Competency Based Curriculum (CBC)

Boiler Operation and Maintenance

Level-2

Light Engineering Sector

Curriculum Code:CBC-LE-BOM-L2-EN-V1

National Skills Development Authority
Chief Adviser's Office
Government of the People's Republic of Bangladesh

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The curriculum is designed based on NSDA approved **Boiler Operation and Maintenance, Level – 2,** Occupation Competency Standards. It covers the information required to implement the **Boiler Operation and Maintenance, Level - 2** standard. It is an important supporting document for trainers, assessors and curriculum developers.

This document has been developed by NSDA with the support of ISC representatives'/industry representatives from relevant sectors, academia, curriculum specialists, expert trainers and professionals.

All Government-Private-NGO training institutes of the country recognized by NSDA can use this curriculum to implement skill-based training of **Boiler Operation and Maintenance, Level –2** course.

Introduction

The importance of skill-based training in socio-economic development of the country is immense. Demand oriented training is an important area for increasing productivity, creating employment and alleviating poverty. Skill development training institutes established at public and private level in Bangladesh are providing skill development training commercially. It is important to have uniform training curriculum based on occupation to improve and harmonize the overall quality of training conducted in all these training institutions. NSDA as provided in the National Skill Development Authority Act, 2018 is formulating uniform curriculum for training programs conducted across the country in various occupations/trades.

Competency standards for various occupations (level based) are being formulated by NSDA with the aim of creating skilled manpower as per the demand of domestic and international labor market.

Skilled and trained trainers are essential for providing training and assessment according to competency standards. For this purpose, the curriculum of **Boiler Operation and Maintenance, Level -2** has been formulated through an expert committee consisting of ISC/Industry representatives from respective sectors, academia, curriculum specialists, expert trainers and professionals. This curriculum includes essential course design, course structure, course delivery methods, equipment and facilities inventory, and physical facilities. Apart from this, the assessment criteria of trainees, assessment procedure, qualification level and certification process have been inserted.

This curriculum is an NSDA-approved document that describes the overall contents of the training implementation of **Boiler Operation and Maintenance, Level –2** as per industry demand-based competency standards. The trainees of **Boiler Operation and Maintenance, Level –2** course can develop themselves as skilled and qualified **Assistant Boiler Operator** by following properly.

Competency Based Learning Materials (CBLM) and Assessment tools are developed following this document. Assessment and certification of trainees will also follow this curriculum.

List of Abbreviations

CS	Competency Standard
ISC	Industry Skills Council
NSDA	National Skills Development Authority
BNQF	Bangladesh National Qualifications Framework
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SCVC	Standards and Curriculum Validation Committee
STP	Skills Training Provider
SOP	Standard Operating Procedure
UoC	Unit of Competency
ISO	International Organization for Standardization
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures

Table of Content

Course Design

Name of Course: Boiler Operation and Maintenance

Skill Level : National Skills Certificate(NSC)-2

Nominal Hours : 360 Hours

List of Unit of Competency

Generic Unit of Competency

1 Apply Occupational Safety and Health (OSH) Procedure in the Workplace
2 Work in a Team Environment
3 Communicate in the Workplace

Sector Specific Unit of Competency

4 Work Effectively within Light Engineering Sector

Occupation Specific Unit of Competency

5 Interpret Basics of Boiler
6 Interpret Basic Safety and Legislation
7 Carryout Boiler Startup Activities
8 Carryout Routine Operation and maintenance of Boiler
9 Carryout Boiler Shutdown Activities

Description of Course

It is a skill-based training course designed to develop the knowledge, skills and workplace attitude required for the Boiler Operation and Maintenance in Light Engineering Sector. The curriculum covers various skills such as, apply occupational safety and health (OSH) procedure in the workplace, work in a team environment, communicate in the workplace, work effectively within light engineering sector, interpret basics of boiler, interpret basic safety and legislation, carryout boiler startup activities, carryout routine operation and maintenance of boiler and carryout boiler shutdown activities

Learning Outcome of the Course

Successful completion of this course will lead to certification in **Boiler Operation and Maintenance**, Level-2 under the Bangladesh National Qualification Framework (BNQF). Also, the course has the following functional, economic, and social learning outcomes.

Work Oriented Learning Outcome

1. Can work effectively as a **Junior Boiler Operator**
2. Occupational Safety and Health Regulations (OSH) may apply

Financial Learning Outcome

1. Job opportunities will be created as **Junior Boiler Operator** in country and abroad.
2. Can contribute to socio-economic development by participating in skill development activities

Social Learning Outcome

1. Social status will increase by achieving personal development
2. The share of skilled human resources will increase in line with changing technology
3. The number of skilled and trained **Junior Boiler Operator** will increase in the society

Course Structure

Generic Unit of Competency – 55 Hrs.

Sl. No.	Unit of Competency	Module Title	Learning Outcome	Nominal Hours
1	Apply Occupational Safety and Health (OSH) Procedure in the Workplace	Applying Occupational Safety and Health (OSH) Procedure in the Workplace	1. Identify OSH policies and procedures 2. Follow OSH procedures 3. Report hazards and risks 4. Respond to emergencies 5. Maintain personal well-being	15
2	Work in a Team Environment	Working in a Team Environment	1. Define team role and scope 2. Identify individual role and responsibility 3. Participate in team discussions 4. Work as a team member	20
3	Communicate in the Workplace	Communicating in the Workplace	1. Receive verbal instructions. 2. Interpret verbal and written information/ instruction 3. Convey instructions using verbal and written forms of communication 4. Complete written documentation 5. Participate in work place meetings and discussions	20
Total Hours				**55**

Sector Specific Unit of Competency – 15 Hrs.

