Upgradation of ITIs into Centres of Excellence

Syllabi of Advanced Modules

Sector "Construction & Wood Working "

Directorate General of Employment & Training

M/o Labour & Employment

CWWAT -01	Concrete Technology
CWWAT-02	Modern Construction Techniques & Management
CWWAT-03	Wood Work in Construction
CWWAT-04	Form work & Bar Bending

Upgradation of ITIs into Centres of Excellence-
Broad guidelines for implementation of Advanced Module of Sector "Construction & Wood Working".

These Centres will be providing multiskill training to meet the skill requirement of particular sector of industry with their active involvement in all aspects of training. The training will be provided in three parts as given below:

- Training in Basic skill areas for a period of one year.
- Training in Advanced modules of six months duration after Broad based basic Training(BBBT)
- Testing & Certification both for the Broad Based Basic Training & Advanced Module Training during subsequent six months will be conducted under the aegis of NCVT .
- Training in specialized modules mainly by the industry (The course curricula, duration etc will be designed in consultations with the IMC/local industry). The trade testing & certification for specialized module will be done jointly by the State Government & Industry. Said certificate will have recognization from NCVT
- *As per the recommendations of the EFC, Training in the shop floor should constitute atleast 25-40% of the curriculum.*

The training programme will have multi-entry and multi-exit provisions as given below:

- trainee can opt to go to the labour market after completing broad based basic training of one year duration or after completing advanced module/s.
- multi-entry and multi-exit provisions would enable a trainee to take admission for advanced/ additional advanced /specialized module as per his/her need .

Guidelines for Training in Advanced modules

- A minimum of three modules would be essentially needed , so as to ensure that all the 96 trainees are accommodated in the three modules may be selected in consultation with IMC for which in two shifts .
- If it is felt that available modules for which the course curricula has been developed at National Level are not sufficient to cater to the needs of local industry in a particular state, States are free to select module as per need in consultation with industry . They may develop suitable module(s) accordingly in consultations with the industry clearly indicating tool & equipment list , instructor qualifications , space norms etc. & forward the same to DGE&T for seeking approval of NCVT.
- A trainee at a time can opt only for one Advanced Module .
- Admission Criteria, Space requirement, Qualification of instructor of the various modules of **"Construction & Wood Working** " sector are attached herewith.

Admission to Advanced Module for the graduates of ITI in related trades:

There is a provision for lateral entry for graduates of ITIs (NTC /NAC passed outs from conventional system) of the related trades subject to availability of seats in Advanced Module. Trades of conventional system mentioned against each advanced module in the following statement, could be offered admission in Advanced Module .

Sl.No.	Name of the Module	Admission criteria	Space requirement	Duration In Weeks	Qualification/ Status Of Instructor
CWWAT -01	Concrete Technology	Completed BBBT in Sector "Construction & Wood Working" or NTC/NAC in Mason (Building Constructor) trade	80 sq m	24 weeks	Degree in Civil Engineering with minimum two years teaching/industrial experience in the relevant field OR Diploma in Civil Engineering with min four years teaching/industrial experience in the relevant field
CWWAT-02	Modern Construction Techniques & Management	Completed BBBT in Sector Construction & Wood Working" or NTC/NAC in Mason (Building Constructor)			
CWWAT-03	Wood Work in Construction	Completed BBBT in Sector Construction & Wood Working" or NTC/NAC in Carpenter / NAC in Furniture & Cabinet Maker trade			
CWWAT-04	Form work & Bar Bending	Completed BBBT in Sector Construction & Wood Working" or NTC/NAC Mason (Building Constructor)trade			

Module I

Concrete Technology

	Theory	Practicals
Overview of Concrete Technology	• Introduction to concrete technology. Job opportunities available • Definitions and terms related to concrete technology • Pre caste concrete components • Applications of concrete technology and modern trends	• Visits to typical concrete construction sites • Listing of modern equipment and operations
Reading & interpretations of construction blue prints	• Notations and convention used in drawings • Understanding of specifications • Interpretations of a given drawing	• Prepare list of material note down dimensions • Prepare table of specification of different items of work • Calculate required information

