

JOB SPECIFICATON
AND
SKILL TEST

\JOB TITLE : BOILER OPERATOR, L - 2
SECTOR : MECHANICAL ENGINEERING
SUB-SECTOR : THERMAL

COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING

NATIONAL SKILL TESTING BOARD

MADHYAPUR THIMI -17, SANOTHIMI, BHAKTAPUR, NEPAL

2002 (2058/059)

The National Skill Standards and Test was developed by

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Approved by the Tripartite National Skill Testing Board.

2002 (2058/059)

JOB SPECIFICATION

1	JOB TITLE : Boiler Operator LEVEL : 2 (Two)
2	JOB DESCRIPTION Boiler operator, L – 2 checks boiler before operation, operates boiler, regulates and maintains operating parameter within normal condition, shuts down the boiler, services fuel feed pump/fuel line and prepares for long period of shut down of boiler.
3	LIST OF TASKS: <ol style="list-style-type: none">1. Checking boiler before operation.2. Operating boiler.3. Shutting down the boiler.4. Servicing fuel feed pump/fuel line.5. Preparing for long period of shut down of boiler.
4	QUALIFYING NOTES (entry requirement etc.) PHICYSICAL REQUIREMENTS : Normal Health. EDUCATIONAL REQUIREMENTS : Understand specifications and interprets manufacturer's or workshop manual.

TASK SPECIFICATION

5	TASK NO: 1 Checking boiler before operation.	JOB TITLE:: Boiler Operator, L - 2
6	TASK ELEMENTS: 1.1 Receives verbal/written instructions. 1.2 Uses protective clothing. 1.3 Selects appropriate tools and materials 1.4 Checks fuel level in fuel tank. 1.5 Checks fuel pipe line and the pumping of the fuel. 1.6 Checks treated water level and quality of feed water, through lab report. 1.7 Checks pipe lines and the pumping of treated water. 1.8 Checks treated water level in boiler by water level indicator (sight glass) and feeds if necessary. 1.9 Pre-heats fuel oil, if necessary. 1.10 Operates fuel pump. 1.11 Checks and adjusts fuel supply pressure to required value. 1.12 Fills up log sheet.	

TASK SPECIFICATION

7 TASK PERFORMANCE REQUIREMENTS

Torch, wire brush, basket, emery paper, pencil, note book, goggles, industrial gloves, adjustable wrench, screwdriver (Flat and Philips), gasket cutter, files, hammer, mallet hammer, fuel, weighing balance, required chemicals for water and log sheet.

8 TASK PERFORMANCE STANDARDS

Operator dressed in appropriate clothing. Appropriate tools and materials selected as required. Fuel level in fuel tank checked as required. Pumping of fuel/pipe line checked. Treated water level and quality of feed water checked through lab report. Pumping of treated water and pipe line checked as required. Treated water level checked in boiler by water level indicator (sight glass), and fed if necessary. Fuel oil pre-heated, if necessary. Fuel pump operated safely. Fuel supply pressure checked and adjusted to required value. Log sheet filled up properly.

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
1	1 2 3 4 5 6 7 8 9 10 11	Knowledge of types of fuel and checking procedure of fuel level. Knowledge of function and types of fuel pumps and pumping of fuel. Knowledge of function and types of fuel filter, water filter and oil filter. Knowledge of the construction of different types of feed water pumps and their operation. Knowledge of water gauge, its construction and working principle. Knowledge of the procedure of checking treated water level and quality of feed water. Knowledge of feeding methods of water. Knowledge of fuel heating and heating system. Knowledge of pre-heating procedure of fuel oil and its advantages. Knowledge of checking and adjusting procedure of fuel supply pressure. Knowledge of importance of log sheet and its filling up			Safety in boiler operation. Safety requirements in the handling different types of boiler fuels.

