Appendix-10:Updated Competence BasedCurriculum for Steel BarInstallation NCII(TESDA Training Material)

COMPETENCY-BASED CURRICULUM





Sector :

Qualification :

CONSTRUCTION

REINFORCED STEEL BAR (RSB) INSTALLATION NC II



TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY

East Service Road, South Superhighway, Taguig City, Metro Manila

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COURSE DESIGN

COURSE TITLE : REINFORCED STEEL BAR (RSB) INSTALLATION

NOMINAL DURATION : 162 hours

QUALIFICATION LEVEL : NC II

COURSE DESCRIPTION :

This course is designed to enhance the knowledge, skills and attitudes to gather interpret and convey information in response to workplace requirement; to identify role and responsibility as a member of a team; to promote career growth and advancement; to comply with regulatory and organizational requirements for occupational health and safety accordance with industry standards. Perform mensuration and calculation, interpret plans and specifications, prepare tools materials and equipment, maintain tools and equipment, use handle tools, apply occupational health and safety practices. It also include core competencies such as Use reinforced steel bar tools and equipment, Handle RSB materials, Fabricate RSB materials and Install RSB materials.

ENTRY REQUIREMENTS:

Student/trainee must posses the following qualifications:

- Good moral character
- Ability to communicate
- Physically fit and mentally healthy
- Can perform basic mathematical computation and mensuration

COURSE STRUCTURE:

UNIT OF COMPETENCY	MODULE TITLE	LEARNING OUTCOMES	NOMINAL DURATION
1. Participate in workplace	1.1 Participating in workplace	1.1.1 Obtain and convey workplace information	4 hours
communication	communication	1.1.2 Complete relevant work related documents.	
		1.1.3 Participate in workplace meeting and discussion.	
2. Work in a team environment	2.1 Working in a team environment	2.1.1 Describe and identify team role and responsibility in a team.	4 hours
		2.1.2 Describe work as a team.	
3. Practice career professionalism	3.1 Practicing career professionalism	3.1.1 Integrate personal objectives with organizational goals	6 hours
		3.1.2 Set and meet work priorities	
		3.1.3 Maintain professional growth and development	
4. Practice occupational	4.1 Practicing occupational	4.1.1 Identity hazards and risks	4 hours
health and safety	health and safety	4.1.2 Evaluate hazards and risks	
		4.1.3 Control hazards and risks	
		4.1.4 Maintain occupational health and safety awareness	

BASIC COMPETENCIES (18 hours)

COMMON COMPETENCIES (24 hours)

	UNIT OF COMPETENCY	MODULE TITLE	LEARNING OUTCOMES	NOMINAL DURATION
1.	Prepare construction materials and	1.1 Preparing construction materials and	1.1.1 Identify materials and tools applicable to a specific construction job	4 hours
	tools	tools.	1.1.2 Request appropriate materials and tools	
			1.1.3 Receive and inspect materials	
2.	Perform mensuration	2.1 Performing mensuration	2.1.1 Select measuring instruments	6 hours
	and calculation	and calculations	2.1.2 Carry out measurements and calculations	
3.	Maintain tools and equipment.	3.1 Maintaining tools and	3.1.1 Check condition of tools and equipments	4 hours
		equipment.	3.1.2 Perform basic preventive maintenance	
			3.1.3 Store tools and equipment	
4.	Observe procedures, specifications	4.1 Observing procedures, specifications	4.1.1 Identify, access, and interpret specification/ manuals.	4 hours
	and manuals of instructions	and manuals of instructions.	4.1.2 Apply information in manual.	
			4.1.3 Store manuals.	
5.	Interpret Technical	5.1 Interpreting technical	5.1.1 Read/interpret blueprint and plans	6 hours
	Drawings and plans	drawings and plans	5.1.2 Perform freehand sketching	

CORE COMPETENCIES (120 hours)

UNIT OF COMPETENCY	MODULE TITLE	LEARNING OUTCOMES	NOMINAL DURATION
1. Use reinforced steel bar (RSB)	1.1 Using reinforced (RSB) tools and	1.1.1 Identify RSB tools and equipment	35 hours
tools and equipment	equipment	1.1.2 Use RSB tools and equipment	
		1.1.3 Perform basic maintenance of RSB tools and equipment	
2. Handle RSB materials	2.1 Handling RSB materials	2.1.1 Plan work for RSB material handling	21 hours
		2.1.2 Sort, stack and handle materials and components	
		2.1.3 Perform good housekeeping	
3. Fabricate RSB materials	3.1 Fabricating RSB Materials	3.1.1 Plan work for fabrication of RSB materials	32 hours
		3.1.2 Prepare materials, tools and equipment	
		3.1.3 Fabricate RSB material	
4. Install RSB materials	4.1 Installing RSB Materials	4.1.1 Plan work for installation of fabricated RSB materials	32 hours
		4.1.2 Prepare fabricated RSB materials and components, tools and equipment	
		4.1.3 Install fabricated RSB material	
		4.1.4 Clean-up	

RESOURCES:

	TOOLS		EQUIPMENT		MATERIALS
٠	Bolt cutters	٠	Angle grinders	•	RSB (12 mm Ø X 6 m)
•	Wire nippers	•	Bar bender (circular)	•	RSB (10 mm ∅ x 6 m)
٠	Steel hook	•	Bar bender (angular)	•	G.I tie wire (gauge 26)
٠	Steel tape	•	Bar cutter (electric)	•	Chalk stone
•	Bar cutter (manual)			•	Rags
٠	Bar bender (manual)				
•	Hack saw				
٠	Hammers (ball peen)				
٠	Hard hat				
•	Goggles				
•	Safety shoes				
•	Gloves (maong)				

ASSESSMENT METHODS:

- Written and interview assessment
- Portfolio assessment
- Third party report
- Demonstration

COURSE DELIVERY:

- Group discussion and demonstration
- Modular/self paced
- Project based instruction
- OJT/DTS

TRAINERS QUALIFICATION

- Must be a holder of RSB Installation NC-II
- Must have undergone training on Trainers Training Methodology II (TM II)
- Good moral character
- Must be computer literate
- Must be physically and mentally fit
- *Must have at least 1 year industry experience and /or teaching experience

* (Optional. Only when required by the hiring institution.)

MODULES OF INSTRUCTION

BASIC COMPETENCIES

REINFORCED STEEL BAR (RSB) INSTALLATION NC II

UNIT OF COMPETENCY :	PARTICIPATE IN WORKPLACE COMMUNICATION
MODULE TITLE :	PARTICIPATING IN WORKPLACE COMMUNICATION
MODULE DESCRIPTOR :	This module covers the knowledge, skills and attitudes required to obtain, interpret and convey information in response to workplace requirements.
NOMINAL DURATION :	4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students/trainees must be able to:

- LO1. Obtain and convey workplace information
- LO2. Complete relevant work related documents.
- LO3. Participate in workplace meeting and discussion.

LO1. OBTAIN AND CONVEY WORKPLACE INFORMATION.

ASSESSMENT CRITERIA:

- 1. Specific relevant information is accessed from appropriate sources.
- 2. Effective questioning, active listening and speaking skills are used to gather and convey information.
- 3. Appropriate medium is used to transfer information and ideas.
- 4. Appropriate non-verbal communication is used.
- 5. Appropriate lines of communication with superiors and colleagues are identified and followed.
- 6. Defined workplace procedures for the location and storage of information are used.
- 7. Personal interaction is carried out clearly and concisely.

CONTENTS:

- Parts of speech
- Sentence construction
- Effective communication

CONDITIONS:

The students/trainees must be provided with the following:

- Writing materials (pen & paper)
- References (books)
- Manuals

METHODOLOGIES:

- Group discussion
- Interaction
- Lecture
- Reportorial

- Written test
- Practical/performance test
- Interview

L02. COMPLETE RELEVANT WORK RELATED DOCUMENTS.

ASSESSMENT CRTERIA:

- 1. Ranges of forms relating to conditions of employment are completed accurately and legibly.
- 2. Workplace data is recorded on standard workplace forms and documents.
- 3. Basic mathematical processes are used for routine calculations.
- 4. Errors in recording information on forms/documents are identified and rectified.
- 5. Reporting requirements to superior are completed according to enterprise guidelines.

CONTENTS:

- Basic mathematics
- Technical writing
- Types of forms

CONDITIONS:

The students/trainees must be provided with the following:

- Paper
- Pencils/ball pen
- Reference books
- Manuals

METHODOLOGIES:

- Group discussion
- Interaction
- Lecture

- Written test
- Practical/performance test
- Interview

LO3. PARTICIPATE IN WORKPLACE MEETINGS AND DISCUSSIONS

ASSESSMENT CRITERIA:

- 1. Team meetings are attended on time.
- 2. Own opinions are clearly expressed and those of others are listened to without interruption.
- 3. Meeting inputs are consistent with the meeting purpose and established protocols.
- 4. Workplace interactions are conducted in a courteous manner appropriate to cultural background and authority in the enterprise procedures.
- 5. Questions about simple routine workplace procedures and matters concerning conditions of employment are asked and responded.
- 6. Meeting outcomes are interpreted and implemented.

CONTENTS:

- Sentence construction
- Technical writing
- Recording information

CONDITIONS:

The students/trainees must be provided with the following:

- Paper
- Pencils/ball pen
- References (books)
- Manuals

METHODOLOGIES:

- Group discussions
- Interaction
- Lecture

- Written test
- Practical/performance test
- Interview

UNIT OF COMPETENCY	:	WORK IN A TEAM ENVIRONMENT
MODULE TITLE	:	WORKING IN A TEAM ENVIRONMENT
MODULE DESCRIPTOR	:	This module covers the knowledge, skills, and attitudes required to relate in a work based environment.
NOMINAL DURATION	:	4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the students/ trainees will be able to:

- LO1. Describe and identify team role and responsibility in a team.
- LO2. Describe work as a team.

LO1. DESCRIBE AND IDENTIFY TEAM ROLE AND RESPONSIBILITY IN A TEAM.

ASSESSMENT CRITERIA:

- 1. Role and objective of the team is identified.
- 2. Team parameters, relationships and responsibilities are identified.
- 3. Individual role and responsibilities within team environment are identified.
- 4. Roles and responsibilities of other team members are identified and recognized.
- 5. Reporting relationships within team and external to team are identified.

CONTENTS:

- Team role.
- Relationship and responsibilities
- Role and responsibilities with team environment.
- Relationship within a team.

CONDITIONS:

The students/trainees must be provided with the following:

- Standard operating procedure (SOP) of workplace
- Job procedures
- Client/supplier instructions
- Quality standards
- Organizational or external personnel

METHODOLOGIES:

- Group discussion/interaction
- Case studies
- Simulation

- Written test
- Observation
- Simulation

LO2. DESCRIBE WORK AS A TEAM MEMBER

ASSESSMENT CRITERIA:

- 1. Appropriate forms of communication and interactions are undertaken.
- 2. Appropriate contributions to complement team activities and objectives were made.
- 3. Reporting using standard operating procedures followed.
- 4. Developments of teamwork are plans based from role team were contributed.

