



COMPETENCY STANDARD

Boiler Operation and Maintenance

Level: 3

(Light Engineering Sector)

Competency Standard Code: CS-LE-BOM-L3-EN-V1



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

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National Skills Development Authority
Prime Minister's Office
Level: 10-11, Biniyog Bhaban,
E-6 / B, Agargaon, Sher-E-Bangla Nagar Dhaka-1207, Bangladesh.
Email: ec@nsda.gov.bd
Website: www.nstda.gov.bd.
National Skills Portal: <http://skillsportal.gov.bd>

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This Competency Standard for Boiler Operation and Maintenance is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of industry in order to meet the qualification of individuals who graduated through the established standard via competency-based assessment for a relevant job.

This document has been validated by NSDA in association with Light Engineering Sector, industry representatives, academia, related specialist, trainer and related employee.

Public and private institutions may use the information contained in this standard for activities benefitting Bangladesh.

Introduction

The NSDA aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public and private training providers qualitatively and quantitatively. It also aims to establish and operationalize a responsive skills ecosystem and delivery mechanism through a combination of well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training program. "**Boiler Operation and Maintenance**" is selected as one of the priority occupations of Construction Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

To support this effort, technical assistance has been provided by GIZ through its Skills Development for Sustainable Energy Solutions (Skills4SE) project, which focuses on strengthening the training ecosystem for grid connected renewable energy and energy efficiency. Skills4SE works closely with NSDA, training institutions, and industry stakeholders to enhance CS & CAD, develop curricula, and provide capacity-building support for trainers and assessors in line with industry demands. Additionally, GIZ is going to support the piloting of training programs to ensure effective implementation and industry alignment.

Generally, a competency standard informs curriculum, learning materials, assessment and certification of trainees enrolled in Skills Training. Trainees who successfully pass the assessment will receive a qualification in the Bangladesh National Qualification Framework (BNQF) and will be listed on the NSDA's online portal.

This competency standard is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding Elements.

Overview

A competency standard is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of a competency standards is to:

- provide a consistent and reliable set of components for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of representative from NSDA, Key Institutions, ISC, and industry experts to identify the competencies required of an occupation in Light Engineering Sector.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasizing what the learner can do, not how or where they learned to do it.

With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guides

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes and the Unit of Competency titles and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide.

Competency Standards for National Skill Certificate, Level-3 in Boiler Operation and Maintenance in Light Engineering Sector

Level Descriptors of NSQF (BNQF 1-6)

Level & Job classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager/ Sub Assistant Engineer	Comprehensive actual and theoretical knowledge within a specific work or study area with an awareness of the validity and limits of that knowledge, able to analyse, compare, relate and evaluate.	Specialised and wider range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues and solutions to the team and to external partners/users.	Work under broad guidance and self-motivation to execute strategic and operational plan/s. Lead lower-level management. Diagnose and resolve problems within and among work groups.
5-Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize and break information into parts by identifying motives or causes.	Broad range of cognitive and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems and possible solutions to external partners.	Work under guidance of management and self-direction to resolve specific issues. Lead and take responsibility for the work and actions of group/team members. Bridge between management.
4-Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing and applying acquired knowledge.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying the full range of methods, tools, materials and information. Communicate using technical terminology and IT technology with partners and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements and lead/guide a team/ group.
3-Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools. Communicate with his team and limited external partners upholding the values, nature and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.
2-Semi Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 –Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

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
MSDS	Material Safety Data Sheet
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures

Approved by

---th Executive Committee (EC) Meeting of NSDA

Held on -----

Deputy Director (Admin)

and

Officer of Secretarial Duties for EC meeting
National Skills Development Authority

Table of Contents

Copyright.....	i
Introduction.....	ii
Overview	iii
Level Descriptors of NSQF (BNQF 1-6).....	iv
List of Abbreviations.....	v
Course Structure	1
Units & Elements at Glance	2
Generic Units of Competencies	4
Unit Code and Title	5
GU-08-L2-V1: Work in a Team Environment	5
Unit code and Title	8
GU-10-L3-V1: Demonstrate Work Values	8
Sector Specific Units of Competencies	12
Occupation Specific Units of Competencies	13
Unit Code and Title.....	14
OU-LE-BOM-01-L3-V1: Interpret Fundamentals of Boiler Functions	14
OU-LE-BOM-02-L3-V1: Interpret Safety and Legislation.....	20
OU-LE-BOM-03-L3-V1: Perform Boiler Activities.....	22
OU-LE-BOM-04-L3-V1: Perform Routine Operation of Boiler	27
OU-LE-BOM-05-L3-V1: Perform Boiler Shutdown Activities	31
OU-LE-BOM-06-L3-V1: Troubleshoot Faults of Boiler.....	34
Development of Competency Standard	40

**Competency Standards for National Skill Certificate, Level- 3 in
Boiler Operation and Maintenance in Light Engineering Sector**

Course Structure

SL No	Unit code and Title	UOC Level	Nominal (hours)
Generic Units of Competencies			
1.	GU-08-L2-V1	Work in the team environment	20
2.	GU-10-L3-V1	Demonstrate work values	20
Sub Total			40
Sector Specific Units of Competencies			
Occupation Specific Units of Competencies			
3.	OU-LE-BOM-01-L3-V1	Interpret Fundamentals of Boiler Functions	20
4.	OU-LE-BOM-02-L3-V1	Interpret Safety and Legislation	20
5.	OU-LE-BOM-03-L3-V1	Perform Boiler Activities	50
6.	OU-LE-BOM-04-L3-V1	Perform Routine Operation of Boiler	60
7.	OU-LE-BOM-05-L3-V1	Perform Boiler Shutdown Activities	20
8.	OU-LE-BOM-06-L3-V1	Troubleshoot Faults of Boiler	60
Sub Total			230
Total Duration			270

Units & Elements at Glance

Generic Competencies

Code	Unit of competency	Elements of competency	Duration (hours)
GU-08-L2-V1	Work in the team environment	<ol style="list-style-type: none">1. Define team role and scope2. Identify individual role and responsibility3. Participate in team discussions4. Work as a team member	20
GU-10-L2-V1	Demonstrate work values	<ol style="list-style-type: none">1. Define the purpose of work2. Apply work values / ethics3. Deal with ethical problems4. Maintain integrity of conduct in the workplace	20
Total hours			40

