AGREEMENT

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Titel:	**Guideline for the erection of steam boiler plants – Pressure relief areas**
Signatories:	BDH FDBR Vd-TÜV VGB
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Agreement Steam Boilers 007
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between

BDH Bundesindustrieverband Deutschland Haus-, Energie- und Umwelttechnik e.V., Köln

FDBR FDBR e.V. Fachverband Anlagenbau, Düsseldorf

VdTÜV Verband der TÜV e.V., Berlin

VGB VGB PowerTech e.V., Essen

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Guideline for the erection of steam boiler plants – Pressure relief areas

Preamble

This agreement is intended to supplement the pertinent rules and regulations. It is a collection of experience made, recommendations and, where required, a concretization of the rules and regulations, which, to the best of our knowledge, reflects the state-of-the-art at its date of publication. This agreement aims at ensuring the operational safety of steam boiler plants and their components.

No liability will be taken for the correctness of the contents of this agreement. Patents and other protective rights shall be clarified under the responsibility of the user.

The associations having participated in the establishment of this guideline will appreciate the support and further development of its contents through other national and international associations/institutions.

Contents

1 Scope

This agreement applies to the erection of land-based (stationary) steam boilers (both water-tube and shell boilers) of category IV to the Pressure Equipment Directive 97/23/EC and with an allowable working pressure P_B exceeding 1 bar in case of steam generators and an allowable operating temperature exceeding 120 °C in case of hot-water generators. Mobile boiler plants and boilers in containers are not covered by this guideline.

2 Definitions

The boiler room is that room or part of a room required for installation, attendance and maintenance of the steam boiler and of the equipment serving its operation.

3 General requirements

3.1 Structural requirements

For structural works – e.g. boiler houses, stacks, bunkers, and silos – the pertinent laws, rules and regulations apply.

3.2 Requirements for erection

Steam boiler plants shall be so erected as to make adequate attendance, servicing, maintenance, and supervision possible. During such activities occupational safety and health protection of employees and protection of third persons shall be ensured.

Adequate distance to building walls or platen elements shall be maintained to consider the thermal expansions to be expected.

Steam boilers and facilities belonging to the steam boiler plant shall be so erected that, regarding the protection against shock, vibration and noise, safe operation of the plant is ensured.

Valves being part of the steam boiler or steam boiler plant, to which safety or relief devices are attached shall be installed such that they can discharge or be operated without danger.

3.3 Free spaces for attendance and maintenance

Areas to which access is required for attendance and maintenance purposes of the steam boiler plant shall provide headroom of at least 2 m and a free passage width of at least 1 m. This free width may be restricted to 0.8 m by individual boiler valves or mountings.

Passageways to personally assigned workplaces as well as provisional stairways and maintenance and operating platforms for shell boilers shall have a free passage width of 0.6 m.

For the other areas a clear distance of 0.5 m to adjacent components, and in the case of horizontal cylindrical boiler bodies a clear distance of 0.3 m will suffice.

The distance between boiler furnace roof and boiler top casing shall be at least 0.75 m as far as attendance and maintenance is required in this area.

All access and inspection openings of the steam boiler plant components shall be accessible, or it shall be possible to make them readily accessible.

3.4 Access to boiler rooms

Access to the steam boiler plant by unauthorized persons shall be prohibited by affixing durable signs at conspicuous places in accordance with the German Workplace Ordinance (ASR) 1.3.

The steam boiler owner shall nominate the persons being authorized to access.

4 Indoor installations

The boiler room shall not have any direct connection by doors, windows, or other openings to rooms that may be subject to fire[1] or explosion hazards, to residential rooms[2] and stairwells. Partition walls and ceilings between these rooms shall be fire-resistant. Pipework penetrations through such walls shall be designed to provide fire-safe protection.

It shall be possible to sufficiently vent the boiler room. To this end, openings shall be provided at suitable locations.

If combustion air is to be taken from the boiler room this shall be taken into account in the dimensioning of openings for incoming or exhaust air. In this case, care shall be taken to ensure that the boiler can only be operated if these openings are sufficiently open.

Principally, no vacuum pressure greater than 0.5 mbar shall exist in the boiler room. Higher vacuum pressures are permitted if the operability of the doors and escape exits, if any, is not impaired. In addition, care shall be taken to ensure that the vacuum pressure in the boiler room does not endanger the safe operation of the firings systems including flue gas discharge.

