SAFED

SAFETY ASSESSMENT FEDERATION

Guidance

In-Service Inspection Procedures

Guidance for the competent person when assessing overpressure protection.

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1. INTRODUCTION

A number of safety valve issues have been identified by SAFed member companies, some of which are of concern as they affect the correct operation of the system and could allow an overpressure situation to occur. This guidance addresses some of the issues found in order to assist the Competent Persons when assessing overpressure protection.

The Competent Person should also consider the requirement of paragraph 130 of the PSSR ACoP which states:

> *At the end of the examination, the competent person should be satisfied that the protective devices, especially any safety valves, have been tested and set correctly. Where protective devices which have been removed during an examination are found to be defective, the cause of the problem should be investigated further by the user/owner and the necessary corrective measures taken (see also paragraphs 138–143 for guidance on action in case of imminent danger).*

2. SCOPE

This guidance addresses a range of issues that a Competent Person may encounter when performing examinations and applies the combined experience of SAFed members to address:

- Set pressure
- Valve replacement — Discharge capacity
- Valve replacement — Design temperature
- Discharge pipework
- Position of the safety valve
- Maintenance

3. SET PRESSURE

The set pressure of the safety valve must not exceed the safe operating limit quoted on the inspection report. Where the written scheme also quotes a safe operating limit then this must be considered, if the report is to show a different safe operating limit then either, the scheme should be updated, or reasons for the difference quoted on the report.

It is inadvisable for a Competent Person to quote a set pressure greater than the SOL on the report unless the item is being reported as defective.

Note: Further information on safety valve set pressure is contained in SAFed guide PEC 13.

4. VALVE REPLACEMENT — DISCHARGE CAPACITY

Due to financial constraints it is often cheaper to replace smaller safety valves than to overhaul an existing unit. When looking for replacement valves the market is often driven to “the cheapest”, this does not always represent value for money. It is therefore not unusual to find that the valve fitted at the last exam has been replaced with a different make/type of valve. What the user often fails to check is the dischargecapacity of the valve. Not all similar sized valves have the same capacity and an example for a simple saturated steam safety valve is shown below.

A. Spirax Sarco SV3, 25mm Valve set at 10.0 Bar, has a capacity of 825 kg/h

B. Spirax Sarco SV615, 25mm Valve set at 10.0 Bar, has a capacity of 1940 kg/hmore than twice the capacity (the SV615 has a larger outlet port).

C. Nabic Fig 542, 25mm Valve set at 10.0 Bar has a capacity of 588 kg/hr.

D. Nabic Fig 500,25mm Valve set at 10.0 Bar has a capacity of 1481 kg/hr.

Note: All the above allow for 10% accumulation

Where a safety valve is replaced the capacity of the valve should be verified to ensure that the replacement valve can relieve sufficient quantities to prevent overpressure.

This issue mainly arises with local reducing sets supplying lower pressure steam to ancillary plant and calorifiers.

5. VALVE REPLACEMENT — DESIGN TEMPERATURE

Many valves on the market are not designed to operate at elevated temperature. In these instance safety valves with the correct set pressure have been fitted to steam services though the temperature rating is not adequate for the actual conditions. The key limiting factor is the material used for the seals, where rubber is used then the temperature will be limited to less than 100°C (typically 95°C). These valves are generally intended for water or air applications, though difficult to tell apart from the appearance. The valves are marked with the limiting temperature on the data plate. Ifthe temperature is not suitable for the application the valve should be replaced.

