

## DEMINERALIZER SPECIFICATIONS

Demineralizer, Class "A", disposable, 12 cu ft. Unloaded.

- A. Material: Carbon steel with Epoxy-coated liner.
- B. Specifications: Designed and welded to ASME boiler Code Section VIII, Division I, 150 psig working pressure rating with stamp affixed. Design temperature: 140 degrees F.
- C. Quantity: total four (4).
- D. Size: Each demineralizer shall not exceed the dimensions of 24" diameter and 72" high (maximum height from bottom of pressure vessel pedestal to top of pipe stubs) without additional written approval from Code 2380.3, PHNS & IMF.
- E. Vessel Requirements:
  - 1. Demineralizers shall include lifting lugs which meet the specifications of item II below.
  - 2. Each demineralizer shall have a total of 3 penetrations (inlet, outlet and vent). All penetrations shall be carbon steel, seamless, schedule 40, located at the top of the demineralizer. Only top penetrations are allowed.
  - 3. Inlet and outlet connection shall be 1" IPS with male pipe thread. Dust caps shall be installed for shipment.
  - 4. Vent connection shall be 1-1/2" IPS with male pipe thread. Dust cap shall be installed for shipment.
  - 5. Nominal thickness of the shell and top and bottom heads shall be 1/4 ".
  - 6. Size outlet retention elements at a mesh of 200 or greater (74 micron or less openings). Size the inlet diffuser / distributor at a mesh of 200 or less (74 micron or more openings).
  - 7. Exposed surfaces of the demineralizer shall have a non-porous surface to provide for easy decontamination of all external exposed surfaces of the demineralizer. Wetted surfaces of carbon steel demineralizer vessels shall be coated with an epoxy like liner to prevent corrosion.
  - 8. Install a minimum 1/4" thick, 24" diameter carbon steel base plate on bottom of each demineralizer.
  - 9. The bottom of the inlet diffuser/distributor shall be above the top level of 12 cu ft of media.
  - 10. Vessel shall be capable of being de-watered to less than 0.5% free standing liquid by volume.
  - 11. Empty weights shall be clearly marked on the side of the container with 1" or greater lettering.

12. The demineralizer liner, inlet diffuser/distributor and outlet lateral holes shall be sized for a maximum flow of 25 gallons per minute.
13. Design maximum differential pressure drop of 5 psid at 25 gpm.
14. Cleanliness level shall be Commercial grade. Demineralizer shall be free of grease, oil, flux and loose foreign material.
15. Demineralizers must have OSHA material safety warnings specified.
16. Demineralizer must be constructed to support the waste processing media as a fixed bed retained inside the demineralizer.
17. Provide a unique serial number for each demineralizer for accountability and record keeping purposes. Permanently label/mark the serial number on each demineralizer.

## II. Lifting Lug Specifications:

### A. Design Criteria:

1. The lifting lugs and attachment welds shall have a minimum safety factor of 10 to 1 based on direction of applied loads during lifting and on the yield strength of the materials used in their construction.

### B. Load Test Criteria:

1. The applied test load shall be arranged in such way that actual load conditions are closely represented. Use lift angle  $60 \pm 5$  degrees from horizontal for load test.
2. The load shall be a 150% +5%, -0% of the gross weight to be established for each lifting lug. Use 1,900 lbs as the gross weight of the demineralizer.
3. The load test shall be held for a minimum of 10 minutes.
4. The lifting lugs and their attachment shall meet the requirements of ANSI N14.6-1993. This requires a drop weight test per ASTM E 208 or a Charpy impact test per ASTM A 370 as specified by paragraph 4.2.6 of ANSI N14.6-1993. The nil ductility transition (NDT) temperature, as determined by the drop weight test, shall be a minimum of -20 degrees F (assuming the anticipated minimum service temperature for the lifting lugs is 20 degrees F).

### C. NDT Criteria: Lift lugs (entirely) and their attachment welds and the base metal within 1" of the weld area shall have non-destructive test (NDT) consisting of the following:

1. Prior to and after the load test, perform Magnetic Particle Test (MT) per NAVSEA Technical Publication T9074-AS-GIB-010/271 (latest revision) for handling attachments and attachment strength welds. Acceptance criteria: No indications greater than 1/16". MT inspection criteria shall be per MIL-STD-2035 (latest revision) for wrought material.
2. Padeyes and lugs shall be in good condition with no pits or irregularities and have a uniform weld and weld finish.

### III. Hydrostatic Test:

- A. A hydrostatic test shall be performed on each vessel to a minimum of 226 psig to verify the integrity of each demineralizer.
- B. Hydrostatic test pressure shall be held for a minimum of 30 minutes. Acceptance criteria: no leakage or permanent deformation.
- C. Each demineralizer shall be blown down of free standing liquid after hydrostatic test. The internals shall be dried by filtered air or nitrogen to the maximum extent practicable. No residual water should be observed when looking into inlet and vent pipes. Inlet diffuser should be free of water.

### IV. The following data/documentation must be provided to PHNS:

- A. A copy of Washington State burial site accepted dewatering procedure.
- B. Two copies of the vendors drawing shall be provided that specify the manufacturing details of the demineralizer assembly, including the padeye dimensions, weld size and all materials of construction.
- C. A copy of safety factor calculations/structure evaluation for lifting lugs and attachment welds to demonstrate a minimum safety factor of 10 to 1. The calculations shall account for the lifting angle of  $60 \pm 5$  degrees from horizontal and a gross weight of 1900 pounds.

### V. Certification traceable to each vessel is required for the following:

- A. Seamless piping used for inlet, outlet and vent piping.
- B. Disposal certification: A certification that the vessel is capable of being dewatered to less than 0.5% by volume and it complies with the Washington State radioactive Material License for dewatering to less than 0.5% free standing liquid by volume.

- C. Load test certification: Certification that handling attachments have been load tested for a minimum of 10 minutes to 150% +5%, -0% of the gross weight. Certification papers must include the demineralizer serial number.
  - D. NDT Certification per paragraph II.C.1 for each padeye for each demineralizer.
  - E. Certification that the lifting lugs and attachment meet ANSI N14.6-1993 requirements.
  - F. Hydrostatic test certification papers for each demineralizer with the hydrostatic test pressure and duration of test.
  - G. Certificate of Compliance: A Certificate of Compliance state "All items furnished on this contract are in full compliance with all specification and contract requirements." Additionally, when inspection and test reports are required, the following statement will be included with the certificate of compliance: "The inspection and test reports provided represent the actual attributes of the items furnished on this contract and indicate full compliance with all applicable specification and contract requirements." The above statements shall be signed by a contractor official designated responsible for quality assurance.
- VI. All documentation in Section IV and V above shall have sufficient information for traceability linking the documents to the demineralizer provided and shall be thoroughly reviewed for accuracy and completeness prior to submittal. Absence of the documents listed above shall be cause for rejection.

FIGURE 1