Sector specific competencies

Occupation specific competencies

Code	Unit of competency	Elements of competency	Duration (hours)
OU-LE-BOM-01-L3-V1	Interpret Fundamentals of Boiler Functions	<ol style="list-style-type: none"> 1 Interpret boiler 2 Interpret feed pump 3 Identify boiler mountings and accessories 4 Identify boiler control panel board 5 Comprehend water treatment parameters 6 Interpret fundamentals of economizer 	30
OU-LE-BOM-02-L3-V1	Interpret Safety and Legislation	<ol style="list-style-type: none"> 1 Follow 5s 2 Interpret boiler act 3 Interpret boiler registration procedure 4 Comprehend boiler related rules and regulation 	20
OU-LE-BOM-03-L3-V1	Perform Boiler Activities	<ol style="list-style-type: none"> 1 Prepare for Boiler operation activities 2 Perform boiler pre-starting activities 3 Check deaerator 4 Start gas fired boiler 5 Start liquid fuel fired boiler 6 Start solid fuel fired boiler 	50
OU-LE-BOM-04-L3-V1	Perform Routine Operation of Boiler	<ol style="list-style-type: none"> 1. Hand over and take over shift duties 2. Update logbook 3. Monitor overall boiler operation 	60
OU-LE-BOM-05-L3-V1	Perform Boiler Shutdown Activities	<ol style="list-style-type: none"> 1. Prepare for Shutdown work 2. Perform emergency shutdown 3. Perform stop operation of boiler 4. Recheck and ensure shutdown activities 	30
OU-LE-BOM-06-L3-V1	Troubleshoot Faults of Boiler	<ol style="list-style-type: none"> 1. Prepare for Troubleshooting 2. Perform maintenance of boiler 	40

		<ul style="list-style-type: none"> 3. Identify electrical fault 4. Identify mechanical fault 5. Identify instrumental fault 6. Respond to the emergency situation 	
Total Hours			230

Generic Units of Competencies

Unit Code and Title	GU-08-L2-V1: Work in a Team Environment
Unit Descriptor	This unit covers the knowledge, skills and attitudes (KSAs) required in working in a team environment. It 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
Elements of Competency	Performance Criteria <u>Bold & Underlined</u> terms are elaborated in the Range of Variables
1. Define team role and scope	1.1. Role and objectives of the team are defined. 1.2. Team structure, responsibilities and reporting relations are identified from team discussions and other external sources.
2. Identify individual role and responsibility	2.1 Individual roles and responsibilities of <u>team members</u> are identified. 2.2 Reporting relationships among team members are defined and clarified. 2.3 Reporting relationships external to the team are defined and clarified.
3. Participate in team discussions	2.1 Ideas related to team plans are contributed. 2.2 Recommendations for improving team work are put forward.
4. Work as a team member	4.1. Effective forms of communication are used to interact with team members. 4.2. Communication channels are followed. 4.3. OHS practices are followed.
Range of Variables	
Variables	Range (may include but not limited to):
1. Sources of information	1.1 Standard Operating Procedures 1.2 Job Description 1.3 Operations Manual 1.4 Organizational Structure
2. Team Members	2.1 Coach/mentor 2.2 Supervisor/Manager 2.3 Peers/Colleagues 2.4 Employee representative
3. Workplace context	3.1 National Laws and Statutes 3.2 Standard Operating Procedures 3.3 Workplace Rules and Regulations

Evidence Guide	
The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency	
1. Critical aspects of competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 demonstrated knowledge in working in a team environment. 1.2 satisfied the requirements mentioned in the Performance Criteria and Range of Variables
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Team Structure, Role and Responsibility 2.2 Individual Members' Roles and Responsibilities 2.3 Communication Flow and Reporting Structures 2.4 Team Planning 2.5 Interpersonal Communication Skills 2.6 Team Meeting Procedures 2.7 OHS Practices
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Identifying the role and responsibility of the team 3.2 Identifying roles and responsibilities of individual members 3.3 Participating in team discussions 3.4 Working as a team member
4. Underpinning Attitudes	<ul style="list-style-type: none"> 4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace 4.6 Communication with peers and seniors in Workplace
5. Resource implications	<ul style="list-style-type: none"> 5.1 Pens 5.2 Telephone 5.3 Computer 5.4 Writing materials 5.5 Online communication
6. Methods of assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> 6.1. Workplace observation 6.2. Demonstration 6.3. Oral questioning 6.4. Written test 6.5. Portfolio
7. Context of assessment	<ul style="list-style-type: none"> 7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any BNQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit code and Title	GU-10-L3-V1: Demonstrate Work Values
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to demonstrate work values. It specifically includes – define the purpose of work; apply work values / ethics; deal with ethical problems; and maintain integrity of conduct in the workplace.
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <u>Bold & Underlined</u> terms are elaborated in the Range of Variables Training Components
1. Define the purpose of work	1.1 One’s unique sense of purpose for working and the why’s of work are identified, reflected on and clearly defined for one’s development as a person and as a member of society. 1.2 Personal mission is in harmony with industry values are defined.
2. Apply work values / ethics	2.1 <u>Work values / ethics / concepts</u> are classified and reaffirmed in accordance with the transparent industry ethical standards, policies and guidelines. 2.2 <u>Work practices</u> are undertaken in compliance with industry work ethical standards, industry policy and guidelines. 2.3 Personal behavior and relationships with co-workers are maintained as per standards, policy and guidelines. 2.4 <u>Company resources</u> are used in accordance with transparent company ethical standard, policies and guidelines.
3. Deal with ethical problems	3.1 industry ethical standard, organizational policy and guidelines on the prevention and reporting of unethical conduct are accessed and applied in accordance with transparent company ethical standard, policies and guidelines. 3.2 Work <u>incidents / situations</u> are reported and/or resolved in accordance with company protocol / guidelines. 3.3 Resolution and / or referral of ethical problems identified are used as learning opportunities.
4. Maintain integrity of conduct in the workplace	4.1 Personal work practices and values are demonstrated consistently with acceptable ethical conduct and company’s core values. 4.2 <u>Instructions</u> to co-workers are provided based on ethical, lawful and reasonable directives. 4.3 Company values / practices are shares with co-workers using appropriate behavior and language.

