RMG Sustainability Council (RSC)

Technical Guidelines for Boiler Inspection©

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TABLE OF CONTENTS

Disclaimer

The technical requirements of this guidelines are intended for use by professional Engineers, Boiler specialist, Boiler Inspector who are competent to evaluate the significance and limitation of its content.

Compliance with the RSC Boiler Inspection Technical Guidelines do not exempt the user from legal responsibilities.

If there is any ambiguity or uncertainty as to the meaning or effect of any part of the boiler inspection technical guidelines, or anything that should be done or omitted in order to fully comply with this document, the question shall be referred to the Chief Safety Officer (CSO) of the RSC.

Part 1: Scope and Definitions

1.1 Scope:

This document addresses and establishes minimum criteria to minimise danger to life and contribute to operating safety and prevent uncontrolled fire, explosion and boiler failures.

1.2 Application:

This document is to provide guidance for the maintenance, repair, movement, water treatment requirement, owner responsibility of all boilers and pressure vessels used for RMG sectors in Bangladesh. "This Technical Guidelines" include the requirements for the prevention of over-heating and inadmissible over pressurisation of boilers & pressure vessels. All other requirements from Bangladesh Boiler Act - 2022, Boiler Use & Inspection Guideline - Office of the Chief Inspector of Boilers, and Bangladesh Boiler Regulation 1951 Amended 2007 shall apply or CIoB approved Boiler Standards according to which designed.

1.3 Purpose:

The purpose of this "technical guidelines" is to establish a common set of minimum requirements that provide a uniform and effective method for assessing boiler & pressure vessel safety in new and existing readymade garment factories utilized by the RSC covered factories.

1.4 Definitions:

This document developed by the RMG Sustainability Council (RSC) on boiler may be defined as "the Boiler Inspection Technical Guidelines". All definitions as stated in Boiler Act 1923 & Boiler Regulation 1951 Amended 2007 shall apply to this Technical Guidelines, except as specifically supplemented or changed herein. Additional definitions are provided within each part of this "technical guidelines".

A. Boiler Act means the Bangladesh Boiler Act (BBA), 1923

B. Boiler Regulation means the Bangladesh Boiler Regulation (BBR) 1951 Amended 2007

C. RSC means the RMG Sustainability Council

D. Chief Safety Officer (CSO) means the Chief Safety Officer of the RMG Sustainability Council.

E. Office of the Chief Inspector of Boilers (CIoB) means the regulatory authority of boilers for the Government of the Peoples' Republic of Bangladesh.

F. Inspector means RSC Boiler Safety Engineer.

G. Existing Boiler means a boiler that has been registered with the office of the Chief Inspector of Boilers (CIoB) before[*] 11 February 2021.

H. New Boiler means a boiler that has been registered with the office of the Chief Inspector of Boilers (CIoB) from[*] 11 February 2021.

I. Small Boiler: "Small Industrial Boiler" means:

i. a shell type boiler generating steam for use external to itself under pressure up to 7 kg/cm^2 and having a volumetric capacity exceeding 25 litres but not exceeding 500 litres including the volumetric capacity of all pressure parts being heated from the same heating source and connected to the boiler, or

[*] *Date on which the Bangladesh National Building Code 2020 was gazetted*.

ii. a coil type boiler or a once-through boiler or a water tube boiler having the conditions specified in clause (i) about except that:
   - the limitation of pressure shall be 7 kg/cm^2, and
   - the capacity shall not be exceeding 150 litres.

J. Reserved

Part 2: Administration and Enforcement

The administration of this “Technical Guidelines”, including establishing inspection protocols and conducting factory compliance inspections, will be administered by the RMG Sustainability Council (RSC). Jurisdictional requirements describe the frequency, scope, type of inspection, whether internal, external, or both, and type of documentation required for the inspection. The Inspector shall have a thorough knowledge of jurisdictional regulations where the item is installed, as jurisdictional or regulatory inspection requirements do vary.

Part 3: General Requirements of Boiler & Pressure Vessel (B & PV)

This section describes the requirements for Boiler & Pressure Vessel (B & PV) based on evaporation capacity, design & working pressure.

3.1 Definition:

A. **Boiler:** "Boiler" means any closed vessel exceeding 25 litres in capacity which is used expressly for generating steam under pressure and includes any mounting or other fitting attached to such vessel, which is wholly or partly under pressure when steam is shut off. Such capacity is measured from the feed check valve to the main steam stop valve.

B. **Non-BBR Boiler:** Closed vessel less than 25 litres in capacity, which is used to generate steam under pressure and above 1 bar (14.5 psi).

C. **Pressure Vessel:** Pressure Vessel means a housing designed & built to contain gases or liquids under pressure.

D. **Vessel:** 'Vessel' means a housing designed and built to contain fluids under pressure including its direct attachments up to the coupling point connecting it to other equipment; a vessel may be composed of more than one chamber.

E. **Pressure Equipment:** "Pressure Equipment' means boilers, vessels, piping, safety accessories and pressure accessories, including, where applicable, elements attached to pressurized parts, such as flanges, nozzles, couplings, supports, lifting lugs.

F. **Owner:** "Owner" includes any person using a boiler as agent of the owner thereof and any person using a boiler which he has hired or obtained on loan from the owner thereof.

G. **Pressure:** 'Pressure' means pressure relative to atmospheric pressure, i.e., gauge pressure. Therefore, vacuum is designated by a negative value.

H. **Design Pressure:** The pressure used in the design of a vessel component together with the coincident design metal temperature, for the purpose of determining the minimum permissible thickness of physical characteristics of the different zones of the vessel. When applicable, the static head shall be added to the design pressure to determine the thickness of any specific zone of the vessel.

I. **Working Pressure:** "Working Pressure" shall mean gauge pressure above atmospheric pressure in kg/cm^2 or psi.

J. **Maximum Allowable Working Pressure:** The maximum gauge pressure permissible at the top of a completed vessel in its normal operating position at the designated coincident temperature for that pressure. This pressure is the least of the values for the internal or external pressure to be determined by the rules of this division for any of the pressure boundary parts, including the static head thereon, using nominal thicknesses exclusive of allowances for corrosion and considering the effects of any combination of loadings listed in UG-22 that are likely to occur at the designated coincident temperature. It is the basis for the pressure setting of the pressure relieving devices protecting the vessel. The design pressure may be used in all cases in which calculations are not made to determine the value of the maximum allowable working pressure.

'Maximum allowable pressure' means the maximum pressure for which the equipment is designed, as specified by the manufacturer, and defined at a location specified by the manufacturer, being either the connection of protective and/or limiting devices, or the top of equipment or, if not appropriate, any point

specified.

It is also known as the pressure at which the safety valve(s) is/are set and as specified in the boiler certificate issued by the CIoB.

K. **Maximum/Minimum Allowable Temperature:** 'Maximum/Minimum Allowable Temperature' means the maximum/minimum temperatures for which the equipment is designed or as specified by the manufacturer.

