# SECTION 15473
# LIQUID FILTER HOUSINGS FOR NUCLEAR SERVICE

## PART 1 - GENERAL

### 1.1 SCOPE

A. This specification addresses the design, materials, testing and inspection, preparation for shipment, and documentation of Liquid Filter Housings for Nuclear Service.

### 1.2 INDUSTRY CODES AND STANDARDS

A. Liquid Filter Housings shall be designed, fabricated, tested and inspected in accordance with the industry codes and standards listed below.
   1. ASME Boiler and Pressure Vessel Code, 1998 Base with 1999 Addenda, Section VIII, Div. 1
   2. ASME B16.5 Pipe Flanges and Flanged Fittings, 1996
   3. ASNT SNT-TC-1A, 1998
   4. DOE Standard 1020-94 with Change Notice No. 1, January 1996

### 1.3 RELATED SECTIONS

A. Section 09960, High Performance Coatings.

### 1.4 QUALITY ASSURANCE

A. Filter Housings for Nuclear Service shall be furnished by a firm which is qualified and regularly engaged in this type of work. The firm shall maintain facilities for fabrication of subject items.

B. Materials and products used in the fabrication of Filter Housings shall be new. Materials shall be furnished and installed in strict accordance with Sub-Tier Supplier's current published recommendations, recognized good practices and these specifications.

C. The Supplier shall have and maintain approved quality control system that complies with the requirements of ASME Section VIII. The Supplier’s quality control system shall be reviewed and approved by the Buyer.

D. The Buyer reserves the right to access the Supplier's and Sub-Tier Supplier's facilities at which work is being performed. Access shall be provided for any personnel designated by the Buyer. The purpose of accessing facilities shall be to perform assessments, audits, reviews, surveillance, inspections, investigations, or test witnessing applicable to the work being performed by the Supplier or Sub-Tier Suppliers under this specification.

E. The Supplier shall resolve all deficiencies noted, to the Buyer's satisfaction. The Buyer's concurrence with "use-as-is" or "repair" disposition of any nonconformance must be obtained. Concurrence will not be unreasonably withheld. The terms "use-as-is, "repair, and "rework" are defined below.
   1. "Use-as-is" is a disposition permitted for a nonconforming item when it can be established that the item is satisfactory for its intended use.
   2. "Repair" is the process of restoring a nonconforming characteristic to a condition to ensure that the capability of an item to function reliably and safely is unimpaired, even though that item still does not conform to the original requirements.
   3. "Rework" is the process by which an item is made to conform to the original requirements by completion or correction.

F. Witness and hold points are specific points in the fabrication process requiring witnessing or verification by the Buyer. Activities shall not proceed past a hold point without witness or verification by the Buyer unless specifically waived in writing by the Buyer.

G. All provisions contained herein shall be extended to cover Sub-Tier Suppliers employed by the Supplier.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Each Filter Housing shall be a National Board registered ASME pressure vessel regardless of its design pressure and internal volume.

B. Nozzles shall be dimensionally in accordance with ASME B16.5. Specific nozzle types, ratings and configurations are addressed on the equipment data sheets or component drawings. Flanges on horizontal nozzles shall be oriented with two holes straddling the vertical centerline. Threaded connections are not permitted.

C. A minimum of two lifting lugs shall be welded to the Filter Housing for assemblies weighing more than 100 lbs.

D. Each Filter Housing, including the closure, shall be equipped with lead shielding. Lead shielding thickness shall vary between 1/2 and 2 inches depending on the severity of the filter application. The required lead shield thickness for each filter housing shall be specified on the individual equipment data sheets or component drawings.

E. All Filter Housings shall be provided with a quick access closure that requires no tools for opening or closing. A quick access closure shall be provided for the shielding as well as the Filter housing. The time required to change a filter cartridge should be as low as reasonably achievable.

F. Each Filter Housing shall be provided with the options specified on the equipment data sheets. Options may include vent and drain valves, specific connection types, or a differential pressure gauge.

