Elevator Safety Program - Technical Clarification

T/C #: 20-03

Equipment Type: Passenger/Freight Elevators		Topic: Sump Pump Testing	
Residential ☐ Commercial ☒		Code:	ASME A17.1/CSA B44,
Created:	September 1, 2020	Section/Req:	2.2.2.5
Last Revision:	**November 1, 2023**	WAC/RCW:	

Elevator Sump Pumps & Oil Detection System Installation

As of late, many questions have arisen regarding various configurations for the discharge of elevator sump pumps. Requirements for oil detection systems, oil-water separators, discharge collection systems, discharge locations, etc., are not a function of the elevator code! The elevator code simply states that the installation of an elevator sump pump or drain must comply with the plumbing code.

During acceptance inspections, the elevator inspectors will require confirmation that the installation complies with the plumbing code. A plumber should be on site during this evaluation and test.

The current adopted elevator code, ASME A17.1-2019/CSA B44-19, states:

> ***2.2.2.4*** *Drains and sump pumps, where provided, shall comply with the applicable plumbing code, and they shall be provided with a positive means to prevent water, gases, and odors from entering the hoistway.*
> ***2.2.2.5*** *In elevators provided with Firefighters' Emergency Operation, a drain or sump pump shall be provided. The sump pump/drain shall have the capacity to remove a minimum of 11.4 m^3/h (3,000 gal/h) per* **single hoistway or multiple hoistway.** ***(2019 change)***

Since plumbing systems do not connect to elevator control systems, the installation of related junction boxes, control boxes, alarm boxes, strobe lights, operating panels, remote control wiring interface boxes, or other related equipment is prohibited from being installed in elevator pits, hoistways, or elevator equipment rooms. This presents challenges to plumbers and electricians charged with installing this pump-related equipment. One of the major reasons elevators fail inspection is due to unauthorized equipment being installed in pits, hoistways, and elevator equipment rooms.

Another reason for limiting such equipment in the elevator pit is that the pit area is not supposed to be accessible to non-elevator personnel and the elevator code makes it very clear:

> *ASME A17.1-2019/CSA B44-19, 2.2.4.4*
> *Pits shall be accessible only to elevator personnel.*

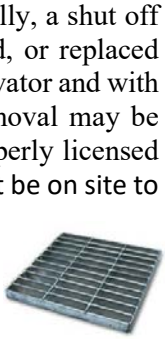
This minimizes the need for untrained elevator personnel to enter the pit area to perform pump maintenance or repair without trained elevator personnel present.

According to the IBC 3004.4*: Plumbing and mechanical systems shall not be located in an elevator shaft. Exception: Floor drains, sumps, and sump pumps shall be permitted at the base of the shaft provided they are indirectly connected to the plumbing system.*

Figure 1 Suggested plumbing fittings and connections: union; check valve; shut-off valve.

It is recommended that sump pump piping consist of copper, steel, or cast to limit damage from falling objects. Removing the pump easily (while not flooding the pit) recommends that a union at the edge of the slotted steel grate (see Fig. 1) be provided; then a check valve; and finally, a shut off valve. This allows the pump to be serviced, repaired, or replaced quickly with the least amount of down time for the elevator and with limited water spillage. The pit access and pump removal may be done by a licensed elevator mechanic or persons properly licensed and authorized by the owner. Elevator personnel must be on site to provide access to the elevator pit and spot the car if necessary if persons other than elevator mechanics are removing or replacing a pump. Building maintenance should be on-hand to take the pump for repair or provide a replacement.

Figure 3 Sensor Wiring



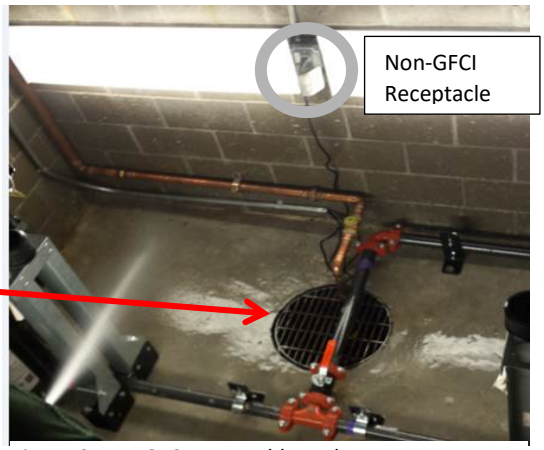


Figure 2 Non-GFCI receptable and open grate cover (round or square as applicable).

