

SECTION 44 44 13.15

DECARBONATOR TOWER SYSTEM - GENERAL  
04/08

PART 1 GENERAL

1.1 WORK INCLUDED

This Section covers the work necessary to furnish, install, and test the decarbonator tower systems specified herein and as further specified in the following Detail Specification sections:

<u>Specification Section</u>	<u>Item</u>
44 44 13.15 01,DS - FIBERGLASS REINFORCED PLASTIC (FRP) DECARBONATOR	FIBERGLASS REINFORCED POLYESTER (FRP) DECARBONATOR
44 44 13.15 02, DS - RANDOM PACKING MEDIA AND APPURTENANCES	RANDOM PACKING MEDIA AND APPURTENANCES
44 44 13.15 03, DS - Air Supply Blowers	Force Draft Air Supply System

1.2 GENERAL

The system specified herein and in the following Sections 44 44 13.15 01, FIBERGLASS REINFORCED PLAST (FRP) DECARBONATOR, 44 44 13.15 02, RANDOM PACKING MEDIA AND APPURTENANCES, and 44 44 13.15 03, AIR SUPPLY BLOWERS, shall be the end product of one system supplier. The decarbonator system supplier shall bear full responsibility for the design, assembling, shipping to the site, installation assistance, startup, factory testing, and field performance testing of the complete decarbonator systems specified herein. Like items of equipment provided herein shall be the end product of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

See Conditions of the Contract and Section F, General Conditions, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

1.3 MANUFACTURERS' SERVICES

As stated in the Detail Specification sections, a manufacturer's representative for the equipment specified shall be present at the jobsite for installation, assistance, inspection, and certification of installation, equipment testing, startup assistance, and training of the District's personnel.

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 582

(2002) Contact-Molded Reinforced

Thermosetting Plastic (RTP) Laminates for  
Corrosion-Resistant Equipment

ASTM D 2563

(1994; R 2002e1) Classifying Visual  
Defects in Glass-Reinforced Plastic  
Laminate Parts

ASTM D 2583

(2007) Indentation Hardness of Rigid  
Plastics by Means of a Barcol Impressor

ASTM D 2584

(2008) Standard Test Method for Ignition  
Loss of Cured Reinforced Resins

ASTM D 3299

(2000) Filament-Wound  
Glass-Fiber-Reinforced Thermoset Resin  
Corrosion-Resistant Tanks

## 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Submittals shall be made in accordance with Section 01 33 00, SUBMITTAL PROCEDURES and in the Detailed Specifications.

### SD-05 Design Data

#### Calculations

The equipment anchorage calculations shall be stamped and signed by a registered Civil or Structural Engineer currently licensed in the State of California. Design criteria is as stated on Drawing G-10, Structural Construction Notes.

## PART 2 PRODUCTS

### 2.1 GENERAL

The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the General Conditions.

### 2.2 SYSTEM COMPONENTS

See Detail Specification Section 44 44 13.15 01, FIBERGLASS REINFORCED PLASTIC (FRP) DECARBONATOR, Section 44 44 13.15 02, RANDOM PACKING MEDIA AND APPURTENANCES, and 44 44 13.15 03, AIR SUPPLY BLOWERS.

### 2.3 SERVICE CONDITIONS

#### a. Chemical, Physical, Hydraulic, and Thermal Loading Conditions:

1. Fluid in Tower (Normal Service): Reverse osmosis effluent (pH 5.0 to 7.0).

2. Influent Water Flow Rate: 4.5 mgd (maximum).
  3. Hydraulic Loading Rate: 28 gpm per square feet (maximum).
  4. Minimum Air Loading Rate: 4.4 scfm/gpm.
  5. Packed Depth: 12 feet (minimum).
  6. Distributor Type: Distribution header.
  7. Distributor Turndown Ratio: 5:1.
  8. Nominal Sump Capacity: 4,300 gallons (minimum).
  9. Inside Diameter: 12 feet 0 inches.
  10. Water Temperature: 20 to 27 degrees C.
  11. Outside Air Temperature (D.B.): 30 to 99 degrees F.
  12. Outside Air Temperature (W.B.): 67 degrees F.
  13. Internal Pressure (above sump level): As designed by system supplier.
- b. Design Loads: The following loads shall be assumed for design of the various system components:
1. Media Supports: The media supports shall be designed to support the weight of wet media in a fouled condition.
  2. Reinforced Concrete Foundation: A minimum compressive strength of 4,000 psi shall be used in calculations for anchor bolt sizing and embedment depth. The equipment anchorage structural calculations shall be submitted, stamped and signed by a registered Civil or Structural Engineer currently licensed in the State of California. Design criteria is as stated on Drawing G-10, Structural Construction Notes. The reinforced concrete foundation is provided under another section of the Contract.
  3. Seismic and Wind Loads: Seismic and wind design shall be in accordance with Design Criteria provided on Drawing G-10 Structural Construction Notes.
- c. The decarbonator system shall meet the following listed performance requirements when operating at the service conditions above:
1. Air shall be evenly distributed over the cross-sectional area of the packed tower. The face velocity of the air through the packing support shall not deviate more than 5 percent from the mean face velocity over the entire cross-section of the tower at any point.
  2. Liquid shall be evenly distributed over the entire cross-section of the packing, with no visual evidence of low flow areas or dead branches to the inlet distributor.
  3. Required Performance at Liquid Design Temperature:

