

Short Term Competency based Curriculum

Occupation: Construction Craftsman (Mason) - Concreting

Course Duration: 03 Months Institutional followed by 06 Months OJT in industry

Short Term Competency based Curriculum

Occupation: Construction Craftsman (Mason) - Concreting

Index

Module #	Module Title	Page/s
CCB M 01	Use safe work practices	03 - 05
CCB M 02	Setting out Buildings & Structures	06 - 08
CCB M 03	Concrete & Reinforcements	09 - 11
CCB M 04	Use of concrete for Foundations	12 - 13
CCB M 05	Formwork for concrete work	14 - 17
CCB M 06	Carry out concreting work	18 - 20

Occupation: Construction Craftsman (Mason) - Concreting

Module Title:

Use safe work practices

Module Reference:

CCB – M 01

Module Aim

On completion of this module the learner should be able to,

- Recognize hazards in a given worksite
- Demonstrate correct emergency techniques & procedures for a given hazard.
- Minimize hazards by applying safe work practices

Module Content	
Task	Task descriptions/ Performance standards
<p>Describe/Illustrate hazards in the Construction Craftsman (Mason) Trade</p>	<p>Hazards may include, but not limited to following: Sharp objects – glass and metal <input type="checkbox"/> Overhead hazards/Moving equipment <input type="checkbox"/> Electrical hazards <input type="checkbox"/> Flammable and explosive materials <input type="checkbox"/> Atmospheres- Flammable, explosive, oxygen-deficient <input type="checkbox"/> Slips, trips and falls <input type="checkbox"/> Toxic substances, Bio hazards, Heavy metals Asbestos, Other Industry products <input type="checkbox"/> Respiratory implications</p>
<p>Emphasize the importance of personal Protective Equipment (PPE)</p>	<p>Illustrate and explain</p> <ul style="list-style-type: none"> - Safety footwear - Eye protection - Ear protection - Head protection - Gloves - Respiratory protection - Fit test for respirator <p>Personal protective equipment provided by the employer should be used for one’s own safety</p> <p>Gloves should be worn when handling or contacting chemicals.</p> <p>Mask should be worn when working in a dusty environment.</p>

Continued-

<p>Discuss the proper use of various types of personal fall protection equipment</p> <p>Demonstrate the proper use of various types of personal fall protection equipment.</p> <p>Discuss safe work practices for erecting and dismantling scaffolds</p> <p>Illustrate with diagrams and other visuals - Safe work practices for erecting and dismantling scaffolds</p> <p>Describe the steps of ladder safety</p> <p>Demonstrate the steps of ladder safety</p> <p>Explain safety practices used when working in confined Spaces</p> <p>Demonstrate the safety practices applied when working in confined spaces</p>	<p style="text-align: right;">Continued-</p> <p>Eye and Ear protectors should be worn whenever necessary</p> <p>Safety harness should be worn and secure it to a safe anchorage point when working at height. A bamboo scaffold is not a safe anchorage point, so do not fasten the safety harness to it.</p> <p>Safety shoes should be worn to prevent foot injury.</p> <p>Consider-following aspects too. Pre-planning, inspecting scaffold components, load capacity, platform construction, access requirements, and fall protection</p> <p>Steps of ladder safety should include: selection, inspection, set-up, safe techniques and proper maintenance and storage of ladders</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Training Delivery

Develop Performance Guides for each Task

In respect of each of the above operations

- First provide guided practice
- Then allow groups to practice with minimum guidance

Suggested Training Methodology

1. Illustration & Practical Demonstration
2. Self-paced Instruction
3. Group Discussion
4. Small group activities

Assessment

This Module should be subjected to continuous assessment particularly during institutional training phase

All above tasks should be assessed during both institutional training phase as well as Industry Training phase

Consistency of performance of following to be continuously Observed/Assessed and Recorded

- **Safe work practices- Working with cement/concrete**

Assessment of Technical competencies (Performance /Knowledge Assessments)

(Includes Mode of assessment and Assessment Instruments/tools to be used in assessment)

Summative assessment also to be conducted in respect of each module

Assessment of Technical competencies (Knowledge Assessments)

MCQ and Structured essay type questions and oral questions (short viva) to be used to assess the knowledge component

Occupation: Construction Craftsman (Mason) - Concreting

Module Title: **Setting out Buildings & Structures**

Module Reference: **CCB - M 02**

Module Aim

On completion of this module the learner should be able to accurately perform following setting out operations

- establish angles to set out corners
- set levels according to building plan
- check diagonals, offsets, and angles to ensure accuracy