6. VALVE REPLACEMENT — USE OF A NON SAFETY VALVE

When sourcing replacement valves due to financial restraints the purchaser is often driven to "the cheapest" in the valve manufacturer's catalogue rather than a direct likefor like replacement. This sometimes leads to purchasing a pressure relief valve whichis not a safety valve. Typical differences to look for are described below:

Safety valves

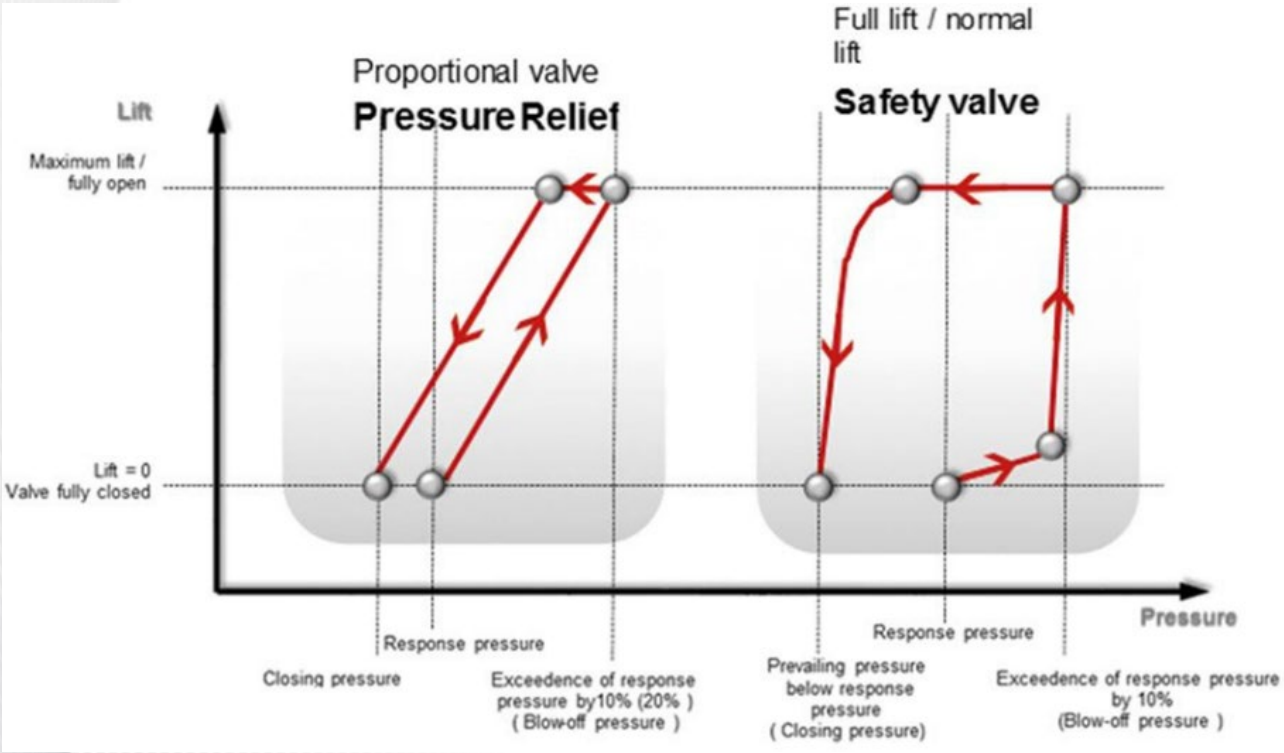
- Certified valves, UKCA marked in accordance with the PE(S)R 2016 (applies to all valves with a design pressure greater than 0.5 bar)
- Manufactured to a recognised safety valve standard such as EN ISO 4126-1, BS 6759 (now obsolete) or API 526
- Tamperproof to prevent unauthorised adjustment of set pressure

If there is any doubt reference should be made to the valve manufacturer's catalogue/technical specification or the manufacture's EU Declaration of Conformity should be requested.

6.1. Proportional type valves versus 'Pop' type valves

Historically safety valves built in the UK for use on pressure systems were to British Standard BS 6759 and were of the 'pop' type. The valve seat and disc are designed sothat as the valve starts to discharge an increase in pressure will cause it to rapidly lift to its fully open position. BS 6759 was superseded by BS EN ISO 4126-1 in 2004.

