Skills for Employment Investment Program (SEIP)

COMPETENCY-BASED LEARNING MATERIAL (FACULTY GUIDE)

FOR

STEEL BINDING AND FABRICATION

(CONSTRUCTION SECTOR)

Finance Division, Ministry of Finance
Government of the People's Republic of Bangladesh

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Approval Sheet

Identification and validation of modules and content for this occupation were made by experts within this sector. A series of consultations were held to accurately capture industry and employer needs and expectations and develop the learning material that would help to enhance the employability of the youth trained. This process started on 2 September 2017 and concluded with a validation workshop with a sectoral working group on 27 December 2017.

Experts Involved

Industry and subject-matter experts who provided their valuable inputs to develop this competency-based learning material [September 2017 – December 2017]:

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Md. Monirul Islam	NDE	Project Engineer
Md. Golam Mostafa	AR Ahmed Developers Limited	Supervisor
Md. Moniruzzaman	Homes Technology Limited	Senior Project Engineer
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David King	British Council - SD03	Team Leader
Md. Sayedur Rahman	British Council - SD03	National Subject Matter Consultant - Construction Sector

Validation Workshop

Competency-based learning material validation workshop participants [held on 27 December 2017]:

Name	Organisation	Designation
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Mr. Md. Ahsan Habib	SEIP	TVET Specialist
Mr. Mohiuzzaman	SEIP	Course Specialist
Dr. Md. Wazed Ali	British Council - SD03	Deputy Team Leader
Rashmi Mehra	British Council - SD03	International CBLM Expert
Md. Sayedur Rahman	British Council - SD03	National Subject Matter Consultant - Construction Sector

Committee Workshop

The National competency-based learning material for National Skills Certificate in Steel Binding and Fabrication**, NTVQF Level [INSERT LEVEL]** qualification is a document developed by the Skill for Employment Investment Programme (SEIP), Finance Division, Ministry of Finance. This competency-based learning material has been developed by an industry expert group under guidance of SEIP. The competency-based learning material was approved by the SCDC [BTEB to insert date] at NTVQF Cell, BTEB.

Respectable members of the SCDC:

Steel Binding and Fabrication - Level [INSERT LEVEL]		

How to Use this Competency-based Learning Material

Welcome to the competency-based learning material for Steel Binding and Fabrication for use in Construction works. These modules contain training materials and activities for learners to complete in order to become competent and qualified as a skilled worker.

There are six (6) modules that make up this course which comprises the skills, knowledge and attitudes required to become a skilled worker including:

1. Perform preparation works
2. Perform fabrication works
3. Perform assembly of prefabricated steel works
4. Perform steel re-bar installation works
5. Perform basic construction levelling procedures
6. Perform formworks installation

As a trainer, you are required to guide the learners through a series of activities in order to complete each learning outcome of the module. These activities may be completed as part of structured classroom activities or they may be required to work at their own pace.

These activities will require the learners to complete associated learning and practice activities in order to gain knowledge and skills they need to achieve the learning outcomes. Refer to **Learning Activity Page of each module** to know the sequence of learning tasks and the appropriate resources to use for each task.

This page will serve as the road map towards the achievement of competence. If you read the **Information Sheets,** these will give you an understanding of the work, and why things are done the way they are. Once the learners have finished reading the Information Sheets, they are required to complete the questions in the **Self-Check Sheets**.

The self-check process follows the Information Sheets in the learning guide. Completing self-checks will help the learners know how they are progressing. To know how they fared with self-checks, they can review the **Answer Key**.

The learners are required to complete all activities as directed in the **Job Sheet**. This is where they will apply their newly acquired knowledge while developing new skills. When working, high emphasis should be laid on safety requirements. The learners should be encouraged to raise relevant queries or ask the facilitator for assistance as required.

When the learners have completed all the tasks required in the learning guide, an assessment event will be scheduled to evaluate if they have achieved competency of the specified learning outcomes and are ready for the next task.

Introduction to Teaching Adult Learners

Since you will be dealing with adult learners, it is important to understand the basic principles of adult learning and methodologies. Adults learn best through associations, experiences and application. A few facts to consider while teaching adult learners:

Discussion: Adult learning is best managed through mutual dialogue and discussion. Discussion needs to be encouraged and used in the classroom to maximise learning.

Associations: Adults have experiences which can be related to any learning objectives to create associations which enhance conceptual comprehension. Associations can be used to create user interest and gain attention. Adults learn new attitudes or skills best in relation to previous life experiences.

This strategy also ensures knowledge retention.

Create an environment conducive to learning and sharing: Make people feel comfortable talking to you and each other. They should feel at ease asking questions, sharing views even if they are not very sure of the efficacy of their suggestions or views.

Physical surroundings: Temperature, light, space and furniture should be optimal. There should be no distractions.

Inculcate respect: Encourage learners' contributions and experiences. People are more encouraged to learn and share when their experiences are acknowledged - new information builds easily on past knowledge and experience.

Reward and recognition: Acknowledging the efforts of people, even small attempts, can reap great benefits. Learners like to receive praise and positive encouragement, which motivates them to deliver their best.

Learners also like to be reassured that they are correctly recalling or using information they have absorbed in the classroom.

Structured teaching: Learners study faster when information or skills are presented in a structured way**:**

- Concepts to be taught in small, bite sized portions for easy assimilation
- Put forth the easiest ideas or skills first and then gradually build on them
- Bring in the important ideas first
- Reinforce key ideas at regular intervals
- Reinforce high order concepts at regular intervals

Move learner from generic to specific flow of information: Introduce the generic concepts first and then move to specific more complex information to ease understanding and comprehension.

Application of concepts/ideas taught: Help students put into practice the concepts taught in the class through exercises and work-based projects. Application ensures knowledge retention and skill building.

Relevance building: Build up relevance of the concepts being taught in class by relating them to day-to-day life and workplace experiences.

Learners should know to use and apply what they have learned in the classroom as they learn faster when they recognise that what they are learning will be useful in the future.

Sharing: Encourage learners to learn from each other and solve problems collectively. This makes learning easier and improves team spirit and the interpersonal skills of the learners.

Participation: Involve learners in the class - adults favour to be *active participants* in learning rather than passive receivers of knowledge. People learn faster when they actively process information, solve problems and practice skills.

Motivate: Inspire the class so that teaching does not become a one-way process of knowledge download. Learners will learn faster when they feel an inner urge to learn and be an active participant in the class.

Create a learning environment in which the learners feel free and able to shed their inhibitions and develop receptivity towards new ideas and concepts.

Students will have different motivation levels - some will be more eager to learn than others as each leaner is different from the other and therefore need to be treated differently.

And remember - adapt your communication style to suit the needs of the audience.

Communicate effectively: Communicate in a manner that is understood by the class. The language and sentence structuring should be clear and succinct.

Technical concepts should be explained in a manner that de-mystifies the concept - make things simple and easy to understand.

Avoid using *too much* technical jargon - if it is part of the curriculum, ensure the class is first made familiar with the words or jargon used.

Assessments: Conduct skill and knowledge checks regularly:

- Reinforce high order concepts at regular intervals.
- Conduct formative and summative assessments.
- Strengthen areas which appear to be weak.

