

Part 3 a

Guidelines for a Safety Management Plan

Applied to

Boilers & Fired Systems

**While the Risk in Boilers may be low,
the Consequences of a Boiler Failure can be high**

therefore,

Good Safety Management and Maintenance is Critical

- **Documents**

To keep updated the documents will be used for:

- Training
- Operation
- Maintenance
- Testing
- Manufacturer Manuals
- Maintenance Plan, Procedures & Programs
- Standards, Codes, Regulations, Acts,...

The operators must have all relevant information including:

- Operating manual
- Maintenance history
- Ensure that operators are familiar with all the relevant information.

- **Keeping Records**

- **Inspection records** (Operation / Maintenance...)
- **Repair and Maintenance records**
- **Daily / Weekly / Monthly Boiler Inspection records** (Internal inspections)
- **Chemical Analysis reports** (weekly / monthly)
- **Safety Device Tests/Check records**
- **Safety Valve Certification records**
- **To keep records of all works conducted on the boiler, all repairs and modifications and inspection made in each visit**

• Identification & Evaluation of Risks & Hazards

- Steam/hot water burns
- Burns from hot equipment
- Steam explosions
- Furnaces explosions
- Dust Explosions
- Fires
- Chemical exposure
- **Mechanical, Electrical**
- Physical, Biological,...etc...

• Hazard Controls

Engineering Controls

- Insulation of hot areas such as piping and boiler components,
- Automatic shutdown devices,
- Automatic fire and fuel controls,
- Relief valves
- Water level controls, ..etc.....

Administrative Controls

- Operator Training
- Chemical control procedures
- Operational procedures,
- Inspections, audits,
- water chemistry control and planned maintenance , etc.....

Personal Protective Equipment (PPE)

- **External Inspections**

- **Independent (external) inspector** (not your maintenance contractor) **should** complete a certified boiler-safety inspection in accordance with local and provincial regulation
- **Leaks**
- **Indicating Devices**
(Gages, thermometers, thermocouples, gage glasses,.....)
- **Control Systems**
(Fuel controls, Electrical controls, etc....)
- **Safety Devices**
(boiler cutoffs, low water level alarms, burner failure alarms, safety valves,.....)
- **All valves**

- **External Inspections** (cont)
 - **Piping Supports**
(Example: support brackets,.....)
 - **Housekeeping**
 - **Safety Signs**

After any extensive repair or new installation of equipment, make sure a qualified boiler inspector re-inspects the entire system.

- **Internal Inspections**

- **Door gaskets**
- **Fire side insulation**
- **Tube sheet**
- **Tubes**
- **Supports**
- **Blower**
- **Corrosion signs**
- **Stack (Internal)**

- **Internal Inspections** (cont)
 - **Tube bundle**
 - **Scale buildup**
 - **Condensate feed water tanks**
 - **Chemistry control systems**
 - **Level floats**

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Tests in Boilers & Fired Systems

All tests should be conducted in accordance with manufacturer recommendations and local & provincial legislation

Examples

- **Burner test**
- **Water Chemistry test**
- **Safety/Relief Valve Operational Test**
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- **Check System for Leaks**
- **Low Water Fuel Cutoff (LWFCO)**
- **Pump test**
- **Safety Valve Set point Test**

- **Blow Downs**

Boilers should be blown down frequently (daily)

- Blow downs should be conducted to low Total Dissolved Solids (TDS), to limit sludge buildup and to adjust boiler chemistry.

- **Water Chemistry**

- **Chemicals** used in boilers are caustic and should be handled by trained personnel
- **Adequate PPE**, as indicated on the **MSDS**, should be used at all times -
- Spills of boiler chemicals should be cleaned immediately

Essential Operational Parameters

The following parameters are useful for operators to analyze trends.

pH:

Steam Pressure

Stack temperature

Establish a checklist for proper startup and shutdown of boilers and all related equipment according to manufacturer's recommendations.

Pre-Startup Checks

Prior to firing a boiler all pre-startup checks recommended by the manufacturer are to be conducted.

Automatic Boiler Shutdown Checks

- Flame Out Shutdown Device
- Low Water Level Alarm and Boiler Shutdown Device

Before startup



ensure that the boiler room is free of all potentially dangerous situations, like flammable materials and mechanical or physical damage to the boiler or related equipment.



Clear intakes and exhaust vents; check for deterioration and possible leaks.

Daily Controls

- **Leakage of water, steam or fuel**
- **Thermal insulation**
- **Pipe supports for proper alignment and condition**
- **Boiler area clear of debris and combustible material**
- **Low water level shutdown and alarm**
- **Flame out shutdown**
- **Safety valves not obstructed or leaking**
- **Gages, thermometers and gage glasses readable and functioning**

Maintenance

- Substituting improper materials or parts can result in a boiler explosion or catastrophic rupture of the steam system
- Maintenance works should be made complying with the Lockout /Tag out, Confined Space Procedures, Electrical Safety procedures, and Hot Work programs
- Use boiler operating log sheets, maintenance records, and manufacturer's recommendations to establish a preventive maintenance schedule based on operating conditions, past maintenance, repair, and replacement that were performed on the equipment.