Range of Variables	
Variable	Range (may include but not limited to):
1. Work values / ethics / concepts	1.1 Commitment / Dedication 1.2 Sense of urgency 1.3 Sense of purpose 1.4 Love for work 1.5 High motivation 1.6 Orderliness 1.7 Reliability 1.8 Competence 1.9 Dependability 1.10 Goal-oriented 1.11 Sense of responsibility 1.12 Being knowledgeable 1.13 Loyalty to work/company 1.14 Sensitivity to others 1.15 Compassion/Caring attitude 1.16 Balancing between family and work 1.17 Benjamin spirit/teamwork 1.18 Sense of nationalism 1.19 Gender awareness
2. Work practices	2.1 Quality of work 2.2 Punctuality 2.3 Efficiency 2.4 Effectiveness 2.5 Productivity 2.6 Resourcefulness 2.7 Innovativeness / Creativity 2.8 Cost consciousness 2.9 5S 2.10 Attention to details
3. Company resources	3.1 Consumable materials 3.2 Equipment / Machineries 3.3 Human 3.4 Time 3.5 Financial resources
4. Incidents / situations	4.1 Violent / intense dispute or argument 4.2 Gambling 4.3 Use of prohibited substances 4.4 Pilferages

	<ul style="list-style-type: none"> 4.5 Damage to person or property 4.6 Vandalism 4.7 Falsification 4.8 Bribery 4.9 Sexual Harassment 4.10 Blackmail
5. Instructions	<ul style="list-style-type: none"> 5.1 Verbal 5.2 Written
<p>Evidence Guide</p> <p>The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency</p>	
1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 defined one's unique sense of purpose for working 1.2 clarified and affirmed work values / ethics / concepts consistently in the workplace 1.3 demonstrated work practices satisfactorily and consistently in compliance with industry work ethical standards, organizational policy and guidelines 1.4 demonstrated personal behavior and relationships with co-workers and / or clients consistent with ethical standards policy and guidelines 1.5 used company resources in accordance with company ethical standard, policies and guidelines 1.6 followed company ethical standards, organizational policy and guidelines on the prevention and reporting of unethical conduct / behavior 1.7 demonstrated sufficient knowledge of the factors influencing negotiation to achieve agreed outcome 1.8 participated in negotiation with at least one person to achieve an agreed outcome.
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 Occupational safety and health. 2.2 Work values and ethics. 2.3 Company performance and ethical standards. 2.4 Company policies and guidelines. 2.5 Fundamental rights at work including gender sensitivity. 2.6 Work responsibilities / job functions. 2.7 Corporate social responsibilities. 2.8 Company code of conduct / values. 2.9 Balancing work and family responsibilities. 2.10 Codes of practice and guidelines for the organization. 2.11 Organization policy and procedures for negotiations.

	<p>2.12 Decision making and conflict resolution strategies procedures.</p> <p>2.13 Problem solving strategies on how to deal with unexpected questions and attitudes during negotiation.</p>
3. Underpinning Skills	<p>3.1 Developing interpersonal skills to strengthen rapport with other parties.</p> <p>3.2 Communicating with others (verbal and listening).</p> <p>3.3 Self-awareness, understanding and acceptance.</p> <p>3.4 Applying good manners and right conduct.</p> <p>3.5 Observation skills.</p> <p>3.6 Negotiation skills.</p>
4. Underpinning Attitude	<p>4.1 Commitment to occupational health and safety</p> <p>4.2 Promptness in carrying out activities</p> <p>4.3 Sincere and honest to duties</p> <p>4.4 Environmental concerns</p> <p>4.5 Eagerness to learn</p> <p>4.6 Tidiness and timeliness</p> <p>4.7 Respect for rights of peers and seniors in workplace</p> <p>4.8 Communication with peers, sub-ordinates and seniors in workplace</p>
5. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Tools, equipment and physical facilities appropriate to perform activities</p> <p>5.2 Materials, consumables to perform activities</p>
6. Methods of Assessment	<p>6.1 Written Test</p> <p>6.2 Demonstration</p> <p>6.3 Oral Questioning</p> <p>6.4 Portfolio</p>
7. Context of Assessment	<p>7.1 Competency assessment must be done in NSDA Accredited Assessment center</p> <p>7.2 Assessment should be done by NSDA certified/ nominated assessor</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any BNQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p>	

Sector Specific Units of Competencies

Occupation Specific Units of Competencies

Unit Code and Title	OU-LE-BOM-01-L3-V1: Interpret Fundamentals of Boiler Functions
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to interpret fundamental of boiler functions. It includes interpreting boiler, identifying boiler mountings and accessories, boiler control panel board and water treatment plant.
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <u>Bold & underlined</u> terms are elaborated in the Range of Variables
1. Interpret boiler	1.1 Direct fired and indirect fired boilers are interpreted 1.2 Types of boiler burner are identified 1.3 <u>Gas and oil burner parts</u> are identified. 1.4 <u>Electric Boiler Parts</u> are identified. 1.5 Burner controller is identified 1.6 Solid fuel burning system is identified. 1.7 Safety precaution of boiler operation is stated.
2. Interpret feed pump	2.1 Feed tank water level and temperature are ensured. 2.2 Feed pump is prepared for operation. 2.3 Feed pump is operated as per SOP. 2.4 Dozing activity is performed.
3. Identify boiler mountings and accessories	3.1 <u>Boiler mountings</u> are identified. 3.2 Usages of boiler mountings in boiler operation is stated. 3.3 <u>Boiler accessories</u> and <u>auxiliary equipment</u> are identified. 3.4 Function of boiler accessories and auxiliaries is stated. 3.5 Application of accessories and auxiliary equipment in boiler operation is comprehended.
4. Identify boiler control panel board	4.1 Control switches of panel board are identified. 4.2 Functions of control switches are identified. 4.3 Function of control panel is interpreted.
5. Comprehend water treatment parameters	5.1 Water impurity particles are identified. 5.2 Water treatment process is interpreted. 5.3 <u>Water parameter</u> standard values are interpreted. 5.4 <u>Water treatment equipment</u> are used. 5.5 Quality of water is reported as per SOP.
6. Interpret fundamentals of economizer	6.1 Types of economizer are identified. 6.2 Function of economizer is identified. 6.3 Basic <u>faults of economizer</u> are identified.

Range of Variables	
Variable	Range (may include but not limited to):
1. Gas burner parts	1.1 Servo motor (modulation motor) 1.2 Photocell 1.3 Ionization rod 1.4 Programmable controller 1.5 Ignition transformer 1.6 Ignition rod 1.7 Pilot solenoid valve 1.8 Air pressure switch 1.9 Gas pressure switch 1.10 Gas strainer (filter) 1.11 Pressure gauge 1.12 Gas pressure regulator 1.13 Safety shut-up valve 1.14 Main gas solenoid valve / hydro motor 1.15 Air damper 1.16 Gas actuator 1.17 Blower 1.18 Butterfly valve 1.19 Looking glass 1.20 Diffuser
2. Oil burner parts	2.1 Furnace oil burner 2.1.1 Oil nozzle 2.1.2 Oil preheater 2.1.3 Programmable controller 2.1.4 Atomizing air pressure switch 2.1.5 Atomizing air pressure valve 2.1.6 Electric heater 2.1.7 Strainer / filter 2.1.8 Oil flow meter 2.1.9 Inlet pressure gauge 2.1.10 Inlet temperature meter 2.1.11 Outlet temperature gauge 2.1.12 Oil temperature switch 2.1.13 Outlet pressure gauge 2.1.14 Oil pressure regulator 2.1.15 Oil pressure switch 2.1.16 Oil pressure safety valve 2.1.17 Main solenoid valve 2.1.18 Pilot solenoid valve 2.1.19 Fuel pump