Regular feedback:

- Provide regular feedback to learners
- Help them identify their strengths and areas of improvement
- Feedback should always be constructive
- Timely and specific feedback is easier to accept and act on

List of Icons

Icon Name	Icon
Module content	
Learning outcomes	
Performance criteria	
Contents	
Assessment criteria	
Resources required	
Information sheet	
Self-check Quiz	
Answer key	
Activity	
Video reference	
Learner job sheet	
Assessment plan	
Review of competency	

Module 1: Perform preparation works

Module Descriptor:	This module covers the knowledge, skills and attitudes to perform preparation works for steel binding and fabrication in construction. It specifically includes acquiring job assignment from lead man, reading and interpreting construction drawing, checking work area and preparing hand tools, equipment and materials.	
Nominal Duration:	32 hours	
Learning Outcomes:	**1.1.**	Acquire job assignment from lead man
	1.2.	Read and interpret construction drawing
	1.3.	Check work area
	1.4.	Prepare hand tools, equipment and materials
Performance Criteria:	**1.1.**	Job assignment is received from immediate superior based on work priority.
	1.2.	Details about job assignment are received through appropriate means in accordance with company practices.
	1.3.	Symbols and abbreviations for steel work are recognized based on applicable construction drawings/plans.
	1.4.	Detailed work specifications are interpreted in accordance with applicable construction drawings and plans.
	1.5.	Re-bar materials are identified from design specifications.
	1.6.	Work area is arranged in accordance with work requirements and OHS guidelines and procedures.
	1.7.	Unused/excess materials, debris and other obstacles are removed in accordance with workplace and safety requirements.
	1.8.	Building lines determined by the surveyor are checked to ensure alignment of structures based on approved plans/drawings.
	1.9.	Hand tools and equipment are identified and gathered in accordance with workplace procedures.
	1.10.	Hand tools, equipment and PPEs are checked in accordance with manufacturer's guidelines.
	1.11.	Hand tools and equipment are maintained and stored in compliance with OHS requirements.
	1.12.	Bending table is assembled.
	1.13.	Bending and cutting equipment is set-up and get ready for use.
	1.14.	Materials are hauled to work site and stationed in accordance with workplace requirements.

Learning Outcome 1.1 – Acquire Job Assignment from Lead Man

Contents:	▪ Job assignment ▪ Appropriate means		
Resources Required:	▪ Details about job assignment: o work instruction sheet o work order o meeting minutes		
Learning Activities:	**Activity**	**Resource**	**Student Guide Page**
	1.1	▪ Information Sheet 1.1.1 ▪ Self-Check Quiz 1.1.1 ▪ Answer Key 1.1.1	8 10 30
Assessment Criteria:	▪ Job assignment is received from immediate superior based on work priority ▪ Details about job assignment are received through appropriate means in accordance with company practices		

Learning Outcome 1.2 – Read and Interpret Construction Drawing

Contents:	▪ Symbols and abbreviations for steel work ▪ Work specifications ▪ Re-bar materials		
Resources Required:	▪ Symbols and abbreviations used on construction site ▪ Detailed structural drawing ▪ Re-bar materials		
Learning Activities:	**Activity**	**Resource**	**Student Guide Page**
	1.2	▪ Information Sheet 1.2.1 ▪ Self-Check Quiz 1.2.1 ▪ Answer Key 1.2.1 http://abbreviations.yourdictionary.com/articles/list-of-commonly-used-abbreviations	11 13 30
Assessment Criteria:	▪ Symbols and abbreviations for steel work are recognised based on applicable construction drawings/plans ▪ Detailed work specifications are interpreted in accordance with applicable construction drawings and plans ▪ Re-bar materials are identified from design specifications		

Learning Outcome 1.3 – Check Work Area

<table>
<tr><td>Contents:</td><td colspan="3">▪ Arrangement of work area
▪ Unused/excess materials</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Safety equipment
▪ Cleaning tools and equipment
▪ Transport/vehicle
▪ Steel re-bars</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>1.3</td><td>▪ Information Sheet 1.3.1
▪ Self-Check Quiz 1.3.1
▪ Answer Key 1.3.1
www.constructconnect.com/blog/construction-safety/10-construction-site-safety-tips/</td><td>15
18
30</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Work area is arranged in accordance with work requirements and OHS guidelines and procedures
▪ Unused/excess materials, debris and other obstacles are removed in accordance with workplace and safety requirements
▪ Building lines determined by the surveyor are checked to ensure alignment of structures based on approved plans/drawings</td></tr>
</table>

Learning Outcome 1.4 – Prepare Hand Tools, Equipment and Materials

<table>
<tr><td>Contents:</td><td colspan="3">▪ List of tools and their uses/functions
▪ List of equipment and their uses
▪ PPE
▪ Requirement of materials</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Tools: hacksaw, handsaw, hammer, combination pliers, steel wire twisting tool, vice grip, adjustable wrench, wrench set, combination pliers, pipe wrench, measuring tape, steel rule, marking pen/pencil, screw driver, spirit level
▪ Equipment: re-bar bending table/stand, bar cutting machine, steel bender, power hacksaw, electric wood saw, friction cutter (circular cutter), oxy-acetylene cutting/welding outfit, angle grinder, power drill, impact gun
▪ Personal protective equipment (PPE): safety helmet/hard hat, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug/muff, safety shoes
▪ Materials: steel re-bars (different types and sizes), nail (common), nail (concrete), tie wire (different sizes and gauge), cotton rag</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>1.4</td><td>▪ Information Sheet 1.4.1
▪ Information Sheet 1.4.2
▪ Information Sheet 1.4.3
▪ Information Sheet 1.4.4
▪ Self-Check Quiz 1.4.1
▪ Self-Check Quiz 1.4.2
▪ Self-Check Quiz 1.4.3
▪ Self-Check Quiz 1.4.4
▪ Answer Key 1.4.1
▪ Answer Key 1.4.2
▪ Answer Key 1.4.3
▪ Answer Key 1.4.4
http://abbreviations.yourdictionary.com/articles/list-of-commonly-used-abbreviations</td><td>20
21
25
28
21
25
27
29
30
31
31
31</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Hand tools and equipment are identified and gathered in accordance with workplace procedures
▪ Hand tools, equipment and PPEs are checked in accordance with manufacturer’s guidelines
▪ Hand tools and equipment are maintained and stored in compliance with OHS requirements
▪ Bending table is assembled
▪ Bending and cutting equipment is set-up
▪ Materials are hauled to work site and stationed in accordance with workplace requirements</td></tr>
</table>