G. Filter Housings shall be designed to accept a single manufacturer’s standard filter cartridge designed for inside to outside radial flow to contain filtered particles.

H. Filter cartridge details such as the filter media, micron size, maximum operating pressure and temperature and required flow rate shall be given on the individual equipment data sheets.

I. Filter Housings shall be designed for a 40-year life.

J. Each Filter Housing shall be provided with a flat circular base plate suitable to withstand loads described in the ASME Boiler and Pressure Vessel Code and Doe Standard 1020. The site specific acceleration (Ca) is 0.21g and Ip is 1.5 for a PC-2 Loading. The Supplier shall submit the structural and filter vessel calculations prior to fabrication.

2.2 MATERIAL REQUIREMENTS

A. Materials for the Filter Housings and the Filter Cartridges are specified on the equipment data sheets. The Supplier, on the fabrication drawings, shall indicate materials not

addressed on the data sheets, and indicate the ASME material specifications for all materials.

B. Nozzles shall be constructed using seamless pipe or seamless mechanical tubing.

C. Pipe flange gaskets furnished with the Filter Housing are specified on the equipment data sheets. The gasket class, as defined in ASME B16.5, shall match the flange rating for each nozzle.

D. Certified Material Test Reports (CMTRs) shall be provided for Filter Housing components that form the pressure boundary.

E. Carbon steel components shall be supplied with one coat of primer per Specification Section 09960. Stainless steel components shall not be painted.

## PART 3 - PART 3 – EXECUTION

### 3.1 FABRICATION REQUIREMENTS

A. Controls are to be exercised during all stages of fabrication to minimize exposure of stainless steel to contaminants including chlorides and carbon steel. Any compounds, liquids, or markers that come into contact with stainless steel surfaces shall not contain more than 250 ppm by weight chlorides.

B. Carbon arc or iron powder cutting shall not be used on stainless steel. All cut or raw edges shall be deburred and shall be smooth to the touch.

C. In order to preserve the original finish of stainless steel sheet material, care shall be exercised to prevent scratching, abrading, nicking, and denting during receiving, storage, fabrication and handling. The original protective coating shall be preserved as long as practical.

D. Grinding wheels and wire brushes shall either be new or previously used only on austenitic stainless steel. Wire brushes shall have stainless steel bristles.

### 3.2 TESTING AND INSPECTION

A. The Filter Housing shell shall be hydro-tested per ASME Section VIII, Division 1 for a minimum of one hour.

B. Minimum radiographic inspection shall be performed in accordance with the ASME Boiler and Pressure Vessel Code per UW-52. Nozzles connections shall be inspected using magnetic particle examination per ASME Section VIII, Division 1, Appendix 6 or liquid penetrant examination per ASME Section VIII, Division 1, Appendix 8.

C. Instruments used for testing and inspection shall carry a current certification from NIST.

### 3.3 PACKAGING, DELIVERY, STORAGE AND HANDLING

A. The Supplier shall thoroughly clean the Filter Housings of water, debris, weld splatter, grease, oil, markings from pens and dyes, shop soil, visible rust, and other foreign matter before shipment. After the water rinse, inside surfaces shall be dried. Supplier shall seal closures, caps and plugs dust-tight.

B. Filter Housings shall not be packaged and shipped until all testing and inspection has been performed and the results have been approved by the Buyer.

C. Filter Housings shall be shipped as completely assembled units with the filter cartridge installed. If shipping limitations restrict complete assembly shipments, the Supplier shall propose a recommended alternative for approval by the Buyer. Other components such as spare filter cartridges, gauges, valves or items that may work loose or be lost in transit shall be packed separately.

D. Ship Filter Housings after they have been prepared for the intended method of transport. Lifting weight of each unit shall be clearly marked on the unit's nameplate and in shipping documents. Each shipping package shall be labeled with a waterproof label indicating applicable component tag number.

E. The Supplier shall be responsible for the dimensional stability and overall integrity of the equipment during shipment. Any special lifting, rigging, or setting procedures shall be provided. For larger units the center of gravity shall be clearly marked on the equipment skids for hoisting and rigging purposes.