CONTENTS:

- Communication process
- Team structure/team roles
- Group planning and decision making

CONDITIONS:

The students/trainees must be provided with the following:

- SOP of workplace
- Job procedures
- Organization or external personnel

METHODOLOGIES:

- Group discussion/interaction
- Case studies
- Simulation

- Observation of work activities
- Observation through simulation or role play
- Case studies and scenarios.

UNIT OF COMPETENCY	:	PRACTICE CAREER PROFESSIONALISM
MODULE TITLE	:	PRACTICING CAREER PROFESSIONALISM
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes in promoting career growth and advancement, specifically; to integrate personal objectives with organizational goals set and meet work priorities and maintain professional growth and development.
NOMINAL DURATION	:	6 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

- LO1. Integrate personal objectives with organizational goals
- LO2. Set and meet work priorities
- LO3. Maintain professional growth and development

LO1. INTEGRATE PERSONAL OBJECTIVES WITH ORGANIZATIONAL GOALS

ASSESSMENT CRITERIA:

- 1. Personal growth and work plans towards improving the qualifications set for professionalism are evident.
- 2. Intra and interpersonal relationship in the course of managing oneself based on performance evaluation is maintained.
- 3. Commitment to the organization and its goal is demonstrated in the performance of duties.
- 4. Practice of appropriate personal hygiene is observed.
- 5. Job targets within key result areas are attained.

CONTENTS:

- Personal development-social aspects: intra and interpersonal development
- Organizational goals
- Personal hygiene and practices
- Code of ethics

CONDITIONS:

The students/trainees must be provided with the following:

- Workplace
- Code of ethics
- Organizational goals
- Hand outs and Personal development-social aspects
- CD's, VHS tapes, transparencies

METHODOLOGIES:

- Interactive -lecture
- Simulation
- Demonstration
- Self paced instruction

- Role play
- Interview
- Written examination

LO2. SET AND MEET WORK PRIORITIES

ASSESSMENT CRITERIA:

- 1. Competing demands to achieve personal, team and organizational goals and objectives are prioritized.
- 2. Resources are utilized efficiently and effectively to manage work priorities and commitments.
- 3. Practices and economic use and maintenance of equipment and facilities are followed as per established procedures.
- 4. Job targets within key result areas are attained.

CONTENTS:

- Organizational Key Result Areas (KRA)
- Work values and ethical standards
- Company policies on the use and maintenance of equipment

CONDITIONS:

The students/trainees must be provided with the following:

- Hand outs on
- Organizational KRA
- Work values and ethics
- Company policies and standards
- Sample job targets
- Learning guides
- CD's, VHS tapes, transparencies

METHODOLOGIES:

- Interactive lecture
- Group discussion
- Structured activity
- Demonstration

- Role play
- Interview
- Written examination

LO3. MAINTAIN PROFESSIONAL GROWTH AND DEVELOPMENT

ASSESSMENT CRITERIA:

- 1. Training and career opportunities relevant to the job requirements are identified and availed.
- 2. Licenses and/or certifications according to the requirements of the qualifications are acquired and maintained
- 3. Fundamental rights at work including gender sensitivity are manifested/ observed
- 4. Training and career opportunities based on the requirements of industry are completed and updated.

CONTENTS:

- Qualification standards
- Gender and development (GAD) sensitivity
- Professionalism in the workplace
- List of professional licenses

CONDITIONS:

The students/trainees must be provided with the following

- Quality standards
- GAD handouts
- CD's, VHS tapes on professionalism in the workplace
- Professional licenses samples

METHODOLOGIES:

- Interactive lecture
- Film viewing
- Role play/simulation
- Group discussion

- Demonstration
- Interview
- Written examination
- Portfolio assessment

UNIT OF COMPETENCY : PRACTICE OCCUPATIONAL HEALTH AND SAFETY PROCEDURES
 MODULE TITLE : PRACTICING OCCUPATIONAL HEALTH AND SAFETY PROCEDURES
 MODULE DESCRIPTOR : This module covers the knowledge, skills and attitudes required to comply with the regulatory and organizational requirements for occupational health and safety such as identifying, evaluating and maintaining occupational health and safety (OHS) awareness.

NOMINAL DURATION : 4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

- LO1. Identity hazards and risks
- LO2. Evaluate hazards and risks
- LO3. Control hazards and risks
- LO4. Maintain occupational health and safety awareness

LO1. IDENTIFY HAZARDS AND RISKS

ASSESSMENT CRITERIA:

- 1. Workplace hazards and risks are identified and clearly explained.
- 2. Hazards/risks and its corresponding indicators are identified in with the company procedures.
- 3. Contingency measures are recognized and established in accordance with organizational procedures.

CONTENTS:

- Hazards and risks identification and control
- Organizational safety and health protocol
- Threshold limit value (TLV)
- OHS indicators

CONDITIONS:

The students/trainees must be provided with the following:

- Workplace
- Personal protective equipment (PPE)
- Learning guides
- Hand-outs
- Organizational safety and health protocol
- OHS indicators
- Threshold limit value
- Hazards/risk identification and control
- CD's, VHS tapes, transparencies

METHODOLOGIES:

- Interactive -lecture
- Simulation
- Symposium

- Situation analysis
- Interview
- Practical examination
- Written examination

LO2. EVALUATE HAZARDS AND RISKS

ASSESSMENT CRITERIA:

- 1. Terms of maximum tolerable limits are identified based on threshold limit values (TLV)
- 2. Effects of hazards are determined.
- 3. OHS issues and concerns are identified in accordance with workplace requirements and relevant workplace OHS legislation.

CONTENTS:

- TLV table
- Philippine OHS standards
- Effects of hazards in the workplace
- Ergonomics
- ECC Regulations

CONDITIONS:

The students/trainees must be provided with the following

- Hand outs on
- Philippine OHS standards
- Effects of hazards in the workplace
- Ergonomics
- ECC regulations
- TLV table
- CD's, VHS tapes, transparencies

METHODOLOGIES:

- Interactive lecture
- Situation analysis
- Symposium
- Film viewing
- Group dynamics

- Interview
- Written examination
- Simulation

LO3. CONTROL HAZARDS AND RISKS

ASSESSMENT CRITERIA:

- 1. OHS procedures for controlling hazards and risk are strictly followed.
- 2. Procedures in dealing with workplace accidents, fire and emergencies are followed in accordance with the organization's OHS policies.
- 3. Personal protective equipment (PPE) is correctly used in accordance with organization's OHS procedures and practices.
- 4. Procedures in providing appropriate assistance in the event of workplace emergencies are identified in line with the established organizational protocol.

CONTENTS:

- Safety regulations
- Clean air act
- Electrical and fire safety code
- Waste management
- Disaster preparedness and management
- Contingency measures and procedures

CONDITIONS:

The students/trainees must be provided with the following:

- Hand outs on
- Safety Regulations
- Clean air act
- Electrical and fire safety code
- Waste management
- Disaster preparedness and management
- Contingency measures and procedures
- OHS personal records
- PPE
- CD's, VHS tapes, transparencies

METHODOLOGIES:

- Interactive lecture
- Symposium
- Film viewing
- Group dynamics
- Self-paced instruction

- Written examination
- Interview

LO4. MAINTAIN OCCUPATIONAL HEALTH AND SAFETY AWARENESS

ASSESSMENT CRITERIA:

- 1. Procedures in emergency related drill are strictly followed in line with the established organization guidelines and procedures.
- 2. OHS personal records are filled up in accordance with workplace requirements.
- 3. PPE are maintained in line with organization guidelines and procedures.

CONTENTS:

- Operational health and safety procedure, practices and regulations
- Emergency-related drills and training

CONDITIONS:

The students/trainees must be provided with the following

- Workplace
- PPE
- OHS personal records
- CD's, VHS tapes, transparencies
- Health record

METHODOLOGIES:

- Interactive lecture
- Simulation
- Symposium
- Film viewing
- Group dynamics

- Demonstration
- Interview
- Written examination
- Portfolio assessment

MODULES OF INSTRUCTION

COMMON COMPETENCIES

REINFORCED STEEL BAR (RSB) INSTALLATION NC II

UNIT OF COMPETENCY	:	PREPARE CONSTRUCTION MATERIALS AND TOOLS
MODULE TITLE	:	PREPARING CONSTRUCTION MATERIALS AND TOOLS
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes on identifying, requesting and receiving construction materials and tools based on the required performance standards.
NOMINAL DURATION	:	4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Identify materials and tools applicable to a specific construction job.
- LO2. Request appropriate materials and tools.
- LO3. Receive and inspect materials.

LO1. IDENTIFY MATERIALS AND TOOLS APPLICABLE TO A SPECIFIC CONSTRUCTION JOB

ASSESSMENT CRITERIA:

- 1. Tools and materials are identified as per job requirements
- 2. Tools are classified according to its function as per job requirements.
- 3. Materials are classified according to its uses to a specific construction project.
- 4. Tools and materials are selected as per job requirement.

CONTENT:

- Types and uses of construction materials and tools
- Description of materials and tools
- Listing of materials as per company standards.

CONDITIONS:

Students/trainees must be provided with the following:

- Workplace location
- Materials relevant to the unit of competency
- Materials and tools
- Materials and tools different brand names, size, capacity and kind of application.
- Handouts/instructional materials

METHODOLOGIES:

- Lecture demonstration
- Self-paced Instruction
- Group discussion
- PowerPoint presentation

- Oral questioning
- Direct observation
- Written test

LO2. REQUEST APPROPRIATE MATERIALS AND TOOLS

ASSESSMENT CRITERIA:

- 1. Needed materials and tools listed as per job requirement.
- 2. Materials and tools are requested according to the list prepared.
- 3. Requests are done as per company standard operating procedures (SOP)
- 4. Materials and tools are substituted and provided unavailable without sacrificing cost and quality of work.

CONTENT:

- Different forms
- Job order slip
- Tools and materials requisition slip
- Borrower's slip
- Requisition procedures

CONDITIONS:

Students/trainees must be provided with the following:

- Sample of company standard in tools and materials requisition.
- Job order form
- Requisition slip
- Borrowers slip
- Handouts/instructional materials

METHODOLOGIES:

- Lecture demonstration
- Self-paced Instruction
- Group Discussion

- Oral questioning
- Direct observation
- Written test

LO3. RECEIVE AND INSPECT MATERIALS

ASSESSMENT CRITERIA

- 1. Received and inspected materials and tools as per quantity and specification based on requisition.
- 2. Tools and materials are checked for damages and manufacturing defects.
- 3. Materials and tools received are handled with appropriate safety devices.
- 4. Materials and tools are set aside to appropriate location nearest to the workplace.

CONTENT:

- Procedures in receiving tools and materials
- Proper inspection of tools and materials received.
- Proper handling of tools and materials.