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

11	TASK TITLE : Checking boiler before operation. TASK NO : 1	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<p><u>DID THE CANDIDATE ?</u></p> <ol style="list-style-type: none"> 1. Dress in appropriate clothing. 2. Select appropriate tools and materials as required. 3. Check fuel level in fuel tank as required. 4. Check fuel/pipe line and the pumping of fuel. 5. Check treated water level and quality of feed water, through lab report. 6. Check pipe lines and the pumping of treated water as required. 7. Check treated water level in boiler by water level indicator (sight glass), and feeds if necessary. 8. Pre-heat fuel oil, if necessary. 9. Operate fuel pump safely. 10. Check and adjust fuel supply pressure to required value. 11. Fill up log sheet properly. 		

TASK SPECIFICATION

5	TASK NO: 2 Operating boiler.	JOB TITLE:: Boiler Operator, L - 2
6	TASK ELEMENTS: 2.1 Receives instructions and interprets accordingly. 2.2 Selects appropriate tools and materials. 2.3 Supplies power to main switch board. 2.4 Supplies power to control panel. 2.5 Ensures that the control panel is in normal condition. 2.6 Operates the air blower motor of fuel burner. 2.7 Maintains ignition switch for low fire and assures proper flame, through sight glass. 2.8 Switches ON the fuel for ignition (Boiler ON). 2.9 Checks firing through sight glass. 2.10 Checks steam pressure, temperature and flame. 2.11 Opens steam valve, after the required pressure is reached, and checks steam flow meter. 2.12 Ascertains steam flow requirement of end use device and adjusts the burner to high flame, if necessary. Maintains appropriate flame. 2.13 Supplies the steam to end use devices as required. 2.14 Checks water level in water level indicator periodically and maintains water level in boiler by opening blow down valve, if level is high or pumping feed water, if the level is low. 2.15 Fills up log sheet	

TASK SPECIFICATION

7 TASK PERFORMANCE REQUIREMENTS

Line tester, torch, multimeter, clock/watch, goggles, industrial glove, adjustable wrench, open wrench, broom, cotton cloth, pencil, note book, fire extinguisher, log sheet.

8 TASK PERFORMANCE STANDARDS

Operator dressed in appropriate safety clothing. appropriate tools and materials selected as required. Power Supplied to main switch board safely. Power supplied to control panel safely. Air blower motor of fuel burner operated. Ignition switch maintained for low fire and proper flame assured through sight glass. Fuel for ignition switched ON properly. Firing checked through sight glass. Steam pressure and temperature checked as required. Steam valve opened, after the required pressure is attained, and steam flow meter checked properly. Ascertained steam flow requirement of end use device and burner adjusted to high flame, if necessary. Appropriate flame maintained. Steam Supplied to end use devices as required. Water level checked in water level indicator periodically and water level maintained in boiler by opening blow down valve, if level is high or pumping feed water pump, if the level is low. Log sheet Filled up properly.

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
2	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Knowledge of function, types and construction of boiler Knowledge of basic principle of electricity. Knowledge of working pressure of boiler. Knowledge of air blowers and their function. Knowledge of operating the air blower motor. Knowledge of steam gauge and its operation. Knowledge of boiler mountings and accessories. Knowledge of stop valve and its function. Knowledge of construction and operation of non- return valve. Knowledge of steam trap and its operation. Knowledge of feed check valve, its construction and operation. Knowledge of blow down valve and its operation. Knowledge of fusible plug. Knowledge of appropriate feed water. Knowledge of flame detector. Knowledge of function and types of burner. Knowledge of types of flame. Knowledge of feed water regulator and its functions. Knowledge of operation of control devices such as low water level control, extra low water level alarm, high water level alarm, low fuel oil temperature cut off, high pressure control, thermal over load relays for various motor, smoke temperature sensor, and their operations. Knowledge to recognize any abnormal condition such as, but not limited to, excessive black smoke, non concentric burning flame, dripping nozzle excessive fuel consumption (scale formation) and appropriate action required.			Hazards of high pressure steam.