	<ul style="list-style-type: none"> 2.1.20 Bypass oil line 2.1.21 Oil viscosity meter 2.1.22 LP regulator 2.1.23 Ignition transformer 2.1.24 Ignition cable 2.1.25 Ignition rod 2.1.26 Looking glass 2.1.27 Oil diffuser 2.1.28 Blower <p>2.2 Diesel Burner</p> <ul style="list-style-type: none"> 2.2.1. Oil nozzle 2.2.2. Programmable controller 2.2.3. Atomizing air pressure switch 2.2.4. Strainer/ filter 2.2.5. Oil flow meter 2.2.6. Oil Actuator 2.2.7. Inlet pressure gauge 2.2.8. Outlet pressure gauge 2.2.9. Pilot solenoid valve 2.2.10. Main solenoid valve 2.2.11. Oil pressure regulator 2.2.12. Oil pressure switch 2.2.13. Oil pressure safety valve 2.2.14. Fuel pump 2.2.15. Bypass oil line 2.2.16. LP regulator 2.2.17. Ignition transformer 2.2.18. Ignition cable 2.2.19. Ignition rod 2.2.20. Looking glass 2.2.21. Oil diffuser 2.2.22. Blower
3. Electric Boiler Parts	<ul style="list-style-type: none"> 3.1 Electrical Heater Coil 3.2 Thermostat 3.3 Magnetic contactor 3.4 Steam Pressure Switch
4. Boiler mounting	<ul style="list-style-type: none"> 4.1 Safety valve 4.2 Main steam stop valve 4.3 Feedwater check valve (non-return valve) 4.4 Steam pressure gauge 4.5 Water level indicator (gauge glass) 4.6 Water level controller 4.7 Blowdown valve

	<ul style="list-style-type: none"> 4.8 Blowdown controller 4.9 Air cock (air vent valve) 4.10 Fusible plug
5. Boiler accessories	<ul style="list-style-type: none"> 5.1 Feed water pump 5.2 Combustion safety door 5.3 Force Draft (FD) fan 5.4 Induced Draft (ID) fan 5.5 Surface blowdown cock 5.6 Ground/bottom blowdown cock 5.7 Boiler flue gas stack 5.8 Ferrule 5.9 Steam trap / steam separator / steam dome 5.10 Steam pressure switch
6. Boiler auxiliary equipment	<ul style="list-style-type: none"> 6.1 Economizer 6.2 Air pre heater 6.3 Water pre heater 6.4 Super heater 6.5 Condensate recovery system 6.6 Blowdown vessel 6.7 Deaerator 6.8 Damper 6.9 Feedwater tank
7. Water parameter	<ul style="list-style-type: none"> 7.1 TH (Total Hardness) 7.2 pH (Potential of hydrogen) 7.3 TDS (Total Dissolved Solid) 7.4 Dissolved oxygen 7.5 Conductivity 7.6 CL— Chloride ion 7.7 Dissolved iron 7.8 Silica content 7.9 Total Suspended Solid (TSS)
8. Water treatment equipment	<ul style="list-style-type: none"> 8.1. Softeners 8.2. DM (De-mineralization) plant 8.3. Reverse Osmosis (RO) Plant 8.4. Iron removal plant 8.5. Filtration
9. Faults of economizer	<ul style="list-style-type: none"> 9.1. Tube leakages 9.2. Tube blockages 9.3. Tube corrosion and erosion 9.4. Carbon deposition
<p>Evidence Guide</p> <p>The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.</p>	

1. Critical aspects of competency	<p>Assessment required evidences that the candidate:</p> <ul style="list-style-type: none"> 1.1 identified gas and oil burner parts; 1.2 identified electric boiler parts; 1.3 Interpreted feed pump 1.4 identified boiler mounting and accessories; 1.5 identified boiler control panel and control system; 1.6 comprehended water treatment process..
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Functions boiler burner 2.2 Types of boiler burner 2.3 Parts of gas and oil burner 2.4 Parts of electric boiler 2.5 Feed pump and dozing 2.6 Boiler mounting, boiler accessories and auxiliary equipment. 2.7 Water treatment process 2.8 Usage of gas regulator valve 2.9 Particle of water <ul style="list-style-type: none"> 2.9.1 Iron 2.9.2 Magnesium 2.9.3 Calcium 2.9.4 Potassium 2.9.5 Silica 2.9.6 Calcium bi-carbonate 2.9.7 Magnesium bi-carbonate 2.9.8 Sulfate 2.9.9 Calcium magnesium sulfate 2.9.10 Dissolved gases 2.10 Raw water, softener water, demineralized water feed water and blow down water standard parameter 2.11 Ammeter, voltmeter, ohmmeter, watt meter, multimeter 2.12 Measurement unit 2.13 KG/ cm² , KPA, Bar, PSI, N /mm² 2.14 phase voltage 2.15 PLC/ Microcontroller
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Identifying boiler and types of boiler 3.2 Identifying gas and oil burner parts. 3.3 Identifying electric boiler parts 3.4 Identifying boiler mounting, boiler accessories and auxiliary equipment 3.5 Listing water parameter standard value. 3.6 Using water treatment equipment

4. Required attitudes	<ul style="list-style-type: none"> 4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resources implication	<p>The following resources must be available:</p> <ul style="list-style-type: none"> 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Relevant drawings, manuals, codes, standards and reference materials.
6. Methods of assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> 5.1 written test 5.2 demonstration 5.3 oral questioning 5.4 portfolio
7. Context for assessment	<ul style="list-style-type: none"> 6.1 Competency assessment must be done in NSDA accredited assessment centre 6.2 Assessment should be done by a NSDA certified/nominated assessor
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p>	

Unit Code and Title	OU-LE-BOM-02-L3-V1: Interpret Safety and Legislation
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to interpret safety and legislation. It includes the tasks of following 5s, interpreting boiler act, boiler registration procedure and boiler related rules and regulation.
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <u>Bold & underlined</u> terms are elaborated in the Range of Variables
1. Follow 5s	1.1 <u>5s</u> is interpreted 1.2 5s is followed
2. Interpret boiler Act	2.1 Boiler Act is interpreted. 2.2 Boiler Act is followed.
3. Interpret boiler rules	3.1 Boiler rules are interpreted. 3.2 Boiler rules are followed.
4. Interpret boiler regulations	4.1 Boiler regulations are interpreted. 4.2 Boiler regulations are followed.
5. Interpret boiler registration procedure	5.1 Boiler registration procedure is interpreted. 5.2 Boiler registration procedure is followed.
Range of Variables	
Variable	Range (may include but not limited to):
1. 5s	Sort Set in order Shine Standardize Sustain
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 followed 5s ; 1.2 interpreted boiler Act; 1.3 interpreted boiler registration procedure; 1.4 interpreted boiler related rules and regulation;
2. Underpinning knowledge	2.1 Describe 5s 2.2 Boiler Act 2022 2.3 Boiler registration procedure 2.4 Boiler related rules and regulation.