When job specifications or local plumbing code requires the installation of oil detection devices on elevator sump pumps, the following recommendations should be followed to assure a code compliant installation:

1. Install the sump pump in a compliant sump pit requiring a floor level steel grated cover (rated at 150 lbs./ft^2 min.) The open grating allows the water to enter the sump unimpeded and be pumped out.
2. Pump's in pit should be plugged into a single **Non-GFCI outlet** (see Fig 2) located near enough to the sump as to be high as possible on the pit wall to be above the water line. Code limits the length of the power cord to 6-ft. (see NFPA 70 Art. 620-21(A)(1)(d)). However, some listed/labeled pumps may be supplied with power cords longer than 6-ft. In such cases, only 6-ft. of the power cord should be exposed above the pit floor to the receptacle. The remainder of the cord should be coiled and placed in the sump (room permitting). A single **Non-GFCI** receptacle should be wired to the oil detection device so power can be removed from the sump pump if oil is detected. The oil detection device would need to be plugged into a **Non-GFCI** receptacle located near the discharge point (janitor's sink, etc.). This can be done if the oil detection device receptacle complies with NFPA 70, Art. 210.8(B)(5) *"…where receptacles are installed within 1.8 m (6 ft.) of the outside edge of the sink".*
3. The sensor wiring (see Fig. 3) shall be piped in conduit mounted on the wall (not the floor) within a few feet of the sump pump pit. The wire may run exposed, but must be secured, so it will not be a tripping hazard.

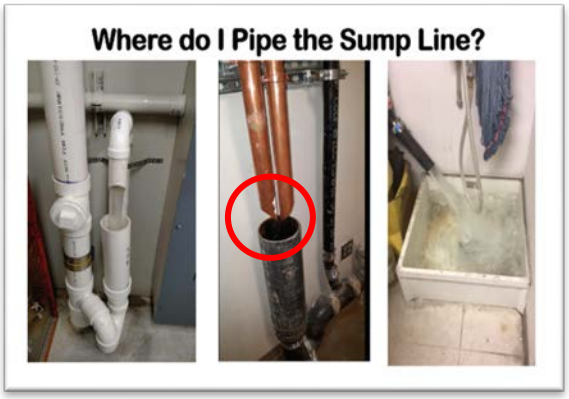


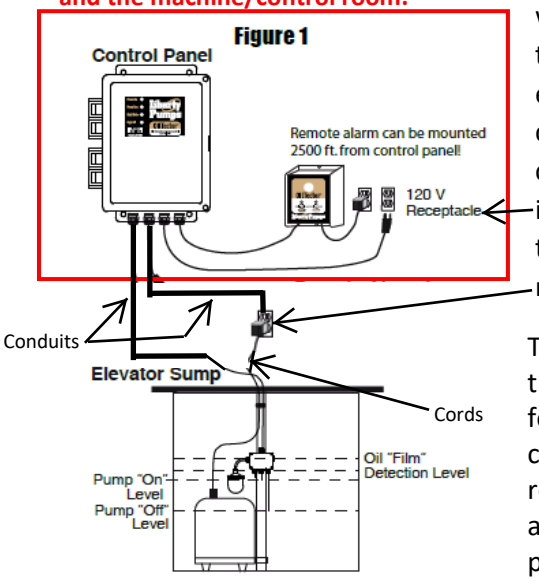
Figure 4: The pipe is cut at 75 degrees, so it does not spray on floor.

4. The discharge of the sump pump line should be code compliant following city, county, and state regulations. When the sump is discharged into a janitor's floor sink, the sink drain must be able to handle a flow of 50-gpm per **single hoistway or multiple hoistway. (2019 change)**
5. A standard janitor's 10-inch-high floor sink with a 3-inch drain will normally handle the flow for 50-gpm. The sink shown on the far right (see Fig. 4) is flowing at 85-gpm. An air gap permits visual inspection that the water does not contain oil. This is also one method to prevent gases and liquids from backing up into the pit in addition to a check valve (see ASME A17.1/CSA B44, 2.2.2.4).