Classification & specifications of concrete	• Classification of concrete according to grade, weight & methods of mixing
	• Ready mixed concrete, self leveling concrete, nominal mixed and design mixed concrete
	• Specifications of concrete
	  o Prescriptive specifications
	  o Performance oriented specifications
	• Properties of concrete
	  o Workability & consistency
	  o Segregation
	  o Bleeding
	  o Strength
	  o Durability
	  o Impermeability
	  o Volume stability	

	Theory	Practicals
Ingredient • **Cement**	Types of cement, relevant IS codes comparative study of their physical & chemical properties, significance of different properties • Hydration of cement • Selection of cement • Storage of cement • Factors affecting strength of cement • Rejection of cement	• Test cement for consistency, setting times & strength • Conduct field tests for adulteration • Make proper arrangement to store cement at site
• **Aggregate**	• Classification (IS : 383) • Grading • Characteristics (grading, fineness modules) • Bulking of fine aggregate • Deleterious substances • Factors affecting strength of concrete	• Perform sieve analysis on aggregate • Determine grading, fineness modulus • Determine presence of silt and clay • Perform test to determine shape & size of aggregate • Perform test to determine bulking of sand
• **Water**	• Quality • Water requirement for hydration & workability • Effect of impurities present in water	• Perform test and analyse the effect of water cement ratio (w/c) on strength of cement
• **Admixture**	• Meaning of terms • Functions • Classification • Water proofing and permeability reducing admixture • Interpretation of specifications manufactures	
• **Construction chemicals**	• Meaning of terms • Functions • Classification (IS : 4082) • Water proofing and permeability reducing admixture • Interpretation of specifications manufactures	

	Theory	Practicals
Preparation of concrete	Methods used, merits and demerits of methods, tools and equipment used and precautions to be taken for the following processes : • Batching • Mixing • Transportation • Placing • Compaction • Curing • Finishing • Strength & durability requirements (IS : 456 – 2000) • Stripping of form work • Application of Modern Power Tools	• Prepare concrete and lay at required place using power tools • Carry out all operations taking necessary precautions related to from work and reinforcement • Test strength of concrete • Remove form work properly
Reinforced cement concrete	• Definition, purpose and types of reinforcement • Methods and tools used for bar bending • Precautions to be taken	• Prepare reinforcement for foundation, beams, columns, slabs
Material and labour constants	• Factors affecting RCC/PCC work • Methods of overcoming constraints	
Scaffolding & form work	• Definitions of common terms • Types & applications • Different materials used in form work • Safety precautions to be observed in scaffolding	• Erect scaffolding & form work using safety measures

	Theory	Practicals
Estimating & Costing		
Estimating & costing	• Need & importance • Types of estimates • Approximate estimate	
Approximate estimate	• Approximate estimate o Service unit basis o Plinth area method o Cubic content method o Typical bay method o Approximate quantity method	• Calculate the cost of a building by – o Service unit basis o Plinth area method o Cubic content method o Typical bay method o Approximate quantity method
Forms used in estimating	• Measurements or calculation of quantities	• Read and understand various forms used in estimating
Measurements	• Measurement of various constructed elements : o Foundation o Column o Bema, and o Slabs	
Specification	• General specifications • Detailed specifications	• Reading of specification published by PWD/CSR
Calculation of quantities	• Calculation of quantity	
Rate analysis	• Rate analysis – • Material – quality & quantity • Labour – rate • Plant and machinery required • Overhead charges • Profit	• Workout rate analysis of PCC/RCC work
Use of computer	• Basic operations using common office software • Use of software available for construction sector. • Introduction to internet	• Operate and shutdown the computer • Make data entries, create files and folders • Draft simple letters • Use computer for email & internet search • Prepare inventory using computer

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
1.	Steel taps (3 meter)	16
2.	Steel taps (15 meter)	8
3.	Steel taps (30 meter)	4
4.	Masons square 300 x 600	8
5.	Marking rope & thread (15 m)	64 each
6.	Bevel	8
7.	Shovel	16
8.	Pan (M.S. or PVC)	16
9.	Mortar board (2000 x 2000)	2
10.	Measuring box (35 ltr. Capacity)	4
11.	Plumb rule and Bob	8
12.	Spirit level	8
13.	Straight edge	8
14.	Water tube (6 m)	8
15.	Bucket (5 ltr. & 10 lrt.)	8 each
16.	Trowel (required shape & sizes)	8 set
17.	Concrete mixer	2
18.	Concrete vibrator (pin type & plate type)	2 each
19.	Drop chute	4
20.	Compaction tools (durmut)	4
21.	Water drum 200 ltr.	4
22.	Bar bending table	4