This international standard also allows proportional type valves to be manufactured assafety valves. With this type of valve the valve disc lifts proportionally to an increase in pressure at the valve seat. The differences in valve lift characteristics are illustratedin Figure 1. In the UK this type of valve was previously regarded as a pressure relief valve for liquid applications rather than a safety valve for pressure systems.



'Pop' type valves are traditionally the preferred safety valve in the UK but a proportional type valve is also acceptable providing it is manufactured in accordance with ISO 4126-1, it is UKCA marked in accordance with the PE(S)R 2016 and the manufacturer'stechnical data confirms its suitability for the particular fluid.

The valves shown in Figures 2 and 3 below highlight the difference in body shapebetween the two types of valve to aid identification.

Easing levers are an optional accessory in ISO 4126-1, as it may be undesirable on certain applications for an easing lever to be present e.g. refrigeration system safety valves. Therefore if an easing lever is required for a particular application i.e. in orderto test the valve, then this needs to be specified when ordering. Easing levers should be considered as part of a like for like replacement.

7. DISCHARGE PIPEWORK.

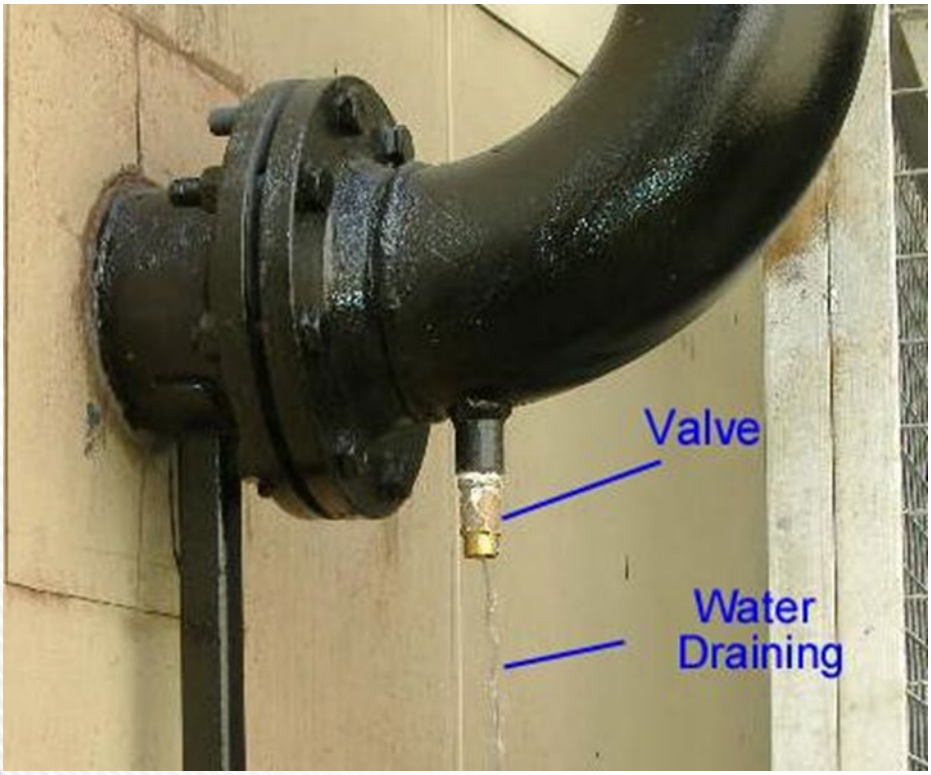
7.1. Termination Point

Safety valves should discharge to a safe place, often the terminal point of dischargepipe is not easily seen from the safety valve. The Competent Person should ensurethat discharge is in fact in a safe area. An example of an unsafe area is shown in Figure 4.

Note: The discharge lines are directly below opening windows in a residential block, with obvious consequences should the window be open. As can be seen from the staining on the frames and brickwork these valves have lifted in the past. Even though the discharge area is fenced off someone standing adjacent to the discharge could still be at risk. These discharges are from DN50 safety valves.