Sl. No.	Unit of Competency	Module Title	Learning Outcome	Nominal Hours
1	Work Effectively within Light Engineering Sector	Working Effectively within Light Engineering Sector	1. Identify the organizational structure 2. Interpret processes and procedures 3. Identify workplace requirements 4. Organize own workload	15
Total Hours				**15**

Occupation Specific Unit of Competency–290 Hours

Sl. No.	Unit of Competency	Module Title	Learning Outcome	Nominal Hours
1.	Interpret Basics of Boiler	Interpreting Basics of Boiler	1. Interpret boiler 2. Identify boiler mountings and accessories 3. Identify boiler control panel board 4. Interpret water treatment plant 5. Interpret feed pump and dozing	30
2.	Interpret Basic Safety and Legislation	Interpreting Basic Safety and Legislation	1. Interpret safety for boiler operation 2. Interpret boiler related rules and regulation	20
3.	Carryout Boiler Startup Activities	Carrying out Boiler Startup Activities	1. Prepare for works 2. Carryout boiler pre-starting activities 3. Start gas fired boiler 4. Start liquid fuel fired boiler	100
4.	Carryout Routine Operation and Maintenance of Boiler	Carrying out Routine Operation and Maintenance of Boiler	1. Hand over and take over shift duties 2. Monitor operation 3. Check fuel 4. Check water 5. Routine maintenance	80
5	Carryout Boiler Shutdown Activities	Carrying out Boiler Shutdown Activities	1 Prepare for works 2 Demonstrate stop operation of boiler 3 Take further action for stopping oil fired boiler 4 Take further action for stopping gas fired boiler 5 Respond to the emergency situation 6 Shut down for maintenance 7 Recheck shut down activities	60
			Total Hours	**290**

Analysis of Competency

Generic Unit of Competency	Number of Module
1. Apply Occupational Safety and Health (OSH) Procedure in the Workplace	01
2. Work in a Team Environment	01
3. Communicate in the Workplace	01
Sector SpecificUnit of Competency	
4. Work Effectively within Light Engineering Sector	01
Occupation SpecificUnit of Competency	
5. Interpret Basics of Boiler	01
6. Interpret Basic Safety and Legislation	01
7. Carryout Boiler Startup Activities	01
8. Carryout Routine Operation and maintenance of Boiler	01
9. Carryout Boiler Shutdown Activities	01
Total	**09**

Course Delivery

1. Face to Face
2. Self Paced Learning
3. On the job
4. Off the job
5. Blended

Course Training Method

A variety of methods can be applied to course training depending on the students' learning interests and abilities. Instructors should select appropriate methods to train students. Some of the common methods used during skills training are:

1. Lecture
2. Presentation
3. Discussion
4. Demonstration
5. Guided Practice
6. Individual Pactice
7. Project Work
8. Problem Solving
9. Brainstorming

Module of Instruction

- Generic
- Sector Specific and
- Occupation Specific

Generic Modules

Unit of Competency	**Apply Occupational Safety and Health (OSH) Procedure in the Workplace**
Unit Code	**GU-02-L1-V1**
Module Title	**Applying occupational safety and health (osh) procedure in the workplace**
Module Descriptor	This module covers the knowledge, skills and attitudes required to apply occupational safety and health (OSH) procedure in the workplace. It specifically includes identifying OSH policies and procedures, following OSH procedures, reporting hazards and risks, responding to emergencies, and maintaining personal well-being.
Nominal Hours	**15 Hours**
Lerning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Identify OSH policies and procedures 2. Follow OSH procedures 3. Report hazards and risks 4. Respond to emergencies 5. Maintain personal well-being

Learning Outcome -1: Identify OSH policies and procedures	
Assessment Criteria	1. OSH policies and safe operating procedures are accessed and stated 2. Safety signs and symbols are identified and followed 3. Emergency response, evacuation procedures and other
Conditions and Resources	• Workplace or Simulated Workplace • Materials and equipment for OSH • Safety sign and symbols • OSH policies • CBLM • Handout • Multimedia Projector • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. OSH policies 2. Safe operating procedures 3. Safety signs and symbols 4. Emergency response, evacuation procedures and other contingency measures
Job/ Task/ Activity	1. State occupational safety and health policy

	2. Identify safety signs and symbols
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning

Learning Outcome -2: Follow OSH procedures	
Assessment Criteria	1. Personal protective equipment (PPE) is selected and collected as required 2. Personal protective equipment (PPE) is correctly used in accordance with organization OSH procedures and practices 3. A clear and tidy workplace is maintained as per workplace standard 4. PPE is maintained to keep them operational and compliant with OSH regulations
Conditions and Resources	• Workplace or Simulated Workplace • Necessary PPE • CBLM • Handout • Multimedia Projector • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Personal Protective Equipment (PPE) 2. OSH procedures and practices 3. Clear and tidy workplace 4. Maintainence of PPE
Job/ Task/ Activity	1. Select, collect and use personal protective equipment (PPE) 2. Perform cleaning and make tidy your workplace 3. Maintain Personal Protective Equipment (PPE)

Training Method	1. Discussion 2. Presentation 3. Demonstration 4. Guided Practice 5. Individual Practice 6. Project Work 7. Problem Solving 8. Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning

Learning Outcome -3: **Report Hazards and Risks**	
Assessment Criteria	1. Hazards and risks are identified, assessed and controlled 2. Incidents arising from hazards and risks are reported to designated authority
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Handout • Multimedia Projector • Paper, Pen, Pencil, • Internet Facilities • White Board and marker • Necessary PPE
Contents	1. Identifying, assessing and controllinghazards and risks 2. Incidents arising from hazards and risks
Job/ Task/ Activity	1. Identify and assess hazards and risks 2. Report incidents arising from hazards and risks to appropriate authorities
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning 4. Portfolio

Learning Outcome -4: **Respond to Emergencies**	
Assessment Criteria	1. Alarms and warning devices are responded 2. Workplace emergency procedures are followed 3. Contingency measures during workplace accidents, fire and other emergencies are recognized and followed in accordance with organization procedures 4. Frist aid procedures is applied during emergency situations
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Handout • Multimedia Projector • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device • Necessary tools • Necessary PPE
Contents	1. Alarms and warning devices andworkplace emergency procedures 2. Contingency measures during workplace accidents, fire and other emergencies 3. Frist aid procedures
Job/ Task/ Activity	1. Follow the signals of alarm and warning devices 2. Determine contingency management during workplace accidents, fires and other emergencies 3. Administer first aid
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning 4. Portfolio

Learning Outcome -5: **Maintain Personal Well-being**	
Assessment Criteria	1. OSH policies and procedures are adhered 2. OSH awareness programs are participated as per workplace guidelines and procedures 3. Corrective actions are implemented to correct unsafe condition in the workplace 4. "Fit to work" records are updated and maintained according to workplace requirements
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Handout • Computer/Laptop • Multimedia Projector • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. OSH policies and procedures 2. OSH awareness programs 3. Corrective actions for unsafe condition 4. "Fit to work" records
Job/ Task/ Activity	1. Identify Occupational Safety and Health policies and procedures 2. Identify and apply corrective actions to correct unsafe conditions 3. Maintain "Fit for work" record
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning 4. Portfolio