	2.5 Relevant regulations/ codes of boiler
3. Underpinning skills	3.1 Identifying 5s. 3.2 Identifying boiler Act 2022 3.3 Identifying boiler relevant regulations/ codes
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn 4.5 Tidiness and timeliness 4.6 Environmental concerns 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Relevant drawings, manuals, codes, standards and reference materials.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/ nominated assessor
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p>	

Unit Code and Title	OU-LE-BOM-03-L3-V1: Perform Boiler Activities
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform boiler startup activities. It includes the tasks of preparing for Boiler operation activities, performing boiler pre-starting activities, checking deaerator, starting gas fired boiler, liquid fuel fired boiler and solid fuel fired boiler.
Nominal Hours	50 Hours
Elements of Competency	Performance Criteria <u>Bold & underlined</u> terms are elaborated in the Range of Variables
1. Prepare for Boiler operation activities	<p>1.1 <u>Personal Protective Equipment (PPE)</u> is used;</p> <p>1.2 Hazards are identified and mitigated as per workplace procedure.</p> <p>1.3 Log book is received and information are checked before starting boiler.</p> <p>1.4 Main circuit breaker is turned on and three phase power supply is ensured;</p> <p>1.5 Soft <u>water parameter</u> is checked using appropriate <u>testing kits and devices</u>.</p> <p>1.6 Softener is regenerated as per SOP.</p>
2. Perform boiler pre-starting activities	<p>2.1 Feed water temperature is checked and recorded as per SOP.</p> <p>2.2 Feed tank water level is checked.</p> <p>2.3 Feed water pump is turned ON.</p> <p>2.4 Air vent valve position is checked.</p> <p>2.5 Blowdown valve is checked.</p> <p>2.6 Suction and delivery valve (feed water line) is checked.</p> <p>2.7 Water level in boiler is checked.</p> <p>2.8 Fuel / energy availability is checked and quality is ensured;</p> <p>2.9 Air blower is turned on.</p> <p>2.10 Steam header and outlet valve is checked.</p> <p>2.11 Function of pneumatic valve is checked.</p> <p>2.12 Boiler main power is turned ON.</p> <p>2.13 Faulty signal is identified.</p> <p>2.14 Fault is solved and informed as per SOP.</p>
3. Check deaerator	<p>3.1 Function of <u>deaerator</u> is interpreted.</p> <p>3.2 Necessity of deaerator in boiler operation is identified.</p>
4. Start gas fired boiler	<p>4.1 <u>Safety system for running condition</u> is checked.</p> <p>4.2 Faults of safety system is identified for malfunctioning condition.</p> <p>4.3 <u>Faults of gas fired boiler</u> are solved as per SOP.</p> <p>4.4 Gas burner switch is turned on.</p>

	<p>4.5 Purging in combustion area is observed.</p> <p>4.6 Ignition and pilot solenoid valve is set in auto mode as per SOP.</p> <p>4.7 Indication of opening of main solenoid valve is ensured.</p> <p>4.8 Pilot ignition turned off and main solenoid valve turned on is observed.</p> <p>4.9 Low load (10-20%) is maintained in the initial stages of boiler startup operation.</p> <p>4.10 Boiler inside flame condition is visually observed through looking glass.</p> <p>4.11 Boiler starting procedure is monitored in panel board.</p> <p>4.12 Main steam stop valve is opened after achieving required steam pressure.</p> <p>4.13 Exhaust gas temperature is observed and recorded.</p>
5. Start liquid fuel fired boiler	<p>5.1 Burner switch is turned on.</p> <p>5.2 Purging in combustion area is observed.</p> <p>5.3 Liquid fuel supply is monitored.</p> <p>5.4 Ignition and pilot solenoid valve is set in auto/manual mode according to the requirement.</p> <p>5.5 Indication of opening of main solenoid valve is monitored.</p> <p>5.6 Fuel supply inside the burner is ensured;</p> <p>5.7 Pilot ignition is turned off and main solenoid valve turned on is observed.</p> <p>5.8 Low load (10-20%) is maintained in the initial stages of boiler startup operation.</p> <p>5.9 Boiler inside flame condition is visually observed through looking glass.</p> <p>5.10 Boiler starting procedure is monitored in panel board.</p> <p>5.11 Main steam stop valve is opened after achieving required steam pressure.</p> <p>5.12 <u>Faults of liquid fired boiler</u> are identified.</p> <p>5.13 Faults are solved as per SOP.</p>
6. Start solid fuel fired boiler	<p>6.1 <u>Solid fuel</u> supply is ensured.</p> <p>6.2 Pilot Burner switch is turned on.</p> <p>6.3 Function of ID fan and FD fan is monitored.</p> <p>6.4 Temperature of combustion chamber is monitored, controlled and recorded.</p> <p>6.5 Fuel supply inside the combustion chamber is ensured;</p> <p>6.6 Low load (10-20%) is maintained in the initial stages of boiler startup operation.</p> <p>6.7 Boiler starting procedure is monitored in panel board.</p> <p>6.8 Main steam stop valve is opened after achieving required steam pressure.</p>

	6.9 Faults of solid fuel fired boiler are identified. 6.10 Faults are solved as per SOP.
Range of Variables	
Variable	Range (may include but not limited to):
1. Personal Protective Equipment (PPE)	1.1 Safety shoes 1.2 Hand gloves 1.3 Helmet 1.4 Mask 1.5 Safety glass 1.6 Ear plug 1.7 Apron
2. Water parameter	2.1 TH (Total Hardness) 2.2 pH (Potential of hydrogen) 2.3 TDS (total dissolved solid) 2.4 CL (Chloride ion) 2.5 Dissolved oxygen 2.6 Conductivity 2.7 Iron test 2.8 Silica content 2.9 Total Suspended Solid (TSS)
3. Testing kits and devices	3.1 pH meter 3.2 TDS meter 3.3 Conductivity meter 3.4 Hardness tester 3.5 DO meter
4. Deaerator	4.1 Non-pressurized 4.2 Pressurized
5. Safety system for running condition	5.1 Gas pressure 5.2 Steam pressure 5.3 Water level 5.4 Conductivity
6. Faults of gas fired boiler	6.1 Gas pressure sensor malfunctioning 6.2 Main gas valve blocked 6.3 Filter blocked 6.4 Regulator abnormalities 6.5 Steam pressure sensor malfunctioning 6.6 Water level sensor malfunctioning 6.7 Conductivity sensor malfunctioning
7. Faults of liquid fuel fired boiler	7.1 Oil pressure and temperature sensor malfunctioning 7.2 Oil valve blocked 7.3 Filter blocked