7.2. Drainage

Where the discharge pipework fitted to the valve incorporates any vertical legs then adrain should be fitted at the low points to prevent liquid from accumulating within. Ahead of liquid will affect the set pressure of the valve, it could freeze causing a blockage, and could cause corrosion within the valve body. In addition it will eject a slug of liquid into the air when the valve lifts. In the example shown in Figure 5 thedischarge pipework is fitted with a drain, though because it kept dripping a valve waslater fitted to it. When the valve was eventually opened it took almost 40 minutes forthe liquid to drain. (DN150 Vent)



7.3. Additional Fittings in discharge pipes

Fittings located within the discharge pipework could have an adverse effect on the protective device. Discharge pipework should not be smaller in diameter than the discharge port of the valve at any point on its length, and similarly the valve should not be mounted on pipework smaller than its inlet port (see Figure 6). If this is foundthen justification of the valve capacity will be required.

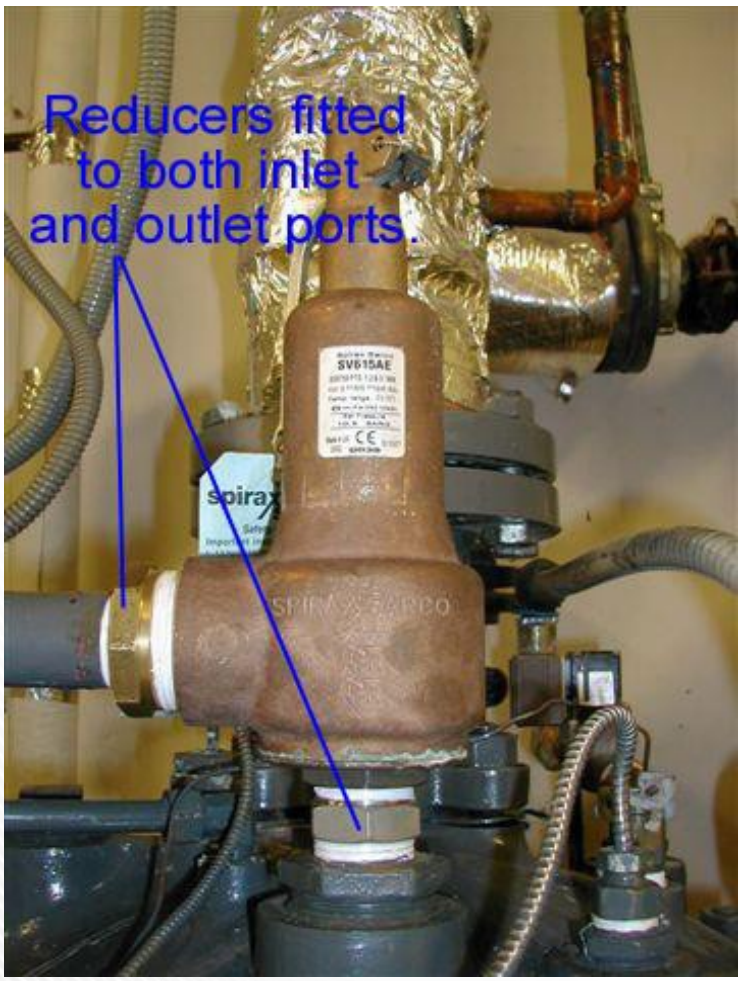
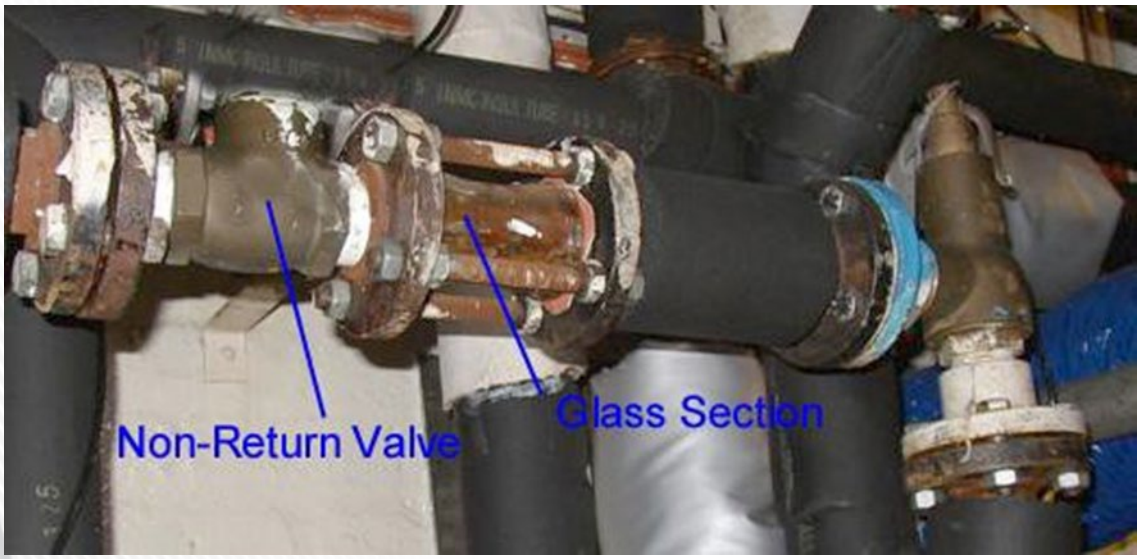