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
2	21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38	Knowledge of function and types of electrical circuit breaker, contractor, relay, and timer. Knowledge of working principle of circuit breaker, contractor, relay, and timer Knowledge of sequential operations and functions of contractor, relay and timer. Knowledge of transformer. Knowledge of basic principle and functions of magnets. Knowledge of float valve. Knowledge of function of solenoid valve. Knowledge of combustion of fuel. Knowledge of function of air flow dampers. Knowledge of thermostat control. Knowledge of conduction of heat. Knowledge of thermal insulation, their types and operations. Knowledge of function of heat exchangers. Knowledge of expansion of materials due to heat. Knowledge of latent heat and the latent heat of water. Knowledge of hardness of water, its causes, and its effect on boiler. Knowledge of dryness fraction, saturated and superheated steam. Knowledge of pressure-enthalpy diagram for water/steam.			

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

	TASK PERFORMANCE TEST (SKILL ASSESSMENT)		
11	TASK TITLE : Operating boiler. TASK NO : 2	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<p><u>DID THE CANDIDATE ?</u></p> <ol style="list-style-type: none"> 1. Select appropriate tools and materials as required. 2. Supply power to main switch board. 3. Supply power to control panel. 4. Ensure that the control panel is in on normal condition. 5. Operate the air blower motor of fuel burner. 6. Maintain ignition switch for low fire and assures proper flame, through sight glass. 7. Switch ON the fuel for ignition. 8. Check firing through sight glass. 9. Check steam pressure, temperature and flame properly. 10. Open steam valve, after the required pressure is reached, and check steam flow meter. 11. Ascertain steam flow requirement of end use device and adjust the burner to high flame, if necessary, and assuring proper flame. 12. Supply the steam to end use devices as required. 13. Check water level in water level indicator periodically and maintain water level in boiler by opening blow down valve, if level is high/pumping feed water, if the level is low. 14. Clean and change the electric contractors. 15. Clean and adjust the float valve 16. Adjusts the air flow damper. 17. Fill up log sheet. 		

TASK SPECIFICATION

5

TASK NO: 3

Shutting down the boiler.

JOB TITTLE:: Boiler Operator, L - 2

6

TASK ELEMENTS:

1. Receives verbal/written instructions.
2. Selects appropriate tools and materials.
3. Shut downs feed water pump.
4. Shut downs ignition switch.
5. Shut downs fuel pump.
6. Closes steam gate valve outlet.
7. Switches off the power supply to control panel.
8. Switches off the power supply to main switch board.
9. Fills up log sheet.

TASK SPECIFICATION

7 TASK PERFORMANCE REQUIREMENTS

Cotton cloth, gloves, pipe wrench, open ended and ring spanner set, adjustable wrench, clock/watch, and log sheet.

8 TASK PERFORMANCE STANDARDS

Operator dressed in appropriate safety clothing. Appropriate tools and materials selected as required. Feed water pump shut off safely. Ignition switch shut off safely. Fuel pump shut off safely. Steam gate valve outlet closed. Power supply switched off to control panel and main switch board safely. Log sheet filled up properly.

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
3	1 2 3 4 5	Knowledge of function and types of feed water pump and its shut down procedure. Knowledge of function of ignition switch and its shut down procedure. Knowledge of function and types of fuel pumps and its shut down procedure. Knowledge of steam outlet gate valve and its operation. Knowledge of power supply and switching off procedure of the power supply to control panel and main switch board.			Hazards involved in electric shock.

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

	TASK PERFORMANCE TEST (SKILL ASSESSMENT)		
11	TASK TITLE : Shutting down the boiler. TASK NO : 3	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<u>DID THE CANDIDATE ?</u> 1. Dress in appropriate safety clothing. 2. Select appropriate tools and materials as required. 3. Shut down feed water pump safely. 4. Shut down ignition switch safely. 5. Shut down fuel pump safely. 6. Close steam gate valve outlet properly. 7. Switch off the power supply to control panel safely. 8. Switch off the power supply to main switch board safely. 9. Fill up log sheet properly.		

TASK SPECIFICATION

5 **TASK NO: 4**

Servicing fuel feed pump/fuel line..

JOB TITTLE:: Boiler Operator, L - 2

6 **TASK ELEMENTS:**

1. Receives verbal/written instructions..
2. Selects appropriate tools and materials.
3. Diagnoses the faults of feed pump, if any.
4. Dismantles feed pump.
5. Changes gland packing.
6. Change bearing, if necessary.
7. Assembles feed pump.
8. Cleans the fuel filters and changes, if necessary.

