



# Curriculum for Boiler Operator

(6 months)

# Contents

Introduction .....	3
Overall Objective of the Course.....	3
Competencies gained after completion of course.....	3
Job Opportunities .....	3
Curriculum Salient Points.....	4
Overview about the program.....	5
Boiler Operator Curriculum Contents .....	6
Module 1: Operational work and materials.....	6
Module 1: Assessment.....	8
Module 2: Accessories and Operator responsibility.....	10
Module 2: Assessment.....	11
Module 3: Safety at work .....	12
Module 3: Assessment .....	14

# Introduction to the Boiler Operator Curriculum

## Overall Objective of the Course

This curriculum is designed to impart the skills needed to operate a boiler.

The Trainee will be able to:-

- Define the types of boilers & related operational equipment /systems.
- Identify the accessories of boiler & heat sources.
- Read & understand instructions.
- Describe the safety rules & regulations.
- Describe boiler ASME code, ISO, BS standard
- Calculate the Boiler Heating surface (H.S).
- Maintain the record of boiler house.
- Operate the accessories, instruments & control of boiler.

## Competencies gained after completion of course

The learner will be able to demonstrate the working principles of boiler operation as well as cope with trouble shooting related to the boiler.

## Job Opportunities

After completion of this course, the learner will have opportunities to work in the following areas:

- Sugar industries,
- Rice par boiling units,
- Textile industries,
- Restaurants,
- Power plants
- Milk plants,
- Vegetable oil and ghee factories

## Curriculum Salient Points

<b>Entry Level</b>	Matric
<b>Duration of course</b>	6 months
<b>Total training hours</b>	800
	34 hours (per week)
	6 days (week)
	6 hours a day (except Friday 4 hours)
<b>Training Methodology</b>	
	Practical 80%
	Theory 20%
<b>Medium of training</b>	
	English and Urdu

## Over view of the program –Boiler operator

Module Title & Aim	Learning Units	Theory Hours	Working place Hours
<b>Module 1: Operational work And Materials</b> Aim: The trainee will be able to understand the major types of boilers, mounting fittings, main parts and the materials used in a boiler along with proper functioning of boiler.	1- Identify the major types of boiler and their uses.	12	56
	2- Identify the mounting fittings and their working.	18	84
	3- Identify the material, main parts of boiler & demonstrate the working of boiler.	24	112
<b>Module 2: Accessories and Operator responsibility</b> Aim: After completion of this module, the trainee will be able to demonstrate the functions of accessories, instruments and the control of a boiler and be able to describe the responsibilities of a boiler operator and how to maintain the boiler house record.	4- Identify & demonstrate the accessories, Instruments & control of boiler.	24	112
	5- Describe the responsibilities.	18	84
	6- Maintain Record of Boiler House .	12	56
<b>Module 3: Safety at work</b> Aim: After completion of this module, the trainee will be able to describe the precautions, safe working environment procedures and how to cope with hazards during boiler operations.	7- Describe the Importance of safe working environment and first aid	12	48
	8- Principles of safety measures & emergency alarm	6	28
	9- Identify the protective Procedures including clothing and accident report	6	28
	10- Inspections & Precautions.	12	48
<b>Total Hours</b>		<b>144</b>	<b>656</b>

# Boiler Operator Curriculum Contents (Teaching and Learning Guide)

**Module 1:** Operational work and materials

**Objective:** The trainee will be able to understand the major types of boilers, mounting fittings, main parts and the materials used in a boiler along with proper functioning of boiler.

**Total Hours = 306**

**Theory = 54 hours**

**Practical = 252 hours**

Learning Unit	Learning outcomes	Learning Elements	Duration	Materials Required	Learning Place
1- Identify the major types of boiler and their uses	1.1 The trainee will be able to understand the basic type of water tube boiler and fire tube boiler	Define the Boiler and its types and also describe the actual principle of boilers.	68	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab.
		<b>WATER TUBE BOILER</b> <ul style="list-style-type: none"> <li>- Vertical Water tube Boiler</li> <li>- Cross tube vertical Boiler</li> <li>- Try Drum vertical Boiler</li> <li>- Cross Drum Boiler</li> <li>- Parallel Drum boiler</li> <li>- Double Drum D-Type Boiler</li> <li>- Slimular water tube boiler</li> </ul>			
	<b>FIRE (SMOKE) TUBE BOILER</b> <ul style="list-style-type: none"> <li>- Cochran Vertical Boiler</li> <li>- Smoke tube vertical boiler</li> <li>- Locomotive Boiler</li> <li>- Simpler Vertical Boiler</li> <li>- Lancashire Boiler</li> <li>- Package Boiler</li> <li>- Cornish Boiler</li> <li>- Marine Boiler</li> </ul>				
	1.2 Demonstrate the basic types of boiler according to operation	<ul style="list-style-type: none"> <li>- Industrial</li> <li>- Domestic</li> <li>- Railway Engine</li> <li>- Marine</li> <li>- Turbine</li> </ul>			