Figure 6 — Example of additional fittings in discharge pipes

Note: Picture Courtesy of Spirax Sarco

7.4. Effect of fitting a non-return valve

In one circumstance a safety valve was found to have been fitted with a non-return valve in the discharge (see Figure 7). This could have seriously affected the valves performance as it will reduce the effective diameter of the discharge pipework or in extreme circumstances could seize closed. This particular system was fitted with a glass viewing section to enable a user to see if the valve was passing. The use of a glass section is undesirable as rapid thermal shock would be applied to the component and this could lead to failure.



7.5.Support of Discharge Pipework

Discharge pipework is often considered to be at or near atmospheric pressure, however when a relief device operates sudden reaction loads will be applied. If the pipework is inadequately supported severe injury and damage can occur.

Catastrophic failure of discharge pipework during safety valve discharge can lead to the discharged fluid or projectiles from the construction materials coming into contactwith personnel. In figure 8 below, inadequately supported pipework caused a complete failure of the inlet flange to the safety valve. This led to an uncontrolled release of superheated water flashing to steam.

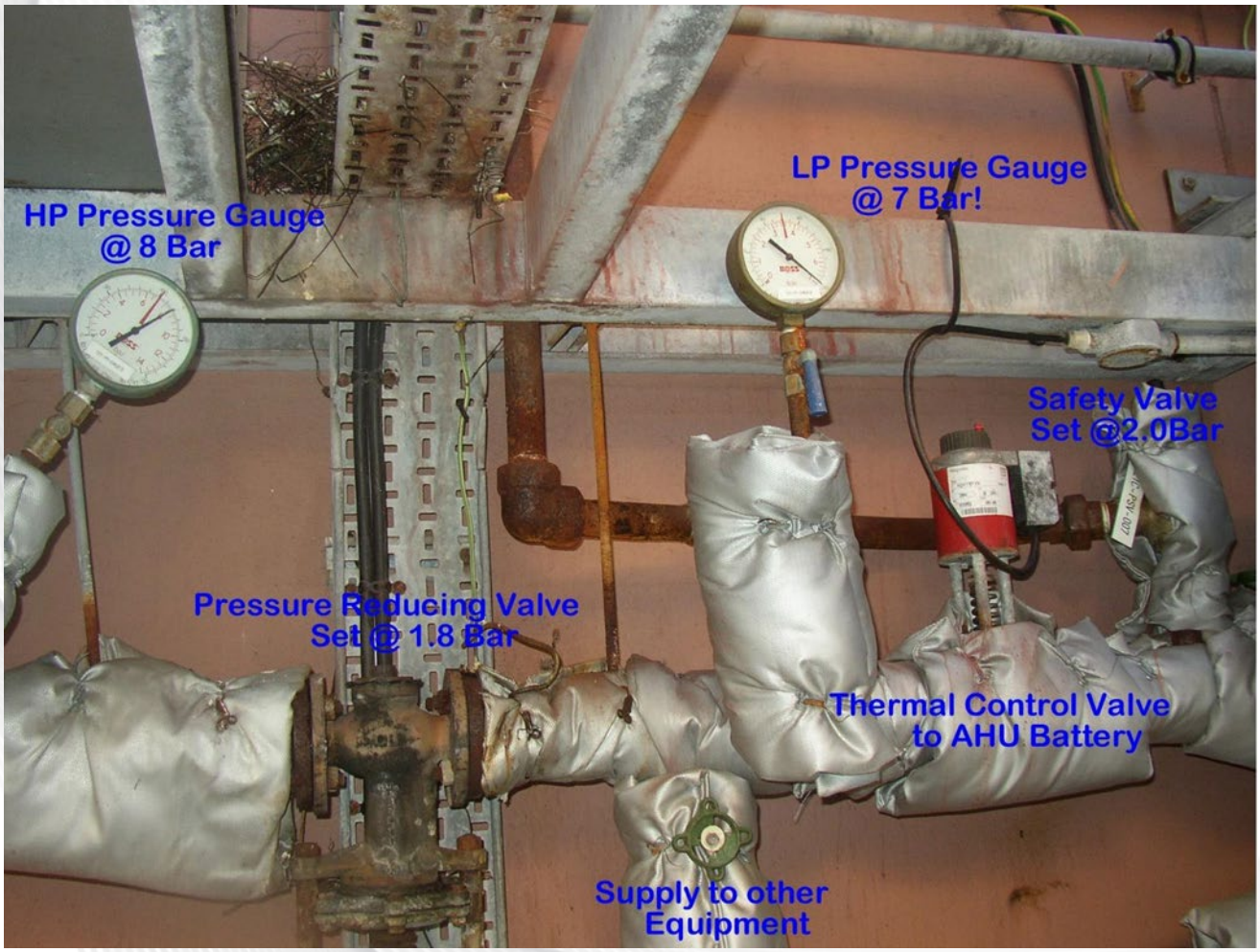
Figure 8 — Example of the effect of inadequately supported pipework

7.6. Position of the safety Valve

Figure 9 shows a fairly typical reducing station for a low pressure steam supply. The downstream system feeds the Air Handling Units heating battery and also provides low pressure steam for use within the building facilities.