Module 2: Perform fabrication works

Module Descriptor:	This module covers the knowledge, skills and attitudes to perform fabrication works for steel binding. It specifically includes cutting steel re-bars, bending main bars using manual benders, bending main bar using bending machine, bending stirrups using manual bender, bending stirrups using bending machine and cleaning/maintaining the workplace.	
Nominal Duration:	56 hours	
Learning Outcomes:	**2.1.**	Cut steel re-bars
	2.2.	Bend main bars using manual bender
	2.3.	Bend main bars using bending machine
	2.4.	Bend stirrups using manual bender
	2.5.	Bend stirrups using bending machine
	2.6.	Clean/maintain the workplace
Performance Criteria:	**2.1.**	Cutting tools/equipment are selected in accordance with steel re-bar size and type.
	2.2.	Steel re-bars are accurately measured, marked and ready for cutting.
	2.3.	Steel re-bars are cut using appropriate cutting tools/equipment based on cutting list.
	2.4.	Cut steel re-bars are arranged in designated area according to workplace requirements.
	2.5.	Excess steel re-bars are gathered and disposed in accordance with workplace procedures.
	2.6.	Relevant OHS guidelines are applied at all times.
	2.7.	Appropriate bending tools and equipment are prepared in accordance with the work requirements.
	2.8.	Bending forms/jigs are installed according to cutting list specifications.
	2.9.	Main bars are manually bended according to required bar shapes and quantity.
	2.10.	Bended main bars are stocked pile at the designated storage area.
	2.11.	Relevant OHS guidelines are applied at all times.
	2.12.	Bending machine components are checked and maintained in accordance with manufacturer's specifications.
	2.13.	Stirrups are manually bended according to required stirrup shapes and quantity.
	2.14.	All bended stirrups are grouped according to shapes or use.
	2.15.	Tools and equipment are cleaned and stored in accordance with workplace requirements.
	2.16.	Work place is cleaned in accordance with workplace requirements.
	2.17.	Waste materials are disposed in designated and proper place.

Learning Outcome 2.1 - Cut Steel Re-Bars

<table>
<tr><td>Contents:</td><td colspan="3">▪ List of cutting tools and equipment and uses
▪ Types of steel re-bar type
▪ Sizes of steel re-bar size
▪ Structural drawing with re-bar schedule
▪ Occupational health and safety (OHS) guidelines (including PPE)</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: hand hacksaw, hammer, pliers, steel wire twisting tool, re-bar bending table/stand, bar cutting machine, steel bender, power hacksaw, friction cutter (circular cutter), oxy-acetylene cutting/welding outfit
▪ Steel re-bars of different type and size (as required)
▪ Structural drawing with re-bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>2.1</td><td>▪ Information Sheet 2.1.1
▪ Information Sheet 2.1.2
▪ Information Sheet 2.1.3
▪ Information Sheet 2.1.4
▪ Self-Check Quiz 2.1.1
▪ Self-Check Quiz 2.1.2
▪ Answer Key 2.1.1
▪ Answer Key 2.1.2
https://www.whitecap.com/shop/wc/manual-rebar-cutting-bending-tying-tools
https://www.youtube.com/watch?v=psjEaZSLt1M</td><td>34
34
34
36
36
37
58
58</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Cutting tools/equipment are selected in accordance with steel re-bar size and type
▪ Steel re-bars are accurately measured, marked and ready for cutting
▪ Steel re-bars are cut using appropriate cutting tools/ equipment based on cutting list
▪ Cut steel re-bars are arranged in designated area according to workplace requirements
▪ Excess steel re-bars are gathered and disposed in accordance with workplace procedures
▪ Relevant OHS guidelines are applied at all times</td></tr>
</table>

Learning Outcome 2.2 - Bend Main Bars Using Manual Bender

<table>
<tr><td>Contents:</td><td colspan="3">▪ Manual tools and equipment for bending steel re-bar
▪ Bending forms/jigs (depending various sizes and shapes of main bars)
▪ Main bars – definition and functions
▪ Bar shapes
▪ Stack and storage of bended main bar</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, re-bar bending table/stand
▪ Steel re-bars of different type and size (as required)
▪ Structural drawing with re-bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>2.2</td><td>▪ Information Sheet 2.2.1
▪ Information Sheet 2.2.2
▪ Self-Check Quiz 2.2.1
▪ Answer Key 2.2.1</td><td>38
39
41
58</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Appropriate bending tools and equipment are prepared in accordance with the work requirements
▪ Bending forms/jigs are installed according to cutting list specifications
▪ Main bars are manually bended according to required bar shapes and quantity
▪ Bended main bars are stocked pile at the designated storage area
▪ Relevant OHS guidelines are applied at all times</td></tr>
</table>

Learning Outcome 2.3 – Bend Main Bars Using Bending Machine

<table>
<tr><td>Contents:</td><td colspan="3">▪ Bending machine for steel re-bar
▪ Bending guides/forms (depending various sizes and shapes of main bars)
▪ Stack and storage of bended main bar</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, re-bar bending table/stand, portable bending machine
▪ Steel re-bars of different type and size (as required)
▪ Structural drawing with re-bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>2.3</td><td>▪ Information Sheet 2.3.1
▪ Job Sheet 1
▪ Self-Check Quiz 2.3.1
▪ Answer Key 2.3.1
www.doityourself.com/stry/how-to-use-a-rebar-bender</td><td>42
45
46
58</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Bending machine components are checked and maintained in accordance with manufacturer’s specifications
▪ Bending guides/forms are set based on re-bar size and shape
▪ Main steel bars are bended according to required shape and quantity
▪ Bended main steel bars are stock-piled at the designated storage area
▪ Relevant OHS guidelines are applied at all times</td></tr>
</table>

Learning Outcome 2.4 - Bend Stirrups Using Manual Bender

<table>
<tr><td>Contents:</td><td colspan="3">▪ Manual tools and equipment for bending stirrups
▪ Stirrups – definition and functions
▪ Stirrup shapes
▪ Bending guides/forms (depending various sizes and shapes of stirrups)
▪ Stack and storage of bended stirrups</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, re-bar bending table/stand
▪ Steel re-bars of different type and size (as required)
▪ Structural drawing with stirrup schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>2.4</td><td>▪ Information Sheet 2.4.1
▪ Self-Check Quiz 2.4.1
▪ Answer Key 2.4.1
https://www.quora.com/Why-do-we-provide-stirrups-in-beam
https://www.youtube.com/watch?v=ukdXgoa8nZg</td><td>48
48
58</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Appropriate bending tools and equipment are prepared in accordance with the work requirements
▪ Stirrup bending guides/forms are installed according to cutting list specifications
▪ Stirrups are manually bended according to required stirrup shapes and quantity
▪ All bended stirrups are grouped according to shapes or use
▪ Relevant OHS guidelines are applied at all times</td></tr>
</table>

Learning Outcome 2.5 - Bend Stirrups Using Bending Machine

Contents:	▪ Bending machine for steel re-bar ▪ Stirrup shapes ▪ Bending guides/forms (depending various sizes and shapes of stirrups) ▪ Stack and storage of bended stirrups		
Resources Required:	▪ Workplace (simulated or actual) ▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes ▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, re-bar bending table/stand, portable bending machine ▪ Steel re-bars of different type and size (as required) ▪ Structural drawing with stirrup schedule		
Learning Activities:	**Activity**	**Resource**	**Student Guide Page**
	2.5	▪ Information Sheet 2.5.1 ▪ Job Sheet 2 ▪ Self-Check Quiz 2.5.1 ▪ Answer Key 2.5.1 https://www.youtube.com/watch?v=in0dp-UF4SE https://www.youtube.com/watch?v=6xXLXajidaU	50 52 53 59
Assessment Criteria:	▪ Bending machine components are checked and maintained in accordance with manufacturer's specifications ▪ Bending guides/forms are set based on re-bar size and shape ▪ Stirrups are bended according to required shape and quantity ▪ Bended stirrups are stock-piled at the designated storage area ▪ Relevant OHS guidelines are applied at all times		