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
23.	Bending pipes (suitable dia & length)	2 each
24.	Bar bending lever (suitable size & length)	2each
25.	Bar bending machine	2
26.	Power cutter	2
27.	Mono block pump set (1/2 HP)	4 Nos.
28.	Steel / plywood shuttering plates	50 sqm.
29.	Telescopic pipes / props	100
30.	Telescopic/ adjustable spans	25
31.	Masonry grinder	2
32.	Scientific calculator	16
33.	Personal computer with advance configuration and required software	4
34.	Gloves (canvas and plastic)	16 Pair each
35.	Gum boots	16 Pair
36.	90 micron is sieve	2 set
37.	Rice plates	16
38.	Weighing balance 1 kg., 10 kg. Digital	2 each
39.	Bristle brush (25 & 40 mm with 250 handle)	2 each
40.	Vicat apparatus with plunger, needles and mould	2 set
41.	Stop watch	8
42.	Cube mould (70.5 mm size)	24
43.	Gauging trowel	4
44.	Digital compression testing machine	1
45.	Cube mould (150 mm size)	24

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
46.	Crucible	8
47.	Measuring cylinder 100 ml., 500 m., 1000 ml.	4 each
48.	Non porous plate	16
49.	Water container (1000 ltr.)	1
50.	Vibrating machine (12000 ± 400 rpm)	1
51.	Indian standard test sieve	2 set
52.	Thickness gauge and length gauge	2 each
53.	Graduated cylinder	8
54.	Metal tray	8
55.	Steel rules	8
56.	Beaker	8
57.	Oven	1
58.	Weighing plateform (100 kg.) digital	1
59.	Spatula	4
60.	Slump test apparatus with temping rod	2 set

- Adjustment in list may be made according to requirement and local needs.
- Raw material and consumables are not included in the list.

Module II

Modern Construction Techniques & Management

	Theory	Practicals
Overview of construction technology	• Overview of modern techniques in different areas of constructions • Applications of techniques in construction industry • Career opportunities in construction sector	• Visits to constructions sites • Prepare a report on the application of new techniques
Reading & interpretations of construction blue prints	• Notations, conventions & symbols used • Interpretation of a given drawing • Specifications & dimensions	• Prepare list of material & tools required • Prepare table of specifications of different items of work • Set layout according to plan
Preparation & mixing of concrete	• Batching of material • Hand mixing & machine mixing • Transportation of concrete • Placing of concrete • Compaction of concrete • Curing of concrete • Finishing of concrete • Stripping of form work • Application of Power tools • Safety precautions	• Batch materials using different methods • Prepare concrete by hand mixing and using mixer • Use vibrator for compaction • Prepare concrete using admixtures and construction chemicals • Remove form work • Use power tools in different operations • Observe safety precautions in all operations

	Theory	Practicals
Masonry	• Definitions of terms • Types of masonry • Different types of bonds • Material used in different masonry • Use of tools and instruments • Ingradients of mortar • Preparation of mortar using different ratios of materials	• Prepare mortar of given ratio • Lay stone & brick masonry in different bonds • Use various tools & instruments for different operations • Observe safety precaution in masonry work
Foundation	• Definitions of common terms • Setting out of work layout • Different types of foundation & applications • Plain cement concrete (PCC) • Reinforced cement concrete (RCC) • Shoring • Form work in foundation • Laying foundation	• Set work layout, mark center line & size of excavation • Lay PCC (bad concrete) in foundation • Prepare foundation according to given specifications • Fix cover to the reinforcement • Fix shoring in a foundation • Observe safety precautions
Damp proof course	• Terms & definitions • Different materials used • Laying damp proof course using different materials • Termite treatment	• Lay damp proof course using different materials and provide termite treatment
Scaffolding & form work	• Definitions of common terms • Types & applications • Different materials used in form work • Safety precautions to be observed in scaffolding	• Erect scaffolding & form work using safety measures
Casting & fixing	• Definitions of terms	• Perform casting operations