On closer inspection it can be seen that the downstream pressure gauge is reading 7.0 bar, though the reducing valve is supposedly set at 1.8 bar, the safety valve is not lifting. Whilst it is possible that the downstream pressure gauge was faulty, in this instance the reducing valve was in fact faulty.

The position of the safety valve causes it to be isolated from the rest of the system when the thermal control valve closes. Therefore the safety valve is only effective when the AHU is calling for heat. Whilst this adequately protects the heating battery the rest of the system has been left un-protected.



8. MAINTENANCE

The user is expected to complete maintenance and testing of safety devices at intervals appropriate for their duty. Many manufacturers state that the valve should bechecked for correct operation at monthly intervals. Where valves are clearly not beingmaintained between inspections (see Figure 10) this should be brought to the attentionof the user.

9. INTERNET RESOURCES

A. Spirax Sarco; http://www.spiraxsarco.com/

   Spirax Sarco Safety Valve Sizing Calculator;

   https://www.spiraxsarco.com/resources-and-design-tools/calculators/valves/sizing-for-dry-saturated-steam https://www.spiraxsarco.com/resources-and-design-tools/calculators/valves/sizing-for-water

B. Health & Safety Executive Vent Stream Information; http://www.hse.gov.uk/comah/sragtech/techmeasventsyst.htm

C. BSS Website (Note: free registration required); https://www.bssindustrial.co.uk/