Learning Outcome 2.6 - Clean/Maintain the Workplace

<table>
<tr><td>Contents:</td><td colspan="3">▪ Importance and necessity of cleaning tools, equipment and workplace
▪ Methods of cleaning, tools and equipment required for cleaning
▪ Storage of tools, equipment and materials
▪ Waste materials</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): gloves, dust mask, safety shoes, hard hat, belt/body harness, goggles, working clothes, apron
▪ Cleaning tools and equipment: brooms, dusters, dust pans, cleaning brushes, mops, waste containers and cotton rags
▪ Materials: water, detergents, abrasives, bleaches</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>2.6</td><td>▪ Information Sheet 2.6.1
▪ Self-Check Quiz 2.6.1
▪ Answer Key 2.6.1
https://www.gov.hk/en/residents/environment/waste/constructionwaste.htm</td><td>54
57
59</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Tools and equipment are cleaned and stored in accordance with workplace requirements
▪ Work place is cleaned in accordance with workplace requirements
▪ Waste materials are disposed in designated and proper place</td></tr>
</table>

Module 3: Perform assembly of prefabricated steel works

Module Descriptor:	This module covers the knowledge, skills and attitudes to perform assembly of prefabricated steel works for steel binding and fabrication. It specifically includes assembling re-bars for columns, assembling re-bars for beams, assembling re-bars for joists, assembling re-bars for girders, assembling re-bars for slabs, and assembling re-bars for board piles/pile caps.	
Nominal Duration:	62 hours	
Learning Outcomes:	**3.1.**	Assemble re-bars for columns
	3.2.	Assemble re-bars for beams
	3.3.	Assemble re-bars for joists
	3.4.	Assemble re-bars for girders
	3.5.	Assemble re-bars for slabs
	3.6.	Assemble re-bars for board piles/pile caps
Performance Criteria:	**3.1.**	Personal protective equipment and hand tools are used in accordance with safety and work requirements.
	3.2.	Assembly of re-bars for columns is carried out in accordance with OHS requirements.
	3.3.	Metal/wooden supports for main/vertical bars are prepared and assembled according to work requirements.
	3.4.	Size of main/vertical bars and lateral ties are selected based on structural plan, design specifications and relevant local and international construction codes.
	3.5.	Main/vertical bars are held in position by lateral ties in accordance with the column design plan.
	3.6.	Spacing of main/vertical bars and lateral ties are determined in accordance with design specifications and relevant local and international construction codes.
	3.7.	Lateral ties are tied/welded in order to hold the main/vertical bars firmly to its designed position.
	3.8.	Completed column reinforcement assembly is hauled to designated storage area.
	3.9.	Assembly of re-bars for beams is carried out in accordance with OHS requirements.
	3.10.	Main bars and extra/cut bars are held in position by closed stirrups in accordance with the beam design plan.
	3.11.	Closed stirrups are properly spaced and tied/welded in order to hold the main bars firmly to its designed position.
	3.12.	Completed beam reinforcement assembly is hauled to designated storage area.
	3.13.	Assembly of re-bars for joist is carried out in accordance with OHS requirements.
	3.14.	Main bars and extra/cut bars are held in position by closed stirrups in accordance with the joists design plan.

	3.15.	Completed joist reinforcement assembly is hauled to designated storage area.
	3.16.	Assembly of re-bars for girders is carried out in accordance with OHS requirements.
	3.17.	Main bars and extra/cut bars are held in position by closed stirrups in accordance with the girder design plan.
	3.18.	Completed girder reinforcement assembly is hauled to designated storage area.
	3.19.	Assembly of re-bars for slabs is carried out in accordance with OHS requirements.
	3.20.	Metal bed for slab fabrication is prepared in accordance with work requirements.
	3.21.	Slab re-bars are properly spaced and tied/welded in accordance with design specifications and relevant local and international construction codes.
	3.22.	Completed slab reinforcement assembly is hauled to designated storage area.
	3.23.	Assembly of re-bars for board piles/pile caps is carried out in accordance with OHS requirements.
	3.24.	Board pile re-bars are properly spaced and tied/welded in accordance with design specifications and relevant local and international construction codes.
	3.25.	Completed board pile reinforcement assembly is hauled to designated storage area.
	3.26.	Excess materials and debris are properly disposed and work area is cleaned in compliance with OHS guidelines.

Learning Outcome 3.1 - Assemble Re-Bars for Columns

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition and types of column, construction methods and formworks
▪ Size of main/vertical bars and lateral ties:
▪ Structural plan drawing
▪ Design specifications
▪ Spacing of main/vertical bars and lateral ties for columns
▪ Stack and storage of bended bars</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, re-bar bending table/stand, portable bending machine
▪ Steel re-bars and ties of different type and size (as required)
▪ Structural drawing with schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>3.1</td><td>▪ Information Sheet 3.1.1
▪ Job Sheet 3
▪ Self-Check Quiz 3.1.1
▪ Answer Key 3.1.1
https://theconstructor.org › How to Guide › Detailing Guide
http://youtube.com/watch?v=cyLAMpvq5Fs
www.youtube.com/watch?v=KX_4fCZ6fcw
https://theconstructor.org/geotechnical/types-of-shallow-foundations/5308/</td><td>63
67
68
94</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Assembly of re-bars for columns is carried out in accordance with OHS requirements
▪ Metal/wooden supports for main/vertical bars are prepared and assembled according to work requirements
▪ Size of main/vertical bars and lateral ties are selected based on structural plan, design specifications and relevant local and international construction codes
▪ Main/vertical bars are held in position by lateral ties in accordance with the column design plan
▪ Spacing of main/vertical bars and lateral ties are determined in accordance with design specifications and relevant local and international construction codes
▪ Lateral ties are tied/welded in order to hold the main/vertical bars firmly to its designed position
▪ Completed column reinforcement assembly is hauled to designated storage area
▪ Excess materials and debris are properly disposed and work area is cleaned in compliance with OHS guidelines</td></tr>
</table>

Learning Outcome 3.2 - Assemble Re-Bars for Beams

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition and classification of beams, construction methods and formworks.
▪ Size of main, extra/cut bars and stirrups
▪ Hooks, bends and bar bending schedule
▪ Design specifications
▪ Spacing of main, extra/cut bars and stirrups for beams
▪ Stack and storage of bended bars</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, re-bar bending table/stand, portable bending machine
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Structural drawing with schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>3.2</td><td>▪ Information Sheet 3.2.1
▪ Job Sheet 4
▪ Self-Check Quiz 3.2.1
▪ Answer Key 3.2.1
https://theconstructor.org/structural-engg/types-of-rcc-beams-and-reinforcement-details/7383/
http://youtube.com/watch?v=zBUEkkfQoeY</td><td>70
75
76
94</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Assembly of re-bars for beams is carried out in accordance with OHS requirements
▪ Metal/wooden supports for main bars are prepared and assembled according to work requirements
▪ Size of main bars, extra/cut bars and closed stirrups are selected based on structural plan, design specifications and relevant local and international construction codes
▪ Main bars and extra/cut bars are held in position by closed stirrups in accordance with the beam design plan
▪ Closed stirrups are properly spaced and tied/welded in order to hold the main bars firmly to its designed position
▪ Completed beam reinforcement assembly is hauled to designated storage area
▪ Personal protective equipment and hand tools are used in accordance with safety and work requirements
▪ Excess materials and debris are properly disposed and work area is cleaned in compliance with OHS guidelines</td></tr>
</table>