2- Identify the mounting fittings and their working	2.1 Understand the basic fitting, valves and gauges relating to the boiler	<p>Identification of mounting fitting &amp; Classification of mounting fittings</p> <ul style="list-style-type: none"> <li>- Safety Valve</li> <li>- Single safety Valve</li> <li>- Double safety Valve</li> <li>- Roms bottom safety valve</li> <li>- Stop Valve</li> <li>- Glove Valve</li> <li>- Blow down Valve</li> <li>- Ball Valve</li> <li>- Dead weight safety Valve</li> <li>- Feed check Valve</li> <li>- Air vent Valve</li> </ul>	102	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
	2.2 Also understand the water leveling and fitting of pumps relevant to the boiler and demonstrate the proper functioning of boiler accessories	<ul style="list-style-type: none"> <li>- Pressure gauge</li> <li>- Out let temperature gauge</li> <li>- Draft gauge</li> <li>- Gauge glass</li> <li>- Temperature gauge</li> <li>- Water level indicator</li> </ul> <ul style="list-style-type: none"> <li>- Anti-primary pipe</li> <li>- Cock set</li> <li>- Water column</li> <li>- Burner</li> </ul> <ul style="list-style-type: none"> <li>- Single stage Pump</li> <li>- Multi stage pump</li> <li>- Steam donkey pump</li> <li>- Ware pump</li> <li>- Plunger Pu</li> </ul>			
3- Identify the material, main parts of boiler & demonstrate the working of boiler	3.1 Able to understand the coding of external and internal accessories of boiler	ASME Code	136	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
		<ul style="list-style-type: none"> <li>- Shell SA 515-516 Gr 70</li> <li>- Tube plates</li> <li>- Flue</li> <li>- Tubes</li> </ul>			
		<ul style="list-style-type: none"> <li>- Stays SA-29</li> <li>- Long stay</li> <li>- Back stay</li> </ul> <ul style="list-style-type: none"> <li>- Combustion Chamber</li> <li>- Inspection Door</li> <li>- Front and Back Door</li> <li>- Man Hole</li> <li>- Mud Hole</li> <li>- Cover</li> </ul>			

## Assessment

### Module 1: Operational work and Materials

Learning Unit	Theory hours	Workplace Hours	Recommended Formative Assessment	Recommended Methodology	Scheduled Date
1- Identify the major types of boiler and their uses	12	56	<ul style="list-style-type: none"> <li>- Define the Boiler and its types and also describe the actual principle of boilers</li> </ul>	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Vertical Water tube Boiler</li> <li>- Cross tube vertical Boiler</li> <li>- Try Drum vertical Boiler</li> <li>- Cross Drum Boiler</li> <li>- Parallel Drum boiler</li> <li>- Double Drum D-Type Boiler</li> <li>- Slimular water tube boiler</li> </ul>		
			<ul style="list-style-type: none"> <li>- Cochran Vertical Boiler</li> <li>- Smoke tube vertical boiler</li> <li>- Locomotive Boiler</li> <li>- Simpler Vertical Boiler</li> <li>- Lancashire Boiler</li> <li>- Package Boiler</li> <li>- Cornish Boiler</li> <li>- Marine Boiler</li> </ul>		
			<ul style="list-style-type: none"> <li>- Industrial</li> <li>- Domestic</li> <li>- Railway Engine</li> <li>- Marine</li> <li>- Turbine</li> </ul>		

2- Identify the mounting fittings and their working	18	84	Identification of mounting fitting & Classification of mounting fittings	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Safety Valve</li> <li>- Single safety Valve</li> <li>- Double safety Valve</li> <li>- Roms bottom safety valve</li> <li>- Stop Valve</li> <li>- Glove Valve</li> <li>- Blow down Valve</li> <li>- Ball Valve</li> <li>- Dead weight safety Valve</li> <li>- Feed check Valve</li> <li>- Air vent Valve</li> </ul>		
			<ul style="list-style-type: none"> <li>- Pressure gauge</li> <li>- Out let temperature gauge</li> <li>- Draft gauge</li> <li>- Gauge glass</li> <li>- Temperature gauge</li> <li>- Water level indicator</li> </ul>		
			<ul style="list-style-type: none"> <li>- Anti-primary pipe</li> <li>- Cock set</li> <li>- Water column</li> <li>- Burner</li> </ul>		
3- Identify the material, main parts of boiler & demonstrate the working of boiler	24	112	ASME Code	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Shell SA 515-516 Gr 70</li> <li>- Tube plates</li> <li>- Flue</li> <li>- Tubes</li> </ul>		
			<ul style="list-style-type: none"> <li>- Stays SA-29</li> <li>- Long stay</li> <li>- Back stay</li> </ul>		
			<ul style="list-style-type: none"> <li>- Combustion Chamber</li> <li>- Inspection Door</li> <li>- Front and Back Door</li> <li>- Man Hole</li> </ul>		

			- Mud Hole and Cover		
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**Module 2:** Accessories and Operator responsibility.