L. **Hydrotest Pressure:** Hydrotest Pressure is the required pressure that pressurised systems such as vessels, pipelines, plumbing, gas cylinders, boilers, tanks can be tested for strength and leak by water.

3.2 General Provisions:

A. **Permission:** No boiler shall be installed and/or operated in the RMG factories of Bangladesh without the permit issued for the purpose by CIoB. Before commissioning of the boiler, a certificate of compliance shall be obtained from the Chief Inspector of Boilers and a copy provided.

B. **Certificate**: The owner shall ensure that an appropriate registration certificate as per Bangladesh Boiler Regulation 1951 Amended 2007 is issued by the CIoB prior to the operation of the unit. The certificate shall be kept on file by the owner, ready and available to be presented during the inspection. The registration number issued by the CIoB shall be marked permanently thereon in the prescribed manner according to Bangladesh Boiler Act 1923.

C. **Nameplate:** Every boiler & pressure vessel shall bear the manufacturer's nameplate affixed on the boiler in a conspicuous position with detailed technical specifications as per Bangladesh Boiler Regulation 1951 Amended 2007. The nameplate shall be clearly visible & readable.

D. **Identification marks:** According to Bangladesh Boiler Regulation 1951 Amended 2007, each boiler shall be permanently and clearly marked on the boiler at Inspecting Authority's designated place with:
   - Manufactures Identification Mark
   - Inspection Authority's Stamps
   - Date of Hydrostatic Pressure Test and the Year of Manufacture
   - Hydrostatic Test Pressure
   - Permissible Working Pressure
   - Permissible Working Temperature (For boilers with Superheaters)

E. **Ownership:** Any removal and/or change of location or ownership of a steam boiler or pressure vessel shall be reported to the CIoB by the old and new owners not later than thirty (30) days after the sale or transfer. Such boiler or pressure vessel shall not be operated or used without the required written permit from the CIoB.

F. **Operation:** All temporary or permanent boilers shall be operated only by licensed operators. The minimum personnel required in the operation of boilers shall be in accordance with the Bangladesh Boiler Act 2022. The owner or owner's representative shall verify that operators are trained and competent to operate the equipment under all conditions prior to their operation of such equipment.

G. **Boiler Design, Calculation, Construction, Workmanship & Inspection:** It shall be as per Bangladesh Boiler Regulation 1951 Amended 2007 or respective boiler standard. If the boiler shell is not in accordance with standard conditions, Bangladesh Boiler Regulation 1951 Amended 2007 shall apply. Minimum thickness of plate & tube shall be as per respective Boiler Standards.

H. **Prohibition of Use:** According to Bangladesh Boiler Act 2022, no owner of a boiler shall use the boiler or

permit it to be used:

- Unless it has been registered in accordance with the provisions of this Act
- Unless a certificate or provisional order authorising the use of the boiler is for the time being in force under this Act
- At a pressure higher than the maximum pressure recorded in such certificate or provisional order
- Where the Government has made rules requiring that boilers shall be in charge of persons holding certificates of competency, unless the boiler is in charge of a person holding the certificate required by such rules: provided that any boiler registered, or any boiler certified or licensed, under any Act hereby repealed shall be deemed to have been registered or certified, as the case may be, under this Act.

3.3 Documentation:

The required documents related to boiler design, calculation, construction, inspection, product certificates, manufacturer´s operation instructions, electrical wiring diagram, Process and Instrumentation Diagram (P&ID) shall be available on site. Other documents such as maintenance logbook, flue gas analysis report, water quality analysis report etc. shall be maintained as recommended by the manufacturer or in accordance with the local approval & inspecting authority. The documentation shall comply with Bangladesh Boiler Regulation 1951 Amended 2007.

3.4 Safety Valve:

A. **Requirements:** Each boiler shall be equipped with at least two (2) safety valves with a minimum diameter of ¾ inch for a new boiler. For existing boilers, the minimum number of safety valves shall be as per the boiler design standard & safety valve calculation. The safety valve(s) shall be:
   - Placed as close as possible to the boiler
   - Connected to the boiler independent of any other steam connection
   - Placed between the boiler and the discharge point when installed in the pipeline
   - No valve of any description shall be placed between the safety valve and the boiler, and not on the discharge pipe from the safety valve to the atmosphere

B. **Safety Valve Capacity:** The minimum relieving capacity of the safety valve shall be sufficient to discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 10 percent above maximum allowable working pressure or depending on the relevant boiler design standard.

C. **Safety Valve Materials:** Seats and discs of safety valve for boilers shall be of suitable corrosion-resistant materials and the seat shall be secured on the valve body to avoid the possibility of these at lifting off.

D. Safety valves for boilers shall be:
   - Capable of being adjusted and set to operate without chattering
   - Sealed or otherwise protected to prevent tampering from any unauthorized person
   - Provided with a special means for lifting the valve for testing purposes
   - Located to enable the boiler attendant to hear readily the discharge
   - Safety valve shall be mounted in vertical position or shall follow manufacturer published installation guidelines
   - Safety valve manual operating lever should be available and always in line with operation in

accordance with Manufacturer's guidance or as approved by the CIoB

E. **Safe Discharge of Safety Valve Outlet:** Safety valves discharge outlets for boiler shall be located or piped out away from running boards and platforms, preferably not less than 3 meters (10 ft) above the platforms. When the discharge pipes are used on safety valves for boilers, they shall be:
   - Not less in cross-sectional area than the full area of the valve outlets, and
   - Fitted with open drains to prevent water lagging in the upper part of the valves or in the discharge pipes.

F. **Safety or Relief Valve on Economizer:** Economizers used on boilers shall be equipped with at least one (1) safety valve provided with seats and discs of corrosion resistant materials if there is an isolating valve between the drum and economizer.

   Or

   Economizers with pressure parts of cast iron and arranged in groups of tiers connected by circulating piping shall have a safety valve fixed on each group of tiers. Safety valves should have a minimum diameter of 2 inches.

3.5 Steam Stop Valve:

Requirement of Steam stop valve shall meet BBR or CIoB approved Boiler Standards according to which designed.

3.6 Feed Check Valve:

Requirement of feed check valve shall meet BBR or CIoB approved Boiler Standards according to which designed.

3.7 Fusible Plug:

If applicable, the requirement of the fusible plug shall meet BBR or CIoB approved Boiler Standards according to which designed.

3.8 Pressure Gauge:

Pressure gauge & ancillary equipment shall meet BBR or CIoB approved Boiler Standards according to which designed. According to Bangladesh Boiler Regulation 1951 Amended 2007, the steam pressure gauge shall have its dial graduated to not less than twice the maximum allowable working pressure of the boiler. The diameter of the dial shall be at least 100 mm and the pipe connecting the pressure gauge shall be a minimum of 10 mm and the connection shall be through a siphon.

3.9 Water Level Monitoring Equipment:

Water level gauge & other equipment shall comply with Bangladesh Boiler Regulation 1951 Amended 2007 or CIoB approved Boiler Standards according to which designed. According to Bangladesh Boiler Regulation 1951 Amended 2007, every boiler shall be fitted with two independent means of indicating the water level.