Learning Outcome 3.3 - Assemble Re-Bars for Joists

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition of joist
▪ Size of main, extra/cut bars and stirrups
▪ Structural plan drawing
▪ Design specifications
▪ Spacing of main, extra/cut bars and stirrups for joists
▪ Stack and storage of bended bars</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, re-bar bending table/stand, portable bending machine
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Structural drawing with re-bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>3.3</td><td>▪ Information Sheet 3.3.1
▪ Self-Check Quiz 3.3.1
▪ Answer Key 3.3.1</td><td>78
79
94</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Assembly of re-bars for joist is carried out in accordance with OHS requirements
▪ Metal/wooden supports for main bars are prepared and assembled according to work requirements
▪ Size of main bars, extra/cut bars and closed stirrups are selected based on structural plan, design specifications and relevant local and international construction codes
▪ Main bars and extra/cut bars are held in position by closed stirrups in accordance with the joists design plan
▪ Closed stirrups are properly spaced and tied/welded in order to hold the main bars firmly to its designed position
▪ Completed joist reinforcement assembly is hauled to designated storage area
▪ Excess materials and debris are properly disposed of and work area is cleaned in compliance with OHS guidelines</td></tr>
</table>

Learning Outcome 3.4 - Assemble Re-Bars for Girders

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition of girder, difference between beam and girder
▪ Size of main, extra/cut bars and stirrups
▪ Structural plan drawing
▪ Design specifications
▪ Spacing of main, extra/cut bars and stirrups for girders
▪ Stack and storage of bended bars</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, re-bar bending table/stand, portable bending machine
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Structural drawing with re-bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>3.4</td><td>▪ Information Sheet 3.4.1
▪ Self-Check Quiz 3.4.1
▪ Answer Key 3.4.1
https://en.wikipedia.org/wiki/Girder_bridge</td><td>81
82
94</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Assembly of re-bars for girders is carried out in accordance with OHS requirements
▪ Metal/wooden supports for main bars are prepared and assembled according to work requirements
▪ Size of main bars, extra/cut bars and closed stirrups are selected based on structural plan, design specifications and relevant local and international construction codes
▪ Main bars and extra/cut bars are held in position by closed stirrups in accordance with the girder design plan
▪ Closed stirrups are properly spaced and tied/welded in order to hold the main bars firmly to its designed position
▪ Completed girder reinforcement assembly is hauled to designated storage area
▪ Personal protective equipment and hand tools are used in accordance with safety and work requirements
▪ Excess materials and debris are properly disposed and work area is cleaned in compliance with OSHA guidelines</td></tr>
</table>

Learning Outcome 3.5 - Assemble Re-Bars for Slabs

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition of concrete slab, different types of concrete
▪ Size of main, extra/cut bars and stirrups
▪ Structural plan drawing
▪ Design specifications
▪ Spacing of main, extra/cut bars and stirrups for slabs</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, re-bar bending table/stand, portable bending machine
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Structural drawing with bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>3.5</td><td>▪ Information Sheet 3.5.1
▪ Job Sheet 5
▪ Self-Check Quiz 3.5.1
▪ Answer Key 3.5.1
https://civilread.com/16-different-types-slabs-construction/</td><td>84
87
88
95</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Assembly of re-bars for slabs is carried out in accordance with OHS requirements
▪ Metal bed for slab fabrication is prepared in accordance with work requirements
▪ Size of bars are selected based on structural plan, design specifications and relevant local and international construction codes
▪ Slab re-bars are properly spaced and tied/welded in accordance with design specifications and relevant local and international construction codes
▪ Completed slab reinforcement assembly is hauled to designated storage area
▪ Personal protective equipment and hand tools are used in accordance with safety and work requirements
▪ Excess materials and debris are properly disposed of and work area is cleaned in compliance with OHS guidelines</td></tr>
</table>

Learning Outcome 3.6 - Assemble Re-Bars for Bored Piles/Pile Caps

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition and classification of piles
▪ Size of main, extra/cut bars and stirrups
▪ Structural drawing
▪ Design specifications
▪ Spacing of main bars for bored piles
▪ Spacing of main bars for pile caps
▪ Spacing/pitch of spirals for bored piles
▪ Stack and storage of fabricated bars</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, re-bar bending table/stand, portable bending machine
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Structural drawing with spiral bar schedule</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>3.6</td><td>▪ Information Sheet 3.6.1
▪ Job Sheet 6
▪ Self-Check Quiz 3.6.1
▪ Answer Key 3.6.1
https://www.youtube.com/watch?v=p1NFvnHYDuQ</td><td>90
92
93
95</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Assembly of re-bars for bored piles/pile caps is carried out in accordance with OHS requirements
▪ Size of main bars are selected based on structural plan, design specifications and relevant local and international construction codes
▪ Bored pile re-bars are properly spaced and tied/welded in accordance with design specifications and relevant local and international construction codes
▪ Completed bored pile reinforcement assembly is hauled to designated storage area
▪ Personal protective equipment and hand tools are used in accordance with safety and work requirements
▪ Excess materials and debris are properly disposed and work area is cleaned in compliance with OHS</td></tr>
</table>

Module 4: Perform steel re-bar installation works

Module Descriptor:	This module covers the knowledge, skills and attitudes to perform steel re-bar installation works for steel binding and fabrication. It specifically includes checking reference point for determining elevation and centre line, installing scaffolding, installing re-bars for building elements, checking reinforcement prior to pouring concrete and dismantling scaffoldings.	
Nominal Duration:	56 hours	
Learning Outcomes:	**4.1.**	Check reference point for determining elevation and centre line
	4.2.	Install scaffolding
	4.3.	Install re-bars for building elements
	4.4.	Check reinforcement prior to pouring concrete
	4.5.	Dismantle scaffolding
Performance Criteria:	**4.1.**	Alignment and elevations are checked based on architectural drawings, structural drawings and specifications.
	4.2.	Misalign dowel bars are adjusted in accordance with the line marks or building specifications.
	4.3.	Misalignment of initial re-bar is corrected in accordance with approved structural plan.
	4.4.	Tools, equipment and PPE are identified and used according to OHS guidelines and work requirements.
	4.5.	Installation of scaffolding is carried out in accordance with OHS requirements.
	4.6.	Types of scaffolding required are confirmed and associated work tasks identified.
	4.7.	Projected loading on scaffolding and supporting structure is determined based on local and international building codes and project specifications.
	4.8.	Site/workplace access and egress routes are identified.
	4.9.	Scaffolding components are selected and inspected for damage; rejects are labelled and segregated.
	4.10.	Sole board/base plate is selected in accordance with relevant code rules and regulations, and work requirements.
	4.11.	Scaffolding is set up/erected in accordance with work requirements and workplace rules and regulations.
	4.12.	Static/safety lines are installed where specified in accordance with safety rules and regulations.
	4.13.	Lifting device is assembled and installed where specified.
	4.14.	Safety net is placed into position in accordance with design, drawings and specifications.
	4.15.	Size of reinforcement bars for the various building elements are checked based on structural drawing and specifications.
	4.16.	Reinforcement bars are located and positioned in accordance with structural drawings and specifications.