CONDITIONS:

Students/trainees must be provided with the following:

- Sample of company standard in tools and materials in receiving materials.
- Inspection checklist
- Materials handling safety devices
- Inventory form handouts/instructional materials

METHODOLOGIES:

- Lecture demonstration
- Self-paced Instruction
- Group discussion

- Oral questioning
- Direct observation
- Written test

UNIT OF COMPETENCY:PERFORM MENSURATIONS AND CALCULATIONSMODULE TITLE:PERFORMING MENSURATIONS AND CALCULATIONSMODULE DESCRIPTOR:This module covers the knowledge, skills and attitudes on
identifying, and measuring objects based on the required
performance standards.NOMINAL DURATION:6 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Select measuring instruments.
- LO2. Carry out measurements and calculations.

LO1. SELECT MEASURING INSTRUMENTS

ASSESSMENT CRITERIA:

- 1. Object or component to be measured are identified, classified and interpreted according to the appropriate regular geometric shape.
- 2. Measuring tools are selected/identified as per object to be measured or job requirements
- 3. Correct specifications are obtained from relevant sources.
- 4. Measuring instruments are selected according to job requirements.
- 5. Alternative measuring tools are used without sacrificing cost and quality of work.
- 6. Measurements are obtained according to job requirements.

CONTENTS

- Visualizing objects and shapes specifically geometric shapes.
- Interpreting formulas for volume, areas, and perimeters of plane and geometric figures.
- Measuring instruments/measuring tools
- Proper handling of measuring instruments

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Workplace location
- Problems to solve
- Measuring instruments
- Instructional materials relevant to the propose activity.

METHODOLOGIES:

- Actual demonstration
- Classroom discussions

- Actual demonstration
- Direct observation
- Written test/questioning

LO2. CARRY OUT MEASUREMENTS AND CALCULATIONS

ASSESSMENT CRITERIA:

- 1. Calculation needed to complete work tasks are performed using the four basic process of addition (+), subtraction (-), multiplication (x) and division (/) including but not limited to: trigonometric functions, algebraic computations.
- 2. Calculations involving fractions, percentages and mixed numbers are used to complete workplace tasks
- 3. Numerical computations are self-checked and corrected for accuracy.
- 4. Accurate measurements are obtained according to job requirements.
- 5. Identified and converted systems of measurement according to job requirements.
- 6. Measured work pieces according to job requirements.

CONTENT:

- Trade Mathematics/Mensuration
- Four fundamental operation
- Kinds of measurement
- Dimensions
- Ratio and Proportion
- Trigonometric Functions
- Algebraic Equations
- Fractions, Percentage and Decimals
- Conversion

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Workplace location
- Problems to solve
- Measuring instruments
- Instructional materials relevant to the propose activity.

METHODOLOGIES:

- Lecture demonstration
- Self-paced instruction
- Group discussion

- Oral questioning
- Direct observation
- Written test

UNIT OF COMPETENCY	:	MAINTAIN TOOLS AND EQUIPMENT
MODULE TITLE	:	MAINTAINING TOOLS AND EQUIPMENT
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes on checking condition, performing preventive maintenance and storing of tools and equipment based on the required performance standard.
NOMINAL DURATION	:	4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Check condition of tools and equipments.
- LO2. Perform basic preventive maintenance
- LO3. Store tools and equipment.

LO1. CHECK CONDITIONS OF TOOLS AND EQUIPMENTS

ASSESSMENT CRITERIA:

- 1. Tools and equipment are identified according to classification/specification and job requirements.
- 2. Non-functional tools and equipment are segregated and labeled according to classification
- 3. Safety of tools and equipment are observed in accordance with manufacturer's instructions
- 4. Conditions of PPE are checked in accordance with manufacturer's instructions.

CONTENTS:

- Types of Tools and Equipments
- Classification of functional and non-functional tools
- Uses of Personal Protective Equipment (PPE).

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Workplace location
- Tools and equipment related to the following:
 - Electrical supplies
 - Structural
 - Plumbing
- Welding/pipefitting
- Carpentry
- Masonry
- Heavy equipment tools for repair
- Measuring instruments/equipments
- Instructional materials
- Handouts
- PowerPoint presentations

METHODOLOGIES:

- Lecture demonstration
- Self-paced Instruction
- Group discussion

- Oral questioning
- Direct observation
- Written test

LO2. PERFORM BASIC PREVENTIVE MAINTENANCE

ASSESSMENT CRITERIA:

- 1. Lubricants are identified according to types of equipment.
- 2. Tools and equipment are lubricated according to preventive maintenance schedule or manufacturer's specifications.
- 3. Measuring instruments are checked and calibrated in accordance with manufacturer's instructions.
- 4. Tools are cleaned and lubricated according to standard procedures
- 5. Defective equipment and tools are inspected and replaced according to manufacturer's specification.
- 6. Work place is cleaned and kept in safe state in line with OSHC regulations.

CONTENTS:

- Types uses of lubricants
- Types and uses of cleaning materials/solvent
- Types and uses of measuring instruments and equipment.
- Preventive maintenance techniques and procedures.
- OSHC workplace regulations

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Workplace location
- Kinds of manuals:
- Manufacturer's specification manual
- Repair manual
- Maintenance procedure manual
- Periodic maintenance manual
- Maintenance schedule forms
- Handouts/instructional materials
- Maintenance materials, tools and equipment relevant to the proposed activity/task.
- Lubricants
- Cleaning materials
- Rust remover
- Rugs
- Spare parts
- PPE
- Goggles
- Gloves
- Safety shoes
- Aprons/coveralls
METHODOLOGIES:

- Lecture demonstration
- Self-paced Instruction
- Group discussion

- Oral questioning
- Direct observation
- Written test

LO3. STORE TOOLS AND EQUIPMENT.

ASSESSMENT CRITERIA:

- 1. Inventory of tools, instruments, and equipment are conducted and recorded as per company practices.
- 2. Tools are inspected, and replaced after use.
- 3. Tools and equipment are stored safely in accordance with manufacturer's specifications or company procedures.

CONTENTS:

- Inventory of tools and equipment
- Tools and equipment handling
- Tool safe-keeping/storage

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Handouts/instructional materials
- Workplace location/tool room
- Rack
- Tool box
- Forms
- Requisition slip
- Inventory form
- Inspection form

METHODOLOGIES:

- Demonstration
- Classroom discussions

- Practical exam
- Direct observation
- Written test/questioning

UNIT OF COMPETENCY : OBSERVE PROCEDURES, SPECIFICATIONS AND MANUALS OF INSTRUCTIONS
 MODULE TITLE : OBSERVE PROCEDURES, SPECIFICATIONS AND MANUALS OF INSTRUCTIONS
 MODULE DESCRIPTOR : This module covers the knowledge, skills and attitudes on identifying, interpreting, applying services to specifications and manuals and storing manuals.
 NOMINAL DURATION : 4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Identify, access, and interpret specification/manuals.
- LO2. Apply information in manual.
- LO3. Store manuals.

LO1. IDENTIFY, ACCESS, AND INTERPRET SPECIFICATION/MANUALS

ASSESSMENT CRITERIA:

- 1. Manuals are identified and accessed as per job requirements.
- 2. Version and date of manual are checked to ensure that correct specification and procedures are identified.
- 3. Relevant sections, chapters of specifications/manuals are located in relation to the work to be conducted.
- 4. Information and procedure in the manual are interpreted in accordance with industry practices.

CONTENTS:

- Types of manuals used in construction sector
- Different types of symbols.
- Accessing information and data.

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Manuals/catalogues relative to construction sector.
- Instructional materials

METHODOLOGIES

- Classroom discussions/lecture
- Self-paced

- Practical exam
- Oral exam
- Written test/questioning

LO2. APPLY INFORMATION IN MANUAL

ASSESSMENT CRITERIA:

- 1. Work steps are correctly identified in accordance with manufacturer's specification.
- 2. Manual data are applied according to the given task.
- 3. Adjustments are interpreted in accordance with information contained on the manual or specifications.

CONTENT:

• Manual/specification application

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion
- Manuals
- Workplace location
- Measuring Instruments
- Engineer's transit
- Tape measure
- Feeler gauge
- Instructional materials

METHODOLOGIES:

- Demonstration
- Classroom discussions
- Self-paced

- Practical exam
- Oral exam
- Written test/questioning

LO3. STORE MANUAL

ASSESSMENT CRITERION:

1. Manual or specification is stored appropriately to prevent damage, ready access and updating of information when required in accordance with company requirements.

CONTENTS:

Manual Handling

CONDITIONS:

Students/trainees must be provided with the following:

- Classroom for discussion.
- Manuals
- Store rooms/library
- Instructional materials

METHODOLOGIES

- Demonstration
- Classroom discussions
- Self-paced

- Practical exam
- Direct observation
- Written test/questioning.

UNIT OF COMPETENCY : INTERPRET TECHNICAL DRAWINGS AND PLANS

MODULE TITLE : INTERPRETING TECHNICAL DRAWINGS AND PLANS

- MODULE DESCRIPTOR: : This module covers the knowledge, skills and attitudes on analyzing and interpreting symbols, data and work plan based on the required performance standard.
- NOMINAL DURATION : 6 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Read/interpret blueprint and plans
- LO2. Perform freehand sketching

LO1. READ /INTERPRET BLUEPRINT AND PLANS

ASSESSMENT CRITERIA:

- 1. Sign, symbols, and data are identified according to job specifications.
- 2. Sign, symbols and data are determined according to classification or as appropriate in drawing.

