CURRICULUM FOR

STEEL FIXER

6-MONTHS
(Certificate course)

National Vocational & Technical Training Commission, Islamabad (February, 2012)

CONTENTS

TRAINING OBJECTIVES:

The objectives of this course are to:

- Impart theoretical and practical knowledge about steel fixing.
- Calculate the cutting length and number of bars for structural components.
- Perform cutting, bending and binding of steel bars by using conventional as well as modern tools.
- Fabricate the steel bars for different structural members as per structural drawing.
- Learn basic terminologies used in steel fixing, concrete structure and structural drawing of different structural members.

CURRICULUM SALIENTS:

Entry Level	Middle
Duration of course	6-Months
Total Teaching Units	800
	40 period per week
	6 Days per Week
Training methodology	Practical 90%
	Theory 10%
Medium of instruction	Urdu/ English

SKILL PROFICIENCY DETAILS

On successful completion of this course, the trainee should be able to:

1. Select proper tools according to the job.
2. Measure, cut and bend bars.
3. Prepare bends, hooks and overlaps of bars.
4. Bind the steel bars.
5. Perform cutting, bending and binding of steel bars as per bar bending schedule.
6. Fix / fabricate the steel bars for different structural members of concrete structures.

KNOWLEDGE PROFICIENCY DETAILS

On successful completion of this course, the trainee should be able to:-

1. Identify the appropriate basic first aid treatment.
2. Describe the safe handling of material and tools.
3. Elaborate upon the different types of concrete and steel.
4. Read the structural drawing.
5. Illustrate the preparation of bar bending schedule.
6. Explain the tension and compression in concrete and role of steel in concrete.

CURRICULUM DELIVERY STRUCTURE

Area	Curriculum Delivery	Internship	Review / Final Test	Total
WEEK	1 – 18	19 – 22	23-24	24
	18	4	2	

SCHEME OF STUDIES

Steel Fixer

(6 - Month Course)

Sr. No.	Subject	Theory Periods	Practical	Total Periods
1.	Fundamentals of Steel Fixing	10	4	14
2.	Applied Mathematics & Drawing	22	78	100
3.	Occupational health & safety	04	12	16
4.	Measuring, cutting, bending and binding practice	06	52	58
5.	Steel fixing in different structural components of building	18	374	392
6.	Ethics & Communication skills	20	40	60
7.	Internship		160	160
Total		**80**	**720**	**800**

DETAILS OF COURSE CONTENTS

Steel Fixer

(6 – Month Course)

Sr. No.	Detail of Topics	Theory Periods	Practical
1.	**Fundamentals of Steel Fixing**		
	1.1. Steel 1.1.1. Introduction, types and Grades 1.1.2. Types and Sizes of bar (Plain, deformed, tar & coated bars)	2	
	1.2. Concrete 1.2.1. Introduction Types: PPC, RCC, pre-stressed concrete, precast concrete and cast in situ concrete.	3	
	1.3. Role of Steel in concrete construction 1.3.1. Tension and compression in concrete, bends, hooks and overlaps of bars , Concrete cover, effective depth, overall depth, main bars, distribution bars, stirrups, dowel bars, chairs and effective span etc.	4	
	1.4. Tools used in Steel Fixing 1.4.1 Introduction to tools used in steel fixing. 1.4.2 Care and maintenance of tools.	1	4

2.	**Applied Mathematics & drawing**		
	2.1. Basic Mathematics	6	
	2.1.1. Additions & subtraction of whole number		
	2.1.2. Multiplication and division of whole numbers		
	2.1.3. Multiplication & division of fraction		
	2.1.4. Addition & subtraction of fraction		
	2.1.5. Addition & subtraction of decimal fraction		
	2.1.6. Multiplication & division of decimal fraction]		
	2.1.7. Percentage: change number to percent, change percent to decimal and fraction.		9
	2.1.8. Solve problems related to addition, subtraction, multiplication, division and percentage.	6	
	2.2. Measurement System		
	2.2.1. Foot pound system of measurement		
	2.2.2. Parts / fraction of inches and foot		
	2.2.3. Metric system of measurement		
	2.2.4. Multiples and parts of units		12
	2.2.5. Conversion of foot pound to metric system vice versa.		
	2.2.6. Exercise to solve problems related to conversion, addition, subtraction and multiplication & division of measurements.	1	
	2.3. Angles		3
	2.3.1. Angle and its units		
	2.3.2. Types of angles		
	2.3.3. Practice to draw common angles (30,45,60,90)	1	
	2.4. Surface Area		
	2.4.1. Surface area of rectilinear plane figures (square, rectangle, triangle, trapezium, rhombus & parallelogram etc.	1	

