

Specification for Oil and Gas Separators

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Specification for Oil and Gas Separators

1 Scope

1.1 General

This specification covers minimum requirements for the design, fabrication, and shop testing of oil-field type oil and gas separators and/or oil-gas-water separators used in the production of oil and/or gas, and usually located but not limited to some point on the producing flowline between the wellhead and pipeline. Separators covered by this specification may be vertical, spherical, or single or double barrel horizontal.

Unless otherwise agreed upon between the purchaser and the manufacturer, the jurisdiction of this specification terminates with the pressure vessel as defined in the Scope of Section VIII, Division 1 of the ASME *Boiler and Pressure Vessel Code*, hereinafter referred to as the ASME Code. Pressure vessels covered by this specification are normally classified as natural resource vessels by API 510, *Pressure Vessel Inspection Code*. Separators outside the scope of this specification include centrifugal separators, filter separators, and de-sanding separators.

1.2 Compliance

Any manufacturer producing equipment or materials represented as conforming with an API specification is responsible for complying with all the provisions of that specification. API does not represent, warrant or guarantee that such products do in fact conform to the applicable API standard or specification.

2 Definitions

The separation of gas and liquids primarily relies on physical differences in the phases. This section covers mechanical separation of liquids and gases. A separator vessel may be referred to as a knockout, trap, scrubber, flash chamber, or expansion vessel as well as the original term. This terminology is applied regardless of shape. Generally, the following definitions are regarded as basic.

2.1

corrosion

The destruction of a metal by chemical or electrochemical reaction with its environment (see Annex B).

2.2

free water knockout

A type of separator vessel used to separate free water from a flow stream of gas, oil, and water.

NOTE The gas and oil usually leave the vessel through the same outlet to be processed by other equipment. The water is removed for disposal.

2.3

maximum allowable working pressure

MAWP

The maximum pressure, permissible by the ASME Code, at the top of the separator in its normal operating position for a designated temperature.

2.4

operating pressure

The pressure in the vessel during normal operation, not to exceed the MAWP, and usually kept at a suitable level below the setting of the pressure relieving devices to prevent frequent opening (see Annex A).

2.5 scrubber

A type of separator which has been designed to handle flow streams with unusually high gas-to-liquid ratios, commonly used in conjunction with dehydrators, extraction plants, instruments, or compressors for protection from entrained liquids.

2.6 separator

A vessel used in the field to remove wellstream liquid(s) from gas components that may be either two-phase which remove the total liquid from the gas or three-phase which also remove free water from the hydrocarbon liquid.

2.7 total liquid knockout

A type of separator vessel used to remove the combined liquids from a gas stream.

3 Material

3.1 ASME Code

Separators furnished to this specification shall conform to the material requirements stipulated in the latest edition of the ASME Code.

3.2 Selection

Material selection for corrosive fluids should be selected based on a review of related API or NACE publications for materials that conform to 3.1. Consideration should be given to material selection as it relates to weight loss, sulphide stress cracking, chloride stress cracking, or other forms of corrosion. It is the responsibility of the user to determine what consideration for corrosion should be made to the vessel during its intended life (reference ASME Code, as applicable to corrosion). Corrosion guidelines are given in Annex B.

3.3 Corrosion Consideration

Corrosion consideration for separators furnished to this specification shall be for the pressure containing parts of the vessel only, and as can be identified as falling within the requirements of the applicable sections of the ASME Code. Corrosion considerations for vessel internals (non-pressure parts) is by mutual agreement between the purchaser and the manufacturer and not a part of this specification.

4 Design

4.1 Type, Size, Pressure and Temperature Ratings

Separators furnished to this specification may be vertical, horizontal, or spherical, and are available in sizes and MAWP ratings shown in Table 1, Table 2, and Table 3. The following tables are for nominal industry standards. Available sizes and working pressures may vary from the stated ratings. Other sizes, pressure, and temperature ratings may be furnished by agreement between purchaser and manufacturer.

4.2 Process Design and Sizing

Typical process design and sizing calculations are given in Annex C.

4.3 Design Checklist

A suggested checklist of separator design information is included in Annex E.