CONTENTS:

- Drawing symbols and signs
- Drawing lines
- Trade mathematics

CONDITIONS:

Students/trainees must be provided with the following:

- Workplace location
- Measuring instruments
- Blueprints of plan
- Electrical
- Mechanical
- Instructional materials

METHODOLOGIES:

- Demonstration
- Classroom discussions
- Self-paced

- Demonstration
- Direct observation
- Written test/questioning

LO2. PERFORM FREEHAND SKETCHING

ASSESSMENT CRITERIA:

- 1. Necessary tools, materials and equipment are identified according to the plan.
- 2. Components, assemblies or object are recognized as per job requirement.
- 3. Dimensions and specification are identified according to job requirements.
- 4. Freehand sketch is produced according to job specifications

CONTENTS:

- Basic Technical drawing
- Technical plans and Schematic Diagram
- Symbols and Abbreviations
- Techniques in freehand sketching

CONDITIONS:

Students/trainees must be provided with the following:

- Workplace location
- Measuring instruments
- Blueprints of plan
- Instructional materials

METHODOLOGIES

- Demonstration
- Classroom discussions
- Self-paced

- Practical exam
- Direct observation
- Written test/questioning

MODULES OF INSTRUCTION

CORE COMPETENCIES

REINFORCED STEEL BAR (RSB) INSTALLATION NC II

UNIT OF COMPETENCY : USE REINFORCED STEEL BAR (RSB) TOOLS AND EQUIPMENT
MODULE TITLE : USING REINFORCED STEEL BAR (RSB) TOOLS AND EQUIPMENT
MODULE DESCRIPTOR : This module specifies the knowledge, skills and attitudes required to use RSB tools, and equipment. This module also includes basic maintenance (cleaning) for power tools and equipment.
NOMINAL DURATION : 35 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Identify RSB tools and equipment
- LO2. Use RSB tools and equipment
- LO3. Perform basic maintenance of RSB tools and equipment

LO1. IDENTIFY RSB TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

- 1. Work instructions are secured and interpreted in line with job requirements/ specifications
- 2. Safety and environmental protection requirements are identified following job specifications and OSHS requirements.
- RSB tools and equipment are identified in line with job requirements/ specifications
- 4. RSB materials and components quantity requirements are identified and estimated in line with job requirements/specifications

CONTENTS:

- Interpretation of instructions and specifications
- Identification of safety and environmental requirements
- Types and uses of RSB tools and equipment
- Work plans preparation

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

LO2. USE RSB TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

- 1. Hand and power tools and equipment are selected and obtained in line with standard operating procedure
- 2. Start up procedures for power tools and equipment are performed based on manufacturer's recommendations
- 3. Tools and equipment are checked for faults and normal functioning are reported to appropriate personnel in line with standard operating procedures
- 4. Tools and equipment are used in line with manufacturer's specifications and OSHS requirements

CONTENTS:

- Using RSB tools and equipment
- Proper operating procedures
- Safety procedure

CONDITIONS:

The students/trainees must be provided with the following:

- RSB tools and equipment
- Operating manual
- Learning materials
- Workplace/simulated environment

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

EVIDENCE GUIDE PERSONAL PROTECTIVE EQUIPMENT

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize various protective gears a worker should wear.



** In addition, a worker should wear SAFETY GOOGLES when cutting metals, glass and wood.

EVIDENCE GUIDE 2.9 DIFFERENT LAYOUTING TOOLS

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize different tools for lay outing.

LAY OUTING TOOLS:

1. STEEL TAPE – also called TAPELINE, is a flexible rule of thin *steel* that retracts into a protective case. It is used for measuring irregular and regular shapes.



2. LEVEL BAR or LEVELING HOSE – used for checking horizontal level of surface.



LEVELING



LEVEL BAR

3. PLUMB BOB – used to check the vertical alignment of a structure.



CBC Reinforced Steel Bar (RSB) Installation NC II

A2-10-50

4. BAR BENDER/ BAR CUTTER



REBAR BENDER & CUTTER



BAR BENDER (improvised)

5. TIE WIRE TYING HOOK



LO3. PERFORM BASIC MAINTENANCE OF RSB TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

- 1. Tools and equipment are cleaned and safe kept after use following standard operating procedures and manufacturer's recommendations
- 2. Work area is cleaned in line with OSHS requirements and company standard operating procedure
- 3. Scrap materials are disposed in accordance with workplace standard operating procedures.
- 4. Off-cut materials are re-used or recycled in accordance with OSHS and company standard operating procedures.

CONTENTS:

- Maintaining tools and equipment
- Housekeeping procedures
- Disposal and recycling procedures

CONDITIONS:

The students/trainees must be provided with the following:

- RSB tools and equipment
- Equipment maintenance manual
- Learning materials
- Workplace/simulated environment
- Chemical and cleaning materials
- Storage area

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

UNIT OF COMPETENCY	:	HANDLE RSB MATERIALS
MODULE TITLE	:	HANDLING RSB MATERIALS
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes required to handle RSB materials. It includes the skills required to sort, and stack RSB materials and components.
NOMINAL DURATION	:	21 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/students must be able to:

- LO1. Plan work for RSB material handling
- LO2. Sort, stack and handle materials and components
- LO3. Perform good housekeeping

LO1. PLAN WORK FOR RSB MATERIAL HANDLING

ASSESSMENT CRITERIA:

- 1. Work instructions are secured and interpreted in line with job requirements/ specifications
- 2. Safety requirements are identified following job specifications
- 3. RSB materials and components are identified in conformity to material schedule, plans and specifications
- 4. Environmental protection requirements are identified in line with OSHS requirements.

CONTENTS:

- Interpreting job requirement
- Identifying RSB materials
- Safety and environmental requirements

CONDITIONS:

The students/trainees must be provided with the following:

- RSB materials and components
- Work instructions and specification
- Learning materials
- Workplace/simulated condition
- OSHS requirements

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/oral questioning

LO2. SORT, STACK AND HANDLE MATERIALS AND COMPONENTS

ASSESSMENT CRITERIA:

- 1. Materials and components are checked based on bar cutting schedule and plans
- 2. Materials and components are handled following established/recommended practices
- 3. Sorting procedure for materials and components is performed based on established/recommended practices
- 4. Stacking procedure for materials and components is performed following established/recommended practices
- 5. Handling procedure for waste material is performed following OSHS requirements
- 6. Dust suppression procedure is applied to reduce health risk to work personnel and others following OSHS requirements

CONTENTS:

- Handling, sorting and stacking procedure
- Safety and environmental requirements

CONDITIONS:

The students/trainees must be provided with the following:

- RSB materials and components
- Work instructions and specification
- Learning materials
- Workplace/simulated condition
- OSHS requirements

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/oral questioning

LO3. PERFORM GOOD HOUSEKEEPING

ASSESSMENT CRITERIA:

- 1. Work area is cleaned in line with OSHS requirements and company standard operating procedure
- 2. Excess materials are disposed in accordance with workplace standard operating procedure
- 3. Off-cut materials are re-used or re-cycled in accordance with OSHS requirements.

CONTENTS:

- Housekeeping procedures
- Disposal/recycling procedure
- Safety and environmental requirements

CONDITIONS:

The students/trainees must be provided with the following:

- Housekeeping guidelines/procedures
- Workplace regulations and specifications
- Learning materials
- Workplace/simulated condition
- OSHS requirements
- Chemical and cleaning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/oral questioning

UNIT OF COMPETENCY : FABRICATE RSB MATERIALS
MODULE TITLE : FABRICATING RSB MATERIALS
MODULE DESCRIPTOR : This module covers the knowledge, skills and attitudes required to fabricate reinforced steel bar (RSB) materials.
NOMINAL DURATION : 32 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Plan work for fabrication of RSB materials
- LO2. Prepare materials, tools and equipment
- LO3. Fabricate RSB material

LO1. PLAN WORK FOR FABRICATION OF RSB MATERIALS

ASSESSMENT CRITERIA:

- 1. Job requirement is interpreted based on drawings, work location and superior's instructions.
- 2. Occupational Safety and Health Standards (OSHS) specifications are identified in line with job requirements
- 3. Safety hazards are identified in line with job requirements
- 4. RSB tools, materials and equipment are identified according to job requirements

CONTENTS:

- Interpreting job requirements/specifications and instructions
- Safety standards/requirements
- Types of RSB materials, tools and equipment
- Plan work activities

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

EVIDENCE GUIDE 3.6 PERFORMING BEND PATTERNS

Learning Objectives:

After reading this Guide, YOU MUST be able to:

- Familiarize pattern development for rebar.
- Interpret bending schedule of steel reinforcements.

Tools needed:

- 1. Steel tape
- 2. Bar bender
- 3. Bar cutter / hack saw
- 4. Chalk Stone
- 5. Tying hook

Cutting – the process of preparing and cutting the steel with a specific dimension based on a given shop drawing.

Bending Schedule – is a list of reinforcement bars presented in a tabular form for easy visual reference. This table summarizes all the needed particulars of bars – diameter, shape of bending, length of each bent and straight portions, angles of bending, total length of each bar, and number of each type of bar. In turn, all bend and hooks are based on the standard requirements based on the Structural Code.

STANDARD HOOK DETAILS AND BAR BEND

END PORTION





**SAMPLE OF BAR BENDING SCHEDULE

LO2. PREPARE MATERIALS, TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

- 1. RSB tools, materials and equipment are selected in line with job specifications
- 2. Personal protective equipment (PPE) is selected and used in accordance to job requirements
- 3. Start up procedures for tools and equipment are performed in accordance to manufacturer's recommendation
- 4. Tools and equipment are checked for faults and normal function, and reported to the appropriate personnel in line with company standard operating procedures.

CONTENTS:

- Interpreting job requirements
- Types of RSB materials, tools and equipment
- OSHS requirements
- Work and workplace standard operating procedures

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

PROCEDURE IN CUTTING STEEL BARS

In this exercise, we are cut a 10mm steel bar to be used as stirrups/ties for column. Like in all exercises, before starting, one should make sure that the worker has already worn hi PPE for safety reason and all materials & tools are readily available.



- A Worker's PPE
- B Bar Cutter
- C Cut off Saw
- D Hand Saw
- E Marking String

F - L Square G - Hacksaw H - Pencil I - Chalk Stone J - Steel Tape

CUTTING METHODS:

1. Using a chalk stone and steel tape, mark the steel bar for the required length to be used as tie/hook.



 Cutting using a BAR CUTTER. Place the steel bar to the bar cutter. Check that the marked portion is in line with the cutter before cutting the bar.





3. Cutting using a HACK SAW



4. Cutting using a CIRCULAR SAW



LO3. FABRICATE RSB MATERIAL

ASSESSMENT CRITERIA:

- 1. Material preparation procedure is performed in line with job requirements and established/recommended safety practices.
- 2. Fabrication procedure is performed in line with job specifications.
- 3. Unused and off cut materials are stacked/stored for re-use or disposal
- 4. Waste materials are disposed following OSHS requirements
- 5. Work area is cleared in accordance to OSHS requirements and company standard operating procedure
- 6. Tools and equipment are cleaned, and stored according to manufacturer's recommendations

CONTENTS:

- Interpreting job requirements and specifications
- Fabrication procedures and techniques
- OSHS requirements
- Work and workplace standard operating procedures
- Storage, disposal and recycling procedures

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- Procedures manual
- RSB tools and equipment
- RSB materials and components
- OSHS requirements
- Housekeeping procedures
- Workplace/simulated environment
- Additional learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

PROCEDURE IN BENDING STEEL BAR

In this exercise, we are going to bend a 10mm stirrup for a 30cm x 30cm concrete column. Length of bar required: 90 cm

1. Using a steel tape, measure 90cm on the steel bar and mark it using a pencil.



2. Place the steel on a bar cutter to cut.



3. Take the cut bar, refer to the bending schedule to check and mark the area where you need to bend the steel bar.



4. Using a bar bender, start bending the steel bar to its desired shape and size.







STEEL PIPE (to aid steel



5. The stirrup should look like this when finished.



UNIT OF COMPETENCY	:	INSTALL RSB MATERIALS
MODULE TITLE	:	INSTALLING RSB MATERIALS
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes required to install fabricated reinforced steel bar (RSB) materials.
NOMINAL DURATION	:	32 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/student must be able to:

- LO1. Plan work for installation of fabricated RSB materials
- LO2. Prepare fabricated RSB materials and components, tools and equipment
- LO3. Install fabricated RSB Material
- LO4. Clean-up
LO1. PLAN WORK FOR INSTALLATION OF FABRICATED RSB MATERIALS

ASSESSMENT CRITERIA:

- 1. Job requirement is interpreted based on drawings, work location and superior's instructions
- 2. Occupational Safety and Health Standards (OSHS) specifications are identified in line with job requirements
- 3. Safety hazards are identified in line with job requirements
- 4. RSB tools, component materials and equipment are identified according to job requirements

CONTENTS:

- Interpreting job requirements/specifications and instructions
- Safety standards/requirements
- Types of tools and equipment

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

LO2. PREPARE FABRICATED RSB MATERIALS AND COMPONENTS, TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

- 1. RSB tools, equipment and fabricated materials and components are selected in line with job specifications
- 2. Personal protective equipment (PPE) is selected and used in accordance to job requirements
- 3. Start up procedures for tools and equipment are performed in accordance to manufacturer's recommendation
- 4. Tools and equipment are checked for faults and normal function, and reported to the appropriate personnel in line with company standard operating procedures

CONTENTS:

- Interpreting job requirements/specifications and working drawings
- Types of tools and equipment
- OSHS requirements
- Work and workplace standard operating procedures

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

LO3. INSTALL FABRICATED RSB MATERIAL

ASSESSMENT CRITERION:

1. Installation procedure is performed in line with job specifications

CONTENTS:

- Interpreting job requirements/specifications and working drawings
- Installation procedures and techniques
- OSHS requirements
- Types of tools and equipment

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

PROCEDURE IN FABRICATING COLUMN REBAR

In this exercise, we are going assemble the steel reinforcement for a 30cm x 30cm concrete column.