	Theory	Practicals
operations	• Casting of footings, column, beam, lintels, stair & roof, fixing of frame	• Fix different frames in masonry work
Plastering	• Definition of common terms • Methods of plastering • Different materials used in plastering • Surface preparation • Rendering • Wall cladding, defects in plaster • Methods of checking plaster using modern instruments • Method of de-plastering by use of power tools	• Prepare surface for plastering • Perform plastering operation at different surface • Perform rendering & wall cladding • Use of modern gadgets
Flooring	• Meaning of terms • Different material used in flooring • Different types of flooring • Tools & instruments for flooring • Criteria for laying floors • Grinding & polishing of floor	• Select material for different types of flooring • Lay floor of different types using different material and given instructions • Finish floor surface using different techniques • Measure dimensions and slope
Use of precasted elements in construction	• Use of precasted foundation system • Wall panels • Column • Beam • Roof • Mobile toilets • Masonry block • Paving block	• Use various precasted elements in construction
Construction management	• Management of man, materials, machines with economy	

	Theory	Practicals
Estimating and costing	• Need and importance • Types of estimates – approximate and detailed estimates	• Preparation of approximate and detailed estimate
Forms used in estimating	• Measurement • Sheet • Calculation of quantities	• Fill in the forms
Measurement	• Measurement of items	• Take measurement of various items from a constructed building
Specification	• General specification • Detailed specifications	• Read and interpret CSR
Calculation of quantities	• Calculate the quantities of various items	
Rate analysis	• Methods of rate analysis for material, labour, machinery	
Preparation of estimates		• Prepare estimates for common construction and maintenance work
Material and labour constraints	• Factor affecting construction • Methods of overcoming constraints • Methods of planning for overcoming constraints	
Water supply and sanitation	• Need and importance of water supply and sanitation • Methods of layout	• Layout exercise for water supply and sanitation
Electrical layout	• Types of wiring • Identification of different components and accessories • Regulations, safety • Testing procedure	• Take measurements for wiring purpose

	Theory	Practicals
Surveying and leveling	• Purpose of surveying • Principles of surveying • Types of surveying • Plotting of survey data • Purpose of leveling • Leveling instruments • Types of leveling • Methods of leveling • Plotting levels • Use survey for construction management	• Traverses survey with chain and compass • Carry out plane table survey • Carry out leveling • Using dumpy level
Use of computer	• Basic operations using common office software • Use of softwares available for construction sector. • Introduction to internet	• Operate and shutdown the computer • Make data entries, create files and folders • Draft simple letters • Use computer for email & internet search • Prepare inventory using computer

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
1.	Steel taps (3 meter)	16
2.	Steel taps (15 meter)	8
3.	Steel taps (30 meter)	4
4.	Masons square 300 x 600	8
5.	Marking rope & thread (15 m)	64 each
6.	Bevel	8
7.	Shovel	16
8.	Pan (M.S. or PVC)	16
9.	Mortar board (2000 x 2000)	2
10.	Measuring box (35 ltr. Capacity)	4
11.	Plumb rule and Bob	8
12.	Spirit level	8
13.	Straight edge	8
14.	Water tube (6 m)	8
15.	Bucket (5 ltr. & 10 lrt.)	8 each
16.	Trowel (required shape & sizes)	8 set
17.	Concrete mixer	2
18.	Concrete vibrator (pin type & plate type)	2 each
19.	Drop chute	4
20.	Compaction tools (durmut)	4
21.	Water drum 200 ltr.	4
22.	Pick axe	8