TASK SPECIFICATION

7 TASK PERFORMANCE REQUIREMENTS

Bearing puller, grease gun and grease, emery paper, kerosene, wire brush, open ended and ring wrench set, screwdriver (flat and Philips) set, gland packing, gloves, punching tools, gasket cutter.

8 TASK PERFORMANCE STANDARDS

Operator dressed in appropriate safety clothing. Appropriate tools and m materials selected as required. Fault of feed pump diagnosed and reported properly. Pump dismantled as required. Gland packing changed as required. Bearing changed as specified, if necessary. Pump assembled properly. Fuel filter cleaned and changed, if necessary.

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
4	1 2 3 4 5 6	Knowledge of function and types of feed pump. Knowledge of diagnosis of faults of feed pump. Knowledge of function of gland packing and its changing procedure. Knowledge of function and types of bearing. Knowledge of changing procedure of bearing. Knowledge of function and types of fuel filter.			

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

11	TASK TITLE : Servicing fuel feed pump/fuel line. TASK NO : 4	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<u>DID THE CANDIDATE ?</u> 1. Select appropriate tools and materials. 2. Diagnose faults of feed pump and report. 3. Dismantle the pump, if necessary. 4. Change gland packing as required. 5. Change bearing as specified, if necessary. 6. Assemble the pump properly. 7. Clean the fuel filter. 8. Change the fuel filter, if necessary.		

TASK SPECIFICATION

5 **TASK NO: 5**

Preparing for long period of shut down of boiler.

JOB TITLE:: Boiler Operator, L - 2

6 **TASK ELEMENTS:**

1. Receives verbal/written instructions.
2. Selects appropriate tools and materials.
3. Shut downs the boiler.
4. Drains the water.
5. Opens the man hole door.
6. Inserts required amount of anhydrous calcium hydrochloride in a bucket inside the boiler through man-hole for long period of shut down of the boiler.
7. Closes the man-hole with new gasket.

TASK SPECIFICATION

7 TASK PERFORMANCE REQUIREMENTS

Inspection lamp, gloves, adjustable wrench, pipe wrench set, screwdriver (flat and Philips) set, gasket, gasket cutter, punching tools, center punch, bucket, anhydrous calcium chloride.

8 TASK PERFORMANCE STANDARDS

Operator dresses in appropriate safety clothing. Appropriate tools and materials selected as required. Boiler shut downed safely. Water drained without spilling on the floor. Man-hole door opened. Anhydrous calcium chloride placed in boiler as required for long period of shut down of the boiler. Man-hole closed with new gasket properly.

9	10	TASK TRAINING DATA			
TASK NO:	T. E. No.	TECHNICAL KNOWLEDGE	APPLIED CALCULATION	GRAPHIC INFORMATION	SAFETY & HYGENE
5	1 2 3 4 5	Knowledge of shutting down procedure of boiler. Knowledge of function of man-hole door. Knowledge of the effect of moisture in the corrosion inside boiler shell. Knowledge of the procedure of placing the anhydrous calcium chloride inside the boiler and its purpose. Knowledge of short and long term shut down of the boiler.			

TASK PERFORMANCE TEST (SKILL ASSESSMENT)

	TASK PERFORMANCE TEST (SKILL ASSESSMENT)		
11	TASK TITLE : Preparing for long period of shut down of boiler.. TASK NO : 5	LOCATION OF TEST : CANDIDATE'S NAME : EVALUATORS NAMES:	
12	TEST FACTORS AND ITEMS	STANDARD MET	STANDARD NOT MET (Comments)
	<u>DID THE CANDIDATE ?</u> <ol style="list-style-type: none"> 1. Selects appropriate tools and materials. 2. Shut down the boiler properly. 3. Drain the water without spilling on the floor. 4. Open the man-hole door, if necessary. 5. Insert the anhydrous calcium chloride in boiler as required for long period of shut down of the boiler. 6. Close man-hole with new gasket properly. 		