Platforms, temporary staging and the like shall not impair the ventilation of the boiler room. In addition, the regulations of the German Workplace Ordinance apply.

Steam boilers shall not be installed (except for the deviating cases mentioned hereafter)

- in, below or adjacent to residential rooms

as well as

- in, below and above social rooms[3] and work rooms[4].

Deviating here from, stationary steam boilers mentioned under clauses 5.1 (1), (2), (3) may be installed

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1 Storage rooms for non-pulverized coal are not considered to be exposed to fire hazards.

2 This does not apply to stairwells exclusively serving the erection of steam generators; otherwise, stairwells shall be provided with anterooms if they provide direct access to the boiler room.

3 Rooms where a great number of persons are present for a certain time, among others wash-rooms, changing and rest rooms.

4 Rooms without fixed workplaces that will be entered only occasionally, as well as unit control rooms and rooms for pertinent machinery plants which are operated by the boiler attendant or from a control room, do not belong to this type of rooms.

- below, above and adjacent to residential rooms,
- below and above social rooms,
- in, below and above work rooms.

5 Pressure relief areas

Pressure relief areas primarily serve the purpose of maintaining the stability of the building supporting structure in case of unplanned pressure rise due to escaping steam or hot water in the boiler room.

The boiler room area comprises the actual boiler house area without adjacent building areas (e.g. coal handling plant, air preheater and flue-gas cleaning plant in the case of coal-fired power plants) or structural works (turbine house, auxiliary steam boilers and other related systems).

5.1 Buildings with closed supporting structures

Buildings with closed supporting structures show supporting outer walls consisting of masonry, reinforced concrete or similar related materials. Failure of these components may cause failure of individual supporting structures or total building failure.

Each boiler room in such buildings shall be provided with uncovered, uninterrupted exterior wall and/or ceiling areas of at least 1/10 of the boiler room floor area, which in case of overpressure in the boiler room give in more readily to relieve the pressure than the other outer wall/ceiling areas.

In boiler rooms with several boilers or in very large installation rooms this pressure relief area may be reduced to 1/6 of the projected basic area of the largest boiler installed plus a peripheral projection area of 2.0 m.

Alternatively, the dimensions of the pressure relief areas may be determined in dependence of the net volume of the boiler room and the possible damage scenarios within hazard assessment to avoid negative impacts on the building structure stability.

Pressure relief areas are neither required for boiler rooms of steam boilers provided with failsafe or self-checking low-water protective devices, e.g. water level, flow and temperature limiters to DIN EN 12952-11, or DIN EN 12953-9 nor are required

(1) for steam boilers where the product of water volume, in litres, at the lowest water level NW[5] and the allowable working pressure P_B, in bar, or the saturation pressure, in bar, coincident with the allowable flow temperature in the case of hot-water generators does not exceed the number of 20,000, the allowable working pressure P_B or the saturation pressure coincident with the allowable flow temperature in the case of hot-water generators does not exceed 32 bar, the water volume does not exceed 10,000 litres at lowest water level NW and the allowable steam output does not exceed 2 t/h per steam generator or the allowable heat output does not exceed 1.2 MW per hot-water generator;

[5] In the case of steam boilers without defined lowest water level the total volume shall govern.

or if

(2) at an allowable working pressure P_B for steam generators or at a saturation pressure coincident with the allowable flow temperature up to 32 bar for hot-water generators and at an allowable steam output up to 10 t/h for steam generators or at an allowable heat output up to 7 MW for hot-water generators, the external diameter of all heated boiler components subject to direct flue gas flow does not exceed 60.3 mm and no boiler components with an internal diameter greater than 150 mm are used;

or if

(3) at an allowable working pressure P_B for steam generators or at a saturation pressure coincident with the allowable flow temperature up to 32 bar for hot-water generators and at an allowable steam output up to 5 t/h for steam generators or at an allowable heat output up to 3.5 MW for hot-water generators, the external diameter of all heated boiler components subject to direct flue gas flow does not exceed 60.3 mm, and the product of the allowable working pressure P_B, in bar, for steam generators or the saturation pressure, in bar, coincident with the allowable flow temperature in the case of hot water generators and of the water volume, in litres, at lowest water level of all boiler components with an internal diameter exceeding 150 mm, does not exceed the number of 10,000 per steam boiler.

5.2 Buildings with open supporting structures (skeleton structure)

Buildings with open supporting structures consist of supporting steel or concrete skeleton structures with non-supporting envelopes or web bracings made of panels, trapezoidal sheet cladding, non-supporting masonry, or similar construction.

