5 Filters

5.1 General

The requirements in this subsection apply to diatomite-type, sand-type, cartridge-type and high-permeability-type filters.

5.1.1 Filter tanks (pressure service)

5.1.1.1 The working pressure of a pressure service filter shall be 50 psi (345 kPa) or greater. The design burst pressure of a pressure service filter tank shall be at least four times the working pressure (i.e., minimum safety factor = 4:1).

5.1.1.2 The filter tank and its integral components shall not rupture, leak, burst, or sustain permanent deformation when subject to the following conditions in accordance with Annex B, Section B.1:

- a hydrostatic pressure equal to 1.5 times the working pressure for 300 s;
- 20,000 consecutive low-high pressure cycles; and
- a hydrostatic pressure equal to two times the working pressure.

NOTE — As noted in Annex B, leaking from integral components such as valves and fittings that may occur when the hydrostatic pressure is increased to two times the working pressure does not constitute nonconformance to this requirement.

Filter tanks designed, constructed, evaluated, and stamped with the appropriate Code Symbol Stamp, in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section VIII or X, shall be exempt from this requirement.

5.1.2 Filter tanks (vacuum service)

5.1.2.1 The design collapse pressure of a vacuum service filter tank shall be at least 1.5 times the pressure developed by the weight of the water in the tank (i.e., minimum safety factor = 1.5).

5.1.2.2 Vacuum service filter tanks whose inlets may be closed during filter operation shall not rupture, leak, collapse, or sustain permanent deformation when subjected to a vacuum of 25 in Hg (85 kPa) for 300 s in accordance with Annex B, Section B.2.

5.1.3 Internal components

5.1.3.1 Internal components of a pressure service filter shall not sustain damage or deformation that may affect water flow characteristics when the filter is operated in accordance with the manufacturer’s instructions and when operated under the test conditions in Annex B.

5.1.3.2 Internal components of a vacuum service filter shall not sustain damage or deformation that may affect water flow characteristics when the filter is operated in accordance with the manufacturer’s instructions and when operated under the test conditions in Annex B.

5.1.3.3 Filter element components of a filter designed for pressure backwashing shall not sustain damage or permanent deformation when exposed to the pressure differential developed during backwashing operations.

5.1.4 Initial head loss
The head loss through a filter operating at the design flow rate shall not exceed the manufacturer's maximum design head loss when determined in accordance with Annex B, Section B.3.

Precoat media-type filters that regenerate the precoat media filter cake shall be tested in accordance with Annex B, Section B.3 after the media has been conditioned as described in 5.1.9.1. Manufacturers of regenerative precoat filters may specify separate head loss claims for media that is at the beginning and end of the regeneration life or may specify one head loss curve that is not exceeded by the observed head loss when the precoat media is new or at the end of the media life.

5.1.5 Accessibility

Filter components requiring service shall be accessible for inspection and repair when installed in accordance with the manufacturer's instructions. Covers on openings required for access into the filter tank shall be removable.

5.1.6 Drains

A filter shall have a drain so that the filter tank may be drained in accordance with the manufacturer's winterizing instructions.

5.1.7 Air release

If the filter permits accumulation of air in the top of the filter tank, the filter tank shall have an automatic air release at the top of the tank. A manual air release valve shall also be provided.

5.1.8 Cleaning of filter media

The cleaning of filter media in accordance with the manufacturer's instructions shall render the filter media and elements free of visible dirt and debris. For precoat type filters, this shall be checked by a visual inspection of the internals of the filter after soiling per Annex B, Section B.4 and cleaning in accordance with the manufacturer's instructions, but prior to reintroduction of any filtration media. Inspection may be carried out via disassembly of the filter housing or another suitable means agreed upon by the filter manufacturer and laboratory.

- Residual precoat media between adjacent elements near the mounting surface of the elements shall have a depth not exceeding 1% of the total length of the element, rounded up to the nearest ¼”, that extends beyond the mounting surface support plate.
- Residual precoat media remaining on the elements in the form of a cake shall not have any dimension exceeding 1% of the total length of the element, rounded up to the nearest ¼”.
The head loss through the filter after cleaning the media shall not exceed 150% of the initial head loss through the filter. The head loss through the filter after cleaning shall not exceed the manufacturer’s maximum design head loss. Testing shall be conducted in accordance with Annex B, Section B.4.