	4.17.	Dowels are cleaned and aligned before joining with vertical bars.
	4.18.	Reinforcement is located and placed using bar chair, ligatures and spacers according to structural drawing/plan and specifications.
	4.19.	Lateral ties/stirrups are installed and secured in place using appropriate method.
	4.20.	Main re-bars are joined using appropriate splicing method in accordance with relevant code requirements.
	4.21.	Steel reinforcement for slabs are bent according to design drawing and specifications.
	4.22.	Slab reinforcements are positioned and fixed in place in accordance with design specifications.
	4.23.	Stair reinforcements are bent, positioned and fixed in place in accordance with design specifications.
	4.24.	Appropriate PPE are used in accordance with workplace and safety requirements.
	4.25.	Location and position of reinforcement and fixing ties to reinforcement are checked for accuracy.
	4.26.	Depth of coverage, clearance, spacing and overlap of reinforcement materials are checked in accordance with structural drawings/job specifications.
	4.27.	Scaffolding is isolated and appropriately signed and barricaded to ensure safe dismantling.
	4.28.	Scaffolding is dismantled using reverse procedure as for erection in accordance with safety practices.
	4.29.	Scaffolding components are cleaned, inventoried and returned to storage area based on workplace rules and procedures.

Learning Outcome 4.1 - Check Reference Point for Determining Elevation and Centre Line

<table>
<tr><td>Contents:</td><td colspan="3">▪ Architectural, structural approved plan drawing and specifications
▪ Line marks
▪ Dowel bar: definition and uses</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, re-bar bending table/stand, portable bending machine
▪ Re-bars and dowel bars as per job requirements
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>4.1</td><td>▪ Information Sheet 4.1.1
▪ Information Sheet 4.1.2
▪ Self-Check Quiz 4.1.1
▪ Self-Check Quiz 4.1.2
▪ Answer Key 4.1.1
▪ Answer Key 4.1.2
https://en.wikipedia.org/wiki/Architectural_plan
https://en.wikipedia.org/wiki/Dowel</td><td>99
102
101
102
122
122</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Alignment and elevations are checked based on architectural drawings, structural drawings and specifications
▪ Misalign dowel bars are adjusted in accordance with the line marks or building specifications
▪ Misalignment of initial re-bar is corrected in accordance with approved structural plan
▪ Tools, equipment and PPE are identified and used according to OHS guidelines and work requirements</td></tr>
</table>

Learning Outcome 4.2 - Install Scaffolding

<table>
<tr><td>Contents:</td><td colspan="3">▪ Definition, types and uses of scaffolding
▪ Scaffolding components
▪ Name and uses of lifting devices</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, scaffolding, rope, ties, bracing, fixed/rotating clamps, U-jack, plate jack, lock pins, steel/wood platform, steel/wood ladder, bolts and nuts, lifting devices
▪ Structural drawings, plans and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>4.2</td><td>▪ Information Sheet 4.2.1
▪ Job Sheet 7
▪ Information Sheet 4.2.2
▪ Self-Check Quiz 4.2.1
▪ Self-Check Quiz 4.2.2
▪ Answer Key 4.2.1
▪ Answer Key 4.2.2
https://en.wikipedia.org/wiki/Architectural_plan
https://www.turboscaffolding.com.au/blog/scaffolding-types-with-their-uses/
https://en.wikipedia.org/wiki/Bamboo_scaffolding</td><td>104
106
107
107
109
122
122</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Installation of scaffolding is carried out in accordance with OHS requirements
▪ Types of scaffolding required are confirmed and associated work tasks identified
▪ Projected loading on scaffolding and supporting structure is determined based on local and international building codes and project specifications
▪ Site/workplace access and egress routes are identified
▪ Scaffolding components are selected and inspected for damage; rejects are labelled and segregated
▪ Sole board/base plate is selected in accordance with relevant code rules and regulations, and work requirements
▪ Scaffolding is set up/erected in accordance with work requirements and workplace rules and regulations
▪ Static/safety lines are installed where specified in accordance with safety rules and regulations
▪ Lifting device is assembled and installed where specified</td></tr>
</table>

Learning Outcome 4.3 - Install Re-Bars for Building Elements

<table>
<tr><td>Contents:</td><td colspan="3">▪ Building elements
▪ Splicing methods
▪ Lap length and development length
▪ Safety net: necessity and importance</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, sleeves, re-bar bending table/stand, portable bending machine, welding equipment
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>4.3</td><td>▪ Information Sheet 4.3.1
▪ Information Sheet 4.3.2
▪ Self-Check Quiz 4.3.1
▪ Self-Check Quiz 4.3.2
▪ Answer Key 4.3.1
▪ Answer Key 4.3.2</td><td>111
113
113
114
122
123</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Safety net is placed into position in accordance with design drawings and specifications
▪ Size of reinforcement bars for the various building elements are checked based on structural drawing and specifications
▪ Reinforcement bars are located and positioned in accordance with structural drawings and specifications
▪ Dowels are cleaned and aligned before joining with vertical bars
▪ Reinforcement is located and placed using bar chair, ligatures and spacers according to structural drawing/plan and specifications
▪ Lateral ties/stirrups are installed and secured in place using appropriate method
▪ Main re-bars are joined using appropriate splicing method in accordance with relevant code requirements
▪ Steel reinforcement for slabs are bent according to design drawing and specifications
▪ Slab reinforcements are positioned and fixed in place in accordance with design specifications
▪ Stair reinforcements are bent, positioned and fixed in place in accordance with design specifications
▪ Appropriate PPE are used in accordance with workplace and safety requirements</td></tr>
</table>

Learning Outcome 4.4 - Check Reinforcement Prior to Pouring Concrete

<table>
<tr><td>Contents:</td><td colspan="3">▪ Depth of coverage
▪ Clearance
▪ Spacing
▪ Overlap of reinforcement</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, steel bender, hooks, ties, sleeves, re-bar bending table/stand, portable bending machine, welding equipment
▪ Steel re-bars, ties and stirrups of different type and size (as required)
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>4.4</td><td>▪ Information Sheet 4.4.1
▪ Self-Check Quiz 4.4.1
▪ Answer Key 4.4.1
https://www.quora.com/What-checks-must-be-made-before-using-steel-reinforcement
www.acivilengineer.com › Construction
https://www.linkedin.com/.../10-field-tips-inspection-rebars-reinforcement</td><td>116
117
123</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Location and position of reinforcement and fixing ties to reinforcement are checked for accuracy
▪ Depth of coverage, clearance, spacing and overlap of reinforcement materials are checked in accordance with structural drawings/job specifications</td></tr>
</table>

Learning Outcome 4.5 - Dismantle Scaffolding

Contents:	▪ Dismantling methods of scaffolding ▪ Sign and barricade to ensure safe dismantling ▪ Cleaning of scaffolding components ▪ Making inventory, return and store as per standard procedures		
Resources Required:	▪ Workplace (simulated or actual) ▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes ▪ Tools and equipment: measuring tape, steel rule, steel square, marking chalk, hammer, scaffolding, rope, ties, bracing, fixed/rotating clamps, U-jack, plate jack, lock pins, steel/wood platform, steel/wood ladder, bolts and nuts, lifting devices ▪ Structural drawings, plans and specifications		
Learning Activities:	**Activity**	**Resource**	**Student Guide Page**
	4.5	▪ Information Sheet 4.5.1 ▪ Information Sheet 4.5.2 ▪ Self-Check Quiz 4.5.1 ▪ Self-Check Quiz 4.5.2 ▪ Answer Key 4.5.1 ▪ Answer Key 4.5.2	118 120 119 121 123 123
Assessment Criteria:	▪ Scaffolding is isolated and appropriately signed and barricaded to ensure safe dismantling. ▪ Scaffolding is dismantled using reverse procedure as for erection in accordance with safety practices. ▪ Scaffolding components are cleaned, inventoried and returned to storage area based on workplace rules and procedures		