Module Content	
Task	Task descriptions/ Performance standards
<p>1. Provide copies of selected drawings to small groups of students Referring to given drawings Illustrate and explain</p>	<ul style="list-style-type: none"> • Symbols • Dimensions and Scales • Notations • Abbreviations • Elevations • Sectional elevations
<p>2. Discuss/Explain</p> <ul style="list-style-type: none"> • How to calculate Centre Line dimensions • How to sketch the layout as per the site plan 	<p>Site plan to be referred to locate the lay out</p> <p>Site plan to be referred to position the lay out</p>
<p>3. Illustrate and explain</p> <ul style="list-style-type: none"> • How to establish the Base line • How to fix Temporary Bench Mark (TBM) reference points 	<p>Site plan to be referred to establish the Base line</p>
<p>4. Discuss/Explain How fixing of Profile boards and centre pegs be performed</p>	<p>It should be ensured that all pegs to be in one horizontal plane</p>
<p>5. Discuss/Explain How to establish angles to set out corners</p>	
<p>6. Demonstrate how to establish angles to set out corners</p>	

<p>7. Illustrate/Demonstrate How to set levels</p>	<p>Levels should be set according to building plan & appropriate levels maintained to check whether the setting out is done accurately</p> <p>Existing building lines should be extended to set out extensions of the building according to the drawing</p>
<p>8. Demonstrate how to check Diagonals, offsets, and angles</p>	<p>Diagonals, offsets, and angles should be checked for accuracy</p> <p>Building plan should be referred to rectify errors.</p>

Training Delivery

Develop Performance Guides for each of the above Tasks

In respect of tasks (2,3,4,5,& 7)

- First provide guided practice to students
- Then allow them to practice with minimum guidance

Suggested Training Methodology

1. Illustrations & Practical Demonstrations
2. Self-paced Instruction
3. Group Discussion
4. Small group activities

Small group activities

Get students work in small groups to,

- Convert Imperial measurement units to metric measurement units
- Work out their conversion ratios
- Demonstrate taking offset measurements

Assessment

This Module should be subjected to continuous assessment particularly during institutional training phase

All above tasks should be assessed during both institutional training phase as well as Industry Training phase

Important

- Confirm whether student is able to check the accuracy of the setting out by using a different method (another method) to that used for setting out

Consistency of performance of key tasks to be continuously observed and recorded

Assessment of Technical competencies (Performance Assessments)

(Includes Mode of assessment and Assessment Instruments/tools to be used in assessment)
Summative assessment also to be conducted in respect of each module

Following competencies may be assessed task wise.

- **Layout orientation (Using the site plan)**
- **Establishment of baseline**
- **Locating & positioning of layout**
- **Level setting**
- **Establishment of angles**

Assessment of Technical competencies (Knowledge Assessment)

MCQ and Structured essay type questions and oral questions (short viva) to be used to assess the knowledge component

Occupation: Construction Craftsman (Mason) - Concreting

Module Title:

Concrete & Reinforcements

Module Reference:

CCB –M - 03

Module Aim

On completion of this module the learner should be able to explain/demonstrate,

- the Constituents of concrete, properties and behavior of concrete, Concrete mixes –
- the placing and compaction of concrete,
- Curing of concrete &
- Testing of concrete

Module Content

Task	Task descriptions/ Performance standards
<p><u>Illustrate and Explain</u></p> <ul style="list-style-type: none"> • What is concrete • Constituents of concrete • Cement the setting agent of concrete • Water Cement Ratio • Admixtures • Hydration <p><u>Discuss</u> Factors to be considered in storing cement</p> <p><u>Illustrate</u></p> <ul style="list-style-type: none"> • Concrete Mixes • Mixing concrete <p>Explain / Discuss</p> <ul style="list-style-type: none"> • Hand Mixing • Machine mixing • Ready mixed concrete <p>Discuss Factors to be considered in handling Concrete</p>	<p>Concrete as a mixture of cement, finer aggregates, coarse aggregates and water</p> <p>Hydration as Chemical reactions between water and cement</p> <p>Give examples of some common mixes</p> <p>Explain -Batching by Volume & Batching by mass</p> <p>Indicate procedure/process</p>