3.10 Drain & Blowdown:

Drain & Blowdown shall meet Bangladesh Boiler Regulation 1951 Amended 2007 or CIoB approved Boiler Standards according to which designed.

3.11 Chimney:

A vertical duct or stack which finally conveys products of combustion from the boiler flue or flues or from the boiler to the atmosphere. Chimneys or stacks shall be installed in accordance with the manufacturer's recommendations or as approved by the CIoB.

3.12 Purging:

The volume of air required for purging is dependent on the needs of the application and the burner may be required to provide part of or all of the air, according to the extent to which other fans on the boiler can contribute. The purge period is therefore an application-dependent variable. Provision of a second purge period, immediately following controlled shutdown is recommended where a corrosive atmosphere is likely to remain in the boiler. The purging system shall comply with the following requirements:

- Purging air shall be provided by mechanical means.
- Purging shall occur automatically at the correct time(s) in the starting and operating sequence. Where on a multi fuel burner a change from one main burner fuel to another is to be made, purging shall occur before the introduction of the second fuel.
- The purging air flow rate shall be as high as possible and not less than 25 percent of the maximum combustion air flow rate.
- The purge period shall ensure that not less than 5 times the volume swept by the products of combustion in their flow from the burner to the boiler flue connections has been purged to the atmosphere or according to the CIoB approved Boiler Standards according to which designed.
- The purging air shall be circulated so that its distribution is adequate and no zone within the combustion space remains unpurged.

3.13 Water Quality:

A. The water quality shall be in accordance with EN 12953-10 and/or EN12952-12 and/or the manufacturer's operating instructions.

B. It shall be possible at any time during operation to safely take reliable samples of the boiler water, feedwater, make-up water and if relevant the condensate and/or the recirculation water. Depending on the temperature of the media, the samples shall be taken through one or more sample coolers.

C. Boiler feed water quality & make up water shall be manually monitored after every two hours by a competent technician with calibrated test meters.

D. No harmful matter such as oil, grease, organic material, acid, lye, seawater etc. shall contaminate or enter boiler feed water or make up water or condensate water.

3.14 Repair, Structural Alteration, Addition or Renewal:

A. Repair or structural alteration of the boilers before the adoption of this "technical guidelines" shall meet Bangladesh Boiler Regulation 1951 Amended 2007 & Bangladesh Boiler Act 1923. Repair or structural alteration of the Boiler & pressure vessel after the adoption of this "technical guidelines" shall meet the following in accordance with the latest revision, are hereby adopted:

- ASME Boiler and Pressure Vessel Code
- ASME Code for Pressure Piping
- ISO Codes
- European Standard
- Australian Standard

- Bangladesh Boiler Regulations & CIoB approved boiler standards.

B. Major repair work on pressure parts of boilers shall be done after the details of the repair and the design plan shall have been processed and approved by the CIoB. After repairs, the boiler shall not be operated or used without the written permit issued by an authorised person of CIoB.

C. Boilers found unsafe are not permitted to operate until the boiler defect/s is/are corrected and their fittings are in good condition to ensure safe operation.

D. Safety Valve: Safety valves shall be adjusted to at least 70 kPa in excess of working pressure.

3.15 Feed Pump:

Requirements of feed water pump shall comply with BS EN 12952–7 or CIoB approved standards according to which designed. For small industrial boilers, according to Bangladesh Boiler Regulation 1951 Amended 2007, every boiler shall be provided with at least one feed pump.

3.16 Ladders and Runways:

A. All walkways, runways, and platforms shall be:
- of metal construction or equivalent material
- provided between or over the top of boilers, heaters, or vessels that are more than 8 ft (2.4 m) above the operating floor to afford accessibility for normal operation, maintenance, and inspection
- constructed of safety treads, standard grating, or similar material and have a minimum width of 30 inches (760 mm)
- of bolted, welded, or riveted construction, and
- equipped with handrails 42 inches (1070 mm) high with an intermediate rail and 4 inches (100 mm) toe board.

B. Stairways that serve as a means of access to walkways, runways, or platforms shall not exceed an angle of 45 degrees from the horizontal and be equipped with handrails 42 inches (1070 mm) high with an intermediate rail.

C Ladders that serve as a means of access to walkways, runways, or platforms shall:
- be of metal construction and not less than 18 inches (460 mm) wide.
- have rungs that extend through the side members and are permanently secured.
- have a clearance of not less than 30 inches (760 mm) from the front of rungs to the nearest permanent object on the climbing side of the ladder.
- have a clearance of not less than 6.5 inches (165 mm) from the back of rungs to the nearest permanent object
- have a clearance width of at least 15 inches (380 mm) from the centre of the ladder on either side across the front of the ladder.

D There shall be at least two permanently installed means of exit from walkways, runways, or platforms that exceed 6 ft (1.8 m) in length.

3.17 Reserved

3.18 Reserved

Part 4: Requirements for Boiler & Pressure Vessel Room

This section describes the requirements for Boiler & Pressure Vessel room.

4.1 General:

The boiler room should be identified clearly. Appropriate signage regards Identification, working conditions of the boiler (hot or cold or under maintenance) and hazardous equipment must be displayed in accordance with the factory's Risk Assessments and Health & Safety Policy.

4.2 Fire Protection:

A. The boiler room and areas containing heating plants shall be separated from the rest of the occupancy as per BNBC 2020.
B. Two Dry Chemical Powder (DCP) type fire extinguishers minimum of 5 kg capacity each shall be kept at easily accessible locations.
C. Provision for Fire Detection & Alarm and suitable Suppression System inclusive of portable fire extinguishers must be installed in accordance with RSC Technical Guidelines (Standard) Part 5 and BNBC 2020 Part 4, NFPA 13, 14, 20, 72, 86 Chapter 9 and NFPA 10 (for portable fire extinguishers).
D. In case of oil-fired boilers, the capacity and requirements of storage of flammable liquids shall comply with the RSC Technical Guidelines (Standard) Section 3.4.2.1.9.

4.3 Clearance/Access:

The requirement for doors and/or exits in the boiler room shall comply with NFPA 101. Detailed general arrangements of boiler houses & pressure vessel rooms including the location, identity, size and rating of each apparatus. Clearance around the boiler to the boiler room wall or any equipment shall be provided at least 100 cm (3.28 ft.) for proper operation, including visibility of all gauges, for the inspection of all surfaces, tubes, waterwalls, economizers, piping, valves and other equipment, and for maintenance and repair, including replacement of tubes. Boiler clearances shall remain free of all items, including temporarily stored items, other than boiler piping and trim. Boiler piping and trim shall not impede access to the boiler.

Boiler installations shall allow for normal operation, maintenance, and inspections. There shall be at least 36 inches (915 mm) of clearance on each side of the boiler to enable access for maintenance and/or inspection activities. Boilers operated in battery shall not be installed closer than 48 inches (1220 mm) from each other. The front or rear of any boiler shall not be located nearer than 36 inches (915 mm) from any wall or structure.

