SAFETY VALVES FOR STEAM HEATING BOILERS

1. GENERAL

1.01 This section suggests recommendations for the selecting of spring loaded safety valves for installation on low pressure steam heating boilers. The function of these valves is to prevent an overpressure condition from existing in the boiler shell. This section also lists some recommendations for the type, size, capacity, inspection, installation testing and manufacturers of safety valves.

1.02 This section is revised and reissued to bring attention to some new concepts on safety valves and outline, in general, some test procedures for steam boilers. Arrows are used to indicate changes in the text.

1.03 In addition to this section the following P.E.L. and its supplements have a direct bearing on the selection and installation of safety valves for low pressure steam boilers:

P.E.L. 7129 — Safety and Relief Valves for Low Pressure Heating Boilers.

1.04 This section applies to new and existing installations. All new valves shall be selected from the approved list of manufacturers and model numbers which is attached to P.E.L. 7129 and its supplements. All existing valves shall be replaced unless they meet the following requirements:

(a) They are stamped with the A.S.M.E. cloverleaf and have their ratings certified by the National Board of Boiler and Pressure Vessel Inspectors.

(b) Demonstrate their relieving capacity by testing in accordance with 7.03 of this section.

1.05 The following definitions apply to the terms used in this section: A.S.M.E.: American Society of Mechanical Engineers, United Engineering Center, 345 East Forty-Seventh Street, New York, New York 10017.

The Code: A.S.M.E. Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Low Pressure Heating Boilers.

Safety Valve: An automatic pressure relieving device operated by pressure upstream of the valve and characterized by full opening pop action. It is used for gas or vapor service.

Set Pressure: That pressure at which the valve is factory set to open, normally at or below the maximum allowable working pressure of the steam boiler. This is normally 15 psig for steam heating boilers.

Set Pressure Tolerance: The allowable range, above or below the set pressure, at which the valve may open. This is ± 2 psi for steam heating boilers.

Closing Pressure: That pressure at which the valve closes, normally 2-4 psi below the opening pressure. Safety valves constructed under Section IV of the Code have no closing pressure (blowdown) requirements although most manufacturers provide this information.

Maximum Allowable Working Pressure: The maximum pressure at which a steam heating boiler may be operated. This is normally 15 psig and may be lower.

1.06 Where local and/or state codes, rules, and regulations call for other or higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are to be followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each steam heating boiler shall have at least one officially rated safety valve set to relieve at or below the maximum allowable working pressure of the boiler. Safety valves are to be of the spring loaded pop type; factory set and sealed with visual seal or nonadjustable setting; side outlet; disc, seat and stem constructed of corrosion resistant material; stainless steel or cadmium plated spring, top or bottom guided; with drain hole in body below level

of disc; rated by the National Board of Boiler and Pressure Vessel Inspectors and marked in accordance with the Code.

2.02 Safety valves shall be so arranged that they cannot be reset to relieve at a higher pressure than the maximum permitted by 2.01.

2.03 Each safety valve shall have a substantial device which will positively lift the disc from its seat at least 1/16 in. when there is no pressure on the boiler.

2.04 Seats and discs of safety valves shall be of material suitable to resist corrosion. No materials liable to fail due to deterioration or vulcanization when subject to saturated steam temperature corresponding to capacity test pressure shall be used for any part.

2.05 Seals are attached in such a manner as to prevent safety valve from being taken apart without breaking the seal.

3. CAPACITY

3.01 The relieving capacity of the safety valve shall be certified by the National Board of Boiler and Pressure Vessel Inspectors and shall conform to the Code which states:

3.02 The minimum size of valve or valves shall be governed by the capacity marking on →the boiler called for in Par. HG-400.1 of the Code, or,

3.03 The minimum valve capacity in pounds per hour shall be determined by dividing the maximum btu output at the boiler nozzle obtained by the firing of any fuel for which the unit is designed by 1000, or, in the case of steel boilers, by multiplying the square feet of heating surface by 5. In many cases a greater relieving capacity of valves will have to be provided than the minimum specified by these rules. In every case the following requirements shall be met:

3.04 The steam safety valve capacity for each boiler shall be such that with the fuel burning equipment installed, the pressure cannot rise more than 5 psi above the maximum allowable working pressure of a steam boiler.