## 3.4 SUBMITTALS

A. A Fabrication Schedule shall be provided indicating all fabrication steps, hold points, tests and inspections. The Supplier shall provide to the Buyer a revised Fabrication Schedule within seven (7) working days of a modification to the contract, which revises the required delivery date or when other approved Buyer modifications change a scheduled assembly step, hold point, test or inspection.

B. A current copy of the Supplier's Quality Control System Manual, Certificates of Authorization, and an index of the implementing procedures shall be submitted with the proposal.

C. Welding Procedure Specifications (WPS), Welder Performance Qualifications, and supporting PQRs shall be submitted and shall address all joints required in the fabrication of Filter Housings. The WPSs shall also address weld repair and welding equipment.

D. The Supplier shall provide NDE test procedures, inspection procedures, and test reports for Filter Housings to the Buyer for review and comment at least two weeks prior to conducting said test or inspection.

E. Each Filter Housing shall receive a hydrostatic test per ASME Section VIII requirements. The Supplier's standard test procedure shall be submitted for buyer approval. The procedure shall describe how to accomplish the test operation and test report forms shall be included. The Supplier shall submit a hydro-test report prior to shipment.

F. The Supplier shall submit a complete package of material certifications for all materials used in the fabrication and assembly of the Filter Housings, including, but not limited to, stainless steel sheet, structural steel, welding filler rods, and fasteners. Material certifications shall be legible copies of Certified Mill Test Reports (CMTR) indicating chemical analysis, physical test data and heat number. Certificates of Conformance (CoC) may be submitted in lieu of CMTRs, with prior approval by the Buyer.

G. Non-Destructive Examination (NDE) personnel performing examinations and testing operations shall be certified per the guidelines of ASNT SNT-TC-1A. All NDE reports shall be signed by personnel holding either Level II or Level III certifications and who either performed or witnessed the examinations. The Supplier shall provide the NDE certifications for personnel performing or witnessing non-destructive examinations.

H. The Supplier shall submit an ASME compliant Manufacturer's Data Report for each Filter Housing.

I. The Supplier shall submit Fabrication and As-Built drawings for each Filter Housing.

J. The Supplier shall submit Structural and ASME Vessel calculations for each Filter Housing.

K. The Supplier shall submit a cleaning procedure addressing the requirements of this specification.

L. Packaging and shipping procedures shall be submitted by the Supplier. Specific site handling procedures shall also be submitted.

M. The Supplier shall prepare documentation packages with the proposal, prior to fabrication, and after fabrication in accordance with Table 15473-1.

**Table 15473-1 Documentation Requirements**

| *Document Description* | *With Proposal* | *Prior to Fabrication* | *Prior to Shipment* |
|---|---|---|---|
| Quality Control System Manual | X | | |
| Certificate of Authorization for Manufacture of Code Items | X | | |
| ASME Manufacturer's Data Report | X* | X* | X |
| Detailed Fabrication Drawings | | X | |
| Hydro-test Procedure | | X | |
| Non-Destructive Examination Procedure Addressing Radiographic, Magnetic Particle, and Liquid Penetrant Examination | | X | |
| Non-Destructive Examination Report Addressing Radiographic, Magnetic Particle, and Liquid Penetrant Examination | | | X |
| Hydro-test Report | | | X |
| CMTRs for all Filter Housing Components | | X | X |
| As-Built Filter Housing Drawings | | | X |
| Structural and Mechanical Calculations for Filter Housing and Support Plate | | X | |
| Cleaning Procedure | | X | |
| Packaging and Shipping Procedure | | X | |
| Handling Instructions | | | X |
| Welder Performance Qualifications | | X | |
| NDE Personnel Certifications | | X | |
| Fabrication Schedule | X | | |
| Welding Procedure Specifications | | X | |
| Procedure Qualification Reports | | X | |

*Sample

**END OF SECTION 15473**