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
23.	Hammer (different required shape and weight)	4 each
24.	Pitching tool	4
25.	Raking tool	4
26.	Bolster	4
27.	Brick hammer	4
28.	Gauging trowel	8
29.	Floats (wooden)	8
30.	Floats (steel)	8
31.	Floating rule	8
32.	Wire brushes	8
33.	Chisel (required shape & sizes)	8 set
34.	Ladder (3m)	8
35.	Aluminum float	8
36.	Tile cutter (hand operated)	4
37.	Power operated cutting machine	4
38.	Wooden mallet	8
39.	Skirting farma	4
40.	Polishing machine	1
41.	Polishing stone (different grade / number)	8 set
42.	Bar bending table	4
43.	Bending pipes (suitable dia & length)	2 each
44.	Bar bending lever (suitable size & length)	2each
45.	Bar bending machine	2

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
46.	Power cutter	2
47.	Mono block pump set (1/2 HP)	4 Nos.
48.	Steel / plywood shuttering plates	50 sqm.
49.	Telescopic pipes / props	100
50.	Telescopic/ adjustable spans	25
51.	Masonry grinder	2
52.	Scientific calculator	16
53.	Personal computer with advance configuration and required software	4
54.	Gloves (canvas and plastic)	16 Pair each
55.	Gum boots	16 Pair
56.	Chains	3 sets
57.	Prismatic compass	3 sets
58.	Plane tables	3 sets
59.	Auto level	3 sets
60.	Theodolites	3 sets
61.	Multi meter	3 sets
62.	Meger	2 sets
63.	Earth tester	2 sets
64.	Electric tool kit	4 sets

- Raw material and consumables are not included in the list.

Module III

Wood Work in Construction

	Theory	Practicals
Scope of wood work in construction	• Application of wood work in construction including interior decoration • Modern trend of wood application in construction	• Visits at different construction site to observe the scope of application of wood • Identify local needs of wood applications in construction sector
Measurement	• Linear & non linear angular measurement using appropriate & precise instruments • Calculation of area & volume • Units • Conversion of units • Drawing of symmetrical & non symmetrical figures	• Measure dimensions and calculate required parameter • Convert from one unit to other • Draw symmetrical figure using appropriate instrument
Estimating & costing	• Need of estimates • Methods of taking measurements • Measurement tools • Methods of preparing • Read CSR • Use of CSR	• Prepare approximate estimates • Prepare detailed estimates
Material for wood working	**Wood** • Different types of wood and their applications • Properties of wood • Defects in wood • Diseases & decay of wood • Seasoning & preservation	• Select appropriate material for different applications • Use preservative techniques and store material • Prepare small job pieces using all the material • Observe safety precautions throughout the processes

	Theory	Practicals
	• Storage of finished & unfinished product **Plywood & allied product** • Plywood, veneers, particle board, fibre board, laminated boards, zypsom board, pressed / moulded panels • Selection of material for different purposes • Plastic sheets, sheet metal, glass, mirror **Hardware product** • Hardware fixtures used **Adhesive & finishing material** • Use of adhesives & other finishing materials • Safety measures	
Tools	• Different types of hand tools and power tools used in wood working • Correct & safe use of tools • Selection of tools • Maintenance of tools • Safety precautions	• Select tools for different operations • Carry out operation safely • Carry out minor repair & maintain tools • Use power & hand tools for practice jobs
Wood work operations	• Different operation o Sawing o Chamfering o Beveling o Planning o Moulding o Mitring o Scribing	• Mark a plane wood piece using appropriate tool • Carry out all the operations and prepare products used in constructions

	Theory	Practicals
	o Chiseling o Marking o Joints : half joint, mortise joint, tenon joint, fork tenon joints, tenon moritise joint, dovetail joints o Fitting o Fastening o Beeding o Fixing o Drilling o Safety measure	
Product	• Wall paneling • Cabinets • Partitions • Counter tops • Modular kitchen • Cup boards • False ceilings • Acoustics using wood work	• Perform all the operation according to specification meeting quality standard
Finishing	• Preparation of surface • Different finishing material • Methods & techniques of finish • Safety measure	• Carry out finishing operations on the product • Observe safety precautions

	Theory	Practicals
Use of computer	• Basic operations using common office software • Use of software available for construction sector. • Introduction to internet	• Operate and shutdown the computer • Make data entries, create files and folders • Draft simple letters • Use computer for email & internet search • Prepare inventory using computer
Cost of product	• Raw material • Labor • Profit • Final price	• Calculate the cost of making a product like dining table/ almiraha etc.
Material and labour constraints	• Factors affecting labour and material • Methods of overcoming constraints	• Exercises on – redeployment of labour