5.1.9 Turbidity reduction

A filter shall reduce water turbidity by 70% or more when tested in accordance with Annex B, Section B.5.

Precoat media-type filters that regenerate the precoat media filter cake shall be tested for conformance with the turbidity reduction requirements of Annex B, Section B.5 with new precoat and again after the media has been conditioned as described in 5.1.9.1.

5.1.9.1 Regenerative media conditioning

Start with a new application of precoat media and start to recirculate clean water (<2 NTU) through the filter. Initiate injection into the inlet piping of the filter a solution of ball clay and baby oil, in a relative proportion conforming with Annex B, Section B.4.3.1, to achieve a filter influent turbidity of 10±10 NTU, until the pressure drop of the filter increases by 50%, or if the manufacturer recommends a maximum pressure drop, inject the solution of ball clay and baby oil until the pressure drop increases by 50% or until the maximum pressure...
drop recommended by the manufacturer is achieved, whichever is less. Stop injection of the ball clay and baby oil and regenerate the precoat media in accordance with the manufacturer’s instructions. Repeat this soiling/regeneration process until one of the criteria below has been achieved:

- For regenerative filters which determine the end of life of a charge of media based on time, repeat once for each day of the lifespan of a charge indicated by the manufacturer’s instructions.
- For regenerative filters which determine the end of life of a charge of media based on the number of regenerations, repeat a number of times equal to the number of regenerations permitted by the manufacturer’s instructions.
- For regenerative filters which determine the end of life of a charge of media based on the pressure conditions observed after regeneration, repeat until the pressure conditions observed after regeneration meet the manufacturer’s recommended conditions for replacing the media.
- If the lifespan of a charge of media is defined by the manufacturer’s instructions using a combination of the criteria detailed above, repeat until the first criteria indicated by the manufacturer’s instruction has been achieved.

5.2 Precoat media-type filters

The requirements in this subsection apply only to precoat media-type filters utilizing diatomite or other precoat filter media (that conforms to Section 12) and their integral components designed for the filtration of swimming pool or spa / hot tub water.

5.2.1 Filtration area

5.2.1.1 Non-flexible type

5.2.1.1.1 The actual filtration area shall be within ± 5% of the effective filtration area specified on the filter data plate.

- For leaf or disc-type precoat media-type filters, the effective filtration area is equal to the total surface area of all septa minus the combined area of all septum support members wider than 0.25 in (6.4 mm) in contact with the septum during filtration.

- For non-flexible tube-type precoat media-type filters, the effective filtration area is equal to the total surface area of the precoat filter uncoated tubes minus the combined area of all septum support members wider than 0.25 in (6.4 mm) in contact with the septum during filtration. The effective filtration area shall be no more than 1.5 times the total surface area of the uncoated tubes.

5.2.1.2 Flexible Type

5.2.1.2.1 The actual filtration area shall be representative of the non-bridging uncoated area minus the combined area of all septum support members wider than 0.25 in (6.4 mm) in contact with the septum during filtration and shall be within ± 5% of the uncoated effective filtration area specified in the filter data plate.

5.2.1.2.2 For wirewound and similar-type elements, the width of septum support members shall not exceed 0.25 in (6.4 mm). The distance between adjacent septum members and the distance between adjacent openings shall not exceed 0.005 in (0.127 mm).

5.2.1.3 Septa shall be maintained in such a position as to preclude surface contacts that reduce effective filtration area. (PRESCRIPTIVE OF DESIGN – NOT PERFORMANCE BASED)

5.2.2 Turbidity limits, precoat operation

During the precoat operation, the average turbidity of the filter effluent returning to the pool or spa / hot tub shall not exceed 10 nephelometric turbidity units (NTU) over the first 60 s of flow, as determined in accordance with Annex B, Section B.6. except filters designed to re-filter the effluent during the precoat operation or discharge it to waste without returning it to the pool or spa / hot tub are exempt from this requirement.
5.2.3 Spacing of elements

5.2.3.1 Filters shall be designed to provide a minimum clearance between adjacent filter elements equal to the thickness or diameter of the element or 1 in (25 mm), whichever is less.