Unit of Competency	**Work in a Team Environment**
Unit Code	**GU-08-L2-V1**
Module Title	**Working in a team environment**
Module Descriptor	This module covers the knowledge, skills and attitudes required to work in a team environment. It specifically includes defining team role and scope, identifying individual role and responsibility, participating in team discussions and working as a team member
Nominal Hours	**20 Hours**
Lerning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Define team role and scope 2. Identify individual role and responsibility 3. Participate in team discussions 4. Work as a team member

Learning Outcome -1: Define team role and scope	
Assessment Criteria	1. Role and objectives of the team are defined 2. Team structure, responsibilities and reporting relations are identified from team discussions and other external sources contingency measures are determined according to workplace requirements
Conditions and Resources	• Workplace or Simulated Workplace • Role and objectives of the team • Team structure • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Role and objectives of the team 2. Team structure 3. Duties and resposibilities
Job/ Task/ Activity	1. Interpret role and responsibilities of the team. 2. Identify team structure, responsibilities and reporting relations

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning

Learning Outcome -2: Identify individual role and responsibility	
Assessment Criteria	1. Individual roles and responsibilities of team members are identified 2. Reporting relationships among team members are defined and clarified 3. Reporting relationships external to the team are defined and clarified
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Individual roles and responsibilities of team members 2. Reporting relationships among team members 3. Reporting relationships external to the team
Job/ Task/ Activity	1. Identify individual roles and responsibilities of team members 2. Report on relationships among team members 3. Report on reporting relationships external to the team
Training Method	1. Discussion 2. Presentation 3. Demonstration 4. Guided Practice 5. Individual Practice 6. Project Work 7. Problem Solving 8. Brainstorming

Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning 4. Portfolio

Learning Outcome -3: **Participate in team discussions**	
Assessment Criteria	1. Ideas related to team plans are contributed 2. Recommendations for improving team work are put forward
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Handout • Paper, Pen, Pencil, • Internet Facilities • White Board and marker • Necessary PPE
Contents	1. Team plan 2. Recommendations for improving team work
Job/ Task/ Activity	1. Prepare a team plan 2. Make recommendations for improving team work.
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	1. Written Test 2. Demonstration 3. Oral questioning 4. Portfolio

Learning Outcome -4: **Work as a team member**	
Assessment Criteria	1. Effective forms of communication are used to interact with team members 2. Communication channels are followed 3. OHS practices are followed
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Team member 1.1 Coach/mentor 1.2 Supervisor/Manager 1.3 Peers/Colleagues 1.4 Employee representative 2. Effective forms of communication with team member 3. Communication channels 4. OHS practices
Job/ Task/ Activity	1. Demonstrate use of effective forms of communication 2. List communication channels
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Communicate in the Workplace**
Unit Code	**GU-12-L2-V1**
Module Title	**Communicating in the Workplace**
Module Descriptor	This module covers the knowledge, skills and attitudes required to communicate in the workplace It specifically includes the task of receiving verbal instructions, interpreting verbal and written information/ instruction, conveying instructions using verbal and written forms of communication, completing written documentation and participating in workplace meetings and discussions
Nominal Hours	**20 Hours**
Lerning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Receive verbal instructions. 2. Interpret verbal and written information/ instruction 3. Convey instructions using verbal and written forms of communication 4. Complete written documentation 5. Participate in work place meetings and discussions

Learning Outcome -1: Receive verbal instructions.	
Assessment Criteria	1. Instructions are accessed and interpreted 2. Questions are asked to clarify understanding or gain more information. 3. Information/instruction is recorded.
Conditions and Resources	• Workplace or Simulated Workplace • Information/Instruction • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Information 2. Instruction
Job/ Task/ Activity	1. Interpret instructions 2. Record information/instruction

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Interpret verbal and written information/ instruction	
Assessment Criteria	1. Written instructions are interpreted. 2. Work signage's are properly responded. 3. Routine written instructions are followed in sequence. 4. Feedback is given to workplace supervisor.
Conditions and Resources	• Workplace or Simulated Workplace • CBLM • Written instruction • Work sinage's • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Written instruction 1.1 Supervisor's/manager's instructions 1.2 Memoranda 1.3 Rules and regulations 1.4 Signage 1.5 Approved work plan 1.6 External communications 2. Work sinage's 2.1 On-site direction signs 2.2 Common site warnings 2.3 Location signs 2.4 Traffic signs

Job/ Task/ Activity	1. Interpret written instructions 2. Demonstate respose on work sinage's 3. Demonstate response sequentially routine instructions
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: **Convey instructions using verbal and written forms of communication**	
Assessment Criteria	1. Relevant communication methods are used to transmit instructions. 2. Appropriate non-verbal communication is used. 3. Channels of communication are identified and followed 4. Communication tools and equipment are operated and faults are identified and reported. 5. Information is conveyed using appropriate forms.
Conditions and Resources	• Workplace or Simulated Workplace • Communication tools and equipment • CBLM • Handout • Paper, Pen, Pencil, • Internet Facilities • White Board and marker
Contents	1. Relevant communication 1.1 Verbal instructions 1.2 Written instructions 1.3 Online communication 2. Tools and equipment 2.1 workplace (actual or simulated) 2.2 Telephone 2.3 Mobile phone 2.4 Fax machines

	2.5 Two-way radio 2.6 Computers 2.7 Forms 2.8 Memo 3. Forms. 3.1 Memorandum 3.2 Requisitioning form 3.3 Personnel form 3.4 Safety report form
Job/ Task/ Activity	1. Use relevant communication methods to transmit instructions. 2. Identify and follow channels of communication 3. Operate communication tools and equipment 4. Convey information using appropriate forms
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -4: **Complete written documentation**	
Assessment Criteria	1. All required documentation is completed 2. Workplace data are recorded 3. Written information/instruction is passed to personnel.
Conditions and Resources	• Workplace or Simulated Workplace • Required documents • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Required documents 1.1 Reports (Monthly, Quarterly, Half-Yearly, Annual) 1.2 Plans (Strategic Plan, Operational Plan, Monthly Schedule) 1.3 Monitoring and Evaluation Report 1.4 Minutes of Meetings 2. Required information/documentation
Job/ Task/ Activity	1. Demonstrate use of effective forms of communication 2. List communication channels
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -5: **Participate in work place meetings and discussions**	
Assessment Criteria	1. Meetings are attended regularly and on time. 2. Meeting inputs are consistent with the meeting purpose and established protocols. 3. Opinions are expressed without interruption. 4. Meeting outputs are processed and implemented.
Conditions and Resources	• Workplace or Simulated Workplace • Required documents • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Meeting protocols 2. Meeting outputs
Job/ Task/ Activity	1. Demonstate implementation process of meeting output.
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Sector Specific Module

