

GUIDANCE

IN-SERVICE INSPECTION PROCEDURES

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Reference: **Size of access openings in boilers and pressure vessels**

SITUATION:

Taking due cognisance of the Confined Spaces Regulations 1997, under what circumstances should the access facilities for existing equipment need to be reviewed by a responsible person within the user organisation and what factors should be taken into account when determining the size of access openings when designing new boilers and pressure vessels.

GUIDANCE:

INTRODUCTION

The Confined Spaces Regulations 1997 give guidance on the size of openings to enable safe entry access to and egress from confined spaces:

*'Experience has shown that the minimum size of an opening to allow access with full rescue facilities including self-contained breathing apparatus is 575 mm diameter. This size should normally be used for new plant, although the openings for some confined spaces may need to be larger depending on the circumstances, for example, to take account of a fully equipped employee, or the nature of the opening.'*¹

With the exception of certain special cases, the designs of boilers and pressure vessels have normally incorporated manholes substantially smaller than 575mm diameter to provide internal access for maintenance and inspection. In many cases the scantlings required to provide larger openings would lead to a requirement for extensive reinforcement. This may create considerable engineering work and must comply with Regulation 13 of PSSR in case of modifications.

For the particular case of entry into boilers and pressure vessels safe systems of work can be devised using conventional sized openings and, except where entry with self contained breathing apparatus is required, the fitting of larger openings is generally not considered necessary.

IN-SERVICE INSPECTION

The Confined Spaces Regulations 1997 do not in any way negate the need for adequate physical internal inspection where required by the written scheme of examination.

Where non-invasive inspection techniques are to be considered as an alternative to internal inspections then they should provide an equivalent level of confidence in the integrity of the vessel.

Extensive industry experience (gained over many years) demonstrates that where a suitable system of work is employed standard sizes of manhole can facilitate safe internal inspection of Boilers and Pressure Vessels. e.g.:

- BS 470 Inspection, access and entry openings for pressure vessels (460mm x 410mm or 460 mm diameter)
- ASME VIII 11in x 15in or 10in x 16in or 15in diameter (255mm x 380mm or 255mm x 406mm or 380mm diameter)

¹ SI 1997 No. 1713 — The Confined Spaces Regulations 1997; clause 1.51 — Procedures

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- ASME I 12in x 16in or 15in diameter
(305mm x 406mm or 380mm diameter)
- BS 2790 Shell Boilers/BS 1113 Watertube boilers
(400mm x 300mm or 400mm diameter)

In exceptional circumstances it may be necessary to consider fitting larger openings on boilers or pressure vessels to ensure that entry or rescue can be undertaken safely. The risk assessment for confined space entry should take into account the following points:

- Is there a requirement for entry with self-contained breathing apparatus?
- Is there a requirement for entry with harness or other equipment?
Note 1: The use of a harness and rescue line is not practical inside many boilers because of the risk of snagging or catching on internal fittings and attachments preventing further movement.
- Is it reasonably foreseeable that uncontrolled changes to the internal environment may occur leading to emergency rescue actions using self-contained breathing apparatus? e.g.:
 - Chemical release from safety valves or vents on adjacent vessels
 - Automatic fire fighting systems
 - Exhaust fumes from internal combustion engines
 - Residues in vessels

NEW CONSTRUCTION

It is recommended that the requirements for type and size of openings contained in the following harmonised Standards generally be followed as a minimum:

- BS EN 13445 — Unfired Pressure Vessels
- BS EN 12952 — Water-tube boilers and auxiliary installations
- BS EN 12953 — Shell Boilers

These standards require a manhole to be fitted in pressure vessels above 1200mm diameter and boilers above 1400mm diameter. For smaller sizes a manhole is optional. A rescue hole may be specified in place of a manhole in pressure vessels above 1200mm diameter.

Manholes (Boilers & Pressure Vessels)

320 mm x 420 mm or 420 mm inside diameter (Maximum height of the neck or ring = 150 mm)

Note 2: For boilers a reduced size of 300 mm x 400 mm or 400 mm internal diameter is acceptable where there is a suitable distance between the manhole and adjacent tubenests/other obstructions.

Rescue holes (Pressure Vessels)

600 mm inside diameter

Note 3: Where this is not possible, due to design considerations, the size can be reduced to 500 mm provided that the height of the neck does not exceed 250 mm.

A rescue hole may be required rather than a manhole in the following circumstances:

- When specified by the purchaser/user
- When entry for inspection or cleaning is required using self-contained breathing apparatus
- When maintenance or repair work may introduce other hazards which could foreseeably lead to a need for emergency rescue. (e.g. when applying certain linings and special paint processes)
- Where the vessel may contain hazardous substances which cannot be fully removed before entry
- Where the vessel location could lead to the ingress of hazardous substances from adjacent plant

REFERENCES

SI 1997 No. 1713 — The Confined Spaces Regulations 1997;

HSE Guidance No. L101 — Safe work in confined spaces –Approved code of practice, regulations and guidance;

BS 470: 1984 — Specification for inspection, access and entry openings for pressure vessels;

BS 1113: 1999 — Specification for design and manufacture of water-tube steam generating plant (including superheaters, reheaters and steel tube economizers);

BS 2790: 1992 — Specification for design and manufacture of shell boilers of welded construction;

BS EN 12952 (Series) — Water-tube boilers and auxiliary installations;

BS EN 12953 (Series) — Shell boilers;

BS EN 13445 (Series) — Unfired pressure vessels.