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UL 1389

Outline of Investigation for Plant Oil Extraction Equipment

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Summary of Topics

This third issue of the Outline of Investigation for Plant Oil Extraction Equipment, UL 1389, covers the expansion of the scope to include prefabricated plant oil extraction booths, in addition to the closed loop pneumatically operated plant oil extraction equipment currently covered. Also, the instruction manual requirements for plant oil extractors is clarified.

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INTRODUCTION

1 Scope

1.1 These requirements cover commercial or industrial plant oil extraction equipment for installation in accordance with ANSI/NFPA 70, National Electrical Code (NEC), the International Fire Code, and ANSI/NFPA 1, Fire Code, together with the manufacturer's installation instructions.

1.2 This plant oil extraction equipment includes:

a) Plant oil extractors – These plant oil extractors are complete closed loop pneumatically operated equipment, with electrical features such as for heating, cooling and illumination. This equipment has a maximum capacity of 60 gallons (227 L) of plant oil, and uses butane or LP-Gas to extract the plant oils as indicated in the instruction manual provided with each unit. Installation may be in a distinct room that is part of a commercial or industrial building, or in a prefabricated plant oil extraction booth.

b) Prefabricated plant oil extraction booths – These prefabricated booths (including modified shipping containers, or “pods”) are for installation in a distinct room that is part of a commercial or industrial building, and incorporate the following attributes:

1) The area within these booths is classified as a Class I, Division 1 hazardous location in accordance with the NEC, and the area outside these booths around openings is classified as a Class I, Division 2 hazardous location for a distance of 3 ft (0.9 m) in all directions in accordance with the NEC.

2) The plant oil extraction equipment enclosed by these booths use solvents such as liquid butane or liquid propane.

3) These booths are provided with integral electrical equipment and factory-provided interconnections for electrical equipment that are suitable for the area classification.

4) This integral equipment may include control panels, power distribution, illumination, ventilation, vapor detection/alarming equipment, and fire extinguishing equipment, as applicable.

5) Suitable ingress/egress are provided for authorized personnel to operate, service and maintain the intended plant oil extraction process equipment enclosed by the booths.

c) Plant oil extraction systems – Plant oil extraction systems involve any combination of plant oil extraction equipment needed for the overall extraction process.

1.3 These products, when intended for installation in hazardous (classified) locations are marked accordingly.

1.4 The requirements in this outline do not cover the physiological or other attributes or effects that may result from the use of this equipment.

2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3 Undated References

3.1 Any undated reference to a code or standard appearing in the requirements of this outline shall be interpreted as referring to the latest edition of that code or standard.

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this standard shall comply with the requirements for that component.

4.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this outline, or
- b) Is superseded by a requirement in this outline.

4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

PART I – PLANT OIL EXTRACTORS

CONSTRUCTION

5 General

5.1 Plant oil extraction equipment include the gas container, integral supports, and the necessary core components that allow the system to function as intended and in accordance with the installation instructions. Plant oil extraction equipment fabricated of individual core components shall comply with the requirements of this outline.

5.2 All plant oil extraction equipment shall have a maximum pressure rating of 350 psig (2.4 MPa). These ratings apply as indicated to all parts of the system unless otherwise noted in this outline.

6 Containers

6.1 A container shall be constructed, tested, inspected and marked to indicate compliance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, with the exception of UG 125 – 136 containers which are not allowed. The minimum design pressure of the container shall be 250 psig (1.7 MPa).

7 Pippings and Fittings

7.1 Piping shall comply with one of the following:

- a) Welded and Seamless Wrought Steel Pipe, ASME B36.10M;
- b) Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless, ASTM A53;
- c) Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service, ASTM A106;
- d) Standard Specification for Seamless Red Brass Pipe, Standard Sizes, ASTM B43; or
- e) Standard Specification for Seamless Copper Pipe, Standard Sizes, ASTM B42.

7.2 Tubing shall comply with one of the following:

- a) Standard Specification for Seamless Brass Tube, ASTM B135;
- b) Standard Specification for Seamless Copper Water Tube, ASTM B88; or
- c) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service, ASTM B280.

7.3 Fittings shall be fabricated of steel, brass, copper, malleable iron, or ductile iron. Pipe fittings of cast iron shall not be used. Brazing materials shall have a melting point of 538°C (1000°F) minimum.

7.4 Pipe and tube fittings shall have a minimum pressure rating of 350 psig (2.4 MPa) and shall be sized to provide the required rate of flow.

7.5 Piping and tubing shall be secured and protected against damage. Piping shall be run as directly as possible within the system, using the least amount of fittings as would be practical. Piping in contact with the earth, a support member, or other corrosion causing substance shall be protected against corrosion or the piping shall be of corrosion resistant material.

7.6 Exposed joints shall be flanged, threaded or made with full strength welds. Tubing joints shall be flared or brazed.

7.7 Pipe joint compound shall be used on all threaded connections. The compound shall be suitable for LP-Gas.

7.8 Piping shall be capable of compensating for vibration of use, thermal expansion of liquids, and the like. The use of flexible connections is considered to comply with this requirement.

