorage and Bracing.
   k. Fabricator design report.
   l. Fabricator’s Quality Control Program.
   m. Fabricator’s Quality Control Test Plan.

2. Samples: Laminate sample representative of production quality of surface finish and visual imperfections.

C. Approval Required Prior to Work (APW) Submittals:

1. Complete design calculations for tanks, supports and appropriate accessories.
2. Complete design calculations and wiring diagrams for the pad-type tank heaters and RTDs.
3. Seismic anchorage and bracing calculations as required by Section 01 88 15, Seismic Anchorage and Bracing.
4. Certification to ASME RTP-1.
5. Fabricator’s Certificate of Compliance with fabrication requirements.
7. Copy of fabricator’s completed Quality Assurance Program.
8. Special shipping, storage and protection, and handling instructions.
9. Fabricator’s printed installation and tank support instructions.
10. Manufacturer’s Certificate of Proper Installation in accordance with Section 01 43 33.LLE, Manufacturers’ Field Services.

D. Contract Closeout Submittals: Service records for repairs performed during construction.

1.06 QUALITY ASSURANCE

A. Fabricator’s Quality Assurance Supervisor: Minimum of 5 years’ experience in fabrication of fiberglass structures.

B. Designer: Registered professional engineer licensed in Washington State.

1.07 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 01 61 00.LLE, Common Product Requirements. In addition, prepare and protect tank for shipment as follows:

1. Mount tank on padded cradles if shipped horizontally or on a suitable skid if shipped vertically.
2. Protect flanged nozzles with wooden blinds bolted to flange and having a diameter of 2 inches greater than outside diameter of flange.
3. Provide either rigid plugs inside ends to prevent deflection or wooden boxes for unflanged components. Brace open end of tank with suitable stiffening member to prevent deflection.
4. Do not ship components or other pieces loose inside tank.
5. Load tank with at least 2 inches of clearance between tank (including fittings) and bulkheads, or bed of vehicle.
6. Regardless of mode of transportation, firmly fasten and pad components to prevent shifting of load or flexing of components while in transit.

1.08 SEQUENCING AND SCHEDULING

A. Do not ship tank from factory until BTR’s review of Certification of Factory Testing is completed.

PART 2 PRODUCTS

2.01 SUPPLEMENTS

A. Some specific requirements relative to this section are attached as supplements at the end of section.
2.02 SERVICE CONDITIONS

A. As specified on User’s Basic Requirements Specifications (UBRS) attached as supplements at the end of this section.

2.03 MATERIALS

A. Filament-Wound or Hand-Layup: Fabricate in accordance with ASME RTP-1.

B. Resin:

1. Suitable for intended service.
2. Premium grade and corrosion resistant, such as chlorendic polyester, vinyl ester, or bisphenol A fumarate polyester.
3. Use same resin throughout entire tank shell.
4. Add ultraviolet absorbers to surfacing resin to improve weather resistance.
5. No dyes, pigments, or colorants, except in exterior gel coat.
6. No fillers or thixotropic agents.
7. Additives may be added to achieve fire retardancy. The Flame-Spread Rating of finish laminate shall be less than 25, as determined by ASTM E84. Additives shall not be added to interior layer, unless specifically required.
8. Curing System:
   a. As recommended by resin manufacturer or as specified herein.
   b. Cure products as specified in ASME RTP-1.
   c. Measure Barcol hardness according to ASTM D2583.

C. Reinforcements:

1. Surfacing Veil: Chemical surfacing mat, Type C (chemical) glass, 10 mils thick, with a finish and a binder compatible with the lay-up resin.
2. Other Reinforcements: In accordance with ASME RTP-1.

D. Laminate:

1. Consists of inner surface (corrosion barrier), interior layer, and exterior layer (structural layer).
2. Meet visual acceptance criteria in ASME RTP-1.
3. Meet requirements of mechanical properties in ASME RTP-1.
4. Reinforce inner surface with resin-rich surfacing veil as specified herein.
5. Apply a white color coat after inspection of laminate has been completed for non-insulated tanks.
E. Marking:

1. Identify each tank with fabricator’s name, capacity in gallons, maximum temperature, design pressure/vacuum, specific gravity, pH, resin, minimum thickness, tank number, tank name, and date of manufacture.
2. Provide permanent marking. Seal decals, labels, etc., into laminate exterior with clear resin.
3. Calibration Strips:
   a. Translucent, 6 inches wide.
   b. Calibration: Multiples of 100 gallons or less.
   c. Stencil gallonage in 2-inch-high numerals.
   d. Not required for outdoor, insulated tanks.