3.	**3.1 Occupational Health & safety.**	4	0
	3.1.1 Personal Protective Equipment, safety helmet, dongri safety, shoes, goggles and safety belts.		
	3.1.2 Safety precautions during steel bending, cutting and fixing / fabrication		
	3.1.3 First Aid treatment		
	3.1.4 Practice to perform basic first aid treatment for bleeding, fractures, eye injuries and electric shocks		12
	3.1.5 Safe storage and handling of material and fixing		
	3.1.6 Safety for working at height		
4.	**4.1 Measuring, Cutting, Bending and Binding Practices**	6	
	4.1.1 Measuring the diameter of the bar and length of bars.		2
	4.1.2 Quality assurance while cutting the bars.		
	4.1.3 Cutting practice of different types and sizes of steel bar.		3
	4.1.4 Calculation for cut length of straight bars, bend-up bars, stirrups and rings		
	4.1.5 Practice to calculate cut length of straight bars and bend up bars		3
	4.1.6 Practice to calculate cut length of stirrups of different types and shapes		6
	4.1.7 Practice of making hooks and bends.		6
	4.1.8 Practice of making bend up bar at 45^{o} , 30^{o}		9
	4.1.9 Introduction to binding wires (size, quality).		
	4.1.10 Different methods of binding the bars.		
	4.1.11 Practice of bar binding with binding wire.		3
	4.1.12 Practice of making ring and stirrups		6

	4.1.13 Practice of making stirrups of different types and shapes		12
5.	**Steel fixing in Different Structural Components of Building**		
	5.1 Column Base	03	
	5.1.1. Introduction of structure drawing of column base .dowel bars		9
	5.1.2. Calculation of cut lengths of bars and no of bars including dowel bars for isolated square and rectangular base(as like bars bending schedule)		
	5.1.3. Making spacer: concrete/other materials		
	5.1.4. Practice of cutting, making bends of steel bars for column base as per drawing or bar bending schedule square and rectangular	02	12
	5.1.5. Fabrication of steel bars on the prepare bed for column base: demarcation of position of bars, placing, binding and providing spacer		06
	5.1 Column	01	
	5.2.1. Introduction of Structural Drawing of column		
	5.2.2. Calculation of cut lengths and no of bars and stirrups / rings for column of different shapes (square, rectangular, circular)as per drawing or bar bending schedule		9
	5.2.3. Practice of making ring / stirrups as per drawing for rectangular, hexagonal and circular column.		12
	5.2.4. Practice of cutting, making bends, placing and binding of steel bars and ring / stirrups for column as per drawing or bar bending		18

	schedule (a) Circular (b) Rectangular (c) Hexagonal		
	5.1 Beams	02	
	5.3.1. Introduction of structural drawing of simply supported continuous and cantilever beam.		
	5.3.2. Calculation of cut lengths and no of bars for lintel and simply supported beam.		09
	5.3.3. Practice of cutting, making bends, bend-up bars and stirrups, placing and binding of steel bars for simply supported beam and lintels as per drawing or bar bending schedule.		18
	5.3.4. Calculation of cut lengths bars and stirrups and no of bars for continuous beam		09
	5.3.5. Practice of cutting, making bands, stirrups and bend-up, placing and binding of steel bars for overhanging beam as per drawing or bar bending schedule.		18
	5.1 RCC Slabs		
	5.4.1. Introduction of structural drawing of slabs (simply supported, continuous, cantilever).	02	
	5.4.2. Calculation of cut lengths and no of bars for simply supported and cantilever slab.		09
	5.4.3. Making spacers		
	5.4.4. Practice of cutting, making bends and bend-up bars, of steel bars for simply supported slab as per drawing or bar bending schedule.		09
	5.4.5. Fabrication of steel bars on the prepared form work for room slab: demarcation of position of bars, placing, binding and providing spacer		09
	5.4.6. Practice of cutting, making bends and bend-		