<p>Explain & Demonstrate</p> <ul style="list-style-type: none"> • Placing and compaction of concrete • Curing of concrete <ul style="list-style-type: none"> • Demonstrate Testing of concrete <p>Reinforcement for Concrete</p> <p>Illustrate & Explain</p> <ul style="list-style-type: none"> • Steel reinforcement <p>Explain - When the concrete sets and hardens around the bars, a new composite material, reinforced concrete is formed that works well in either tension or compression</p> <p>Reinforced concrete is using one composite material inside another</p> <ul style="list-style-type: none"> • Steel in structural frames must satisfy certain requirements <p><u>Explain</u> The importance of using drawings and bending schedules</p> <p><u>Explain</u> Reinforcement schedules and detailing</p> <p><u>Display and explain</u> Hooks, bend and laps</p> <p>Explain Concrete cover and spacers</p>	<p>Physical and chemical changes involved</p> <p>Slump Test and Cube Test</p> <p>Steel reinforcement is used in concrete to increase the Tensile strength of members</p> <p>Steel bars are placed in the side of member in which tensile stresses occur</p> <ul style="list-style-type: none"> • Tensile strength must be suitable for the required situation • Tensile strength must be achievable without undue deflection • It must be possible to bend the steel to any required shape • The surface of steel must be able to bond itself to the concrete • Steel must be available at reasonable cost <p>Reinforcement in detail drawings is annotated by a coding system</p> <p>Hooks and bends can be used to reduce the anchorage Length at the ends of bars</p> <p>Used to protect reinforcement from corrosion</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Task	Task descriptions/ Performance standards
<p><u>Introduce</u></p> <p>Pre-stressed concrete</p> <p><u>Explain</u></p> <p>Instead of putting steel bars into wet concrete as they are, we tension (pull on) them first. As the concrete sets, the taught bars pull inward, compressing the concrete and making it stronger</p>	<p>Even though reinforced concrete is generally a better construction material, it's still brittle and liable to crack</p> <p>(In tension, reinforced concrete can fail in spite of its steel reinforcement, letting water in.</p> <p>This may cause the concrete to fail and the rebar to rust.</p> <p>The solution is to put reinforced concrete permanently into compression by pre-stressing It is (also called pre-tensioning).</p> <p>Provide Illustrations/Displays to Trainees when explaining</p>

<p><u>Training Delivery</u></p> <p><u>Suggested Training Methodology</u></p> <ol style="list-style-type: none"> 1. Illustration & Practical Demonstration 2. Self-paced Instruction 3. Group Discussion 4. Small Group activities 5. Presentations by students

<p><u>Assessment</u></p> <p>Assessment of Technical competencies (Performance Assessments) (Includes Mode of assessment and Assessment Instruments/tools to be used in assessment)</p> <p>Assessment of Technical competencies (Knowledge Assessment) MCQ and Structured essay type questions and oral questions (short viva) to be used to assess the knowledge component</p>

Occupation: Construction Craftsman (Mason) - Concreting

Module Title:

Use of concrete for Foundations

Module Reference:

CCB - M 04

Module Aim

On completion of this module the learner should be able to make illustrate and explain different types of foundations and their respective uses.

Module Content	
Task	Task descriptions/ Performance standards
Illustrate and explain Strip foundations (Visits to worksites recommended)	Strip foundations provide longitudinal bearing to the walls of a building A strip of concrete of 1:3:6 mix of minimum thickness 150 is recommended
Illustrate and explain Pad foundations (Visits to worksites recommended)	These are isolated foundations provided to support concrete or steel pillars or detached brick or masonry piers
Illustrate and explain Pile and Beam foundations (Visits to worksites recommended)	This consists of a foundation at ground level in the form of thin R.C beam supported on short bored concrete piles placed at intervals of about 3 to 3.5 meters The beam concrete is 1:2:4 and is laid on a 50 mm or 75 mm Thick blinding concrete of 1:4:8 mix.
Illustrate and explain Raft foundations (Visits to worksites recommended)	The raft consists of a concrete slab which will at least cover the full area of a building and often extend beyond

Piles

Illustrate and explain
Pre cast concrete piles

The slab may have a thickness going up to a maximum of 300 mm and is often further thickened under load bearing walls

Lengths up to 18m with section sizes from 250mm to 450mm carrying loadings up to 1000 kN are generally economical.