F. Nozzles:

1. Gusset 4-inch or smaller nozzles with conical or plate type gussets. Larger nozzles shall be gusseted, if noted.
2. Finish flush with inside surface of tank, unless otherwise indicated.
3. Gaskets:
   a. Provide two per nozzle, 1/8-inch-thick, full-face Viton or Buna N having a hardness of Shore A60 plus or minus 5.
   b. Material shall be suitable for intended service.
4. Flanged Nozzles: Rated at 100 psi, with other dimensions and bolting corresponding to ASME B16.5 for 150-pound steel flanges.
5. Back face of flanges shall be spot-faced, flat and parallel to flange face of sufficient diameter to accept SAE metal washer under bolthead or nut.
6. Nozzles shall project beyond the tank wall or insulation jacket as shown on the Tank Data Sheets.
7. Type 316 stainless steel bolting and viton gaskets shall be provided for all manways and blind flanges. Provide two gaskets for all manways and blind flanges.

G. Dip-Pipes (Down-Comers):

1. Provide inside and outside surfaces of dip-pipes with corrosion barrier.
2. Surfacing veil for this corrosion barrier shall be same as specified for tank.
3. Corrosion barrier shall consist of appropriate surfacing veil, backed by two layers of fiberglass mat.
4. If “ready-made” pipe is used, it shall have an equivalent internal corrosion barrier and shall have specified corrosion barrier applied to outside surface.

2.04 TANK INSULATION

A. Insulate tanks with two-pound density polyurethane foam board with thickness as indicated on tank data sheets. Install insulation board in 1-inch thick layers to obtain specified thickness, stagger joints. Insulation shall be
applied to tank structural laminate before laminate has hardened, bonding the insulation to the tank wall.

B. Provide 3/16-inch thick minimum protective exterior fiberglass laminate over the polyurethane foam. The final outside layer of the laminate shall be white pigmented gel-coat. Straight shell protective laminate shall incorporate expansion joints as required for thermal expansion. Provide lip at expansion joints to prevent water from penetrating joint. Minimum overlap shall be 1 inch.

C. At tank fittings, remove insulation and reinforce connection with fiberglass laminate to the outer side of the structural wall laminate. Replace insulation, cover with fiberglass laminate, and caulk interface around fitting.

D. Indicate the location of each tank heating pad by permanent dashed lines molded in the outer covering.

2.05 TANK HEATERS

A. Heating pads shall be located in the areas shown on tank data sheets. Multiple heating pads shall be equally spaced around the periphery of the tank. The heating system shall be furnished with all the necessary components to ensure a complete installation. These components shall include, but not be limited to, NEMA 4X control and power enclosures, power contactors, control devices, failure alarms, RTDs, conduit and cable, connectors, end caps, solvents, splice kits, pad and RTD installation kits, and aluminum tape. Flexible heating pad quantity and capacity for each tank shall be as follows:

<table>
<thead>
<tr>
<th>Equipment Tag Number</th>
<th>Heating Pad Quantity</th>
<th>Capacity Watts/Pad</th>
<th>Total Output Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACHT-Y95A</td>
<td>6</td>
<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>ACHT-Y95B</td>
<td>6</td>
<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>ACHT-Y95C</td>
<td>6</td>
<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>ACHT-Y71A</td>
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<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>ACHT-Y71B</td>
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<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>ACHT-Y71C</td>
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<td>500</td>
<td>3000</td>
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<tr>
<td>ET-Y30</td>
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<td>EFT-Y80</td>
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</tr>
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<td>RCYT-Y40</td>
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<tr>
<td>AST-Y63A</td>
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<td>3000</td>
</tr>
<tr>
<td>AST-Y63B</td>
<td>6</td>
<td>500</td>
<td>3000</td>
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<tr>
<td>FT-Y41A</td>
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<tr>
<td>FT-Y41B</td>
<td>6</td>
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<td>CT-Y41A</td>
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<td>500</td>
<td>2000</td>
</tr>
<tr>
<td>CT-Y41B</td>
<td>4</td>
<td>500</td>
<td>2000</td>
</tr>
</tbody>
</table>
B. Heating pads shall be rated at 277V, single phase, and have a maximum heat output of 0.7 watt per square inch. Install pads and RTDs on structural wall laminate in accordance with manufacturer’s installation instructions. Install high limit cutoff thermostat on heating pad per manufacturer’s installation instructions.