7.9 Return bends or restrictive fittings shall not be used in discharge piping.

8 Gauges

8.1 Pressure Gauges for 1,000 psig (6.9 MPa) and higher shall comply with the requirements in the Standard for Gauges, Indicating Pressure, for Compressed Gas Service, UL 404.

8.2 Gauges for pressure under 1,000 psig (6.9 MPa) shall comply with the requirements in the Standard for Compressed Gas Regulator Accessories, UL 252A.

8.3 Pressure gauges shall be attached directly to an opening in the container, or it shall be connected to a valve or other fitting that is attached directly to an opening in the container.

9 Power-Operated Pumps and Bypass Valves

9.1 Pumps and bypass valves shall comply with the requirements in the Standard for Power-Operated Pumps and Bypass Valves for Anhydrous Ammonia, LP-Gas, and Propylene, UL 51.

9.2 A pump shall be provided with a bypass valve and the bypass valve shall have a flow capacity equal to or greater than the pump in the system, when operated at the differential pressures involved. Bypass valves shall discharge into the pump inlet or back into the container.

9.3 A pump shall be rated for a maximum outlet pressure of 350 psig (2.4 MPa). Bypass valves shall have a service pressure rating of 400 psig (2.8 MPa) minimum.

9.4 Pumps shall be installed so that piping connections and the pump housing are not subject to strain from connected piping runs. Flexible connectors are a means to comply with this requirement.

9.5 Control for the pump shall be provided at the pump or at a minimum as part of the dispensing device that the pump feeds.

10 Meters

10.1 Meters shall comply with the requirements in the Standard for Meters for Flammable and Combustible Liquids and LP-Gas, UL 25.

10.2 Meters shall be rated for a minimum service pressure of 350 psig (2.4 MPa).

10.3 Meters shall be installed so that piping connections and the meter housing are not subject to strain from connected piping runs. Flexible connectors are a means to comply with this requirement.

11 Valves

11.1 General

11.1.1 Valves installed prior to shutoff valves shall be installed within the container or at the point immediately outside where the line enters or leaves the container. If installed outside the container, strain shall not cause breakage between the container and the valve.

11.2 Safety relief valves

11.2.1 The container shall be provided with one or more internal spring-loaded safety relief valves to safeguard against excessive pressure. The container system shall be provided with additional safety relief valves as needed to reduce the risk of rupture of any part of the system. The valves shall comply with the requirements in the Standard for Safety Relief Valves for Anhydrous Ammonia and LP-Gas, UL 132.

11.2.2 The start-of-discharge setting of the valves required by 11.2.1 shall be rated as shown in (a) or (b):

- a) If the valves are located prior to the pump, the rating shall be 250 psig to 275 psig (1.7 MPa to 1.9 MPa).
- b) If the valves are located after the pump, the rating shall be 350 psig to 385 psig (2.4 MPa to 2.6 MPa).

11.2.3 The flow capacity of a safety relief valve shall not be less than that specified in Table 11.1, based on the total outside surface area of the container in square feet (m²). Discharge piping or tubing provided with the safety relief valve shall have a flow capacity equal or greater than that of the valve, or shall be shown to allow the required flow capacity.

Table 11.1
Safety relief valve flow capacity

Minimum required safety-relief valve discharge rate for container assemblies in cubic feet per minute of air at 120 percent of the maximum permitted set pressure							
Surface area square feet ^a	(Square meters)	Flow rate, cubic feet per minute, air ^{b,c}	(Cubic meters per second)	Surface area, square feet ^a	(Square meters)	Flow rate, cubic feet per minute, air ^{b,c}	(Cubic meters per second)
20 or less	(1.8)	626	(0.3)	170	(15.8)	3620	(1.7)
25	(2.3)	751	(0.3)	175	(16.2)	3700	(1.7)
30	(2.8)	872	(0.4)	180	(16.7)	3790	(1.8)
35	(3.2)	990	(0.5)	185	(17.2)	3880	(1.8)
40	(3.7)	1100	(0.5)	190	(17.6)	3960	(1.9)
45	(4.2)	1220	(0.6)	195	(18.1)	4050	(1.9)
50	(4.6)	1330	(0.6)	200	(18.6)	4130	(1.9)
55	(5.1)	1430	(0.7)	210	(19.5)	4300	(2.0)
60	(5.6)	1540	(0.7)	220	(20.4)	4470	(2.1)
65	(6.0)	1640	(0.8)	230	(21.4)	4630	(2.2)
70	(6.5)	1750	(0.8)	240	(22.3)	4800	(2.3)
75	(7.0)	1850	(0.9)	250	(23.2)	4960	(2.3)
80	(7.4)	1950	(0.9)	260	(24.1)	5130	(2.4)
85	(7.9)	2050	(1.0)	270	(25.1)	5290	(2.5)
90	(8.4)	2150	(1.0)	280	(26.0)	5450	(2.6)

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