The clearance between filter elements shall be sufficient to prevent contact between the septa during backwashing operations. \{PRESCRIPTIVE OF DESIGN – NOT PERFORMANCE BASED\}

5.2.4 Flexible element wear test

Flexible precoat media filter elements that may come in to contact with other filtration elements during any part of the filtration cycle shall not show structural degradation resulting in an open area that would permit passage of precoat media when two filter elements are rubbed together with a normal force of 1.0±0.1 pound per linear inch of contact, for 1000 cycles having a travel of 1.0±0.1 inch. \{GROUP DOES NOT SEE A NEED FOR THIS\}

5.2.5 Baffles

A precoat media-type filter shall have a baffle, or other water-deflecting device, that prevents incoming water from eroding the filter aid during filtration.

5.2.6 Removal of waste from filter tank

A precoat media-type filter shall be designed so that wash water, dislodged filter aid, and dirt may be removed from the filter tank.

5.2.7 Installation and operating instructions

The manufacturer shall provide a manual with each filter. The manual shall contain the following information:

- operating instructions;
- cleaning instructions;
- installation instructions;
- design head loss curve;
- parts lists;
- any drawings or charts necessary to permit proper installation, operation, and maintenance of the filter; and
- recommended amount, type, and grade of filter aid.
- recommended lifespan for a charge of media

5.2.8 Data plate

5.2.8.1 A precoat media-type filter shall have a data plate that is permanent, easy to read, and securely attached to the filter housing at a readily accessible location. The data plate shall contain the following information:

- manufacturer’s name and contact information (address, phone number, website, or prime supplier);
- filter model number;
- filter serial number;
- effective filtration area in square meters or square feet;
- if applicable: this precoat filter utilizes flexible tube elements and the effective filtration area represents the non-bridging uncoated area;
- required clearance (vertical and horizontal for service and maintenance);
- design flow rate in liters/minute or gallons/minute;
- working pressure, if applicable; and
- steps of operation.

The data plate shall indicate whether a filter is designed for swimming pool applications only or spa / hot
tub applications only. A filter designed for both applications shall be exempt from this requirement.

If provided with the filter, each valve on the face piping of the filter shall have a permanent label or tag identifying its operation (e.g., influent, backwash, bypass).

5.2.9 Filtration rate

The design filtration rate of precoat media-type filters shall not exceed the values specified in Table 5.1.

<table>
<thead>
<tr>
<th>Filter design</th>
<th>Intended application</th>
<th>Maximum design filtration rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>slurry feed</td>
<td>residential pool or spa / hot tub</td>
<td>3 gal/min/ft² (122 L/min/m²)</td>
</tr>
<tr>
<td>slurry feed</td>
<td>public pool or spa / hot tub</td>
<td>2.5 gal/min/ft² (102 L/min/m²)</td>
</tr>
<tr>
<td>flexible tube type</td>
<td>residential / public</td>
<td>3 gal/min/ft² (122 L/min/m²) based on un-bridged uncoated surface area</td>
</tr>
<tr>
<td>no slurry feed</td>
<td>residential pool or spa / hot tub</td>
<td>2.5 gal/min/ft² (102 L/min/m²)</td>
</tr>
<tr>
<td>no slurry feed</td>
<td>public pool or spa / hot tub</td>
<td>2 gal/min/ft² (81 L/min/m²)</td>
</tr>
</tbody>
</table>

5.2.10 Precoat filter media

Precoat media shall conform to the requirements of Section 3, Materials.

5.2.10.1 Precoat media other than diatomaceous earth (DE)

Precoat media other than DE shall also conform to the requirements of Annex B, Sections B.3, B.4, B.5, B.6, and B.7.

5.2.10.2 Precoat media labeling requirements

Precoat media shall contain the following information on the product packaging or documentation shipped with the product:

— manufacturer’s name and contact information (address, phone number, website, or prime supplier);
— product identification (product type and trade name);
— net weight or net volume;
— when applicable, mesh or sieve size;
— lot number or other production identifier such as a date code;
— when appropriate, special handling, storage and use instructions; and
— the specific certification mark of the certifying organization for certified products.