Note: Alternative clearances in accordance with the manufacturer's recommendations are subject to acceptance by the CioB.

4.4 Emergency Shutdown:

An emergency stop button should be installed at the boiler and outside near the entrance door. Emergency alarms should be provided (horn and lighting) in accordance with the manufacturer's information and NFPA 85. In the event of failure of automatic control devices, the boiler shall be capable of being brought under immediate manual control and shall be dealt in accordance with Bangladesh Boiler Regulation 1951 Amended 2007 and NFPA 85.

4.5 Ventilation Systems:

4.5.1 Natural Ventilation: Natural Ventilation of an occupied space shall be through windows, doors, louvres, skylights, or other openings to the outdoors. Such ventilating openings shall open to the sky or a public street, space, alley, park, highway, yard, court, plaza or other approved space which complies with the requirements of the building code.

4.5.2 Area of Ventilating Openings: The minimum ventilating opening to the outdoors shall be four percent of the floor area being ventilated:

- Adjoining Spaces: Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the unobstructed opening to the adjoining rooms shall be at least eight percent (8%) of the floor area of the interior room or space, but not less than 2.33 m^2. The ventilation openings to the outdoors shall be based on the total floor area being ventilated.
- Opening below Grade: Openings below grade shall be acceptable for natural ventilation provided the outside horizontal clear space measured perpendicular to the opening is one and one-half times the depth below the average adjoining grade.

4.5.3 Mechanical Ventilation: Mechanical Ventilation shall be provided by a method of supply air and return or exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air; however, the system shall not be prohibited from producing a negative or positive pressure. The ventilation system ducts and equipment shall be designed and installed in accordance with BNBC 2020.

4.5.4 Ventilation Air Quantity: The minimum amount of air circulation rate for ventilation shall be determined based on the occupant load/space area and use of the building in accordance with the BNBC 2020 Table 8.2.6. The air circulation rate specified in the BNBC 2020 Table 8.2.6 shall be equal to the combined total of outside air and re-circulated air.

4.5.5 Minimum Outdoor Air: In no case, the ventilation air quantity shall be lower than 2.5 l/s per person.

4.5.6 Air Temperature: The temperature differential between ventilation air and air in the conditioned space shall not exceed 5.5 degrees Celsius except for ventilation air that is part of the air-conditioning system.

4.5.7 Recirculation: Not more than 67 percent of the required ventilation air shall be permitted for recirculation when the concentration of particulates is less than specified in Table 8.2.7 of BNBC 2020. Air in excess of the required ventilation air shall be permitted to be completely recirculated. Air shall not be recirculated to another dwelling unit or occupancy of dissimilar use. Not more than 85 percent of the required ventilation air shall be permitted for recirculation when the system is equipped with effective adsorption or filtering equipment so that the condition of the air supplied to the room or space is within the quality limitations.

4.6 Illumination: Minimum illumination level in the boiler house is 150 lux and is to be accomplished in accordance with Table 8.1.10, BNBC 2020.

4.7 Flash Steam Discharge: Flash Steam Discharge pipe size shall be properly designed. In the absence of such analysis, the diameter of the vent pipe should be 4 times the diameter of the inlet pipe & the vent pipe shall be located in a safe place considering Occupational Health & Safety (OH&S).

4.8 Pressure Relief Area:

Fuel-fired boilers, furnaces and furnaces that contain flammable liquids, gases, or combustible dust shall be equipped with unobstructed explosion relief for freely relieving internal explosion pressures except in the following cases:

Requirements of pressure relief area: Pressure relief area will be appliable as per the following conditions:

A. **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:

- For steam boilers where the product of water volume, in litres, at the lowest water level LL and the allowable working pressure PB, 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 PB 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 LL 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.

  or if

- At an allowable working pressure PB 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

- At an allowable working pressure PB 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 PB, 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 the 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.

B. **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 is 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.

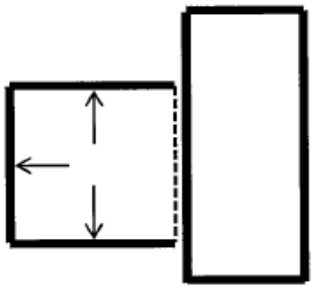


Figure 1: Plan view

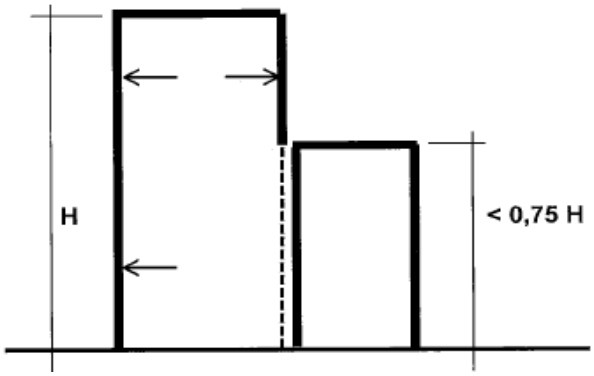


Figure 2: Side view

C. **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 any 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, the set pressure may be fixed to 3.0 kN/m². The load case shall be considered an extreme effect.

4.9 Reserved

Part 5: Boiler Inspections

5.1 Scope:

This section provides general and detailed inspection requirements and guidelines for pressure-retaining items to determine corrosion deterioration and possible prevention of failures for boilers, pressure vessels, piping, and pressure relief devices. Materials to be inspected shall be suitably prepared so that any surface irregularities will not be confused with or mask any defects. Material conditioning such as cleaning, buffing, wire brushing, or grinding may be required by procedure, or if requested by the Inspector. The Inspector may require insulation or component parts to be removed.

5.2 Hydrostatic Pressure Test and Internal Inspection:

Every Boiler & Pressure vessel shall be hydraulically tested every year in presence of an RSC Engineer as per the RSC inspection scheduling process. The factory shall submit a copy of CIoB approved test results to the RSC accomplished in accordance with the local jurisdiction.

5.2.1 Access and Inspection:

The boiler shall be equipped with suitable manholes or other openings for inspection on fire side. Manhole, mudhole or other opening sizes shall meet appropriate regulations in accordance with which boiler has been designed.