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
1.	Work bench (1800 x 9000 x 750)	4
2.	Try square	16
3.	Flexible tape (steel)	16
4.	Scribing knife	8
5.	Bevel	8
6.	Marking point	8
7.	Mortise gauge	8
8.	Marking gauge	8
9.	Mortise chisel	8
10.	Parting chisel	8
11.	Firmer chisel	8
12.	Cross-cut-saw	8
13.	Tenon saw	8
14.	Dovetail saw	8
15.	Compass saw	8
16.	Coping saw	8
17.	Power operated portable saw	04
18.	Ratchet brace with bits (as required)	04 set
19.	Pointed Awl	8
20.	Brad Awl	8
21.	Auger (required sizes)	8 set
22.	Gimlet	8

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
23.	Power drill with bits set	1
24.	Jack plane	8
25.	Rebate plane	8
26.	Mallet	8
27.	Warrington hammer	8
28.	Claw hammer	8
29.	Screw driver	8 set
30.	Ratchet screw driver	8 set
31.	Motorized screw driver	2 set
32.	Wrench	2 set
33.	Vices	8
34.	Files (required shape & sizes)	4 set
35.	Set of power operated modern tools used for wood work	2 sets

- Raw material and consumables are not included in the list.

Module IV

Form Work & Bar Bending

	Theory	Practicals
Overview	• Technical terms used in form work & bar bending • Plain cement concrete (PCC) & Reinforced cement concrete (RCC) • Properties of PCC & RCC in green state and hardened state • Importance of form work and reinforcement in construction	• Visits of typical construction sites • Record observations related to form work and bar bending
Measurement	• Different types of measurement • Measuring instrument • Calculation of area, weight	• Measure dimensions and calculate relevant information
Drawing & Blue prints	• Reading interpretation of given blue prints • Symbols, notations & conventions • Specifications	• Read and interpret given blue prints
Form work	• Common terms used and their meanings • Different material used for form work • Techniques of fixing forms at different location • Defects in form work • Deshuttering /removal of forms • Form release agents • Maintenance & repair of form work • Precaution in form work	• Select appropriate material for form work at different locations • Erect form work at different locations • Identify defects & adjust form work • Remove form work safely

	Theory	Practicals
Bar Bending	• Technical terms & their meanings • Symbols, conventions used in bar bending • Specifications of material • Physical properties of reinforcing bars • Estimate the quantity of material • Structural elements & characteristics (simply supported, continuous, fixed, cantilever, overhang) • Importance of use of reinforcement in concrete • Tools used in bar bending • Correct use of tools • Different operation in bar bending (straightening of bars, cutting of bars, bending of bars, placing of bars, binding of bars, fixing of cover blocks) • Use of relevant BIS codes & tables • Guidelines for laying reinforcement	• Read & interpret a given blue print • Estimate quantity of steel and binding wire required for a given job • Prepare bar bending schedule under the guidance of instructor • Carry out all the operations following guidelines & codes • Demonstrate quality standards in all the practices

List of equipment, tools and instruments

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
1.	Measuring tape 15 mtr. (steel)	4
2.	Measuring tape 3 mtr. (steel)	4
3.	Try square	4
4.	Bevel	4
5.	Marking point	4
6.	Tenon saw, dovetail saw	4 each
7.	Chiesel (different suitable sizes)	4 sets
8.	Hammer 500 gm.	4
9.	Hammer 1 kg.	4
10.	Hammer 5 kg.	4
11.	Bar bending table	2
12.	Bending pipes (suitable diameter and length)	2 each
13.	Bar bending lever (suitable diameter and length)	2 sets
14.	Manual bar bending machine of suitable size	2
15.	Portable hand bender of suitable size	2
16.	Power cutter of suitable size	2

Sl. No.	Item/ Specification	Quantity proposed for a batch of 16 trainees
17.	Repair tools	2 sets
18.	Safety gloves	8 pairs
19.	Safety glass	8
20.	Scientific calculator	2
21.	PC with advance configuration	2

- Raw material and consumables are not included in the list.