3.05 When operating conditions are changed or additional boiler heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and be in accordance with 3.04.

4. MINIMUM AND MAXIMUM INLET SIZE

4.01 Size of safety valves is determined by inlet pipe size. The discharge opening may be one or two pipe sizes larger. Sizes of safety valves shall be the minimum allowable by the Code, presently 3/4 in., to a maximum of 4 in. IPS (Iron Pipe Size).

4.02 Where the capacity requirements exceed the relieving capacity of all approved 4 in. valves, two or more valves shall be installed to provide the required capacity. It is suggested that they be of the same manufacture and they ⌜shall all be mounted on the boiler shell. A manifolded arrangement of two or more safety valves will be acceptable if the manifold provides an unrestricted inlet area of adequate size so that ⌞the capacity of the valves is not reduced.

5. MARKINGS

5.01 Each standard safety valve is plainly labeled with the manufacturer's name or registered trade-mark, the inlet size in inches, pressure in pounds per square inch at which it is set to blow, the capacity in lb/hr or btu/hr, and the A.S.M.E. symbol. These data are usually stamped or cast on a plate securely attached to the casing so as not to be obliterated in normal service.

6. INSTALLATION

→6.01 Installation shall conform to Par. HG-701 of the A.S.M.E. Code, Section IV.

6.02 No shutoff of any description shall be placed between the safety valve and the boiler. Safety valves shall not be connected to an internal pipe in the boiler.

6.03 ⌜ The valve or valves shall be installed on the boiler shell whenever possible. Screw end valves shall be mounted on a pipe flange to reduce the possibility of damaging the valve during installation. The valve should be bench ⌞

mounted to its flange and the other half of the flange attached to the boiler with a nipple. A wrench shall not be applied to the valve body nor shall the valve outlet be used with a pipe or other lever to install it on the boiler. A minimum amount of pipe threading compound shall be used on threaded valves and it shall be applied to the male threads only.

6.04 Valve bodies and marking are not to be painted.

6.05 Discharge piping shall not be permanently connected to the safety valve outlet. If the piping is connected to the safety valve outlet for discharge to the atmosphere during a pressure test, the connection shall be a temporary one adequately supported or fixed and used only during the test period. At all other times the connection shall be broken and ample clearance provided between the safety valve outlet and the exhaust piping for rated discharge. This temporary piping shall be sized at least as large as the valve discharge. If more than 20 feet of temporary piping is to be used, it shall be increased at least one pipe size.

6.06 All safety valves shall have a chain attached to their lifting levers so that testing by raising this lever can be performed from a safe and convenient location.

6.07 Safety valves are to be installed on boilers by steamfitters or Telephone Company building mechanics qualified to do so.

7. TESTS

7.01 Periodic tests of all boiler plants are required to maintain them in good working condition and to assure complete safety. Safety precautions should be exercised at all times to protect both personnel making the test and other occupants of the building. Suggested frequencies for tests and inspections along with needed tools are outlined in detail in Section 770-210-302, Issue 2, Low Pressure Steam Heating Boilers.

7.02 The safety valve (or valves) is the final line of protection against overpressure and is the most important single safety device on any boiler. In testing safety valves, care must be exercised to protect personnel from escaping steam.

7.03 As a precautionary measure, all personnel concerned with conducting a pop or capacity test should be briefed on the location of all shutdown controls in the event of an emergency. The following tests shall be performed on safety valves:

(a) ***Try Lever Test.*** Every 30 days that the boiler is in operation or after any period of inactivity, a try lever test shall be performed. This test should be performed whenever the boiler is operating as follows: With approximately 5 psi steam pressure in the boiler, lift the try lever by means of the chain and allow steam to be discharged from the outlet for about 5 to 10 seconds. Release the chain and allow the spring to snap the disc to the closed position. If the valve simmers, operate the try lever two or three times to allow the disc to properly seat. If the valve continues to simmer, it must be replaced. Inspect the valve for evidence of scale or encrustation within the body. ***Do not disassemble valve or attempt to adjust spring setting.***

(b) ***Pop Test.***

(1) A Pop Test shall be performed once annually.