Training Delivery

Before this module is taught organize few visits to construction sites

- Let students collect information as much as possible on different types of foundations
- Brief them before making visits to worksites
- Provide them with drawings of different types of foundations –Different views
- Let students make presentations after these study visits

Suggested Training Methodology

1. Illustration & Practical Demonstration
2. Self-paced Instruction
3. Group Discussion

Assessment

Assessment of Technical competencies (Performance Assessments)

(Includes Mode of assessment and Assessment Instruments/tools to be used in assessment)

Onsite assessments has to be carried out in industry (at workplace)

Assessment of Technical competencies (Knowledge Assessment)

MCQ and Structured essay type questions and oral questions (short viva) to be used to assess the knowledge component

Occupation: Construction Craftsman (Mason) - Concreting

Module Title: Formwork for concrete work

Module Reference: CCB - M 05

Module Aim

On completion of this module the learner should be able to

- Explain the purpose of Formwork for concrete work.
- Assess the suitability of a formwork for a given concrete work.
- Check whether the joints between members are tight enough to prevent grout leakage.
- Examine a given formwork for any possible causes of Formwork failure

Module Content	
Task	Task descriptions/ Performance standards
<p><u>Introduction</u> Formworks for Concrete Work is usually defined as “A mould or box into which wet concrete can be poured and compacted so that it will flow and finally set to the inner profile of the box or mould</p>	<p>. Formwork can be made using molds out of steel, wood, aluminum and/or prefabricated forms</p> <p>Indicate that Forms mold the concrete to desired size and shape and control its alignment.</p> <p>Emphasize that Formwork act as a temporary structure and Formwork supports: it’s own weight + The freshly placed concrete + Weight of material, human, logistic.</p>
<p><u>Discuss and illustrate</u> Characteristics of a good shuttering</p>	<p><u>Emphasize</u></p> <ul style="list-style-type: none">• A good shuttering should be Safe and Cost Effective or Economical.• Material of the formwork should be cheap and should be suitable for reuse• Material of the formwork should not warp or get distorted when exposed to the elements• Finished concrete surface resulting from the formwork should be of acceptable quality• Formwork should be strong enough to withstand all types of dead and live loads• The joints in the formwork should be tight against leakage of cement grout.

Module Content	
Task	Task descriptions/ Performance standards
<p><u>Illustrate and explain</u> Material for Formwork Construction</p> <p><u>Discuss and illustrate</u> Advantages of following material that can be used for construction of shuttering for concreting (Discuss in relation to different types of material used)</p> <ul style="list-style-type: none"> • Steel formworks: • Aluminium formworks • Plastic formworks 	<p><u>Indicate.</u> Material that can be used for construction of shuttering :</p> <p>a)Timber b)Steel c)Glass Reinforced Plastic</p> <ul style="list-style-type: none"> • Advantages of timber shuttering • Advantages of steel shuttering <p><u>Steel formworks:</u> Indicate that</p> <ul style="list-style-type: none"> • Steel forms are stronger, durable and have longer life than timber formwork and their reuses are more in number. • Steel forms can be installed and dismantled with greater ease and speed. • The quality of exposed concrete surface is good and such surfaces need no further treatment. • Steel formwork does not absorb moisture from concrete <p><u>Aluminium formworks</u> Indicate that Aluminium formworks is</p> <ul style="list-style-type: none"> • Often used in pre-fabricated formwork, that is put together on site. • Aluminium is strong and light • Fewer supports and ties are required. <p><u>Plastic formworks</u> Indicate that</p> <ul style="list-style-type: none"> • Glass reinforced plastics (GRP) and vacuum formed plastics are used when complicated concrete shapes are required • Like steel, plastic formwork can be re-used many times

Task	Task descriptions/ Performance standards
<p>Explain with illustrations and also demonstrate (where possible)</p> <ul style="list-style-type: none"> • Safety precautions to be followed in order to ensure Formwork function <p>Discuss /Explain causes of Formwork failure</p> <p><u>Important</u> Emphasize the importance of preventing grout leakage</p>	<p>Trainee should ensure that:</p> <ul style="list-style-type: none"> • Material used for formwork meets or fulfill the required specifications • Formwork should be fixed firmly • Construction area must be protected to prevent Vandalism <p>Possible causes of Formwork failure checked carefully and -</p> <ul style="list-style-type: none"> - proper functioning of Formwork and - safety requirements of Formwork ensured <ul style="list-style-type: none"> • Improper stripping • Inadequate bracing (Cross bracing & Horizontal bracing) <p>(Inadequate bracing is the more frequent cause of Formwork failure)</p> <ul style="list-style-type: none"> • Vibrations • Unstable soil under mud sills • Shoring not plumbed <p>Before pouring concrete Trainers should essentially check carefully that joints between members must be tight enough to prevent grout leakage</p>

Training Delivery

Before this module is taught organize few study visits to construction sites

- Let students collect information as much as possible on different types of Formwork
- Brief them before making study visits to worksites
- Provide them with drawings of different types of Formwork –Different views
- Let students make presentations using information collected during study visits