Unit of Competency	**Work in the Light Engineering Sector**
Unit Code	**SU-LE-01-L2-V1**
Module Title	**Work in the Light Engineering Sector**
Module Descriptor	This module covers the knowledge, skills and attitudes required to work in the light engineering sector It specifically includes the task of describing the organizational structure within the sector, identifying processes and procedures identifying tools, equipment and materials identifying workplace requirements, organizing own workload and practicing OSH
Nominal Hours	**15 Hours**
Lerning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Describe the organizational structure within the sector 2. Identify processes and procedures 3. Identify tools, equipment and materials 4. Identify workplace requirements 5. Organize own workload 6. Practice OSH

Learning Outcome -1: Describe the organizational structure within the sector	
Assessment Criteria	1. Scope, nature and major fields of the Light Engineering sector are determined 2. The profile of the Light Engineering sector in relation to Bangladesh employment conditions is determined 3. Trends and technologies relevant to the sector are explained 4. Relevant policies and guidelines are identified and interpreted 5. Instructions as to procedures in achieving quality are obtained, understood and clarified
Conditions and Resources	• Workplace or Simulated Workplace • Scope, nature and major fields of the Light Engineering sector • Profile of the Light Engineering sector • Relevant policies and guidelines • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities
Contents	1. Scope, nature and major fields of the Light Engineering sector 2. Profile of the Light Engineering sector 3. Relevant policies and guidelines 4. Employment conditions 4.1 Code of Practice 4.2 Salary/Wage System

	4.3 Labor Practices 4.4 Anti-Discrimination Policy 4.5 Gender Issues 4.6 Collective Bargaining and Other Practices 4.7 Awards 4.8 Procedures for Handling Disputes 4.9 Innovations in the Sector 5. Instructions for achieving quality 5.1 Specifications and requirements 5.2 Standard operating procedures 5.3 Manuals of Instruction 5.4 Operations Manual 5.5 Environmental Guidelines 5.6 Gender and Develop Guidelines
Job/ Task/ Activity	1. Identify scope, nature and major fields of the Light Engineering 2. Identify the employment condition of Light Engineering Sector 3. Identify relevant policies and guidelines 4. Identify instructions for achieving quality
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Identify processes and procedures	
Assessment Criteria	1. Light Engineering processes are identified, described and explained 2. Work activities are correctly identified 3. Adjustments are interpreted

Conditions and Resources	• Workplace or Simulated Workplace • Light Engineering processes, work activities and adjustments • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Light Engineering processes 2. Work activities 3. Adjustments
Job/ Task/ Activity	1. Identify Light Engineering processes 2. Identify work activities 3. Interpret adjustment
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: **Identify tools, equipment and materials**	
Assessment Criteria	1. Appropriate manuals are accessed to ensure up-to-date specifications of tools, materials and equipment 2. Light Engineering tools, materials and equipment are identified 3. Substitutes are identified in case of non-availability
Conditions and Resources	• Workplace or Simulated Workplace • Appropriate manuals • Light Engineering tools, materials and equipment • Non available substitute list • CBLM • Handout • Paper, Pen, Pencil,

Contents	1. Appropriate manuals 1.1 Manual of Instructions 1.2 Manual of Specifications 1.3 Repair Manual 1.4 Quality Manual 1.5 Maintenance Procedure and Troubleshooting 2. Light Engineering tools, materials and equipment 2.1 Refers to all tools, equipment and materials appropriate for any of the Light Engineering fields 3. Non available substitute list
Job/ Task/ Activity	1. Interpret appropriate manuals 2. Identify Light Engineering tools, materials and equipment 3. Identify Non available substitute list
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -4: **Identify workplace requirements**	
Assessment Criteria	1. Workplace requirements are identified and clarified. 2. Roles and responsibilities of all personnel are described 3. Workplace's practices are identified 4. Roles and responsibilities are used to address bottlenecks, inconsistencies and other concerns
Conditions and Resources	• Workplace or Simulated Workplace • Workplace requirements • Roles and responsibilities • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Workplace requirements 2. Roles and responsibilities 3. Problem-solving strategies
Job/ Task/ Activity	1. Identify workplace requirements 2. Interpret roles and responsibilities of all personnel 3. Identify workplace's practices
Training Method	• Discussion • Presentation • Demonstrationr • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -5: **Organize own workload**	
Assessment Criteria	1. Own work activities are planned and progress of work is communicated to relevant staff 2. Work activities are completed 3. Difficulties and bottlenecks are identified, and solutions are put forwarded 4. Own work is monitored against workplace standards and areas for improvement identified and acted upon
Conditions and Resources	• Workplace or Simulated Workplace • Own work activities are plan • Difficulties and bottlenecks • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Own work activities plan 2. Difficulties and bottlenecks 3. Own work monitoring plan
Job/ Task/ Activity	1. Prepare own work activities plan 2. Identify difficulties and bottlenecks 3. Prepare own work monitoring plan
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -6: **Practice OSH**	
Assessment Criteria	1. Relevant OSH practices are identified 2. Relevant OSH practices are interpreted and implemented
Conditions and Resources	• Workplace or Simulated Workplace • Relevant OSH practices • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Relevant OSH practices
Job/ Task/ Activity	1. Identify relevant OSH practices
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Occupation Specific Module

Unit of Competency	**Interpret Basics of Boiler**
Unit Code	**OU-LE-BOM-01-L2-V1**
Module Title	Interpreting Basics of Boiler
Module Descriptor	This unit covers the knowledge, skills and attitudes required to interpret basics of boiler. It includes interpreting boiler, identifying boiler mountings and accessories, boiler control panel board, water treatment plant and interpreting feed pump and dozing
Nominal Hours	**30 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Interpret boiler 2. Identify boiler mountings and accessories 3. Identify boiler control panel board 4. Interpret water treatment plant 5. Interpret feed pump and dozing