This activity is also applicable when fabricating rebar for beams.

Based on the Bending Schedule below, we are going to fabricate a steel reinforcement assembly for column:

COLUMN SCHEDULE					
FLOOR	<u>C1</u>	VERT. BAR		TIES	
LEVEL	CI	CORNER BAR	MID BAR	OUTER RING	INNER RING
FOUNDATION LEVEL TO 2nd FLOOR LEVEL	300 40, 220, 40 0000000000000000000000000000000000	4-16 mm Ø DEFORMED BAR	4-16 mm Ø DEFORMED BAR	2-10 mm Ø @ 50 mm O.C. 2-10 mm Ø @ 100 mm O.C. REST @ 150 mm O.C.	2-10 mm Ø @ 50 mm O.C. 2-10 mm Ø @ 100 mm O.C. REST @ 150 mm O.C.

1. Lay **3 vertical bars** on a work table. These will serve as guide in forming the column reinforcement assembly.

For a faster layout and distribution of stirrups/hooks, you can make a **wooden guide/ruler** showing different space requirements for hooks. With this tool, you don't have to measure the spaces between stirrups in every assembly.



The Urgent Development Study on the Project on Rehabilitation and Recovery from Typhoon Yolanda in the Philippines Final Report (II) Appendix Technical Supporting Report 3 (Volume 2)

2. Using a chalk stone, mark the spacing of the hooks as indicated in the wooden guide.



3. Start placing the stirrups into the 3 vertical bars. In this exercise, the verticals bars are 16mm diameter deformed steel bars, while the hooks are 10 mm diameter deformed bars.

It is necessary to put all the required numbers of stirrups needed for the column steel reinforcement.



4. When all the stirrups/hooks are in place, start tying the hooks into the vertical bars using a #16 tie wire. It will fix the hook to the vertical bars.

When tying, start at the corners of the hook. This will put the vertical bars in place. Use the markings on the vertical bars as guide to ensure that the spaces between the hooks are correct and as specified in the plan.



5. A **temporary brace** may be added to keep movement of the 3 vertical bars. This is also to avoid misalignment among the members while it is not yet fixed/ tied.



6. Before tying the hooks to vertical bars, make sure they are in correct spacing. You can check by using the ruler guide or the markings made on the vertical bar.



7. When all stirrups are in place, use a **tying hook** to tie the stirrups to the vertical bars with a tie wire. Tie all connections.





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8. Repeat the same procedure as you add the remaining vertical bars for the columns.







PROCEDURE IN SETTING UP REINFORCED STEEL ASSEMBLY

In this exercise, the column reinforcement assembly will be attached to the footing prior to pouring of concrete to the foundation.



1. Once all the column hooks are attached to the vertical bars, it is now ready for setting up for concrete pouring.

Before fixing the column rebar assembly, one should take note of the following factors to avoid misalignment of the structural member:



- A. CENTERLINE MARKING common construction practice which center of the column is marked on the scaffolding as guide in attaching rebar assemblies and the same time to check its alignment
- B. STRING visual guide to check the location and alignment (vertical and horizontal) of structural members.

- C. HORIZONTAL BRACE holds the forms and rebar assemblies in place. Also used to check the elevations of different structural members.
- D. VERTICAL BRACE holds the horizontal brace in place.
- E. DIAGONAL BRACE holds the vertical brace in place. The diagonal braces prevents the scaffoldings from moving sideways.
- 2. Lower the column rebar assembly into the excavation with a footing rebar. You may use a chain block for safer transfer and if the assembly is too heavy for the manpower to carry.







3. While lowering, use the layout strings as guide to check to the alignment and location of the web member. Use the plumb bob to check for that the member is vertical upright.



4. When location of rebar assembly is confirmed, start fixing the vertical column rebar to the footing rebar by tying it with a tie wire.



5. Install temporary brace on the column assembly to avoid misalignment and sideway movements of the member while concrete is being poured.



LO4. CLEAN-UP

ASSESSMENT CRITERIA:

- 1. Unused and off cut materials are stacked / stored for re-use or disposal.
- 2. Work area is cleared in accordance to OSHS requirements and company standard operating procedure
- 3. Tools and equipment are cleaned, and stored according to manufacturer's recommendations
- 4. Waste materials are disposed following OSHS requirements

CONTENTS:

- Interpreting job requirements/specifications and working drawings
- Installation procedures and techniques
- OSHS requirements
- Types of tools and equipment

CONDITIONS:

The students/trainees must be provided with the following:

- Job requirements/specifications
- RSB tools and equipments
- RSB materials and components
- OSHS requirements
- Workplace/simulated environment
- Learning materials

METHODOLOGIES:

- Demonstration
- Self-paced instruction
- Classroom discussions
- Multimedia presentation
- Practical application

- Direct observation
- Written test/questioning

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.

These materials are available in both printed and electronic copies.

For more information please contact: **Technical Education and Skills Development Authority (TESDA)** Telephone Nos.: 893-8281, 817-4076 to 82 loc. 611, 630, 631 and 635 or visit our website: <u>www.tesda.gov.ph</u> or the TESDA Regional or Provincial Office nearest you.



Appendix-11: TESDA Training Module for Foamwork fabrication (TESDA Training Material)





(CARPENTRY NC II)

Unit of Competency: FABRICATE FORMWORKS

Module No.: 2

Module Title: Fabricating Formworks

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HOW TO USE THIS MODULE

Welcome to the Module in <u>**"Fabricating Formworks</u>".** This module contains training materials and activities and activities for you to complete.</u>

The unit of competency "**Fabricate Formworks**" contains the knowledge, skills and attitudes for a **Carpentry NC II** course.

You are required to go through a series of learning activities in order to complete each of the learning outcomes of the module. In each learning outcomes there are <u>Information Sheets, Job Sheets, and Operation Sheets.</u> Follow these activities on our own and answer the Self-Check at the end of each learning activity.

If you have questions, don't hesitate to ask your facilitator assistance.

Recognition of Prior Learning (RPL)

You may already have some or most of the knowledge and skills covered in this module because you have:

- \square been working for some time
- \Box already completed training in this area

If you can demonstrate to your teacher that you are competent in a particular skill or skills, talk to him/her about having them formally recognized so you don't have to do the same training again. If you have a qualification or Certificate of Competency form previous training shows it to your teacher. If the skills you acquired are still current and relevant module, they may become part of the evidence you can present for RPL. If you are not sure about the currently of your skill, discuss this with your trainer.

After completing this module ask your teacher to assess your competency. Result of your assessment will be recorded in your competency profile. All the learning activities are designed for you to complete at your own pace.

Inside this module you will find the activities for you to complete followed by relevant information sheets each learning outcome. Each learning outcome may have more than one learning activity

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Program / Course CARPENTRY NC II

Unit of Competency FABRICATE FORMWORKS

MODULE FABRICATING FORMWORKS

INTRODUCTION:

This module contains information and suggested learning activities on **<u>Carpentry II.</u>** It includes instruction and procedure on how **<u>Fabricate</u> <u>Formworks.</u>**

Completion of this module will help you better understand the succeeding module on **Installing Formwork Components**.

This module consists of $\underline{3}$ learning outcomes. Each learning outcome contains learning activities supported by instruction sheets. Before you perform the instructions, read the information sheets and answer the self-check and activities provided to ascertain to yourself and your teacher that you have acquired the knowledge necessary to perform the skill portion of the particular learning outcome.

Upon completing this module, report to your instructor for assessment to check your achievement of knowledge and skills requirements of this module. If you pass the assessment, you will be given a certificate of completion.

SUMMARY OF LEARNING OUTCOMES:

Upon completing this module the trainees/students should be able to:

- LO1. Prepare materials, tools and equipment for fabricating formworks.
- LO2. Lay-out dimension of form sheeting and stiffeners.

LO3. Assemble form panels.

ASSESSMENT CRITERIA:

Refer to assessment criteria of learning outcomes #1-3 of this module.

PREREQUISITES:

None

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TECHNICAL TERMS

Assemble	means to fit together as the part of the mechanism
Bulge	means to swell; make or be protuberant.
Dimension	any measurable extent or magnitude, as the length,
Fabricate	means to make, assemble or manufacture
Form	is a temporary boarding, sheathing or pan used to produce the desired shape and size concrete.
Lumber	is sawed or sliced to board, plank.
Plywood	is a material composed of a number of thin sheets of wood glued together with the grains of adjacent sheets at right angles.
Sheet	is a broad, piece of any thin material
Stable	means standing firmly in place; not easily moved, shaken, or overthrown; fixed
Stiff	means not moving easily

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EVIDENCE GUIDE PERSONAL PROTECTIVE EQUIPMENT

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize various protective gears a worker should wear.



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Unit of Competency FABRICATE FORMWORKS

MODULE FABRICATING FORMWORKS

LEARNING OUTCOME # 1

• Prepare materials, tools and equipment for fabricating formworks.