5.2.2 Preparation for Inspections:

Preparation for Hydrostatic Pressure Test and Internal Inspection shall be done in accordance with Bangladesh Boiler Regulation 1951 Amended 2007:

- At every examination of a boiler, the boiler shall be empty and thoroughly cleaned all its parts. Except as provided for all doors of manholes, hand holes and sight holes and cleaning plugs and all caps in the headers and mud drums of water-tube boilers all fire-bars, bearers, front plates, bridge plated, fire bridges brick arches, oil fuel burners and mechanical stoker fittings shall be removed. All valves and cocks comprising the boiler mountings shall be opened up and taken apart and the valves or cocks ground, when necessary, before the Inspectors' visit.
- Provision shall, if required by the Inspector, be made for the removal of lagging or brick-work or other concealing parts and for the drilling of plates and for verifying the pressure gauge and safety valve dimensions and weights.
- All smoke tubes, exterior of water tubes, smoke boxes and external flues shall be swept clean.
- Provision shall be made for the effective disconnection of all steam and hot water communication with any other boiler under steam as prescribed in chapter X of the Bangladesh Boiler Regulation 1951 Amended 2007. This shall be effected either by the removal of a length of pipe from the steam and feed piping or by the insertion of substantial blank flanges. Where blank flanges are employed, they shall be inserted between the flange of the chest and the pipe attached to it.
- No blank flange shall be inserted between a safety valve chest and the boiler.

5.2.3 Preparation for Hydrostatic Pressure Test:

- The chests of all mountings subject to steam pressure shall be in place and shut tight or blank flanged.
- The safety valves shall either be jammed down or removed and the chest-opening blank flanged.

- The attachment for the Inspector's pressure gauge and the nipple for connecting the Inspector's test pump hose shall be in order.
- All doors shall be properly jointed and tightened up. The boiler shall be completely filled with water care being taken to allow air to escape and if possible, a preliminary test not exceeding the working pressure of the boiler shall be taken before the Inspector's visit to test the tightness of the joints.
- When a boiler is hydraulically tested for the first time it shall entirely be cleared of lagging or brickwork; at subsequent tests, the lagging or brickwork portions thereof shall be removed if required by the inspector.

5.2.4 Test Pressure:

Hydrostatic pressure tests shall be applied by raising the pressure gradually to not less than 1.5 times & for small boilers, 2 times the maximum allowable working pressure as shown on the data report to be stamped on the boiler or as approved by the CIoB.

5.2.5 Procedure of Hydrostatic Pressure Test:

- The boiler shall satisfactorily withstand test pressure without appreciable leakage or undue deflection or distortion of its parts for at least ten consecutive minutes.
- After the application of the hydraulic test the Inspector shall carefully examine the boiler inside and outside and satisfy himself that it has satisfactorily withstood the test.
- Should any part of the boiler show undue deflection or indication of a permanent set during the progress of the test the pressure shall be released immediately after such indications are observed. The working pressure for the part shall be 40 percent of the test pressure applied when the point of the permanent set was reached. This procedure shall apply to any boiler at any test.
- When the internal construction or size of a boiler does not permit the Inspector to get inside it or of examining closely all its parts, s/he shall see it tested by hydraulic pressure to one and a half times the working pressure at each inspection for the grant or renewal of a certificate.
- Water tube locomotive type and all tubular boilers shall be hydraulically tested at each inspection.
- When carrying out the hydraulic test, inspectors shall use a pressure gauge which is duly calibrated

5.3 Internal Inspection:

The Inspector should whenever the size permits go inside it and make a thorough inspection of all its internal parts. Before doing so he should of course satisfy the inspector that proper provision has been made for disconnecting the boiler from any other boiler under steam. Should he/she find that proper provision for disconnection has not been made or that the boiler has not been properly cleaned or scaled or that it is unreasonably hot, she/he should decline to proceed with the inspection and should report the facts to the designated authority. When a boiler is of such a size or its construction is such that the Inspector cannot go inside it, there should be sufficient sight-holes or hand holes provided to enable him to see the principal internal parts if any important part of a boiler is so constructed that the inspector cannot examine it, she/he should report the facts to the designated authority.

5.3.1 Boiler Corrosion Considerations:

- Corrosion causes deterioration of the metal surfaces. It can affect large areas, or it can be localized in the form of pitting. Isolated, shallow pitting is not considered serious if not active.
- The most common causes of corrosion in boilers are the presence of free oxygen and dissolved salts in the feedwater. Where active corrosion is found, the Inspector should advise the owner or user to obtain

competent advice regarding proper feedwater treatment.

- For the purpose of estimating the effect of severe corrosion over large areas on the safe working pressure, the thickness of the remaining sound metal should be determined by ultrasonic examination or by drilling.
- Grooving is a form of metal deterioration caused by localized corrosion and may be accelerated by stress concentration. This is especially significant adjacent to riveted joints.
- All flanged surfaces should be inspected, particularly the flanges of unstayed heads. Grooving in the knuckles of such heads is common since there is slight movement in the heads of this design, which causes a stress concentration.
- Some types of boilers have ogee or reversed-flanged, construction which is prone to grooving and may not be readily accessible for examination. The Inspector should insert a mirror through an inspection opening to examine as much surface as possible. Other means of examination, such as the ultrasonic method, may be employed.
- Grooving is usually progressive and when it is detected, its effect should be carefully evaluated, and corrective action should be taken.
- Pitting and corrosion on the waterside surfaces of the tubes should be examined. In vertical firetube boilers, excessive corrosion and pitting is often noted at and above the water level.

5.3.2 Concerns of Specific Types of Boilers:

Description and concerns of specific types of boilers such as Cast-Iron boilers, Firetube boilers, Watertube boilers, Waste Heat boilers, Electric boilers, Thermal Fluid boilers and others shall comply with The National Board Inspection Code (NBIC) or CIoB approved standards according to which designed.

5.4 Functional Test:

5.4.1 Water Level Monitoring: Each steam boiler shall be equipped with three (3) water level limiters. The HWL (High water level), the LWL (Low water level) & the LLWL (Low-Low water level) shall be clearly marked & visible by an attendant from the monitoring position. The Level Limiters cut off and lock out the heat supply when the water level falls to the "LLWL" position & shall activate the monitoring alarm in the boiler room & outside of the boiler room. It should be attended to by the boiler operator and should reset locally. For electrically heated steam boilers, LLWL shall be 30 mm above the uppermost surface of the immersion heaters. Limiters shall be properly operated and maintained to ensure reliability in accordance with the manufacturer's operating instructions & other relevant documents.

5.4.2 Pressure Monitoring: Each steam boiler shall be equipped with at least one pressure limiter to cut off and lock out the heat supply before the set pressure of the safeguard against excessive pressure (safety valve) is reached & shall activate monitoring alarm on the boiler room & outside the boiler room. Limiters shall properly be operated and maintained to ensure reliability in accordance with the manufacturer’s operating instructions & other relevant documents. Abnormal noises, smells, or other noticeable factors shall be inspected.

5.4.3 Fuel Train(s) Automatic Functionality:

5.4.3.1 Purging & Flame Detection: If a flame simulation signal is detected at any time before the means of ignition is activated, the start-up cycle shall cease, and the lockout condition shall occur. As well as trouble alarm shall be activated.

5.4.3.2 Fuel Admission: No fuel shall be admitted to the combustion chamber before the means of ignition has been energized.

5.4.3.3 Spark Ignition Period: The spark ignition system shall comply with the following requirements:

- The spark shall not commence before the completion of the purge period.
- Any pre-ignition spark period shall not exceed 6s.
- The spark ignition period shall cease at the end of the start-flame establishment period.