Module 5: Perform basic construction levelling procedures

Module Descriptor:	This module covers the knowledge, skills and attitudes to perform basic construction levelling procedures for steel binding and fabrication. It specifically includes checking reference point for planning and preparing for work, setting up and using levelling device, cleaning/maintaining work area.	
Nominal Duration:	32 hours	
Learning Outcomes:	**5.1.**	Plan and prepare for work
	5.2.	Set-up and use levelling device
	5.3.	Clean/maintain the workplace
Performance Criteria:	**5.1.**	Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied in accordance with organizational standards and procedures.
	5.2.	Safety requirements are followed in accordance with OHS regulations and procedures.
	5.3.	Signage/barricade requirement are selected and implemented according to workplace operation.
	5.4.	Tools and equipment are selected, checked for serviceability and any defect are rectified consistent with job requirements.
	5.5.	Environmental protection requirements are identified and applied in accordance with environmental protection plans and regulations.
	5.6.	Heights or levels to be transferred/established are identified from project plans or instructions.
	5.7.	Levelling devices and staffs are set-up, tested and correctly used in accordance with standard operating procedures and manufacturers' guidelines.
	5.8.	Levels are measured and heights transferred to required location and marked and/or recorded consistent with job requirements.
	5.9.	Results of levelling procedure are documented according to organizational requirements.
	5.10.	Work area is cleared of any obstruction and scraps materials disposed or recycled in accordance with workplace environmental plan and regulations.
	5.11.	Tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' specification and instruction, and workplace standard practices.

Learning Outcome 5.1 - Plan and Prepare for Work

<table>
<tr><td>Contents:</td><td colspan="3">▪ Quality requirements
▪ Safe operating procedures
▪ Emergency procedures
▪ Requirement of signage/barricade
▪ Tools and equipment
▪ Environmental protection requirements</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, hammer, rope, ties, marking pen/pencil/chalk, spirit level, string line, pegs (wood or steel), plumb bob, chalk line, ladder, levelling equipment
▪ Firefighting equipment
▪ First aid kits
▪ Cleaning tools and equipment
▪ Standard operating procedure
▪ Manufacturer’s specifications and guidelines</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>5.1</td><td>▪ Information Sheet 5.1.1
▪ Information Sheet 5.1.2
▪ Information Sheet 5.1.3
▪ Self-Check Quiz 5.1.1
▪ Answer Key 5.1.1</td><td>126
126
127
126
134</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied in accordance with organizational standards and procedures
▪ Safety requirements are followed in accordance with OHS regulations and procedures
▪ Signage/barricade requirement are selected and implemented according to workplace operation
▪ Tools and equipment are selected, checked for serviceability and any defect are rectified consistent with job requirements
▪ Environmental protection requirements are identified and applied in accordance with environmental protection plans and regulations</td></tr>
</table>

Learning Outcome 5.2 - Set-Up and Use Levelling Device

<table>
<tr><td>Contents:</td><td colspan="3">▪ Transferring/establishing procedure of heights or levels
▪ Levelling devices</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Tools and equipment: measuring tape, steel rule, steel square, hammer, rope, ties, marking pen/pencil/chalk, spirit level, string line, pegs (wood or steel), plumb bob, chalk line, ladder, levelling equipment
▪ Firefighting equipment
▪ First aid kits
▪ Cleaning tools and equipment
▪ Standard operating procedure
▪ Manufacturer’s specifications and guidelines</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>5.2</td><td>▪ Information Sheet 5.2.1
▪ Job Sheet 8
▪ Self-Check Quiz 5.2.1
▪ Answer Key 5.2.1</td><td>129
131
132
134</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Heights or levels to be transferred/established are identified from project plans or instructions
▪ Levelling devices and staffs are set-up, tested and correctly used in accordance with standard operating procedures and manufacturers’ guidelines
▪ Levels are measured and heights transferred to required location and marked and/or recorded consistent with job requirements
▪ Results of levelling procedure are documented according to organizational requirements</td></tr>
</table>

Learning Outcome 5.3 - Clean/Maintain the Workplace

<table>
<tr><td>Contents:</td><td colspan="3">▪ Importance and necessity of cleaning tools, equipment and workplace
▪ Methods of cleaning, tools and equipment required for cleaning
▪ Storage of tools, equipment and materials
▪ Waste materials</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): gloves, dust mask, safety shoes, hard hat, belt/body harness, goggles, working clothes, apron
▪ Cleaning tools and equipment: brooms, dusters, dust pans, cleaning brushes, mops, waste containers and cotton rags
▪ Materials: water, detergents, abrasives, bleaches</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>2.6</td><td>▪ Information Sheet 2.6.1
▪ Self-Check Quiz 2.6.1
▪ Answer Key 2.6.1
https://www.gov.hk/en/residents/environment/waste/constructionwaste.htm</td><td>54
57
59</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Tools and equipment are cleaned and stored in accordance with workplace requirements
▪ Work place is cleaned in accordance with workplace requirements
▪ Waste materials are disposed in designated and proper place</td></tr>
</table>

Module 6: Perform formworks installation

Module Descriptor:	This module covers the knowledge, skills and attitudes to perform formwork installation for steel binding and fabrication works. It specifically includes planning and preparing formwork installation, installing formworks for building elements, installing formworks for catch basin and manhole and repairing and replacing damaged formworks.	
Nominal Duration:	40 hours	
Learning Outcomes:	**6.1.**	Plan and prepare formwork installation
	6.2.	Install formworks for building elements
	6.3.	Install formworks for catch basin and manhole
	6.4.	Repair and replace damaged formworks
Performance Criteria:	**6.1.**	Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied according to preparation plan.
	6.2.	Appropriate PPE is selected and used according to job requirements and construction safety guidelines.
	6.3.	Signage/barricade requirements are identified and implemented according to safety and workplace regulations.
	6.4.	Tools and equipment selected to carry out tasks are checked for serviceability and any faults are rectified or reported to immediate superior prior to commencement.
	6.5.	Hand and power tools are selected and used in accordance with safe operating requirements of the workplace.
	6.6.	Formwork components and materials are selected and prepared consistent with job requirements.
	6.7.	Material quantity requirements are calculated in accordance with plans and/or specifications.
	6.8.	Materials appropriate to the task are identified, obtained, prepared, safely handled and located ready for use.
	6.9.	Formworks components are installed in accordance with specified tolerance requirements.
	6.10.	Form panel components are installed/fixed in accordance with specified tolerance requirements.
	6.11.	Connectors, braces, locks, bolts and nuts for plastic forms are properly secured according to job requirements.
	6.12.	Accomplishment report is made according to company rules and regulations.
	6.13.	Housekeeping is performed in accordance with workplace and OHS requirements.
	6.14.	Formwork components for catch basin and manhole are installed in accordance with specified dimensions and tolerance requirements.
	6.15.	Form panels components for catch basin and manhole are installed/fixed for in accordance with specified dimension and tolerance requirements.