	<ul style="list-style-type: none"> 7.4 Regulator abnormalities 7.5 Steam pressure sensor malfunctioning 7.6 Water level sensor malfunctioning 7.7 Conductivity sensor malfunctioning
8. Solid fuel	<ul style="list-style-type: none"> 8.1 Coal 8.2 Biomass 8.3 Wood chips 8.4 Rice husk 8.5 Garments waste fabrics 8.6 Bagasse 8.7 Waste papers
9. Faults of solid fuel fired boiler	<ul style="list-style-type: none"> 9.1 Combustion chamber temperature sensor malfunctioning 9.2 Filter blocked 9.3 Soot accumulated 9.4 ID fan and FD fan malfunctioning 9.5 Steam pressure sensor malfunctioning 9.6 Water level sensor malfunctioning 9.7 Conductivity sensor malfunctioning
<p>Evidence Guide</p> <p>The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.</p>	
1. Critical aspect of competency	<p>Assessment required evidences that the candidate:</p> <ul style="list-style-type: none"> 1.1 prepared for Boiler operation activities 1.2 performed boiler pre-starting activities 1.3 checked deaerator 1.4 started gas fired boiler 1.5 started liquid fuel fired boiler 1.6 started solid fuel fired boiler
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Boiler operation activities 2.2 Boiler pre-starting activities 2.3 Deaerator 2.4 Starting procedure gas fired boiler 2.5 Starting procedure liquid fuel fired boiler 2.6 Starting procedure solid fuel fired boiler
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Preparing for boiler operation 3.2 Preparing for boiler pre-starting activities 3.3 Checking of deaerator functions 3.4 Preparing for gas fired boiler 3.5 Preparing for fuel fired boiler 3.6 Preparing for solid fired boiler

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Relevant drawings, manuals, codes, standards and reference materials.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p>	

Unit Code and Title	OU-LE-BOM-04-L3-V1: Perform Routine Operation of Boiler
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform routine operation of boiler. It includes the tasks of handing over and taking over shift duties, updating logbook and monitoring overall boiler operation
Nominal Hours	60 Hours
Elements of Competency	Performance Criteria <u>Bold & underlined</u> terms are elaborated in the Range of Variables
1. Hand over and take over shift duties	1.1 Safe work practices are observed and <u>Personal Protective Equipment (PPE)</u> is used 1.2 Hand over and take over <u>documents</u> are prepared; 1.3 Boiler and its surrounding conditions are checked. 1.4 Water level of feed water tank is checked. 1.5 Boiler operation related information in log book and log sheet are checked and received / hand overed
2. Update logbook	2.1 Logbooks are interpreted. 2.2 Logbooks are filled with appropriate data. 2.3 Logbook is updated.
3. Monitor overall boiler operation	3.1 Water level and feedwater line are observed. 3.2 <u>Overall Boiler operation</u> is monitored. 3.3 Boiler inlet and outlet flue gas temperature is observed and recorded. 3.4 Furnace temperature reading is recorded in log book every hour. 3.5 <u>Chemical solution</u> is dosed using dosing pump as per prescribe recommendation. 3.6 Panel board is monitored and <u>data</u> is recorded in log book as per workplace procedure. 3.7 Safety precaution is maintained in every aspect of work.
Range of Variables	
Variable	Range (may include but not limited to):
1. Personal protective equipment (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. Documents	2.1 Log sheet 2.2 Log book
3. Overall Boiler operation	3.1 Water level 3.2 Fuel quantity 3.3 Gauge glass 3.4 Pressure gauge (steam, water and fuel) 3.5 Flue gas temperature 3.6 Feed water and steam temperature 3.7 Feed pump 3.8 Blowdown 3.9 Boiler vibration 3.10 Chemical dosing 3.11 Steam flow record 3.12 Water parameters record
4. Chemical solution	4.1 pH control chemical 4.2 Corrosion inhibitor 4.3 Scale inhibitor 4.4 Steam line corrosion inhibitor
5. Data	5.1 Voltage 5.2 Flow <ul style="list-style-type: none"> 5.2.1 Fuel 5.2.2 Air 5.2.3 Gas 5.2.4 Steam 5.2.5 Water 5.3 Pressure <ul style="list-style-type: none"> 5.3.1 Steam 5.3.2 Fuel 5.3.3 Feed water 5.4 Temperature <ul style="list-style-type: none"> 5.4.1 Furnace 5.4.2 Steam 5.4.3 Flue gas 5.4.4 Stack / chimney 5.4.5 panel 5.4.6 Economizer inlet and outlet 5.4.7 Feed water 5.4.8 Air preheater inlet and outlet 5.4.9 Oil 5.5 Level transmitter <ul style="list-style-type: none"> 5.5.1 Water 5.5.2 Fuel

Evidence Guide	
The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 handed over and taken over shift duties 1.2 updated logbook 1.3 monitored overall boiler operation
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Procedure of hand over and take over shift duties 2.2 Procedure of updating logbook 2.3 Procedure of monitoring overall boiler operation 2.4 Dosing of chemical solution 2.5 Safety precautions
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Handing over and taking over shift duties 3.2 Preparing logbook for updating. 3.3 Preparing for boiler operation 3.4 Preparing for dozing 3.5 Following safety procedure
4. Required attitudes	<ul style="list-style-type: none"> 4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	<p>The following resources must be available:</p> <ul style="list-style-type: none"> 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Relevant drawings, manuals, codes, standards and reference materials.
6. Methods of assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio
7. Context of assessment	<ul style="list-style-type: none"> 7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA

Unit Code and Title	OU-LE-BOM-05-L3-V1: Perform Boiler Shutdown Activities
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform boiler shut down activities. It includes preparing for shutdown work, performing emergency shutdown, stopping operation of boiler and rechecking and ensuring shut down activities.
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <u>Bold & underlined</u> terms are elaborated in the Range of Variables
1. Prepare for Shutdown work	1.1 Safe work practices observed and <u>Personal Protective Equipment (PPE)</u> are used; 1.2 Hazards are identified and mitigated as per workplace procedure.
2. Perform emergency shutdown	2.1 Emergency switch is activated by pressing. 2.2 Surrounding conditions are observed. 2.3 Main steam supply valve is closed. 2.4 Blowdown valve is opened to normalize the steam pressure in the boiler. 2.5 Shutdown report is conveyed to the authority.
3. Perform shutdown operation of boiler	3.1 Burner firing condition is set at low; 3.2 Burner switch is turned off; 3.3 Gauge glass and water control check is performed; 3.4 Main steam stop valve is turned off; 3.5 Blowdown is performed to reduce sludge; 3.6 Boiler water level is ensured after blowdown 3.7 Softener plant is shutdown; 3.8 FD and ID fan are turned off; 3.9 Panel board main breaker is turned off;
4. Recheck and ensure shutdown activities	4.1. Components and parts are rechecked according to the <u>items</u> of checklist 4.2. Information is recorded in log book.
Range of Variables	
Variable	Range (may include but not limited to):

1. Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> 1.1 Safety shoes 1.2 Boiler Suit 1.3 Heat resistant hand gloves 1.4 Helmet 1.5 Mask 1.6 Safety glass 1.7 Ear plug 1.8 Gas cartridge 1.9 Breathing apparatus
2. Items	<ul style="list-style-type: none"> 2.1 Power supply of panel board 2.2 Softener plant 2.3 Gas line valve 2.4 Dosing pump 2.5 Feed pump suction/ delivery valve 2.6 Feed water tank steam valve 2.7 Main steam valve 2.8 Softener valve 2.9 Oil reserve tank valve 2.10 Oil reserve tank heater 2.11 Oil service tank heater 2.12 Gas supply valve 2.13 Circulation fuel pump 2.14 Blowdown valve
<p>Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.</p>	
1. Critical aspect of competency	<p>Assessment required evidences that the candidate:</p> <ul style="list-style-type: none"> 1.1 prepared for Shutdown work; 1.2 performed emergency shutdown; 1.3 performed stop operation of boiler; 1.4 rechecked and ensured shutdown activities
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Emergency shutdown procedure. 2.2 Boiler stopping procedure. 2.3 Check list for shut down.
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Identifying hazard for shutdown 3.2 Demonstrating emergency shutdown activities 3.3 Demonstrating the activities of boiler stop operation 3.4 Demonstrating the recheck shutdown activities as per checklist

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Relevant drawings, manuals, codes, standards and reference materials.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA</p>	

Unit Code and Title	OU-LE-BOM-06-L3-V1: Troubleshoot Faults of Boiler
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to troubleshoot faults of boiler. It includes the tasks of preparing for troubleshooting, performing maintenance of boiler, identifying electrical faults, mechanical faults, instrumental fault and responding to the emergency situation
Nominal Hours	60 Hours
Elements of Competency	Performance Criteria <u>Bold & underlined</u> terms are elaborated in the Range of Variables
1. Prepare for Troubleshooting	1.1 Safe work practices are observed. 1.2 <u>Personal Protective Equipment (PPE)</u> is used; 1.3 Hazard is identified and mitigated as per organizational procedure. 1.4 <u>Tools and Equipment</u> are collected as per workplace requirement.
2. Perform maintenance of boiler	2.1 Preventive maintenance issues are identified. 2.2 <u>Preventive routine maintenance</u> is ensured. 2.3 Safety valve is tested automatically and manually as per schedule. 2.4 Information is recorded in the log book.
3. Identify electrical faults	3.1 Boiler operation is monitored during starting and running operation. 3.2 <u>Electrical faults</u> are identified and recorded in the log book before recheck. 3.3 Identified problems are reported to the designated authority. 3.4 Assistance is provided to the maintenance team.
4. Identify mechanical faults	4.1 Boiler operation is monitored. 4.2 <u>Mechanical faults</u> are identified and recorded in the log book. 4.3 Fuel system is cleaned as per SOP.
5. Identify instrumental faults	5.1 Boiler operation is monitored during starting and running operation. 5.2 <u>Instrumental faults</u> are identified and recorded in the log book before recheck. 5.3 Identified problems are reported to the designated authority. 5.4 Assistance is provided to the maintenance team.

6. Respond to the emergency situation	6.1 Panel board is observed. 6.2 Emergency breakdown situation is identified. 6.3 Boiler operation is shutdown as per SOP. 6.4 Identified situations are reported to the designated authority for immediate solution. 6.5 Assistance is provided to the maintenance team.
Range of Variables	
Variable	Range (may include but not limited to):
1. Personal Protective Equipment (PPE)	1.1 Safety shoes 1.2 Boiler Suit 1.3 Heat resistant hand gloves 1.4 Helmet 1.5 Mask 1.6 Safety glass 1.7 Ear plug 1.8 Gas cartridge 1.9 Breathing apparatus
2. Tools and Equipment	2.1 Spanner 2.2 Pipe wrench 2.3 Screwdriver 2.4 Allen key set 2.5 Slide wrench 2.6 Hammer 2.7 Whole punch 2.8 Chisel 2.9 Files 2.10 Tube expander 2.11 Ratchet 2.12 Pliers 2.13 Pulley 2.14 Multimeter
3. Preventive routine maintenance	3.1 Daily <ul style="list-style-type: none"> 3.1.1. Checking water level 3.1.2. Checking combustion visually 3.1.3. Blowdown of boiler 3.1.4. Blowdown of water column 3.1.5. Check and record feedwater pressure and temperature 3.1.6. Check and record flue gas temperature 3.1.7. Record oil pressure and temperature 3.1.8. Record gas pressure 3.1.9. Treat water according to the established program 3.1.10. Record atomizing air pressure

	<p>3.2 Weekly</p> <p>3.2.1. Check electric control</p> <p>3.2.2. FD and ID fan checking</p> <p>3.2.3. Water controller checking</p> <p>3.2.4. Feed pump</p> <p>3.2.5. Oil filter clean</p> <p>3.3 Monthly</p> <p>3.2.1 Inspecting burner</p> <p>3.2.2 Inspecting for the flue gas leak</p> <p>3.2.3 Inspecting for hot spots</p> <p>3.2.4 Checking cams</p> <p>3.2.5 Checking for tight closing of fuel valve</p> <p>3.2.6 Checking fuel and air leakage</p> <p>3.2.7 Checking indicating lights and alarms</p> <p>3.2.8 Checking operating and limit controls</p> <p>3.2.9 Checking safety and interlock controls</p> <p>3.2.10 Checking for leaks, noise, vibration, unusual conditions</p> <p>3.2.11 Checking low water cutoff operation</p> <p>3.2.12 Draining of pressure gauge, sensors and switches</p> <p>3.4 Half yearly</p> <p>3.3.1 Cleaning low water cutoff</p> <p>3.3.2 Cleaning oil pump strainer, filter</p> <p>3.3.3 Cleaning air cleaner and air/oil separator</p> <p>3.3.4 Inspecting refractory</p> <p>3.3.5 Removing and cleaning oil preheater</p> <p>3.3.6 Checking air pump coupling alignment</p> <p>3.3.7 Inspecting/repairing burner housing to refractory seal</p> <p>3.5 Yearly</p> <p>3.4.1 Cleaning fireside surfaces</p> <p>3.4.2 Cleaning breeching</p> <p>3.4.3 Inspecting waterside surfaces</p> <p>3.4.4 Checking operation and setting of safety valves</p> <p>3.4.5 Performing hydraulic test</p> <p>3.4.6 Performing descaling if necessary</p>
4. Electrical fault	<p>4.1 Burner related faults</p> <p>4.1.1 Carbon or gap in ignition rod</p> <p>4.1.2 Air pressure switch</p> <p>4.1.3 Photocell</p> <p>4.1.4 Gas pressure switch</p> <p>4.1.5 Dual solenoid valve</p> <p>4.1.6 Steam pressure limit switch</p>