Suggested Training Methodology

1. Illustration & Practical Demonstration
2. Self-paced Instruction
3. Group Discussion

Assessment

Assessment of Technical competencies (Performance Assessments)

(Includes Mode of assessment and Assessment Instruments/tools to be used in assessment)

Onsite assessments has to be carried out in industry (at workplace)

Following aspects may be important from assessment point of view

- **Fixing the Formwork Firmly**
- **Plumbing of shoring**
- **Providing proper joints where necessary**
- **No leaks to be observed from the shuttering**
- **Uniform finish of the concrete**

Assessment of Technical competencies (Knowledge Assessment)

MCQ and Structured essay type questions and oral questions (short viva) to be used to assess the knowledge component

Occupation: Construction Craftsman (Mason)-

Module Title: Carry out concreting work

Module Reference: CCB -M-06

Module Aim

On completion of this module the learner should be able to perform competencies required to cast concrete building components, ensuring safe working conditions and safe use of tools, equipment, machinery and material.

Module Content	
Task	Task descriptions/ Performance standards
<p>Provide Sample plans & sketches to students</p> <p>Discuss how to assess the quantity, quality and suitability of Materials,</p> <p><u>Demonstrate</u> <u>Demonstrate as a Sample activity</u></p> <p>Provide sample construction drawings, & bar bending schedules</p> <p><u>Discuss</u> Erecting formwork for (small scale) concreting work Provide sample specifications</p> <p><u>Discuss</u> Erecting prefabricated shutters (made out of steel and timber) for columns</p> <p><u>Discuss</u> How to avoid direct contact of concrete with form work</p> <p><u>Demonstrate</u> Making reinforcement structures</p>	<ul style="list-style-type: none"> • Gather required information from plans & sketches, to plan work and fixing targets to carry out work smoothly • Interpret elevations, sections and detailed drawings, • Determine Resource requirements- Materials, Equipment as per plan • Determine Laour & etc. for concrete work as per plan • Make timber formwork to sides of columns and lintels as per given sample specifications

<p>for a small scale concrete work</p> <p>Get students prepare different reinforcement structures (Group work)</p> <p>Provide sample construction drawings, & bar bending schedules</p> <p>Discuss how to avoid corrosion of reinforced material</p> <p><u>Demonstrate</u></p> <p>Preparation of concrete (Mix)</p> <p>Provide sample construction drawings/specifications</p> <p><u>Discuss</u></p> <p>The use of Accelerators and retarders</p> <p><u>Demonstrate</u></p> <p>Placing of concrete. Get students in group practice same with sample activity</p> <p><u>Demonstrate</u> Curing of concrete</p>	<p>Illustrate different reinforcement structures</p> <p>Provide sketches of different reinforcement structures</p> <ul style="list-style-type: none">● Read and interpret sample construction drawings, & bar bending schedules● Select appropriate size and type of steel bars required to match the sample schedule● Cut steel bars cut according to sample schedule ● Bend steel bars to given shapes following specified standards● Make spaces / benches to suit the specified conditions and requirements● Position bent bars and tie up according to the given plans● Place covering blocks in between reinforcement and form work ● Obtain required volume of water as per given water cement ratios (WCR) in the sample plan● Sample of concrete taken, test cubes made and slump test performed ● Place concrete in layers and vibrated for proper compaction to avoid air trapping● Finish concrete surface according to requirements ● Selecting most appropriate method of concrete curing to suit the conditions and nature of work● Determination of curing time● Perform curing● Confirm result of curing
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Training Delivery

Develop Performance Guides for each Task

In respect of each of the above operations

In this module a sample situation has to be created at the centre
Most tasks will have to be demonstrated by the trainer as samples

Suggested Training Methodology

1. Illustration & Practical Demonstration
2. Self-paced Instruction
3. Group Discussion

Assessment

Assessment of Technical competencies (Performance Assessments)

(Includes Mode of assessment and Assessment Instruments/tools to be used in assessment)

Onsite assessments has to be carried out in industry (at workplace)

Following aspects may be important from assessment point of view

- **No leaks to be observed from the shuttering**
- **Uniform finish of the concrete**
- **Uniformity of the concrete mix**
- **No formation of concrete heaps while laying**
- **Providing proper joints where necessary bars when in use**

Assessment of Technical competencies (Knowledge Assessment)

MCQ and Structured essay type questions and oral questions (short viva) to be used to assess the knowledge component