Learning Outcome -1: Interpret boiler	
Assessment Criteria	1. Boiler and application of boiler are interpreted; 2. Function of boiler is interpreted. 3. Types of boilers are interpreted; 4. Types of boiler burner are identified 5. Burner controller is identified 6. Solid fuel burning system is identified. 7. Economizer is interpreted. 8. Causes and remedies of tearing of pressure parts are interpreted; 9. Safety precaution of boiler operation is stated.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. Application of Boiler 1.1 Pharmaceutical 1.2 Textile and Garment 1.3 Food industries 1.4 Auto-rice mills 1.5 Chemical and fertilizer 1.6 Power station 1.7 Pulp and Paper Industries 1.8 Leather Industries 1.9 Multistoried buildings 1.10 Feed Mills 2. Function of boiler 3. Types of boilers 4. Types of boiler burners 5. Burner controller 6. Economizer 7. Safety precaution of boiler operation
Job/ Task/ Activity	1. Interpret: • application of boiler • function of boiler • types of boilers • economizer • causes and remedies of tearing of pressure parts • safety precaution of boiler operation 2. Identify: • types of boiler burner

	• burner controller • solid fuel burning system
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Identify boiler mountings and accessories	
Assessment Criteria	1. Boiler mountings are listed. 2. Usages of boiler mounting in boiler operation is interpreted. 3. Boiler accessories and auxiliary equipment are listed. 4. Function of boiler accessories and auxiliaries is interpreted. 5. Application of accessories in boiler operation is interpreted.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Boiler mountings 1.1 Safety valve 1.2 Manhole 1.3 Mudhole / handhole 1.4 Main steam stop valve 1.5 Feedwater check valve (non-return valve) 1.6 Steam pressure gauge 1.7 Water level indicator (gauge glass) 1.8 Water level controller 1.9 Blowdown valve 1.10 Blowdown controller 1.11 Air cock (air vent valve) 1.12 Fusible plug

	2. Boiler accessories 2.1 Feed water pump and strainer 2.2 Combustion safety door 2.3 Force Draft (FD) fan 2.4 Induced Draft (ID) fan 2.5 Surface blow down cock 2.6 Ground/bottom blowdown cock 2.7 Boiler flue gas stack 2.8 Ferrule 2.9 Steam trap / steam separator / steam doom 2.10 Steam pressure switch 2.11 Modulating valve 3. Auxiliary equipment 3.1 Economizer 3.2 Air preheater 3.3 Water preheater 3.4 Superheater 3.5 Condensate recovery system 3.6 Blowdown vessel 3.7 Deaerator 3.8 Damper 3.9 Feedwater tank
Job/ Task/ Activity	1. List the boiler mountings 2. Interpret use of boiler mountings 3. List boiler accessories and auxiliary equipment 4. Interpret the function and application of boiler accessories and auxiliary equipment
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Identify boiler control panel board	
Assessment Criteria	1. Boiler control panel board is identified. 2. Electric components of boiler are listed. 3. Electric components of boiler are interpreted.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler control panel board • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Boiler control panel board 2. Electric components of boiler 2.1 Main circuit breaker 2.2 Current transformer 2.3 Potential transformer 2.4 Main power switch 2.5 Volt meter 2.6 Ammeter 2.7 Indicator lamp 2.8 Push button switch 2.9 Selector switch 2.10 Display panel / monitor / Human Machine Interface (HMI) 2.11 Magnetic contactor 2.12 Relay 2.13 Thermal overload relay 2.14 Timer 2.15 Counter 2.16 Water level switch / transmitter 2.17 Burner controller / programme controller 2.18 Water level controller 2.19 Temperature meter 2.20 TDS meter 2.21 Transducer 2.22 PLC
Job/ Task/ Activity	1. Identify boiler control panel board 2. List the boiler electric components 3. Interpret boiler electric components

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -4: Interpret water treatment plant	
Assessment Criteria	1. Sources of water are identified. 2. Water impurity particles are interpreted. 3. Water treatment process is stated. 4. Water parameter standard value is listed. 5. Water treatment equipment is identified. 6. Water sample is collected. 7. Water parameters are measured as per standard. 8. Measured water parameters are reported as per SOP.
Conditions and Resources	• Workplace or Simulated Workplace • Water treatment plant • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Sources of water 1.1 Surface water 1.2 Ground water 2. Water parameter 2.1 TH (Total Hardness) 2.2 pH (Potential of hydrogen) 2.3 TDS (Total Dissolved Solid) 2.4 Dissolved oxygen 2.5 Conductivity 2.6 CL, Chloride ion 2.7 Dissolved iron 2.8 Silica content 2.9 Total Suspended Solid (TSS) 3. Water treatment equipment 3.1 Aeration system 3.2 Softeners 3.3 DM (De-mineralization) plant 3.4 Iron removal plant 3.5 Filtration 4. Particle of water 4.1 Iron 4.2 Magnesium 4.3 Calcium 4.4 Potassium 4.5 Silica 4.6 Calcium bi-carbonate 4.7 Magnesium bi-carbonate 4.8 Sulfate 4.9 Calcium magnesium sulfate

	4.10 Dissolved gases
Job/ Task/ Activity	1. Identify source of water 2. Interpret water impurity particles 3. List water parameter standard values 4. Measure water parameter as per standard
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -5: Interpret feed pump and dozing	
Assessment Criteria	1. Principle of feed pump is interpreted. 2. Function of feed pump is interpreted. 3. Function of dozing pump is interpreted.
Conditions and Resources	• Workplace or Simulated Workplace • Feed pump • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1 Principle of feed pump 2 Function of feed pump 3 Function of dozing pump
Job/ Task/ Activity	1. Interpret principle of feed pump 2. Interpret function of feed pump 3. Interpret function of dozing pump
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Interpret Basic Safety and Legislation**
Unit Code	**OU-LE-BOM-02-L2-V1**
Module Title	Interpret basic safety and legislation
Module Descriptor	This unit covers the knowledge, skills and attitudes required to Interpret basic safety and legislation. It includes interpreting safety for boiler operation and boiler related rules and regulation.
Nominal Hours	**20 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Interpret safety for boiler operation 2. Interpret boiler related rules and regulation