	<ul style="list-style-type: none"> 4.1.7 Pressure transmitter 4.1.8 FD fan motor fault 4.1.9 ID fan motor fault 4.1.10 Servo motor board fault 4.1.11 Sequence controller / programme controller lock 4.1.12 Ignition transformer faults 4.1.13 Ignition cable faults 4.2 Panel <ul style="list-style-type: none"> 4.2.1 Magnetic contact problem 4.2.2 Timer problem 4.2.3 Relay problem 4.2.4 Control transformer 4.2.5 Circuit breaker 4.2.6 Indicating lamp
5. Mechanical faults	<ul style="list-style-type: none"> 5.1 Pipe leakage 5.2 Valve leakage 5.3 Valve gland packing leakage 5.4 Flange gasket leakage 5.5 Safety valve leakage 5.6 Feed water pump problem 5.7 Blower/fans problem
6. Instrumental faults	<ul style="list-style-type: none"> 6.1 Pressure gauge faults 6.2 Level transmitter faults 6.3 Pressure transmitter faults 6.4 Logic controller faults 6.5 Pressure switch 6.6 Sensor problem
7. Emergency breakdown	<ul style="list-style-type: none"> 7.1 Steam pipe main line leakage (within boiler room) 7.2 Blowdown valve leakage 7.3 Shortage of feed water 7.4 Feedwater delivery pipe line leakage 7.5 Fire drum is damaged 7.6 Non return valve malfunctioning 7.7 Feed water suction strainer jam 7.8 Safety valve problem 7.9 Boiler body/ tube leakage
<p>Evidence Guide</p> <p>The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.</p>	
1. Critical aspect of competency	<p>Assessment required evidences that the candidate:</p> <ul style="list-style-type: none"> 1.1 prepared for Troubleshooting 1.2 performed maintenance of boiler 1.3 identified electrical faults

	<ul style="list-style-type: none"> 1.4 identified mechanical faults 1.5 identified instrumental faults 1.6 responded to the emergency situations
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Concept of troubleshooting 2.2 Boiler maintenance procedure 2.3 Preventive routine maintenance 2.4 Electrical faults. 2.5 Mechanical faults. 2.6 Instrumental faults 2.7 Emergency break down situation. 2.8 Safety precaution 2.9 Procedure of hydraulic test 2.10 Procedure of steam test 2.11 Purpose of flue gas analysis
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Identifying boiler related hazards. 3.2 Following preventive routine maintenance. 3.3 Identifying electrical faults. 3.4 Identifying mechanical faults. 3.5 Identifying instrumental faults 3.6 Setting procedure of nozzle in rotary cup / nozzle burner. 3.7 Following emergency break down situation.
4. Required attitudes	<ul style="list-style-type: none"> 4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	<p>The following resources must be available:</p> <ul style="list-style-type: none"> 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Relevant drawings, manuals, codes, standards and reference materials.
6. Methods of assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio.
7. Context of assessment	<ul style="list-style-type: none"> 7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/

	nominated assessor
Accreditation Requirements Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA	

Development of Competency Standard

The Competency Standards for National Skills Certificate in Boiler Operation and Maintenance, Level-3 is developed by NSDA with assistance of GIZ on 05-06 and 11-13 February 2025.

List of Members

SI No	Name and Address	Position in the committee
1.	Engr. M. Reaz Chowdhury Lead Expert GIZ Energy Programme Mobile: +8801730433816 e-Mail: chowdhury.reaz@gmail.com	Member
2.	Engr. Muhammad Zakir Hossain Energy Efficiency Expert GIZ Skills4SE Programme Mobile: +8801717317838 e-Mail: zakir.buet112@gmail.com	Member
3.	Engr. Rejvi Ahmed Inspector of Boilers Office of The Chief Inspector of Boilers, Ministry of Industries Mobile: +8801677142685 e-Mail: mdrejviahmed@gmail.com	Member
4.	Engr. Rusdana Jahan Chief Executive Officer Absolute Engineering Mobile: +8801751974351 e-Mail: rusdana@gmail.com	Member
5.	Engr. Md. Mamun Hossain Khan Maintenance Engineer ACI Godrej Agrovet Pvt. Ltd. Mobile: +8801738149118 e-Mail: mkhanbd81@gmail.com	Member
6.	Engr. Prokash Kumar Biswas Deputy Manager (Mechanical) Fakhruddin Textile Mills Ltd., URMI Group Mobile: +8801714631505 e-Mail: prokash063023@gmail.com prokash@urmigroup.net	Member
7.	Engr. S. M Asif Service Engineer Dana Group Mobile: +8801782414565 e-Mail: sm.asif21@gmail.com asif@danagrpbpd.com	Member

8.	Engr. Md. Jainal Abedin Senior Manager Forbes Marshall Mobile: +8801701229581 e-Mail: jabedin@forbesmarshall.com	Member
9.	Engr. S M Sabahat Hossain Deputy Operative Director Walton Group Mobile: +8801921631004 e-Mail: sabahatrazu@gmail.com , sabahat29884@waltonplc.com	Member
10.	Engr. TM Jakir Hossain Executive Director Walton Hi-Tech Industries PLC Mobile: +8801678048221 e-Mail: jakir.rony@waltonplc.com	Member
11.	Engr. S. M. Nasimul Islam Assistant Engineer Bangladesh Industrial Technical Assistance Center (BITAC) Mobile: +8801755444803 e-Mail: nasim.shish@outlook.com	Member
12.	Md Abdur Razzaque Expert (Curriculum), NSDA Mobile: +8801742-734313 Email: razzaque159@gmail.com	Member