(2) Establish necessary general trial conditions at particular location. Review preparation for test with personnel involved.

(3) Calibrated test gauges should be temporarily installed to check accuracy of the boiler pressure gauge during the test.

(4) Isolate the boiler from the supply and return piping to expedite the test.

(5) Temporarily place test leads across the appropriate terminals on the operating control to demonstrate the ability of the high limit pressure control cutout to function properly. After this has been checked, place test leads across high limit pressure control terminals also to permit continuous operation of the burner.

(6) Observe that the safety valve operates satisfactorily when the maximum design steam working pressure is reached, ie, the set pressure of the safety valve ± 2 psi. The valve should pop open at this pressure to a practically wide-open position.

(7) ***If the valve does not open with these limits (13-17 psig), shut off the burner and keep the boiler inoperative until a new valve is installed and tested as provided herein.***

(8) If the valve pops wide open between these pressure limits, immediately remove the test lead from the high limit pressure control and allow high limit control to stop burner at least once.

(9) Remove test leads from the operating pressure control and allow it to cycle the burner to assure proper operation.

(10) In the event the boiler continues to fire after the leads are removed, shut off main fuel valve and open the main electrical disconnect switch. Check the entire control system, locate and correct trouble before attempting to refire boiler.

(c) ***Capacity Test.*** Capacity test must be performed on safety valves on all new boiler installations or on existing boilers when any modification that affects the steam generating capacity of the boiler, such as: changing the size of the burner, changing the rate of fuel flow to the burner, or changing to a grade or type of fuel not previously fired. A capacity test should also be made after replacing a safety valve. All such tests shall be made in the presence of a Telephone Company representative and/or the Architect's superintendent or the Consulting Engineer with results recorded and submitted to the owner. Hydrostatic testing is not to be considered as an acceptable test to check set pressure or capacity of a safety valve.

(1) Establish necessary general trial conditions at particular location, review preparation for test with personnel involved.

(2) A calibrated test gauge shall be temporarily installed to check accuracy of the boiler pressure gauge during all phases of these tests.

(3) Set burner to operate at its maximum capacity if it has not already been done. Make sure that combustion is complete with proper overfire draft, cutting back on fuel supply, if necessary, to accomplish this.

(4) Isolate the boiler from the supply and return piping making sure, however, that the water feeder can feed water to the boiler if it is necessary to do so during the test.

(5) Temporarily place test leads across the appropriate terminals of the operating pressure control to permit testing the high limit pressure control.

(6) When the high limit pressure control demonstrates its ability to stop the burner, place test leads across its terminals, reset it manually and allow the burner to operate until the boiler pressure approaches 15 psi.

(7) If valve opens at proper set pressure, keep the burner running until the maximum pressure is reached and then hold it for one to two minutes. Maximum pressure should not exceed 20 psi.

(8) ***If valve does not operate at between 13-17 psig or if pressure begins to exceed 20 psig, immediately shut off burner and keep the boiler inoperative until a new valve is installed and tested as provided herein.***

(9) If test conditions in (7) and (8) are met satisfactorily, turn off fuel and observe test gauges to see that valve closes at an accepted less than 13 psi pressure usually 2-4 psi below operating pressure.

(10) In the case of steam heating boilers, the boiler should be equipped with a low water cutoff and automatic water feeder which would prevent a low water condition during the test.

(11) After confirmation of capacity, remove the test leads from the high limit control and allow it to cycle once to determine that it is functioning properly.

(12) Remove test leads from the operating pressure control and allow it to cycle the burner to assure proper operation.

(13) Suitable arrangements should be provided to dissipate the steam created by this test as in 6.05.