5.4.3.4 Flame Establishment Period for Spark Ignition: The start-flame establishment period for any spark-ignited pilot shall not exceed 5 seconds.

5.4.3.5 Start Flame Proving: A proving period of not less than 3 seconds shall be provided at the end of any pilot or low-fire flame establishment period, prior to the opening of any main flame fuel valve.

5.4.3.6 Main Flame Establishment Period for Start Flame Ignition: After the main fuel valve has been energized, a period not exceeding the following periods for various fuels shall be provided for main flame establishment:

- For oil or gas, 5 seconds.
- For solid-fuel-in-suspension – as determined during commissioning or as approved by the CioB.

5.4.3.7 Ignition Failure: If the flame that is being ignited, i.e., start or main flame, has not been detected by the end of its flame establishment period, the fuel shall shut off within 3 seconds of the end of the flame establishment period and lockout shall occur.

5.4.3.8 Flame Failure Response: In the event of flame failure during operation, the flame safeguard controller shall shut off power within 2 seconds and lockout shall occur. A period of 3 seconds shall be allowed to include the combined time for the responses of the flame supervision system and the closing of its associated valves.

5.4.3.9 Fail Safe Control System: The boiler management system should incorporate fail-safe components, circuits and techniques so that the loss or removal of a control signal will result in a shutdown and lockout or a resulting situation which is safe.

5.5 External Test

5.5.1. General: The main purpose of the external test is to check the boiler room and surroundings, leakages, pipe & piping systems etc in order to ensure safe operation, maintenance and inspection. External Test shall be executed in accordance with part 3 section 3.4 D, Part 4, and part 5 section 5.4.2 of this document.

5.5.2. Pipe and Piping Systems: All piping requires positive support. A check should be made to ensure there is no shifting or loosing of support brackets and anchors to mitigate seismic effects. Steam line distribution system and other piping arrangements shall be inspected in a part of external inspection & this part shall be in accordance with The National Board Inspection Code (NBIC) or NFPA 86 or Bangladesh Boiler Regulation 1951 Amended 2007 or CioB approved standards.

5.6 Reserved

5.7 Reserved

Part 6: Testing & Maintenance

6.1 General:

The continued safety and reliability of an unattended or limited attendance boiler during its operation is directly dependent on the regularity and quality of the checking, testing and maintenance carried out on the boiler. The checking, testing and maintenance of each unattended or limited attendance boiler should comply with the Annexes (Annexure 1 to Annexure 5) of this document elaborated in the next section. Every boiler owner/user shall keep a boiler maintenance register which shall show the dates of all the tests, internal and external inspections, hydrostatic pressure tests, replacements and repairs. The boiler attendant shall write performed tests like water quality checks etc. and also abnormal observations in a logbook once per shift or daily.

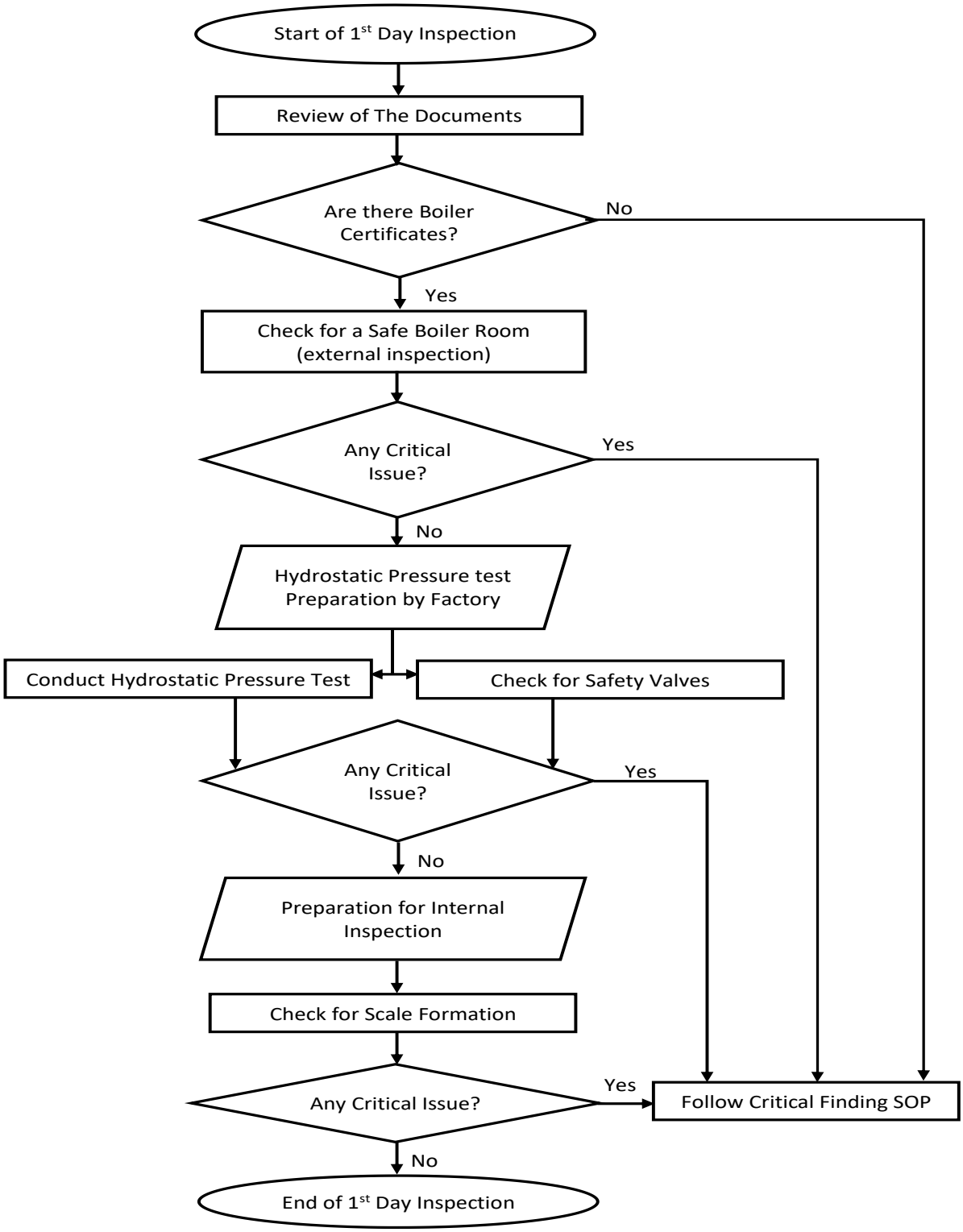
6.2 Periodic Testing and Maintenance:

Periodic and yearly testing and maintenance shall be performed by the contractor under a maintenance contract by the owner or as approved by the CioB.