Table 1—Horizontal Separators Size and Working Pressure Ratings

Nominal Diameter in.	Maximum Allowable Working Pressure psig @ 130°F						
12 ³ / ₄	—	230	600	1,000	1,200	1,440	2,000
16	—	230	600	1,000	1,200	1,440	2,000
20	125	230	600	1,000	1,200	1,440	2,000
24	125	230	600	1,000	1,200	1,440	2,000
30	125	230	600	1,000	1,200	1,440	2,000
36	125	230	600	1,000	1,200	1,440	2,000
42	125	230	600	1,000	1,200	1,440	2,000
48	125	230	600	1,000	1,200	1,440	2,000
54	125	230	600	1,000	1,200	1,440	2,000
60	125	230	600	1,000	1,200	1,440	2,000

NOTE 1 Shell length is generally expanded in 2 ¹/₂-ft increments measured from head seam to head seam and is typically 5 ft, 7 ¹/₂ ft, or 10 ft. A minimum length-to-diameter ratio of 2.0 is normally used.

NOTE 2 Vessel diameter is generally expanded in 6-in. increments, measured either as outside diameter (OD) or inside diameter (ID). OD separators are normally furnished up to 24-in. diameter. Separators above this size may be either OD or ID vessels.

Table 2—Vertical Separators Size and Working Pressure Ratings

Nominal Diameter in.	Maximum Allowable Working Pressure psig @ 130°F						
16	—	230	600	1,000	1,200	1,440	2,000
20	125	230	600	1,000	1,200	1,440	2,000
24	125	230	600	1,000	1,200	1,440	2,000
30	125	230	600	1,000	1,200	1,440	2,000
36	125	230	600	1,000	1,200	1,440	2,000
42	125	230	600	1,000	1,200	1,440	2,000
48	125	230	600	1,000	1,200	1,440	2,000
54	125	230	600	1,000	1,200	1,440	2,000
60	125	230	600	1,000	1,200	1,440	2,000

NOTE 1 Shell length is generally expanded in 2 ¹/₂-ft increments measured from head seam to head seam and is typically 5 ft, 7 ¹/₂ ft, or 10 ft. A minimum length-to-diameter ratio of 2.0 is normally used.

NOTE 2 Vessel diameter is generally expanded in 6-in. increments, measured either as outside diameter (OD) or inside diameter (ID). OD separators are normally furnished up to 24-in. diameter. Separators above this size may be either OD or ID vessels.

4.4 Sample Calculation

Annex D gives an example calculation for separator sizing.

5 Fabrication, Testing, and Painting

5.1 Fabrication

Separators shall be shop constructed, tested, and stamped in accordance with the latest edition of ASME Code. Additional testing for internal or external leaks may be required by agreement between the purchaser and manufacturer.

Table 3—Spherical Separators Size and Working Pressure Ratings

Nominal Outside Diameter, in.	Maximum Allowable Working Pressure psig @ 130°F						
24	—	230	600	1,000	1,200	1,440	2,000
30	—	230	600	1,000	1,200	1,440	2,000
36	—	230	600	1,000	1,200	1,440	2,000
41	125	230	600	1,000	1,200	1,440	2,000
42	125	230	600	1,000	1,200	1,440	2,000
48	125	230	600	1,000	1,200	1,440	2,000
54	125	230	600	1,000	1,200	1,440	2,000
60	125	230	600	1,000	1,200	1,440	2,000

5.2 Painting

Before shipment, separators shall be cleaned of rust, grease, scale, and weld spatter, and externally coated with one application of a good grade of commercial metal primer. Internal coating and finish coating shall be applied if so agreed upon between the purchaser and manufacturer. Special access may be required to adequately apply internal coatings to smaller diameter vessels.

5.3 Internal Coating

Where internal coating is specified by the purchaser, all non-removable internal attachments shall be seal welded and prepared for coating in accordance with the purchaser's specifications. In the absence of purchaser's specifications, some acceptable practices are listed in Annex B. After coating, the vessel shall be stenciled in a conspicuous location "Internal Coating—Do Not Weld."

5.4 Preparation for Shipment

Prior to shipment, all foreign matter (including hydro-test water) shall be removed from the vessel, both internally and externally. All openings shall be protected with shipping covers or plugs.

6 Marking

6.1 API Nameplate

Separators furnished to this specification shall be identified by a nameplate of corrosion resistant material securely attached to a suitable bracket welded to the shell, or stamped on a steel nameplate seal welded to the shell. The nameplate shall bear the information in items 1 through 9 below, as shown in Figure 1.

- 1) Specification 12J.
- 2) Manufacturer's name.
- 3) Manufacturer's serial number.
- 4) Year built.
- 5) Weight, empty, in pounds.
- 6) Shell size, OD × length.