Learning Outcome -1: Interpret safety for boiler operation	
Assessment Criteria	1. Personal Protective Equipment (PPE) is identified. 2. Safety precaution for starting boiler is interpreted. 3. Boiler running safety precaution is interpreted. 4. Boiler related fire safety is interpreted. 5. Boiler related chemical hazards are interpreted. 6. Emergency situation in boiler operation is interpreted
Conditions and Resources	• Workplace or Simulated Workplace • Boiler safety rules • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1 Boiler safety rules 2 Hazards of chemicals used in boiler 3 Emergency sisuation 3.1 Steam pipe main line leakage 3.2 Blowdown valve leakage 3.3 Water level sensor problem 3.4 Feed water delivery pipe line leakage 3.5 Non return valve non functioning 3.6 Feed water suction strainer jam 3.7 Safety valve problem 3.8 Flue gas exhaust system 3.9 Fuel line leakage 3.10 Air pressure sensor blocked 3.11 Water gauge glass drain line blocked
Job/ Task/ Activity	1. Interpret boiler safety precaution for starting operation 2. Interpret boiler safety precaution for running operation 3. Interpret boiler related fire safety 4. Interpret boiler chrmical hazards 5. Interpret emergency sisuation of boiler operation.
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming

Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Interpret boiler related rules and regulation	
Assessment Criteria	1. Boiler rules are identified. 2. Boiler operator licensing process is interpreted 3. boiler registration and renew related rules and regulation are interpreted. 4. Boiler repairing related rules and regulation are interpreted; 5. Emission control process and relevant laws are interpreted;
Conditions and Resources	• Workplace or Simulated Workplace • Boiler rules • Operator licensing process • Boiler registration and renew related rules and regulation • Boiler repairing related rules and regulation • Emission control process and relevant laws • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Boiler rules 2. Boiler operator licensing procedure 3. boiler registration and renew related rules and regulations 4. Boiler repairing related rules and regulations 5. Emission control and relevant laws
Job/ Task/ Activity	1. Identify boiler rules 2. Interpret boiler operator licensing procedure 3. Interpret boiler registration and renew related rules and regulations 4. Interpret boiler repairing related rules and regulations 5. Interpret boiler emission control and relevant laws
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Carryout Boiler Startup Activities**
Unit Code	**OU-LE-BOM-03-L2-V1**
Module Title	Carrying out boiler startup activities
Module Descriptor	This unit covers the knowledge, skills and attitudes required to carry out boiler startup activities. It includes preparing for work, carrying out boiler pre-starting activities starting gas fired boiler, fuel fired boiler.
Nominal Hours	**100 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Prepare for works 2. Carryout boiler pre-starting activities 3. Start gas fired boiler 4. Start liquid fuel fired boiler

Learning Outcome -1: Prepare for works	
Assessment Criteria	1. Personal Protective Equipment (PPE) is used; 2. Hazards are identified and mitigated as per workplace procedure. 3. Log book is received and information are checked before starting boiler. 4. Main circuit breaker is turned on and power supply is ensured; 5. Softener water parameter is checked using appropriate testing kits and devices. 6. Softener water is regenerated using regeneration chemical as per prescribe ratio;
Conditions and Resources	• Workplace or Simulated Workplace • PPE • Logbook • Testing kits and devices • Regeration chemical • Boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. PPE 2. Logbook 3. Water parameter 3.1 TH (Total Hardness) 3.2 pH (Potential of hydrogen) 3.3 TDS (total dissolved solid) 3.4 CL (Chloride ion) 3.5 Dissolved oxygen 3.6 Conductivity 3.7 Iron test 3.8 Silica content 3.9 Total Suspended Solid (TSS) 4. Testing kits and devices 5.1 pH meter 5.2 TDS meter 5.3 Conductivity meter 5.4 Hardness tester 5.5 DO meter 5. Regeneration chemical 1. Softener - Sodium chloride (NaCL/salt) 2. DM plant - hydrochloric acid/sulphuric acid (HCL/ H2S04)
Job/ Task/ Activity	1 Identify and mitigate hazard

	2 Check and maintain logbook 3 Switch on main circuit breaker 4 Check of soft water parameter 5 Use regeration chemical as per SOP
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Carryout boiler pre-starting activities	
Assessment Criteria	1. Feed water temperature is checked and recorded as per SOP. 2. Feed tank water level is checked. 3. Air vent valve position is checked. 4. Blowdown valve is checked. 5. Suction and delivery valve (feed water line) is checked. 6. Water level in boiler is checked. 7. Fuel/energy availability is checked and quality is inspected. 8. Air blower is turned on. 9. Steam header and outlet valve is checked to make it liquid free; 10. Compressed air valve is turned ON and pressure is checked. 11. Boiler main power is turned ON. 12. Faulty signal is checked and informed as per SOP.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Feed water temperature 2. Feed tank water level 3. Air vent valve position 4. Blowdown valve 5. Suction and delivery valve 6. Air blower 7. Steam header and outlet valve 8. Compressed air valve
Job/ Task/ Activity	1. Check; 1.1 feed water temperature 1.2 feed tank water level 1.3 air vent valve position 1.4 blowdown valve 1.5 suction and delivery valve 1.6 water level 1.7 fuel/energy availability 1.8 steam header and outlet valve to make it liquid free;

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Start gas fired boiler	
Assessment Criteria	1. Safety system for running condition is ensured. 2. Gas burner switch is turned on. 3. Purging in combustion area is observed. 4. Ignition and pilot solenoid valve is set in auto mode as per SOP. 5. Indication of opening of main solenoid valve is ensured. 6. Pilot ignition turned off and main solenoid valve turned on is observed and recorded. 7. Low load (10-20%) is maintained in the initial stages of boiler startup operation. 8. Boiler inside flame condition is visually observed through looking glass. 9. Boiler starting procedure is monitored in panel board. 10. Main steam stop valve is opened after achieving required pressure. 11. Exhaust gas temperature is observed and recorded.
Conditions and Resources	• Workplace or Simulated Workplace • Gas fired boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Gas fired boiler 2. Gas burner 3. Combustion area 4. Ignition and pilot solenoid valve 5. Main solenoid valve
Job/ Task/ Activity	1. Ensure safety system of gas fired boiler 2. Turn on gas burner switch 3. Set ignition and solenoid valve as per SOP 4. Turn off pilot ignition 5. Turn on solenoid valve 6. Monitor boiler starting procedure 7. Open steam stop valve after achieving required pressure 8. Record exhaust gas temperature