C. Cover heating pads and RTDs with insulation of the same type and thickness as the tank insulation prior to installation of manway covers.

D. Group the heating pads into multiple circuits such that maximum single circuit capacity does not exceed 16 amps when starting the circuit at 0 degrees F. Each circuit shall serve half of the heating pads.

E. Control Systems: Provide a separate control system for each tank.
   1. Control panels shall be rated NEMA 4X and shall conform to specification section 40 99 90.LLE, Package Control Systems. Separate electrical enclosures must be provided for voltages less that 50 volts and greater than 50 volts.
   2. Control panels shall be stanchion mounted next to tank, installation of panels by others.
   3. Control panels shall incorporate 30mA ground-fault equipment protection devices in accordance with NEC. Ground-fault protection shall initiate alarm and trip functions.
   4. Provide a 4-20mA output signal for remote temperature monitoring.
   5. Provide a set of dry contacts for remote alarm annunciation.
   6. Coordinate power supply to electrical panels with facility lockout/tagout procedures and disconnect requirements. Each electrical panel or enclosure shall be supplied by no more than one source of power.

F. Provide two (2) RTDs for each tank heating circuit, with leads routed to a NEMA 4X electrical enclosure. One RTD for each circuit will be a spare. RTDs shall be located to provide temperature measurement for the purpose of tank heater panel ON/OFF control. Each circuit will control independently.

G. Manufacturers and Products:
   2. HotFoil, ELP.
   3. Or approved equal.

2.06 APPURTENANCES

A. Lifting Lugs: Provide suitably attached for tank weighing over 100 pounds.

B. Anchor Bolts: Type 316 stainless steel bolts, sized by fabricator, and as specified in Section 05 50 00, Metal Fabrications.
C. Manway Bolts: Type 316 stainless steel bolts and nuts as specified in Section 05 50 00, Metal Fabrications.

D. Supports:
   1. Pipe Supports:
      a. Provide for tank overflow pipes, loading pipes, diffuser headers and recirculation pipes as shown on tank data sheets.
      b. Spacing of pipe supports shall be as shown on the Tank Data Sheets. Minimum load rating 400 pounds.
      c. FRP or Type 316 stainless steel.
      d. Supports shown on the Tank Data Sheets are for reference. Provide Manufacturer’s standard clip and attachment design.
   2. Level Probe Supports: FRP or stainless steel.

E. Platforms, Ladders, Handrails, and Kickplates:
   1. Provide OSHA Compliant FRP ladders, handrails, kickplates and platforms as shown on Tank Data Sheets or Contract Drawings.
   2. Fasteners: Type 316 stainless steel.
   3. Supports, FRP: Locate as required for field installation of ladders, platforms, or handrails.

F. Non-Skid Surfaces: Provide non-skid surfaces on tank tops.

2.07 SOURCE QUALITY CONTROL
A. Identify and retain cutouts. Engineer may select certain cutouts for testing for physical properties of laminate.

B. Factory Test Reports: Certify results, by signature, of the following:
   1. Inspections.
   2. Results of hydrostatic testing.
   3. Test reports of physical properties of standard laminates including Barcol harness and Acetone sensitivity.

PART 3 EXECUTION
3.01 INSTALLATION
A. Installation performed by Construction Contractor in accordance with fabricator’s written instructions.

B. Accurately place anchor bolts using templates furnished by fabricator, and as specified in Section 05 50 00, Metal Fabrications.
C. Interface with Other Products: Coordinate with mixer or other equipment manufacturer as required for proper mounting of tank mixers.

3.02 FIELD QUALITY CONTROL

A. Functional Test:

1. Construction Contractor to conduct on each tank.
2. Hydrostatic leak test with tank full of clean water. Allow water to stand for 24 hours to verify no leakage.

3.03 MANUFACTURER’S FIELD SERVICES

A. Provide fabricator’s representative at Site in accordance with Section 01 43 33.LLE, Manufacturers’ Field Services, for installation assistance, inspection and certification of proper installation for specified component, subsystem, equipment, or system. Fabricator’s representative shall inspect interior and exterior of tank after installation to verify no mechanical damage has occurred.

3.04 SUPPLEMENTS

A. The supplements listed below, following “End of Section,” are part of this specification.

1. Individual User’s Basic Requirements Specification (UBRS) Forms for tanks numbered 1 through 20 will be issued by BTR as they become available. UBRS forms include tank data sheets and other pertinent data.
2. UBRS forms for the tanks designed by equipment manufacturers will be prepared and submitted directly to the tank manufacturer.

END OF SECTION