6. The discharge pipe can be located outside of the building if allowed by the local plumbing authority. This water is considered firefighting water and normally allowed in storm drains by city/state standards.

Oil Detection Systems

Ancillary pump equipment is to be located outside of the pit, hoistway, and the machine/control room.



The example below shows one style of an oil detection system. The control panel, remote alarm, outlets, and all associated wiring does not belong in the hoistway, pit area, or elevator machine or control room. The pump control box MUST plug into a non-GFCI receptacle to keep the pit receptacle non-GFCI.

The two conduits that go to the elevator sump pit are for the oil sensor and the conduit for the pump receptacle.

a. The pump power-cord plugs into the single non-GFCI receptacle mounted in the pit. The pit receptacle is piped to the location where the control box has been mounted and connects to a receptacle or is hard-wired to the terminals in a junction box.

b. The oil detector sensor wires are piped in a separate conduit back to the pump control box. There should not be any junction boxes in the pit area and the conduit should be mounted on the wall and stop within a few feet of the sump pit grated cover. This will permit the sensor wires to be secured to the plumbing line if necessary.

Note: Oil detection systems that do not allow the pump to restart after once detecting oil will not be permitted. The pump must be able to start each time water is present!

Round sump volume:

$v = {}^{2}(h - 2.5)$

Tag = v/231

Where,
v = sump volume
r = (d/2) radius of sump
h = sump height (less 2.5" pump displacement)
tag = total gallons

Rectangular sump volume

$v = (h - 2.5)$

tag = v/231

Where,
v = sump volume
l = length of sump
w = Width of sump
H = height of sump (less 2.5" pump displacement)
Tg = total gallons

TEST THE SUMP PUMP

1.) Unplug the sump pump, leave grated lid in place. (This makes sure float will operate correctly).

2.) Fill the unplugged sump just below the grated lid, and shut off water.

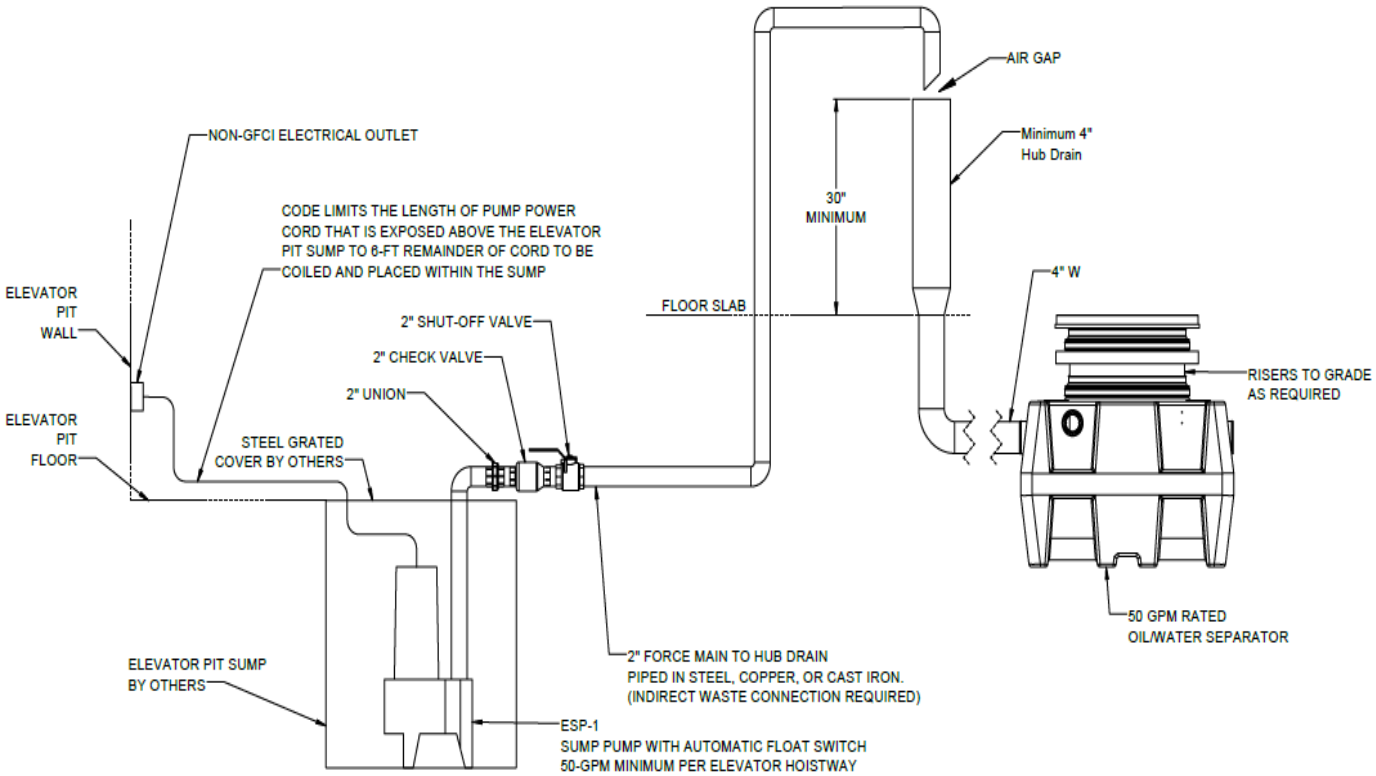
3.) Disable the float shutoff feature for test: hold it up, or just use the pump plug.
4.) Get ready for test by having plug ready to plug in and have stopwatch ready to go; count down; and start!
5.) STOP PUMP and STOPWATCH when pump cavitates (draws air) or it may damage pump!
6.) Now calculate if your pump meets the 50-gpm requirement (±5-gpm for sump pit size differences). Repeat timed test if needed.
7.) Run three full sump pit loads of water (with no float valve working) test to see if it will empty properly.
8.) Turn on water and hook float back up, and run the sump pump normally, and let the float cycle three times to demonstrate the pump can over-come the head pressure on the check valve.
9.) When test is complete, turn off hose and drain hose to sump, and then lift float to drain sump completely.
(Note: Hot water tends to effect the pumps with oil sensors and will sometimes damage the sensors.)