**Objective :** After completion of this module, the trainee will be able to demonstrate the functions of accessories, instruments and the control of a boiler and be able to describe the responsibilities of a boiler operator and how to maintain the boiler house record.

**Total Hours = 306**

**Theory = 54 hours**

**Practical = 252 hours**

Learning Unit	Learning outcomes	Learning Elements	Duration	Materials Required	Learning Place
4- Identify & demonstrate the accessories, Instruments & control of boiler.	4.1 Understand the purifying Steam systems as well as fully understand to control the gases movement	<ul style="list-style-type: none"> <li>- Super Heater</li> <li>- De super heater</li> <li>- Dearater</li> <li>- Economizer</li> <li>- Pre heater</li> </ul>	136	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
	4.2 Carrying out the different types of fuels usage in the boiler	<ul style="list-style-type: none"> <li>- Induced draft Fan (I,D Fan)</li> <li>- Forced draft Fan (F,D Fan)</li> <li>- Distributor</li> <li>- Insulation</li> <li>- Oil Fired</li> <li>- Gas Fired</li> <li>- Coal Fired</li> <li>- Wood Fired</li> <li>- Husk straw Fired</li> <li>- Bagasse Fired</li> </ul>			
5- Describe the responsibilities	5.1 Demonstrate the checking and function of accessories related to the boiler	<ul style="list-style-type: none"> <li>- Check the boiler water level</li> <li>- Check the feed water pump</li> </ul>	102	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
		<ul style="list-style-type: none"> <li>- Check the fuel pumps</li> <li>- Check the fuel tank</li> <li>- Check the pressure gauge</li> </ul>			
		<ul style="list-style-type: none"> <li>- Check the Temperature of Chimney</li> <li>- Check the Economizer inlet &amp; outlet water temperature</li> <li>- Check the feed Check the fuel Temperature</li> </ul>			
6- Maintain Record of Boiler House	6.1 Understand the record of boiler house	<ul style="list-style-type: none"> <li>- To check the previous record data of boiler operator</li> <li>- Ledgerised the complete data on log book</li> <li>- Sending the complete data after completion of duty to the in-charge of boiler house</li> </ul>	68	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab

## Assessment

**Module 2** : Accessories and Operator responsibility.

Learning Unit	Theory hours	Workplace Hours	Recommended Formative Assessment	Recommended Methodology	Scheduled Date
4- Identify & demonstrate the accessories, Instruments & control of boiler.	24	112	<ul style="list-style-type: none"> <li>- Super Heater</li> <li>- De super heater</li> <li>- Deareter</li> <li>- Economizer</li> <li>- Pre heater</li> </ul>	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Induced draft Fan (I,D Fan)</li> <li>- Forced draft Fan (F,D Fan)</li> <li>- Distributor</li> <li>- Insulation</li> </ul>		
			<ul style="list-style-type: none"> <li>- Oil Fired</li> <li>- Gas Fired</li> <li>- Coil Fired</li> <li>- Wood Fired</li> <li>- Husk straw Fired</li> <li>- Bagasse Fired</li> </ul>		
5- Describe the responsibilities	18	84	<ul style="list-style-type: none"> <li>- Check the boiler water level</li> <li>- Check the feed water pump</li> </ul>	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Check the fuel pumps</li> <li>- Check the fuel tank</li> <li>- Check the pressure gauge</li> </ul>		
			<ul style="list-style-type: none"> <li>- Check the Temperature of Chimney</li> <li>- Check the Economizer inlet &amp; outlet water temperature</li> <li>- Check the feed Check the fuel Temperature</li> </ul>		
6- Maintain Record of Boiler House	12	56	<ul style="list-style-type: none"> <li>- To check the previous record data of boiler operator</li> <li>- Ledgerised the complete data on log book</li> <li>- Sending the complete data after completion of duty to the in-charge of boiler house</li> </ul>	Written Test, Oral Test, Task.	

**Module 3:** Safety at work

**Objective:** After completion of this module, the trainee will be able to describe the precautions, safe working environment procedures and how to cope with hazards during boiler operations.