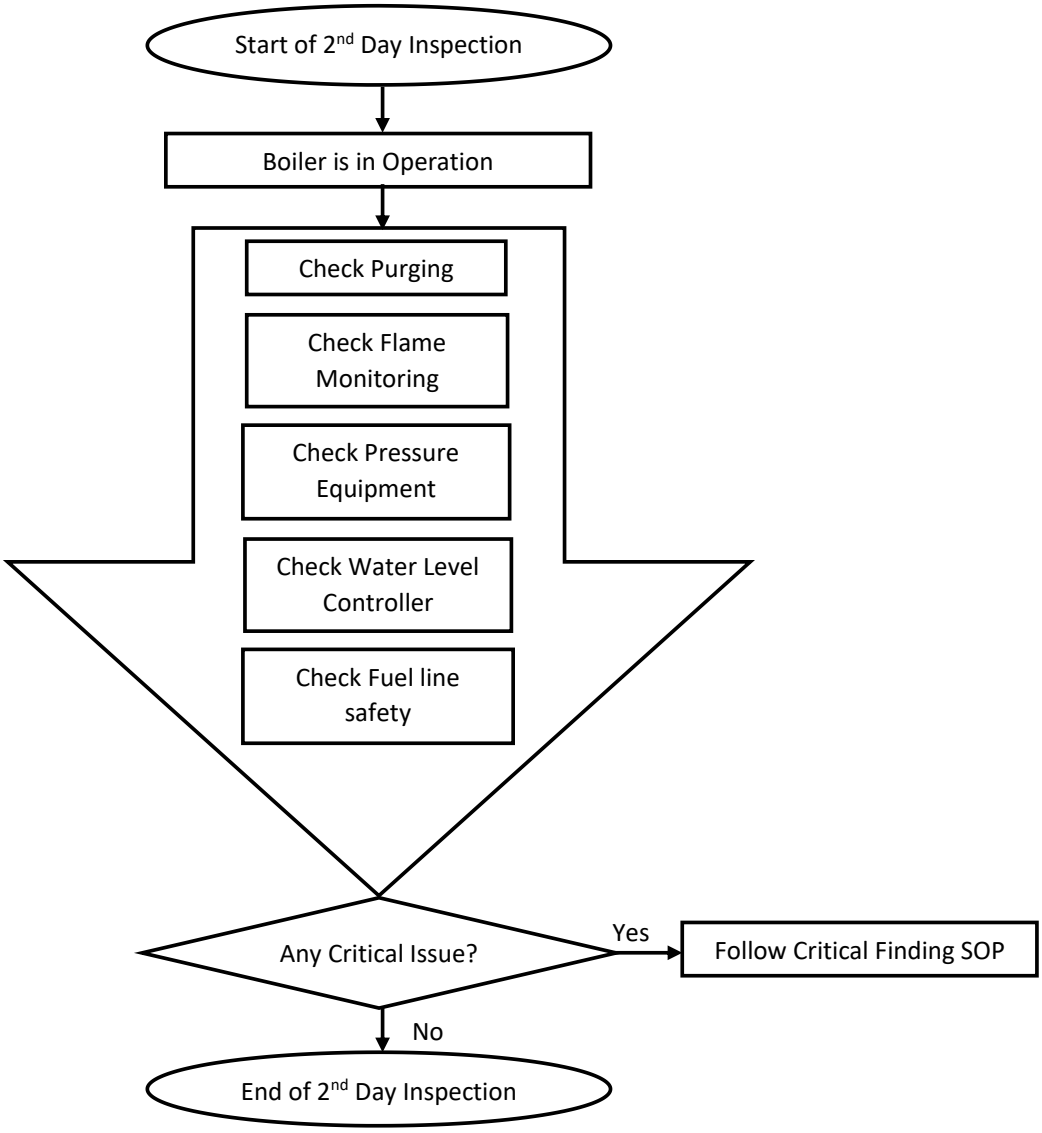
6.3 Reserved

Part 7: Boiler Inspection Procedure Flow Chart

1st Day of Inspection:



2nd Day of Inspection:



Part 8: Annexures

Disclaimer:

The RMG Sustainability Council (RSC) provides this guidance list to enhance safety practices regarding boiler operation in RMG factories. This guidance list is being reviewed and developed continuously. While RSC is trying to standardize and develop this guidance list, factories should not be limitedly confined and restricted to this list only. RSC encourages to follow the existing established standards (e.g., BBR, BNBC, NFPA, EN, and so on), as well as boiler manufacturers' guidelines to ascertain a detailed checklist for an efficient and safe operation and maintenance. If you have any queries about this disclaimer, please contact us via the RSC's website.

ANNEXURE-1

PREVENTIVE MAINTENANCE GUIDANCE LIST OF BOILERS

Factory Name: Date:

Equipment No: Frequency: Daily

SI No	Observations	Status	Remarks
1	Inspect boiler and related equipment for water leakages	Ok/ Not Ok	
2	Check all controllers and if applicable non-failsafe limiters for proper operation	Ok/ Not Ok	
3	Check Exhaust temperature, boiler temperature, and boiler pressure to make sure all readings are within the desired range	Ok/ Not Ok	
4	Check operation of each manual or automatic blowdown system	Ok/ Not Ok	
5	Test boiler water for the levels of pH, total dissolved, O_2, conductivity	Ok/ Not Ok	
6	Inspect alarms and lights to ensure they are functioning properly	Ok/ Not Ok	
7	Check all locks and seals to ensure that there has been no unauthorized tampering	Ok/ Not Ok	
8	Check chemical feed system to ensure that it meets the required levels of chemicals	Ok/ Not Ok	
9	Check for any abnormal odour or smell of fuel evaporation	Ok/ Not Ok	
10	Check for abnormal noise from any equipment	Ok/ Not Ok	
11	Flushing of water level glass and if applicable of external chambers for water level control (and limiters)	Ok/ Not Ok	
12	Ensure that the water pH levels are within the recommended range	Ok/ Not Ok	

ANNEXURE-2

PREVENTIVE MAINTENANCE GUIDANCE LIST OF BOILERS

Factory Name: Date:

Equipment No: Frequency: Weekly

SI No	Observations	Status	Remarks
1	Check the foundation bolts of all components (Pumps, Blower, and Motors)	Ok/ Not Ok	
2	Check start-up sequence and visual sequence indicator operation	Ok/ Not Ok	
3	Check operation of the flame failure detection system to shut down energy input and boiler in the correct order	Ok/ Not Ok	
4	Inspect alarms and lights to ensure they are functioning properly	Ok/ Not Ok	
5	Use water cut-off devices to check and make sure that water levels are within recommended levels	Ok/ Not Ok	
6	Reset any manual reset interlocks, check the water level in gauge glasses	Ok/ Not Ok	
7	Check the fuel safety valves in the main burner for leakage and operating issues	Ok/ Not Ok	
8	Inspect and clean compressor air filters (if available), air swirlers, and ignition electrodes	Ok/ Not Ok	
9	Do an evaporation test for low water levels, at which the burner should stop, and alarms should sound	Ok/ Not Ok	
10	Clean the Fuel & water line strainers	Ok/ Not Ok	
11	Check that feed water pump operating sequence	Ok/ Not Ok	
12	Check the fuel pump coupling and alignment	Ok/ Not Ok	
13	Check all gaskets for any leakages. If any leakages are observed rectify them by replacing them with new gaskets	Ok/ Not Ok	
14	Check that all management systems are operating, all valves are correctly set, and the water level is correct before leaving the boiler	Ok/ Not Ok	