- a. Liquid Rate: 4.5 mgd.
  - b. Air Flow: 14,000 scfm.
  - c. pH (influent): 5.0 to 7.0.
  - d. Carbon Dioxide Concentration in Influent: 50 mg/L.
  - e. Removal Efficiency: 90 percent (minimum).
  - f. Effluent Carbon Dioxide Concentration: 5 mg/L.
4. Removal efficiency shall be computed as:

Removal Efficiency % =

$$\frac{\text{Influent concentration} - \text{Effluent concentration}}{\text{Influent concentration}} \times 100$$

#### 2.4 EQUIPMENT ACCESSORIES

- a. Equipment Identification Plate: Unless otherwise noted, provide a 16 gauge stainless steel identification plate, securely mounted on each piece of equipment in a readily visible location. The plate shall bear a 1/4-inch die stamped identification number corresponding to the equipment identification number assigned to each piece of equipment in the Detail Specification and shown on the Drawings.
- b. Lifting Lugs: Equipment weighing over 100 pounds shall be provided with lifting lugs.

### PART 3 EXECUTION

#### 3.1 GENERAL

- a. All parts of the equipment and appurtenances shall be designed for all stresses that may occur during fabrication, shipment, erection, and intermittent or continuous operation.
- b. The Contractor shall be responsible for the equipment's condition until the completion of the work. Damage or loss of equipment and materials shall be repaired or replaced at the Contractor's sole expense.

#### 3.2 ASSEMBLY AND SHIPMENT

- a. All parts and components shall be factory-assembled in sections convenient for field handling and installation, but requiring the minimum amount of work for field assembly. Any field assembly work shall be bolted. No cutting or welding should be required on either field assembly or erection.
- b. All assembled parts and components ready for shipment shall be securely bundled, coiled, or crated and adequately protected from damage and corrosion during shipment and storage.

#### 3.3 INSTALLATION

The Contractor shall employ skilled and qualified mechanics experienced in

the erection and installation of this type of equipment and shall strictly follow the manufacturer's recommendations, written instructions, and drawings, and shall provide complete systems as shown on the Drawings and specified herein.

### 3.4 ANCHOR BOLTS

a. All anchor bolts and necessary bolt setting plates shall be provided by the manufacturer. Two nuts shall be provided for each anchor bolt, and anchor bolts shall be cast-in-place during concrete placement. Threads shall be protected and shall be cleaned before the nuts are attached and tightened.

b. Anchor bolt materials shall be Type 316 stainless steel.

### 3.5 PAINTING

Shop and field painting and District's selection of colors shall be in accordance with the Detailed Specification sections and as specified in Section 09 90 00.00 40, PAINTING AND COATING.

### 3.6 MANUFACTURERS' CERTIFICATES

Provide manufacturer's certificate(s).

### 3.7 FACTORY TESTING

a. Visual inspection to the requirements of ASTM C 582, ASTM D 2563, and ASTM D 3299. Barcol hardness should be done on completed vessel, not the cutouts.

b. Vessel cutouts shall be tested to verify glass content and degree of cure in accordance with ASTM D 2584.

c. Verify, by Barcol hardness measurements (ASTM D 2583), that all components have been cured to a minimum of 90 percent of the minimum Barcol hardness specified by resin manufacturer.

d. Acetone sensitivity test for all internal secondary bonds.

e. A certification of the results of these tests shall be submitted to the Engineer.

### 3.8 FIELD TESTS

a. Functional Test: All equipment described herein shall be inspected for proper level, proper alignment, and proper connection by the manufacturer's representative.

b. Performance Test:

1. The decarbonator system shall be tested by the installing Contractor. If the decarbonator system fails to meet the required performance, the system equipment shall be altered, modified, or the necessary components replaced until the required performance is met.

2. The required performance shall be as specified above in Article 2.3c. Performance Requirements.

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