**Total Hours** = 188

**Theory** = 36 hours

**Practical** = 152 hours

Learning Unit	Learning outcomes	Learning Elements	Duration	Materials Required	Learning Place
7- Describe the Importance of safe working environment and first aid	7.1 State the responsibilities of employers and employees for creating and maintaining a safe working environment	<ul style="list-style-type: none"> <li>- Safe working environment,</li> <li>- tools, equipment's,</li> <li>- supervision, records training</li> <li>- Employees: safe working practices</li> </ul>	60	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
	7.2 Identify the appropriate basic first aid treatment	<ul style="list-style-type: none"> <li>- Treatment: Shock, Electrical Shock, Bleeding, Breaks to Bones, Miner Burns, Resuscitation, poisoning, eye Injuries.</li> </ul>			
8- Principles of safety measures & emergency alarm	8.1 State the basic principles of fire and identify the different type of fire evacuation means of escape assembly points.	<ul style="list-style-type: none"> <li>- Principle of Fire: Heat, Fuel,</li> <li>- Oxygen.</li> <li>- Types: Wood/Paper,</li> <li>- Oil/spirit, electrical</li> </ul>	34	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
	8.2 Describe emergency procedures	<ul style="list-style-type: none"> <li>- Procedures: Raising alarms, alarm types, save/efficient evacuation, means of escape, assembly points.</li> <li>- Emergencies: Fire drill bomb warning.</li> </ul>			
	8.3 Describe the procedure for the safe storage of materials and fixing	<ul style="list-style-type: none"> <li>- Procedures: loading, unloading, storage</li> </ul>			

9- Identify the protective Procedures including clothing and accident report	9.1 A identify the various types of protective clothing/equipment and their uses.	<ul style="list-style-type: none"> <li>- Protective Clothing: overalls, ear defenders/plugs, safety booths, knee pads, gloves/gauntlets, safety helmet (hard hat), particle masks, glass/goggles/visors.</li> <li>- Equipment's: machine guard, residual, current devices</li> </ul>	34	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
	9.2 A state the content of accident report.	<ul style="list-style-type: none"> <li>- Contents: Name, date/time of incident, date/time of report, location, weather condition, lighting conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified.</li> </ul>			
10- Inspections & Precautions.	10.1 How to boiler purge before operate	<ul style="list-style-type: none"> <li>- Check the water level</li> <li>- Open the air vent valve</li> <li>- Open the damper plate of chimney</li> <li>- Start the forced draft fan and induced draft fan</li> <li>- After purging ignition of pilot burner</li> <li>- Ignition of the main burner</li> </ul>	60	Models Wall Charts Multimedia White board Stationary Relevant data	Class Room/Lab
	10.2 The safety accessories of boiler as we know that boiler have a great protection for causing loss of life and damage to property  10.2.Demonstrate professional behavior towards stakeholders.				

## Assessment

### Module 3: Safety at work

Learning Unit	Theory hours	Workplace Hours	Recommended Formative Assessment	Recommended Methodology	Scheduled Date
7- Describe the Importance of safe working environment and first aid	12	48	<ul style="list-style-type: none"> <li>- Safe working environment</li> <li>- tools, equipments,</li> <li>- supervision, records training</li> <li>- Employees: safe working practices</li> </ul>	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Treatment: Shock,</li> <li>- Electrical Shock, Bleeding,</li> <li>- Breaks to Bones, Miner Burns, Resuscitation,</li> <li>- Poisoning, eye Injuries.</li> </ul>		
8- Principles of safety measures & emergency alarm	6	28	<ul style="list-style-type: none"> <li>- Principle of Fire: Heat, Fuel, Oxygen.</li> <li>- Types: Wood/Paper,</li> <li>- Oil/spirit, electrical</li> </ul>	Written Test, Oral Test, Task.	
			<ul style="list-style-type: none"> <li>- Procedures: Raising alarms, alarm types, save/efficient evacuation, means of escape, assembly points.</li> <li>- Emergencies: Fire drill bomb warning.</li> </ul>		
			<ul style="list-style-type: none"> <li>- Procedures: loading, unloading, storage.</li> </ul>		
9- Identify the protective Procedures including clothing and accident report	6	28	<ul style="list-style-type: none"> <li>- Contents: Name, date/time of incident, date/time of report, location, weather condition, lighting conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified.</li> </ul>	Written Test, Oral Test, Task.	
10- Inspections & Precautions.	12	48	<ul style="list-style-type: none"> <li>- Check the water level</li> <li>- Open the air vent valve</li> <li>- Open the damper plate of chimney</li> <li>- Start the forced draft fan and induced draft fan</li> <li>- After purging ignition of pilot burner</li> <li>- Ignition of the main burner</li> </ul>	Written Test, Oral Test, Task.	