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -4: Start liquid fuel fired boiler	
Assessment Criteria	1. Burner switch is turned on 2. Purging in combustion area is observed. 3. Liquid fuel supply is monitored. 4. Ignition and pilot solenoid valve is set in auto/manual mode according to the requirement 5. Indication of opening of main solenoid valve is monitored. 6. Fuel supply inside the burner is ensured; 7. Pilot ignition is turned off and main solenoid valve turned on is observed and recorded. 8. Low load (10-20%) is maintained in the initial stages of boiler startup operation. 9. Boiler inside flame condition is visually observed through looking glass. 10. Boiler starting procedure is monitored in panel board. 11. Main steam stop valve is opened after achieving required steam pressure
Conditions and Resources	• Workplace or Simulated Workplace • Liquid fuel fired boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	Liquid fuel fired boiler 1. Burner switch 2. Ignition and pilot solenoid valve 3. Main solenoid valve 4. Main stop valve
Job/ Task/ Activity	1. Ensure safety system of liquid fuel fired boiler 2. Turn on burner switch 3. Set ignition and solenoid valve as per SOP 4. Turn off pilot ignition 5. Turn on solenoid valve 6. Monitor boiler starting procedure 7. Open steam stop valve after achieving required pressure

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Carryout Routine Operation and Maintenance of Boiler**
Unit Code	**OU-LE-BOM-04-L2-V1**
Module Title	Carrying out routine operation and maintenance of boiler
Module Descriptor	This unit covers the knowledge, skills and attitudes required to carry out routine operation and maintenance of boiler. It includes handing over and taking over shift, monitoring operation, checking fuel and water and maintaining routine.
Nominal Hours	**80 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Hand over and take over shift duties 2. Monitor operation 3. Check fuel 4. Check water 5. Maintain routine maintenance

Learning Outcome -1: Hand over and take over shift duties	
Assessment Criteria	1. Safe work practices are observed and Personal Protective Equipment (PPE) is used 2. Hand over and take over documents are prepared; 3. Boiler and it surrounding conditions are checked. 4. Water level of feed water tank is checked. 5. Sources of fuel/energy are identified. 6. Boiler operation related information in log book and log sheet is checked and received / handed over;
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • PPE • Logbook • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. PPE 1.1 Safety shoes 1.2 Apron 1.3 Hand gloves 1.4 Helmet 1.5 Mask 1.6 Safety glass 1.7 Ear plug 2. Hand over and take over documents 2.1 Log sheet 2.2 Log book 3. Sources of fuel/energy 3.1 Gas 3.2 Oil 3.3 Solid fuel 3.4 Electricity 3.5 Generator flue gas
Job/ Task/ Activity	1. Prepare handover and takeover documents 2. Identify sources of fuel/energy 3. Check boiler operation related information in log book and log sheet and received / handed over

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Monitor operation	
Assessment Criteria	1. Water level and feedwater line are observed 2. Boiler operation is monitored. 3. Boiler pressure and temperature are measured; 4. Inlet and outlet flue gas temperature is observed and recorded. 5. Furnace temperature reading is recorded in log book every hour. 6. Chemical solution is dosed using dosing pump as per prescribe recommendation. 7. Panel board is monitored and data is recorded in log book as per workplace procedure. 8. Safety precaution is maintained in every aspect of work.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • Boiler mounting and accessories • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Boiler operation 1.1 Fuel quantity 1.2 Gauge glass 1.3 Pressure gauge (steam, water and fuel) 1.4 Flue gas temperature 1.5 Feed water and steam temperature 1.6 Steam flow record 1.7 Water quality record 2. Chemical solution

	2.1 pH control chemical 2.2 Corrosion inhibitor 2.3 Scale inhibitor 2.4 Steam line corrosion inhibitor 3. Data 3.1 Voltage 3.2 Flow 3.2.1 Fuel 3.2.2 Air 3.2.3 Gas 3.2.4 Steam 3.2.5 Water 3.3 Pressure 3.3.1 Steam 3.3.2 Fuel 3.3.3 Feed water 3.4 Temperature 3.4.1 Furnace 3.4.2 Steam 3.4.3 Flue gas 3.4.4 Stack / chimney 3.4.5 Panel 3.4.6 Economizer inlet and outlet 3.4.7 Feed water 3.4.8 Air pre heater inlet and outlet 3.4.9 Oil 3.5 Level transmitter 3.5.1 Water 3.5.2 Fuel 4. Safety precaution of boiler
Job/ Task/ Activity	1. Monitor boiler operation 2. Dose chemical solution as per instruction 3. Maintain safety precaution
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Check fuel	
Assessment Criteria	1. Sufficient fuel is reserved for boiler operation as per organization procedure. 2. Fuel parameter is checked as per boiler fuel type and recoded in log book. 3. Bypass fuel sources are used if any problem occurred in fuel supply.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler fuel system • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Fuel parameter 1.1 Gas regulator inlet pressure 1.2 Gas regulator outlet pressure 1.3 Oil level and temperature 1.4 Quantity of solid fuel 1.5 Number of phases, voltage rating and frequency
Job/ Task/ Activity	1. Check fuel reserve as per standard 2. Check and record fuel parameter 3. Use bypass fuel source
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -4: Check water	
Assessment Criteria	1. Water storage availability is checked. 2. Water parameter of boiler and feed water is checked using testing kits and devices as per schedule. 3. Water treatment is performed as per requirement. 4. Blowdown is carried out as per schedule. 5. Water level is checked as per schedule. 6. Information is recorded in log book after every check;
Conditions and Resources	• Workplace or Simulated Workplace • Water treatment system • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Water parameter 1.1 TH (Total Hardness) 1.2 pH (Potential of hydrogen) 1.3 TDS (Total dissolved solid) 1.4 Iron (Fe) 1.5 Dissolved oxygen 1.6 Conductivity 2. Testing kits and devices 2.1 pH meter 2.2 TDS meter 2.3 Conductivity meter 2.4 Hardness tester 2.5 DO meter 2.6 Iron test kit 3. Water treatment 3.1 Back wash 3.2 Regeneration (anion and cation resin)
Job/ Task/ Activity	1. Check water parameter by using testing kits and devices 2. Perform water treatment as per requirement 3. Carryout blowdown 4. Check water level as per schedule 5. Record information in the logbook