Assessment Criteria:

- 1. Related plans and details are correctly interpreted according to job requirements
- 2. Appropriate PPE is selected and used according to job requirements
- 3. Materials, hand and power tools and equipment are selected and prepared consistent with job requirements.
- 4. Materials are re-checked and properly staged according to job requirements.
- 5. Unexpected situations are responded to in line with the company rules and regulations.
- 6. Housekeeping is performed according to safety regulations

Resources: *References, Tools/Equipment, etc.* – should conform with the Contextual Learning Matrix (Get from the conditions of the CBC)

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LEARNING EXPERIENCES/ACTIVITIES

LO1. Prepare materials, tools and equipment for fabricating formworks			
Learning Activities	Special Instruction		
 Materials, tools and equipment for fabricating formworks. 			
 a. Read attached Information Sheet #1-1 on materials, tools and equipment for fabricating formworks b. Answer self-Check #1-1 c. Compares your Answers to Answers key #1-1 2. Compute board feet of a	• Refer Answers Key #1-1		
lumber a. Read attached Operation Sheet #1-1 on how to compute board feet of a lumber b. Answers Self-Check #1-2 c. Compare your answers to answers Key #1-2	• Refer Answers Key #1-2		

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INFORMATION SHEET #1-1

Tools, materials and equipment for fabricating formwork

A. Tools:

- 1. Claw hammer used to drive and pull out nails.
- 2. Pencil cylindrical instrument containing chalk, lead or carbon used for marking.
- 3. Pull-push rule is a measuring tool made of flexible steel rolled in a case
- 4. Steel square is a highly accurate tool made of flat steel throughout its body used to square big projects used as squaring the foundation of the building
- 5. Try square is smaller than the steel square used to test the square ness of small pieces of work.
- 6. Cross cut saw is used to cut wood across the grain for the purpose of reducing its length.
- 7. Chalk line is used for marking straight line.

B. Equipment:

- 1. Proper foot protection wear footwear of an appropriate type at the places where there are falling objects, sharp-edged tools, nails, abnormally wet surface or slippery surfaces.
- 2. Hand protection Wear suitable gloves or guantes when employed at places where the hands may be exposed to injuries from sharp or rough points, edges or surface objects.

C. Materials

- 1. Dumber is the term applied to wood after it is saved or sliced into boards, planks, flitch etc. for commercial purposes.
- 2. Nails are a round piece of metal with flat head on one end and pointed at the other used to join numbers of the project together.

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SELF-CHECK #1-1

- I. Directions: Write on a sheet of paper what is asked for in each item.
 - _____1. It is used to protect the hand sharp objects.
 - _____2. It is used to drive and pull out nails.
- _____3. It is the term applied to wood after it is sliced.
- _____4. It is cylindrical instrument containing chalk, lead or Carbon used for marking.
- _____5. It is used for marking straight lines.
- _____6. It is used for sawing across the grain of wood.
 - _____7. It is used in testing and squaring big works.
 - 8. It is flexible used for laying out measurements.
 - II. Directions: Enumerate the items asked for. Write your answers on your answer sheet.
 - 1-4 Factor needed in the selections of materials for forms.
 - 5-7 Give at least 3 personal protective equipment

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EVIDENCE GUIDE X.X DIFFERENT TOOLS FOR FORM FABRICATION

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize different tools for lay outing.

FORMWORKS - is an ancillary construction, used as a mold for a structure. Into this mold, fresh concrete is placed only to harden subsequently. The construction of formwork takes time and involves expenditure up to 20 to 25% of the cost of the structure or even more.

FACTORS TO CONSIDER:

- 1. Cost of materials
- 2. The number of times it can be reused.
- 3. Strength and resistance to pressure and wear and tear.

LAY OUTING TOOLS:

1. STEEL TAPE – also called TAPELINE, is a flexible rule of thin *steel* that retracts into a protective case. It is used for measuring irregular and regular shapes.



2. LEVEL BAR or LEVELING HOSE – used for checking horizontal level of surface.



LEVELING HOSE



3. PLUMB BOB – used to check the vertical alignment of a structure.



4. CHALK LINE or CHALK BOX is a tool for marking long, straight lines on relatively flat surfaces, much farther than is practical by hand or with a straightedge.



5. L – SQUARE – or a CARPENTER'S SQUARE, is an instrument used by draftsmen primarily used to measure and draw right angles. Its name comes from the general shape of the instrument.



6. HANDSAW

CROSSCUT – type of saw used for cutting wood across the grain. *RIPSAW* – saw used for cutting wood along the grain.



7. C – Clamp or G – Clamp is a type of clamp device typically used to hold a wood or metal workpiece, and often used in, but are not limited to, carpentry and welding.



OPERATION SHEET #1-2

Title: Compute Board Feet of a Lumber

Board foot is a piece of lumber whose measure are 1"X12"X12" or an equivalent of 144 cubic inches.

To find the number of board feet in a given piece of lumber, use this formula.

 Basic Formula: No. of board feet= no. of pcs X T" X W' X L' Where T is thickness W is width L is length From this formula, other are derived
 No. of board feet= <u>No of pcs X T" X W X L'</u> 12
 No. of board feet = <u>No of pcs X T" X W X L'</u> 12 X12
 No. of board feet = No of pcs X(T' X 12) W' X L'

Examples :

Formula 1.
$$5pcs - 2"X1'X 14'$$

= $5pcs X2"X' 1'X14$
= $10X1'X14'$
= $10X14'$
= 140 board feet
Formula 2. $= \frac{7pcs - 2"X6"X16'}{12}$
= $\frac{7pcs X2"X6"X16'}{12}$
= $\frac{14X6"X16'}{12}$
= $\frac{84"X16'}{12}$
= $\frac{1344}{12}$
= 112 board feet

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Formula 3. \frac{9pcs - 4'X4''X48''}{12X12}
= \frac{9pcs X4''X4''X48''}{12X12}
= \frac{36X4''X4X48''}{12X12}
= \frac{144X48''}{12X12}
= \frac{6912}{144}
= 48 bd ft.
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SELF-CHECK #1-2

Direction. Prepare materials for the construction of forms for Column, Beam and Slab.

Directions: Solve for the number of board feet of the following: Pieces of lumber. Blow your solutions.

- 1. 15 pcs 2" X3"X14'
- 2. 60 pcs 2"X2"X18"
- 3. 75 pcs -1"X1X14'
- 4. 50 pcs 1'X1'X8'
- 5. 48 pcs 2"X3"X16"

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Module FABRICATING FORMWORKS

LEARNING OUTCOME # 2 Lay-out and cut to dimension of form sheeting and stiffeners.

ASSESSMENT CRITERIA:

- 1. Form sheeting and stiffeners are measure and married according to job specifications.
- 2. Form sheeting and stiffener are laid out and cut with tolerance of \pm 3mm for all measurement.
- 3. Form sheeting and stiffeners for column, beam and wall, slab are consistent with standard spacing for studs or mailer with tolerance of \pm mm .o.c
- 4. Unexpected situations are responded to include with company Rules and regulations.
- 5. Housekeeping is performed according to safety regulation

References:

References, tools, (equipment, etc-should conform to the contextual Learning Matrix (get from the conditioner of the CBC)

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LEARNING ACTIVITIES/ EXPERIENCES

LO2. Lay out and cut the dimension of form sheeting and stiffener			
Learning Activities	Special Instruction		
 Read Information Sheet #2-1 on Laying out and cutting to dimension of Form sheeting and stiffeners. 	• Information Sheet #2-1		
 3. Accomplish Self-Check #2-1 4. Compare your answers key #2-1 	• Answer the Self-Check without looking at the answers, refer to		
5. If you miss some items, go back to the information sheet and self-check again.	 Answers refer to Answers key #2-1 		
6. When ready, you can proceed to the next activity.	 If you find difficulty ask assistance from your teacher 		
 Perform job sheet #2-1 on Laying-out and cutting to dimension of form sheeting and stiffeners. 			
8. When prepared, you can proceed to the next activity.			

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INFORMATION SHEET #2-1

Lay-out and cut dimension of form sheeting and stiffeners

You will learn the basic knowledge in lay outing and cutting of forms, materials.

- SAFE and EFFECTIVE USE OF POWER and HAND TOOLS
- TOOLS FOR LAYOUTING SHEETING

Pull pus rule

• Don't pull out the maximum length of the rule so that you will not destroy the tool

Try Square

• Don't use this tool for driving nails

Claw Hammer

• Avoid pulling bigger nails

Chalk line

• Take care of its chord and always check the oil

Note: Always use tools and equipment according to their uses and functions to prolong their life.

ECONOMIC USE OF MATERIALS

Tips for avoiding waste construction materials.

-Study carefully the plan and detailed drawing.

- -From the given detailed drawing, you can study its different parts, Including sizes of these parts
- -Cutting lumbers, always refer to the schedule of cutting
- -Always determine the methods of measurement used in the plan for Marking
- -Always remember the principles for cutting "measure twice and cut Once"
- -In cutting lumber and plywoods, always use effective tools.

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SELF-CHECK # 2-1

LO2 Lay-Out and Cut to dimension of Form Sheeting and Stiffeners

Directions: Write the letter of your chosen answer on your answer sheet.

- 1. In the absence of circular saw; the alternative tools used for ripping plywood is
 - a. Back saw
 - b. Cross cut saw
 - c. Key hole saw
 - d. Rip saw
- 2. Claw hammer is used for
 - a. Driving cold chisel
 - b. Pulling and driving nails
 - c. Driving chisel
 - d. None of the above
- 3. To avoid waste materials
 - a. Always refer to schedule before cutting
 - b. Always ask the teacher the quantity of parts to the cut
 - c. Apply the direct counting method
 - d. All of the above
- 4. To avoid waste construction materials
 - a. Carefully study the plan and specification
 - b. Determine the schedule of cutting
 - c. Use appropriate PPE
 - d. All of the above
- 5. How does method of cutting affect the efficiency of work?
 - a. It affects the fitting of parts
 - b. It increases or decreases the dimension
 - c. It lessens the strength of form when assembled
 - d. All of the above

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JOB SHEET #2-1

Tools: Pencil, Chalk line, Straight edge, working bench, Cross cut saw, Try square, wooden plane

Materials: -12 pcs 2"x2"8' good lumber

- 1 pc ordinary plywood
- ¼ kilo I"cwn
- 2 kilo 3"cwn
- 1 kilo 2"cwn

Equipment:

- Circular saw (optional)

Note: Ask the plan and details from your teacher

Procedure:

- 1. Read and interpret plan and details
- 2. Prepare tools and materials needed as per job requirements
- 3. Adopt the schedule for cutting , mark 2"x2" lumber for the frame.(remember the method of measurement used)
- 4. Determine the plywood to be cut.(always)
- 5. Locate the sizes of the forms to the plywood at both ends then using your chalk line, mark the boundaries to be cut.
- 6. Cut the mark lines (2"x2" w/ plywood)
 - Observe safety while cutting

Note: If you use circular saw for cutting plywood ask the Permission of your teacher

- 7. After cutting, arrange and classify cut members ready for Assembling
- 8. Ask your teacher to evaluate your work based on the following Criteria:

•	Workmanship	= 60%
•	Accuracy	= 10%
•	Speed	= 10%
•	Safety	= 10%
•	Proper handling	= 10%
	Of tools and materials	100%

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EVIDENCE GUIDE X.X CUTTING FORMS AND SETTING UP

Learning Objectives:

- After reading this Guide, YOU MUST be able to:
- Familiarize methods in cutting forms and setting up for concrete pouring.