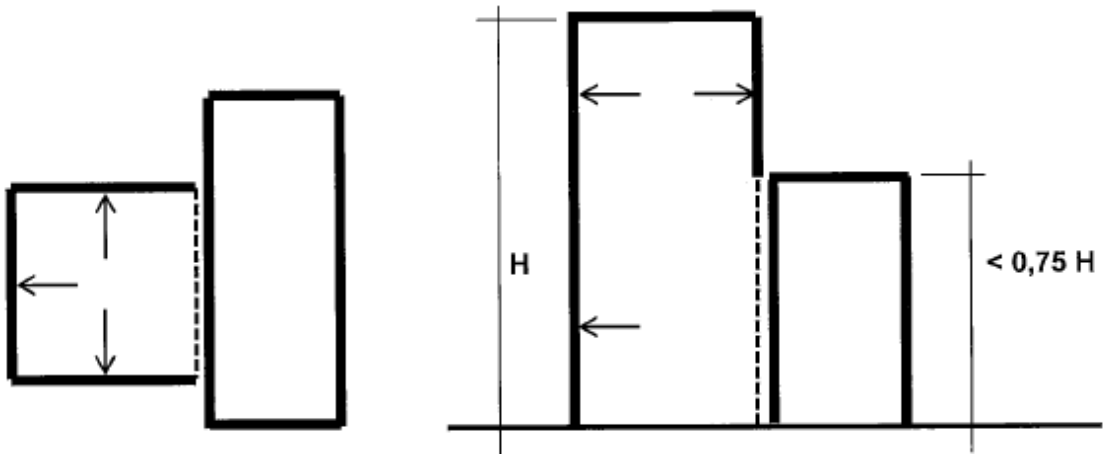
In the case of buildings with supporting structures that are open to all sides the provision of pressure relief areas for maintaining supporting structure stability is not required.

Nevertheless, it is recommended to provide pressure relief areas comprising 2.5% of the boiler room floor area to avoid failure of the building envelope.

Where boiler rooms are covered on three sides by a structural envelope and the fourth side are uncovered to the turbine hall or other structural works, the boiler room stability to withstand any excessive pressure rise shall be substantiated by way of calculation. In such a case, the forces acting on the opposing surfaces – contrary to the case where all sides are covered – will not be neutralized as regards total system stability.

Where pressure relief areas of at least 2.5% are provided and the elevation of adjacent structural works (e.g. turbine hall) amounts to 75% of the boiler house elevation, the stability of the boiler house to withstand any excessive pressure rise may not be substantiated by way of calculation in the case of once-through steam generators.

For buildings showing open and closed supporting structures (mixed construction) the procedural steps under section 4 shall be taken. Alternatively, a more exact analysis shall be made.



Plan view Side view

Arrangement of buildings

5.3 Construction of pressure relief areas and partition walls as delimitation to adjacent rooms

Pressure relief areas shall be designed as uninterrupted structures wherever possible. Greater areas such as openings for incoming or exhaust air may be taken into account if it can be ensured that they are open during plant operation. Roller door surface areas may be included in the design as they generally will give in in case of excessive pressure rise.

Pressure relief areas should not discharge towards public traffic routes. Otherwise, public traffic routes shall be protected against falling-down objects or possible hazards through projection of fragments.

Partition walls as delimitation to adjacent rooms or buildings shall not be designed to withstand excessive pressure rise if they do not

- delimit external areas, or
- divide rooms into separate fire zones, or
- separate permanent workplaces

Walls to external areas or walls dividing rooms into separate fire zones shall locally be designed for the set pressure of the pressure relief openings. Where no pressure relief areas are required on account of the provisions under section 5.2, the set pressure may be fixed to 3.0 kN/m^2. The load case shall be considered an extreme effect to DIN EN 1991.

6 Effective date

This guideline shall apply immediately upon its publication to the erection of stationary land-based steam boilers according to section 1.

Cologne, 1st September 2014
Bundesindustrieverband Deutschland Haus-, Energie- und Umwelttechnik e. V.
Signed: Lücke

Essen, 4th August 2014
VGB PowerTech e.V.
Signed: Christensen

Berlin, 12th September 2014
VdTÜV Verband der Technischen Überwachungs-Vereine e.V.
Signed: Dr. Brüggemann

Düsseldorf, 11th August 2014
FDBR e. V. Fachverband Anlagenbau
Signed: Dr. Maaß