	6.16.	Formworks are checked for damage according to worksite guidelines and procedures.
	6.17.	Damaged formworks are repaired and replaced in accordance with work requirements

Learning Outcome 6.1 - Plan and Prepare Formwork Installation

<table>
<tr><td>Contents:</td><td colspan="3">▪ Preparation plan
▪ Name and uses of hand and power tools
▪ Formworks components
▪ Fasteners
▪ Formwork materials
▪ Scaffolds</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Signage, barricades and barriers (as required)
▪ Tools: Measuring tape, steel rule, steel square, marking pen/pencil/chalk, callipers, adjustable wrench, pipe wrench, spanners, combination pliers, hacksaw, hand saw, screw drivers, spirit level, string line, pegs, plumb bob, chalk line, hammers, tool holster, crow bar
▪ Equipment: electric drill machine, angle grinder, bar cutting machine, circular cutter, electric wood saw
▪ Formwork components and materials: steel, aluminium, timber, plywood, plastic, fabric, fasteners, ties, rope
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>6.1</td><td>▪ Information Sheet 6.1.1
▪ Information Sheet 6.1.2
▪ Information Sheet 6.1.3
▪ Information Sheet 6.1.4
▪ Information Sheet 6.1.5
▪ Self-Check Quiz 6.1.1
▪ Self-Check Quiz 6.1.2
▪ Answer Key 6.1.1
▪ Answer Key 6.1.2</td><td>138
139
139
139
139
138
142
154
154</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied according to preparation plan
▪ Appropriate PPE is selected and used according to job requirements and construction safety guidelines
▪ Signage/barricade requirements are identified and implemented according to safety and workplace regulations
▪ Tools and equipment selected to carry out tasks are checked for serviceability and any faults are rectified or reported to immediate superior prior to commencement
▪ Hand and power tools are selected and used in accordance with safe operating requirements of the workplace
▪ Formwork components and materials are selected and prepared consistent with job requirements
▪ Material quantity requirements are calculated in accordance with plans and/or specifications
▪ Materials appropriate to the task are identified, obtained, prepared, safely handled and located ready for use</td></tr>
</table>

Learning Outcome 6.2 - Install Formworks for Building Elements

<table>
<tr><td>Contents:</td><td colspan="3">▪ Formwork tolerance requirements</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Signage, barricades and barriers (as required)
▪ Tools: Measuring tape, steel rule, steel square, marking pen/pencil/chalk, callipers, adjustable wrench, pipe wrench, spanners, combination pliers, hacksaw, hand saw, screw drivers, spirit level, string line, pegs, plumb bob, chalk line, hammers, tool holster, crow bar
▪ Equipment: electric drill machine, angle grinder, bar cutting machine, circular cutter, electric wood saw
▪ Formwork components and materials: steel, aluminium, timber, plywood, plastic, fabric, fasteners, ties, rope
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>6.2</td><td>▪ Information Sheet 6.2.1
▪ Information Sheet 6.2.2
▪ Job Sheet 9
▪ Self-Check Quiz 6.2.1
▪ Self-Check Quiz 6.2.2
▪ Answer Key 6.2.1
▪ Answer Key 6.2.2
www.engineeringcivil.com/what-are-the-tolerance-limits-on-construction-site.html</td><td>144
145
146
145
148
154
154</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Appropriate PPE is selected and used according to job requirements and OHS guidelines
▪ Formworks components are installed in accordance with specified tolerance requirements
▪ Form panel components are installed/fixed in accordance with specified tolerance requirements
▪ Connectors, braces, locks, bolts and nuts for plastic forms are properly secured according to job requirements
▪ Accomplishment report is made according to company rules and regulations
▪ Housekeeping is performed in accordance with workplace and OHS requirements</td></tr>
</table>

Learning Outcome 6.3 - Install Formworks for Catch Basin and Manhole

<table>
<tr><td>Contents:</td><td colspan="3">▪ Formwork components for catch basin and manhole
▪ Form panels components for catch basin and manhole</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Signage, barricades and barriers (as required)
▪ Tools: Measuring tape, steel rule, steel square, marking pen/pencil/chalk, callipers, adjustable wrench, pipe wrench, spanners, combination pliers, hacksaw, hand saw, screw drivers, spirit level, string line, pegs, plumb bob, chalk line, hammers, tool holster, crow bar
▪ Equipment: electric drill machine, angle grinder, bar cutting machine, circular cutter, electric wood saw
▪ Formwork components and materials: steel, aluminium, timber, plywood, plastic, fabric, fasteners, ties, rope
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>6.3</td><td>▪ Information Sheet 6.3.1
▪ Self-Check Quiz 6.3.1
▪ Answer Key 6.3.1
www.dictionaryofconstruction.com/definition/catch-basin.html
https://en.wikipedia.org/wiki/Manhole</td><td>150
150
154</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Appropriate PPE is selected and used according to job requirements and OHS guidelines
▪ Formwork components for catch basin and manhole are installed in accordance with specified dimensions and tolerance requirements
▪ Form panels components for catch basin and manhole are installed/fixed for in accordance with specified dimension and tolerance requirements
▪ Accomplishment report is made according to company rules and regulations
▪ Housekeeping is performed according to OHS site safety regulations</td></tr>
</table>

Learning Outcome 6.4 - Repair and Replace Damaged Formworks

<table>
<tr><td>Contents:</td><td colspan="3">▪ Damaged formworks</td></tr>
<tr><td>Resources Required:</td><td colspan="3">▪ Workplace (simulated or actual)
▪ Personal protective equipment (PPE): safety helmet, hand gloves, safety glass/googles, appropriate working clothes, safety belt, safety vest, safety harness, dust mask, ear plug, safety shoes
▪ Signage, barricades and barriers (as required)
▪ Tools: Measuring tape, steel rule, steel square, marking pen/pencil/chalk, callipers, adjustable wrench, pipe wrench, spanners, combination pliers, hacksaw, hand saw, screw drivers, spirit level, string line, pegs, plumb bob, chalk line, hammers, tool holster, crow bar
▪ Equipment: electric drill machine, angle grinder, bar cutting machine, circular cutter, electric wood saw
▪ Formwork components and materials: steel, aluminium, timber, plywood, plastic, fabric, fasteners, ties, rope
▪ Architectural drawings, structural drawings and specifications</td></tr>
<tr><td rowspan="2">Learning Activities:</td><td>Activity</td><td>Resource</td><td>Student Guide Page</td></tr>
<tr><td>6.4</td><td>▪ Information Sheet 6.4.1
▪ Self-Check Quiz 6.4.1
▪ Answer Key 6.4.1
www.civilengineeringforum.me/causes-of-formwork-failures/</td><td>152
153
155</td></tr>
<tr><td>Assessment Criteria:</td><td colspan="3">▪ Appropriate PPE is selected and used according to job requirements and OHS safety guidelines
▪ Formworks are checked for damage according to worksite guidelines and procedures
▪ Damaged formworks are repaired and replaced in accordance with work requirements
▪ Accomplishment report is made according to company requirement
▪ Housekeeping is performed according to worksite safety regulations</td></tr>
</table>