FACTORS TO CONSIDER:

- 1. Size of structural member (column and/or beam)
- 2. The number of times it can be reused.

Cutting – the process of preparing and cutting the wood (forms) with a specific dimension based on a given shop drawing.

CUTTING FORMS

1. Prepare the materials. Make sure you have the tools necessary for cutting and PPE to protect yourself from accident/s.



Using a steel tape and pencil, put a marking where you will cut the wood. In this exercise, the column dimension is at 30cm x 30cm. Based on this, you will cut 2 pieces of form with 30cm width, and 2 pieces 34cm width of plywood.



3. Using a straight edge, mark the area where the wood will be cut.



4. Place the wood on a working table. Make sure it is steady to avoid unnecessary movements. For better cutting, use a c – clamp.



5. Place the saw on the marked line. Double check the alignment before pressing the ON button of the saw. When all is set, start cutting the wood with the saw.





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Unit of Competency FABRICATE FORMWORKS

Module FABRICATING FORMWORKS

Learning Outcome # 3 Assemble Form Panels

Assessment Criteria:

- 1. Materials and or fabricated form sheeting and stiffeners are correctly positioned for assembly.
- 2. Assembled from panels are checked for square ness, levelness and alignment to specified tolerance.
- 3. Temporary fixing and / or permanent assembly techniques are applied to hold form panels are checked for compliance with job requirements.
- 4. Assembled form panels are checked foe compliance with job requirements.
- 5. Unexpected situations are responded to in line with prescribed rules and regulations.
- 6. Clean up worksite according to safety regulations and OSHC specifications.
- 7. Daily work report is accomplished in accordance with prescribed rules and regulations.

References:

References, tools, materials and equipment should conform to the Contextual Learning Matrix (get from conditions of the CBC)

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LEARNING EXPERIENCES/ACTIVITIES

Learning Activities	Special Instruction
1. Perform Job Sheet #3.1 on Assemble Forms for Column	 Ask your teacher to evaluate your out put If you fail you seek
2. If you successfully accomplish your task you can advance to the next Job Sheet	assistance from any of your advanced classmates or teacher
3. Perform Job Sheet #3.2 on Installation of Forms for Column	• Ask your teacher to evaluate your out put.
 If you get an outstanding performance, you can proceed to the next module. 	• If you need improvement, you ask help from your teacher or advanced classmates.

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INFORMATION SHEET #3-1

In this lesson you will learn the importance of tools, materials and equipment in assembling form panel.

Tools in Fabricating Formworks:

- -Plan and Detail drawing
- Cross cut saw
- Bar clamp
- String (tansi)
- Claw hammer
- Bar level or plumb bob
- Clear house level
- Try square

Note: Proper handling of tools increases your speed, power and it will make your work accurate.

• Equipment:

- H-frame/Scaffolding (see to it that all parts are well –secured before using)

• Materials:

- Materials for assembling forms should be inspected. See to it that they are free from wood defects so that the efficiency of your work will not get affected.

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JOB SHEET #3.1

Assembling of Forms for Column

Tools: Claw hammer, Chalk line, Try square, Pull-push-rule, Pencil

Materials: Fabricated Forms and Stiffener, 1"cwn, 2"cwn, 3'cwn



Procedure:

- 1. Read end interpret plan/specification
- 2. Prepare all tools and materials required. Note: your materials except fasteners should have been fabricated based on plan.
- 3. Using your skill in squaring stock, layout/mark the length of Longitudinal ribs then cut.
- 4. Cut the perpendicular Ribs Note: For 3 and 4 consider the method of measurement
- 5. Position perpendicular and longitudinal ribs to their position, then drive 3"cwn to fasten.

Note: check the square ness

- 6. Position the plywood to the frame, and then fasten it with protruding plywood outside the frame.
- 7. Position form A1 and A2 to B1, then fasten it with 3"or 4" cwn. Check the square ness and dimension based on plan and detail.
- 8. Secure with braces to avoid changing of angle Note: they should be in 90^o angles.
- Drive at least 8 pieces of 4"cwn at both end of form B2 Note: form B2 is attached to form A1, A2 and B1 (in U form) after placing to its final setting.
- 10. Let your teacher check your work for installation

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Criteria:

•	Workmanship	= 60%
•	Accuracy	= 10%
•	Speed	= 10%
•	Safety	= 10%
•	Proper handling	= 10%
Of	tools and materials	100%

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JOB SHEET # 3-2

Installation of Forms for Column

Tools: Bar level or Plumb Bob, Pull-Push Rule, Claw hammer, Cross Cut saw

Materials: Fabricated Forms ready for Installation, 2"x2" for braces.

Equipment:

H-frame, Ladder, Scaffolding

Procedure:

Note: adopt plan from Job Sheet No 3.

- 1. Prepare all tools, materials and equipment for the installation of forms for column.
- 2. From the center of the foundation located at the battery board, locate one side of the form (0.15 away from the center of the foundation , mark and drive 2" cwn)
- 3. Connect 2"x2"s into this marked line, ready to support the form.
- 4. Install the form into the final positioned
- 5. Cover the form with form B2, secure them with nail. Note: see to it that there will be new open space. Make it water tight.
- 6. Temporarily , place the stiffener /braces then check the vertical and alignment of forms to the center of the foundation

Note: always check the protective covering

- 7. Fix all braces
- 8. Perform good housekeeping
- 9. Let you teacher evaluate your finished work.

Criteria:

•	Workmanship	= 60%
•	Accuracy	= 10%
•	Speed	= 10%
•	Safety	= 10%
•	Proper use	= 10%
	of tools/ materials	100%
	Equipment	

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ANSWER KEYS

SELF-CHECK # 1-1

I.

- 1. Gloves
- 2. Claw hammer
- 3. Lumber
- 4. Pencil
- 5. Chalk line
- 6. Crosscut saw
- 7. Steel square
- 8. Pull push rule

II.

- 1. Cost of materials
- 2. The construction and assembling cost
- 3. The number of times it could be used
- 4. Strength and resistance to pressure and tear & wear
- 5. Proper foot wear
- 6. glove
- 7. Goggles
- 8. Hardhat

SELF-CHECK #1-2

- 1. 105 Bdft.
- 2. 30 Bdft.
- 3. 87.5 Bdft.
- 4. 33.3 Bdft.
- 5. 32 Bdft.

SELF-CHECK # 2-1

- 1. B
- 2. B
- 3. A
- 4. A
- 5. D

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SETTING OF FORMS



STEEL AND PANEL COLUMN FORM

1. Gather the panels of wood to be used as column forms. Install concrete spacer on the column rebar web to ensure that the column will have the required concrete cover. This will protect the rebar from corrosion due to exposure.





2. If necessary, install the steel bar dowels after installing the concrete spacers.

DOWEL /

3. When all the dowels and concrete spacers are installed, place 2 form panels on the column rebar, one per each side.





4. Tighten the bolts into the designated holes to join the 2 panel forms. Always check the alignment of the forms through the layout strings installed.



Continue the same procedure with the rest of the panel forms until the column rebars are completely covered.





EVIDENCE GUIDE X.XX.XX HOW TO FABRICATE FOOTING GUIDE

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize method of fabricating footing guide.

FACTORS TO CONSIDER:

- 1. Size of structural member.
- 2. Number of rebar both ways.

Cutting – the process of preparing and cutting the wood (forms) with a specific dimension based on a given shop drawing.

Bending – the process of bending the steel bar into desired shape as required in the plan.



FOOTING STEEL REINFORCEMENT

FOOTING GUIDE made of Coco Lumber

TOOLS and MATERIALS NEEDED



- **C** Steel tape
- **D** Hand saw

- **G** L Square
- H Coco Lumber

PROCEDURE:

1. Study the plan/ shop drawing of the footing dimension. Take note of the total length and concrete cover to determine the length of rebar.

The length of the rebar will determine the length of the guide that will be fabricated.





2. Based on the drawing, the footing has 11 members per row at 1450 mm length. Thus,

1450 MM \div 10 (number of spaces in between members) = 145 MM

Mark 1450 MM on the coco lumber. From this dimension mark the 145 MM spacing. These indicate the location of the steel bar.



3. The size of the bed bar is a 16mm diameter deformed steel bar. Using the previous marking as basis, make a 20mm wide cut on the coco lumber.





Use a HANDSAW for cutting.

Use a CHISEL to cut a hole.





4. Your lumber should look like this. Make identical FOUR (4) pieces of this pattern.

5. Assemble these 4 patterns to make a square. Use the bed bars as guide to check the dimension of the pattern.





Fix the wooden guide with nails at all corners.

6. Turn the guide over to install diagonal braces on all sides. This will prevent the frame from moving sideways.





7. Place the bended bars on the guide. You can start fixing the members with a tie wire.

EVIDENCE GUIDE X.XX.XX HOW TO PREVENT MISALIGNMENT

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize guides and on – site fundamentals to ensure alignment of structural frame.

TOOLS:

LAY OUTING/ALIGNMENT TOOLS:

1. STEEL TAPE – also called TAPELINE, is a flexible rule of thin *steel* that retracts into a protective case. It is used for measuring irregular and regular shapes.



2. LEVEL BAR or LEVELING HOSE - used for checking horizontal level of surface.



LEVELING



3. PLUMB BOB – used to check the vertical alignment of a structure.



A2-11-42

4. CHALK LINE or CHALK BOX is a tool for marking long, straight lines on relatively flat surfaces, much farther than is practical by hand or with a straightedge.



8. L – SQUARE – or a CARPENTER'S SQUARE, is an instrument used by draftsmen primarily used to measure and draw right angles. Its name comes from the general shape of the instrument.



TEMPORARY BRACING – while a worker needs to have basic lay outing tools to ensure alignment among structural members, a building also needs bracing while construction is on – going.

Braces are important to provide interim stability and stiffness until all structural elements of the building are assembled. Temporary bracing is also necessary to support wind and construction loads on the building.

Temporary bracing must be equivalent to at least 60% of permanent bracing required. It may form part of the installed permanent bracing.





VERTICAL BRACE —— Appendix-12:TESDA Training Module for
Concrete Works
(TESDA Training Material)

INFORMATION SHEET X.X.X

CONSTRUCTION FUNDAMENTALS

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize construction fundamentals.

FORMWORKS - temporary or permanent molds into which concrete or similar materials are poured.

REBAR – is a steel bar or mesh of steel wires used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and hold the concrete in tension.

CONCRETE - is a composite material composed of aggregate bonded together with a cement which hardens over time.

CONCRETE MIX DESIGN - is a process of selecting suitable ingredients and determining their relative proportions with the objective of producing concrete of having certain minimum workability, strength and durability as economically as possible.

TYPES OF MIX:

- 1. NOMINAL MIX is used for relatively unimportant and simple concrete works. In this type of mix, all the ingredients are prescribed and their proportions are specified.
- DESIGN MIX is a performance based mix where choice of ingredients and proportioning are left to the designer to be decided. The user has to specify only the requirements of concrete in fresh as well as hardened state. The requirements in fresh concrete are workability and finishing characteristics, whereas in hardened concrete these are mainly the compressive strength and durability.