Conversion Table [US, Fluid]

Gallon	Cubic Inch	Gallon	Cubic Inch	Gallon	Cubic Inch	Gallon	Cubic Inch
1	231	26	6006	51	11781	76	17556
2	462	27	6237	52	12012	77	17787
3	693	28	6468	53	12243	78	18018
4	924	29	6699	54	12474	79	18249
5	1155	30	6930	55	12705	80	18480
6	1386	31	7161	56	12936	81	18711
7	1617	32	7392	57	13167	82	18942
8	1848	33	7623	58	13398	83	19173
9	2079	34	7854	59	13629	84	19404
10	2310	35	8085	60	13860	85	19635
11	2541	36	8316	61	14091	86	19866
12	2772	37	8547	62	14322	87	20097
13	3003	38	8778	63	14553	88	20328
14	3234	39	9009	64	14784	89	20559
15	3465	40	9240	65	15015	90	20790
16	3696	41	9471	66	15246	100	23100
17	3927	42	9702	67	15477	125	28875
18	4158	43	9933	68	15708	150	34650
19	4389	44	10164	69	15939	175	40425
20	4620	45	10395	70	16170	200	46200
21	4851	46	10626	71	16401	250	57750
22	5082	47	10857	72	16632	300	69300
23	5313	48	11088	73	16863	500	115500
24	5544	49	11319	74	17094	750	173250
25	5775	50	11550	75	17325	1000	231000

Water Oil/Separators

There has been inquiries about the use of oil/water separators, which are commonly used in conjunction with the discharge of firefighting water removal from the pit. This is an inexpensive alternative to oil detection devices and has been the standard for many years. The combination of both is also allowed if the building design team wishes to do so. The requirement to have a 6 inch air gap prior to entering into the sewer system, which the water/oil separator is part of, still needs to be present. See illustration below;



NOTE: INSTALL ELEVATOR SUMP PUMP PER CURRENT ELEVATOR CODE ASME A17.1

ELEVATOR SUMP PUMP DETAIL (B) X P0.01
NOT TO SCALE

www.striemco.com

Respectfully,
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