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -5: Maintain routine maintenance	
Assessment Criteria	1. Heating surface cleaning is carried-out; 2. Gauge glass is cleaned; 3. Hydraulic test is carried-out; 4. Steam test is carried-out; 5. Regular cleaning and maintenance are carried-out;
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1 Heating surface cleaning process 2 Gauge glass cleaning process 3 Hydraulic testing method 4 Steam testing procedure 5 Regular cleaning and maintenance
Job/ Task/ Activity	1. Clean heating surface 2. Clean gauge glass 3. Perform hydraulic test as per instruction 4. Perform steam test 5. Perform regular cleaning and maintenance
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Carryout Boiler Shutdown Activities**
Unit Code	**OU-LE-BOM-05-L2-V1**
Module Title	Carrying out boiler shutdown activities
Module Descriptor	This unit coves the knowledge, skills and attitudes required to carry out boiler shut down activities. It includes preparing for work, stopping gas and oil boiler operation for short time, taking further action for stopping oil fired boiler, responding to the emergency situation, shutting down for maintenance and rechecking shut down activities
Nominal Hours	**60 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Prepare for works 2. Demonstrate shutdown operation of boiler 3. Take further action for shutdown liquid fuel fired boiler 4. Take further action for shutdown gas fired boiler 5. Respond to the emergency situation 6. Shut down for maintenance 7. Recheck shut down activities

Learning Outcome -1: Prepare for works	
Assessment Criteria	1. Safe work practices observed and Personal Protective Equipment (PPE) are used; 2. Hazards are identified and mitigated as per workplace procedure.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • PPE • Logbook • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. PPE 1.8 Safety shoes 1.9 Apron 1.10 Hand gloves 1.11 Helmet 1.12 Mask 1.13 Safety glass 1.14 Ear plug 2. Hazards
Job/ Task/ Activity	1. Maintain safe work practice 2. Identify hazards and mitigate as per workplace procedure.
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Demonstrate shutdown operation of boiler	
Assessment Criteria	1. Burner position is set at low; 2. Burner switch is turned off; 3. Gauge glass and water level is checked; 4. Main steam stop valve is turned off; 5. Blowdown is performed to reduce sludge; 6. Boiler water level is ensured after blowdown 7. Softener plant is shutdown; 8. FD and ID fan are turned off; 9. Panel board main breaker is turned off;
Conditions and Resources	• Workplace or Simulated Workplace • Boiler • Boiler mounting and accessories • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Steps of shutdown operation of boiler 2. Shutdown operation process
Job/ Task/ Activity	1. Shutdown boiler by following shutdown operation procedure;
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Take further action for shutdown liquid fuel fired boiler	
Assessment Criteria	1. Liquid fuel reserve tank valve is stopped. 2. Liquid fuel reserve tank heater is turned off. 3. Liquid fuel service tank heater is turned off 4. Circulation pump is turned off
Conditions and Resources	• Workplace or Simulated Workplace • Fuel fired boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Further action procedure of shutdown of fuel fired boiler
Job/ Task/ Activity	1. Take further action for shutdown of fuel fired boiler
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -4: Take further action for shutdown gas fired boiler	
Assessment Criteria	1. Main gas valve is stopped; 2. By-pass valve is stopped; 3. Vaporization plant is stopped.
Conditions and Resources	• Workplace or Simulated Workplace • Gas fired boiler • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Further action procedure of shutdown of gas fired boiler
Job/ Task/ Activity	1. Take further action for shutdown of gas fired boiler
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -5: Respond to the emergency situation	
Assessment Criteria	1. Panel board is observed. 2. Emergency breakdown situation is identified. 3. Boiler operation is shutdown as per SOP.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler with panel board • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1 Function of panel board 2 Emergency breakdown sisuation 2.1 Steam pipe main line leakage (within boiler room) 2.2 Blowdown valve leakage 2.3 Shortage of feed water 2.4 Feedwater delivery pipe line leakage 2.5 Fire drum is damaged 2.6 Safety valve problem 2.7 Boiler body/ tube leakage 2.8 Shutdown operation procedure of boiler
Job/ Task/ Activity	1. Identify emergency situation 2. Shutdown boiler as per SOP;
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -6: Shut down for maintenance	
Assessment Criteria	1. Boiler is shutdown. 2. Air vent valve is opened. 3. Blowdown valve is opened partially. 4. Boiler is cooled down slowly and exhaust blower is turned on
Conditions and Resources	• Workplace or Simulated Workplace • Boiler with panel board • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1 Shutdown operation procedure of boiler
Job/ Task/ Activity	1. Shutdown boiler as per SOP;
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -7: Recheck shut down activities	
Assessment Criteria	1. Components and parts are rechecked according to the check list. 2. Information is recorded in log book.
Conditions and Resources	• Workplace or Simulated Workplace • Boiler with panel board • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1 Recheck checklist 1.1 Power supply of panel board 1.2 Softener plant 1.3 Gas line valve 1.4 Dosing pump 1.5 Feed pump suction/ delivery valve 1.6 Feed water tank steam valve 1.7 Main steam valve 1.8 Softener valve 1.9 Oil reserve tank valve 1.10 Oil reserve tank heater 1.11 LPG supply valve 1.12 Circulation fuel pump 1.13 Blowdown valve
Job/ Task/ Activity	2. Recheck compononts and parts as per checklist; 3. Record information in logbook
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Competency based curriculum (CBC)

The CBC is also termed as Competency Based Curriculum and is developed based on NCS and labour market needs.

CBT curricula are designed considering the following principles.

- Identification of competencies in consultation with experts from industries and training institutes
- Adopting 21st century pedagogy and methodology
- Training must be in line with labour market need and industrial standard
- Creating training modality to experience real working situation through platform such as OJT and Industrial visit

What is Competency-Based Curriculum (CBC)

- A competency-based curriculum is a framework or guide for the subsequent detailed development of competencies, associated methodologies, training and assessment resources.

- The CBC specifies the outcomes which are consistent with the requirements of the workplace as agreed through the industry or community consultations.

- CBC can be developed immediately when competency standards exist.

- When competency standards do not exist, curriculum developers need to clearly define the learning outcomes to be attained. The standard of performance required must be appropriate to industry and occupational needs through the industry/enterprise or specified client group consultations.

Validation of Competency Based Curriculum

The Competency Based Curriculum for National Skills Certificate in Boiler Operation and Maintenance, Level-2 is developed by NSDA on 05-06 and 11-13 February 2025.

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