CONCRETE COVER - in reinforced concrete, is the least distance between the surface of embedded reinforcement and the outer surface of the concrete. The concrete cover protects the steel reinforcement, embedded within the concrete, from corrosion caused by exposure to earth and air.

INFORMATION SHEET X.X.X PERSONAL PROTECTIVE EQUIPMENT

PPE – or personal protective equipment, is anything used or worn by a person to minimize a risk to the person's health or safety.



A worker shall wear protective gears at all times upon entering the construction site to protect himself from physical, electrical, heat, chemical hazards.

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CONCRETE WORKS

CONCRETE is a composite material composed mainly of water, aggregate, and cement. Often, additives and reinforcements (such as rebar) are included in the mixture to achieve the desired physical properties of the finished material.

AGGREGATES are inert granular such as sand, gravel or crushed stone that along with water and Portland cement are essential ingredients in concrete.

TYPES OF AGGREGATES

- 1. COARSE includes crushed stone, crushed or natural gravel with particles retained on a 5mm sieve.
- 2. FINE crushed stone or gravel, or natural sand with particles passing through the 5mm sieve.

PRINCIPLE OF CONCRETE MIXING

The purpose in mixing concrete is to select optimum proportion of cement, water and aggregates to produce a mixture that will meet the following:

- Workability
- Strength
- Durability
- Economy

The most important consideration is the CEMENT – WATER ratio because it determines the strength, durability and workability of the mixture.

TOOLS and MATERIALS FOR CONCRETE WORKS

- 1. **PORTLAND CEMENT** is the most common type of cement for general use around the world, used as a basic ingredient of concrete.
 - **Type 1** Normal Portland cement. Type 1 is for general use cement.
 - **Type 2** is used for structures in water or soil containing moderate amounts of sulfate, or when heat build-up is a concern.
 - Type 3 High early strength. Used when high strength are desired at very early periods.
 - **Type 4** Low heat Portland cement. Used where the amount and rate of heat generation must be kept to a minimum.
 - Type 5 Sulfate resistant Portland cement. Used where the water or soil is high in alkali.



CHECK LABEL FOR CEMENT TYPE 2. **FINE AGGREGATES / SAND** – one of the 2 aggregates in a concrete mix. Black sand or sand coming from the sea is not recommended.



3. **GRAVE / COARSE AGGREGATES** – another component of concrete mix, 12mm (3/4") diameter size of gravel is used for the mixture.



4. **CONCRETE MIXER** is a device that homogeneously combines cement, aggregate such as sand or gravel, and water to form concrete. A typical concrete mixer uses a revolving drum to mix the components. For smaller volume works portable concrete mixers are often used so that the concrete can be made at the construction site, giving the workers ample time to use the concrete before it hardens.



5. SHOVEL



6. **CONCRETE VIBRATOR** consolidates freshly poured concrete so that trapped air and excess water are released and the concrete settles firmly in place in the formwork.



7. **MEASURING BOX** is one of the most common and convenient way of proportioning concrete mixture.



8. MIXING BOARD is used for mixing concrete manually, or where you temporarily pour concrete after mixing in a concrete mixer.



CONCRETE MIX RATIO

CONCRETE PROPORTION (per cubic meter)

Mixture		Cement in Bag		Sand	Gravel
Class	Proportion	40 kg.	50 kg.	cu. m.	cu. m.
AA	1:1½ : 3	12.0	9.5	.50	1.0
A	1: 2 : 4	9.0	7.0	.50	1.0
В	1:21/2:5	7.5	6.0	.50	1.0
С	1:3:6	6.0	5.0	.50	1.0

SOURCE: "Simplified Construction and Estimate" (Max Fajardo, Jr.) 2000 Edition



Concrete Proportion for different types of Structural Members

INFORMATION SHEET X.X.X

REMOVAL OF FORMS

Walls, Columns, Vortical side of Boams and	24 – 48 hours	
Girders	As may be decided by the Engineer in charge	
Pan Joist forms (metal)		
 760 mm (30") wide or less Over 760 mm (30") wide 	3 days 4 days	
Joist, Beam and Girder Soffits		
 Under 3.00 m clear span between structural support 	7 days	
 Over 3.00 – 6.00 m clear span Over 6.00 m clear span 	14 days 21 days	
One – Way Slab		
 Under 3.00 m clear span between support 	4 days	
- At 3.00 – 6.00 m clear span	7 days	
- Over 6.00 m clear span	10 days	
Two – Way Slab	21 days	



STRIPPING SEQUENCE FOR TWO - WAY SLABS

INFORMATION SHEET X.X.X

QUALITY CONTROL MEASURES

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize quality control tests for materials being used in construction.

QUALITY CONTROL – a procedure or set of procedures intended to ensure that materials used adhere to the standard quality criteria or meets the requirements of the client.

MATERIALS TESTING is conducted to guarantee that components used in an infrastructure or products are fit for purpose and capable of performing over their expected lifespan. It is a diligent approach to ensuring that your infrastructure and vital equipment will provide continued production, undergo minimal degradation and are designed with optimal performance in mind. Materials testing can also supply a wealth of information about the materials you are developing or incorporating into products to ensure they perform within expected specifications.

COMMON STRENGTH OF MATERIALS TESTS (for Infrastructures):

1. **Compressive Strength Test of Concrete** - is mechanical test measuring the maximum amount of compressive load a material can bear before fracturing. The test piece, usually in the form of a cylinder, is compressed between the platens of a compression-testing machine by a gradually applied load. This is primarily used to determine that the concrete mixture designed meets the requirements of the specified strength.



CONCRETE CYLINDER BEFORE APPLYING LOAD



CONCRETE CYLINDER AFTER APPLYING LOAD



CHB SAMPLE BEFORE APPLYING LOAD



CHB SAMPLE AFTER APPLYING LOAD

2. **Tensile Strength Test** - refers to the amount of tensile (stretching) stress a material can withstand before breaking or failing. **Yield Strength** may also be measured. It refers to the amount of stress a material can withstand without permanent deformation.



CORRUGATED STEEL BAR BEFORE APPLYING STRESS



CORRUGATED STEEL BAR AFTER APPLYING STRESS

3. Specific Gravity and Water Absorption Tests for aggregates and filling materials are conducted to measure its strength and quality of the material, as well as its ability to absorb water.



4. FIELD DENSITY TEST by Sand Replacement Method is the commonly used method to measure the amount of compaction achieved during construction.



Soil Boring Test is conducted to determine the following: (1) the type and design of foundation of a building, (2) ability of the soil to support structures on surface with or without additional assistance from piers, footings and other aids, (3) permeability of the soil to determine whether it will percolate sufficiently for an on- site septic system, and (4) discover leakage from underground storage tanks or presence of other contaminants.


INFORMATION SHEET X.X.X

SLUMP TEST PROCEDURE

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Perform slump test on freshly mixed concrete.

SLUMP TEST is a means of assessing the consistency of fresh concrete. It is used, indirectly, as a means of checking that the correct amount of water has been added to the mix.

In order to reduce the influence on slump of the variation in the surface friction, the inside of the mold and its base should be moistened at the beginning of every test, and prior to lifting of the mold the area immediately around the base of the cone should be cleaned from concrete which may have dropped accidentally.

APPARATUS:

- 1. Slump Cone
- 2. Temping Steel Rod
- 3. Steel tape
- 4. Rubber Mallet

PROCEDURE:

1. Place the base of slump cone on a smooth surface. The filling of the container will be done in 3 layers. Fill 1/3 of the container with the freshly mixed concrete.



2. Temp the layer 25 times with a standard 16 mm (5/8") diameter steel rod. Repeat the procedure for the next 2 layers.



3. When the mold is completely filled with concrete, the top surface is struck off (leveled with mold opening) by screening and rolling motion of the temping rod.



4. Immediately after filling and the concrete is leveled, the cone is slowly and carefully lifted vertically, an unsupported concrete will now slump.



- 5. The decrease in the height of the center of the slumped concrete is called **slump**.
- 6. The slump is measured by placing the cone just beside the slump concrete and the temping rod is placed over the cone so that it should also come over the area of slumped concrete.
- 7. The decrease in height of concrete to that of mold is measured with a steel tape (usually measured to the nearest 5 mm (1/4").



INFORMATION SHEET X.X.X

CONCRETE MIXING PROCEDURES

Learning Objectives:

After reading this Guide, YOU MUST be able to:

• Familiarize concrete mixing procedures

CONCRETE – is a building material made by mixing a cementing material (as Portland cement) and a mineral aggregate (as sand and gravel) with sufficient water to cause the cement to set and bind the entire mass

PROCEDURE:

A. MECHANICAL MIXING



EQUIPMENTS

1 – Bagger Concrete Mixer Mixing Board Slump Cone Trowel Shovel Buckets

MATERIALS for 1 – 2 – 4 Mix (based on Design Mix) (Target Strength – 3,500 psi) 1 bag 40kg. Portland Cement Type 1 2 bags Fresh Sand 4 bags Gravel 16 liters Clean Water

PROCEDURE:

1. Load the mixer with 12 LITERS OF WATER





1 PAIL = 16 liters WATER

2. Load 4 bags of Gravel into the mixer





3. Add 1 bag Portland Cement Type 1.



4. Blend for 1 minute until homogenous. For better result in mixing, tip the mixer forward so it is almost horizontal.



5. Load 2 BAGS OF FRESH SAND into the mixer.





6. Add the remaining water. Distribute it evenly. Tip the mixer as horizontal as possible and mix for another 2 minutes.



7. The mixer operator will check the mixture if it's well – blended. If the concrete is already homogenous in form, he'll give the go signal to UNLOAD it for casting.



OPERATOR CHECKING THE MIX.



OPERATOR GIVING A SIGNAL TO UNLOAD THE CONCRETE.



FRESHLY MIXED CONCRETE BEING POURED INTO THE MIXING BOARD.

B. HAND MIXING



Points to consider:

- 1. Mixing board with metal sheet or lean concrete are suitable surfaces for mixing to avoid contamination with soil.
- 2. Surface should be relatively flat.
- 3. Limit the batch size to 0.25 cu.m.

EQUIPMENTS:

Mixing Board Slump Cone set Trowel Shovel Buckets

MATERIALS:

1 bag Portland Cement Type 1 2 bags Fresh Sand 4 bags Gravel (¾" or 1") 16 liters Clean Water

PROCEDURE:

1. Pour the sand into the mixing board,



2. Spread the cement evenly on top of the sand.





3. Using a shovel, mix thoroughly by turning heaps over several times until homogenous.

4. Add coarse aggregate (gravel) and mix thoroughly.



5. Sprinkle the pre – determined quantity of water on top of the mix. Turn the mixture several times, using a shovel, until water is distributed evenly and mixture attain its desired consistency.



6. Cast the concrete.