ANNEXURE-3

PREVENTIVE MAINTENANCE GUIDANCE LIST OF BOILERS

Factory Name: Date:

Equipment No: Frequency: Monthly

SI No	Observations	Status	Remarks
1	Inspect the safety relief valves based on the manufacturer's instructions or against present limit	Ok/ Not Ok	
2	Inspect and investigate the drain system, drain trap, PVC fittings, and condensate drain line	Ok/ Not Ok	
3	Inspect alarms and lights to ensure they are functioning properly	Ok/ Not Ok	
4	Check on the combustion air piping and gas vent piping for any deteriorations, leaks, or blockages	Ok/ Not Ok	
5	Check the burners' diffuser, pilot tube, and valves for wear and deformation	Ok/ Not Ok	
6	Clean spinning cup or nozzle, clean fire eye, and smoke detection eye on the chimney	Ok/ Not Ok	
7	Do an external inspection of the boiler to check for hot spots	Ok/ Not Ok	
8	Check gaskets to ensure tight sealing	Ok/ Not Ok	
9	Examine access openings to look for air leaks	Ok/ Not Ok	
10	Get a water treatment test done to minimize scale impurities that could potentially build up inside in boiler	Ok/ Not Ok	
11	Inspect the fan, air pressure, and high pressure or temperature interlocks	Ok/ Not Ok	

ANNEXURE-4

PREVENTIVE MAINTENANCE GUIDANCE LIST OF BOILERS

Factory Name: Date:

Equipment No: Frequency: Quarterly

SI No	Observations	Status	Remarks
1	Check combustion, inspect burner controls, and inspect burner operation.	Ok/ Not Ok	
2	Lower the boiler water level to check the operation of the low water and extra-low water devices.	Ok/ Not Ok	
3	Check safety shut-off valve(s) for leakage.	Ok/ Not Ok	
4	Check fire start & steam pressure interlock.	Ok/ Not Ok	
5	Check fuel pressure and temperature interlocks.	Ok/ Not Ok	
6	Check combustion efficiency and flue gas analysis through the normal operating range.	Ok/ Not Ok	
7	Inspect electric wirings and switches for any loose connections or signs of overheating.	Ok/ Not Ok	
8	Check the combustion control system and reset it with a combustion analyser that reads oxygen, carbon monoxide, and nitrogen oxide levels.	Ok/ Not Ok	
9	Check the gaskets on the waterside and fireside and replace them if necessary for leak prevention.	Ok/ Not Ok	
10	Check pump alignment on all base-mounted pumps.	Ok/ Not Ok	

ANNEXURE-5

PREVENTIVE MAINTENANCE GUIDANCE LIST OF BOILERS

Factory Name: Date:

Equipment No: Frequency: Yearly

SI No	Observations	Status	Remarks
1	Shut down the boilers to open the access doors and properly inspect all accessories and parts of the boiler system.	Ok/ Not Ok	
2	Inspect the heating system and resolve any issues.	Ok/ Not Ok	
3	Service and thoroughly clean all the parts including tubes and tube sheet.	Ok/ Not Ok	
4	Inspect the burner refractory for cracks bigger than ⅛ of an inch.	Ok/ Not Ok	
5	Check electric equipment and wiring	Ok/ Not Ok	
6	Look out for heavy scaling in the tubes and check for signs of oxygen corrosion.	Ok/ Not Ok	
7	Check the safety valves and conduct the manufacturer's recommended safety tests.	Ok/ Not Ok	
8	Check the insulating materials for any degradation.	Ok/ Not Ok	
9	Inspect the auxiliary and venting systems for any deterioration, corrosions, or blockages.	Ok/ Not Ok	
10	Clean the burner assembly, igniter, and flame sensors as well as the boiler furnace.	Ok/ Not Ok	
11	Conduct an efficiency test on the burner.	Ok/ Not Ok	
12	Recalibrate all the operating controls.	Ok/ Not Ok	

Part 9: Applicable Standards/References

The documents listed in this section are referenced in this Boiler Inspection Guidelines and the portions thereof are considered part of the requirements of this Guidelines to the extent of each such reference.

A. Bangladesh Laws and Rules:

- Bangladesh National Building Code (BNBC), 2020
- Petroleum Act, 1934
- Gas Safety Rules, 2010
- The Bangladesh Gas Act, 2010
- Gas Storage Rules, 1995
- Environment Protection Law, 1997
- Bangladesh Boiler Regulations (BBR) 1951 Amended 2007
- Bangladesh Boiler Act 2022

B. NFPA publications:

- NFPA 10, Portable Fire Extinguishers.
- NFPA 13, Standard for the Installation of Sprinkler Systems
- NFPA 14: Standard for the Installation of Standpipe and Hose Systems
- NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection
- NFPA 30, Flammable and Combustible Liquids Code
- NFPA 31, Standard for the installation of Oil-Burning Equipment
- NFPA 54, National Fuel Gas Code
- NFPA 56, Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems
- NFPA 70, National Electrical Code®
- NFPA 72, National Fire Alarm and Signaling Code, 2022 and 2019 Editions
- NFPA 85, Boiler & Combustion System Hazard Code
- NFPA 86, Standard for Ovens and Furnaces
- NFPA 87, Standard for Fluid Heaters
- NFPA 101, Life Safety Code

C. ASME Publications:

- American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016 USA.
- ASME B&PV: ASME Boiler & Pressure Vessel Code
- ASME B31: Pressure Piping, Parts 1-12

D. CEA Publications: Combustion Engineering Association (CEA), UK

- Guidance on the safe operation of Steam Boilers (Ref: BG 01)
- Guidance on the safe operation of Hot Water Boilers (Ref: BG 02)

E. ISO Publications: International Organization for Standardization, Switzerland

- ISO 16528-1:2016 — Part 1: Performance requirements
- ISO 16528-2:2007 — Part 2: Procedures for fulfilling the requirements of ISO 16528-1

F. BS EN Publications: British Standard European Norm.

- BS EN 12952, Water Tube Boilers & Auxiliary Installations
- BS EN 12953, Shell Boiler

G. Chinese Standard:

- GB/T, Water Tube Boilers
- GB/T, Shell Boilers

H. Australian Standard:

- AS 1228, Pressure Equipment-Boilers
- AS 3814/ AG 501, Industrial & commercial gas-fired appliances
- AS 5601/AG 601, Gas Installations
- AS 1375 Industrial fuel fired appliances
- AS 3788 Pressure Equipment-In service Inspection
- AS 2593 Boilers-Safety management & supervision system

I. The National Board of Boiler and Pressure Vessel Inspectors:

- National Board Inspection Code (NBIC)