	up bars, of steel bars for continuous slab as per drawing or bar bending schedule.		18
	5.4.7. Fabrication of steel bars on the prepared form work for continuous slab: demarcation of position of bars, placing, binding and providing spacer		06
	5.1 Retaining Wall		
	5.5.1. Study of structural drawing of retaining wall		
	5.5.2. Calculation of cut lengths, curtailing and no of bars for R.C.C retaining wall. (as like bars bending schedule)	01	
	5.5.3. Practice of cutting, making bend of steel bars for R.C.C retaining wall as per drawing or bar bending schedule.		06
	5.5.4. Fabrication of steel bars along the prepared form work for retaining wall: demarcation of position of bars, placing, binding and providing spacer		12
	5.1 Raft Foundation		
	5.6.1. Introduction of structural drawing of Raft foundation.		08
	5.6.2. Calculation of cut lengths, and no of bars for Raft foundation (as like bars bending schedule)	01	
	5.6.3. Practice of cutting, making bends, chairs, of steel bars for Raft foundation as per drawing or bar bending schedule.		06
	5.6.4. Fabrication of steel bars on the prepared bed for raft foundation: demarcation of position of bars, placing, binding and providing spacer		
	5.1 Pile Foundation		12
	5.7.1. Introduction of structural drawing of pile		

		foundation.		
	5.7.2.	Calculation of cut lengths of bars and rings and no of rings for a small pile (as like bars bending schedule)		06
	5.7.3.	Practice of cutting and making rings and longitudinal bars for pile.	01	
	5.7.4.	Fabrication of cage for small as per drawing.		03
	5.1	**RCC Arch**		
	5.8.1.	Introduction of structural drawing of RCC Arch (semi circular and segmental)		09
	5.8.2.	Calculation of cut lengths of bars and rings for semicircular and segmental arches (as like bars bending schedule)		06
	5.8.3.	Practice of cutting, bending, of bars for R.C.C Arch(semi circular and segmental) as per drawing or bar bending schedule	01	
	5.8.4.	Fabrication of centering for semi circular and segmental arch (prototype)		06
	5.8.5.	Fabrication of steel bars on the prepared form work of semicircular and segmental arches		18
	5.1	**RCC Stairs**		
	5.9.1.	Introduction of structural drawing of different types of R.C.C stairs.		09
	5.9.2.	Calculating of cut lengths and no of bars for single flight stair.		09
	5.9.3.	Fabrication of sample form work for single flight stair	01	
	5.9.4.	Practice of cutting, bending placing and binding of bars for single flight stair.		
	5.9.5.	Fabrication of steel bars on the prepared		06

	form work for single flight stair		
	5.9.6. Calculating of cut lengths and no of bars for dog legged stair.		06
	5.9.7. Fabrication of sample form work for dog legged stairs		09
	5.9.8. Practice of cutting, bending, making stirrups/ rings of bars for dog legged stair		06
	5.9.9. Fabrication of steel bars on the prepared form work for dog legged stairs		09
	5.1 Domes & Shell Structures		09
	5.10.1. Introduction of structural drawing of dome and shell structure and study of bar bending schedule.		18
	5.10.2. Demonstration of cutting bending, placing & binding of steel bars for of dome and shell through model.	02	09
	5.11 RCC Water Tank		
	5.11.1. Introduction of structural drawing of water tank. Study of bar bending schedule.		12
	5.11.2. Practice of cutting bending, placing & binding of steel bars for a small domestic water tank.	01	12
	5.11.3. Practice of cutting, bending, placing of bars for a small underground water tank.		12
6.	**Ethics & Communication skills**	20	40
7.	**Internship** On job training at a construction site.		160
Total		**80**	**720**

LIST OF TOOLS & EQUIPMENT
(FOR CLASS OF 25 STUDENTS)

Name of Trade	Steel Fixer
Duration of Course	6 – Months

Sr. No.	Nomenclature of Equipment / Tools	QUANTITY
	Tools / equipment for cutting, bending.	
1.	Chisels (for cutting steel)	30 Sets
2.	Hammers (Heavy)	10
3.	Hammers (Light)	05
4.	Cutting base	06
5.	Calipers	06
6.	Measuring Tapes (100')	10
7.	Pliers	10 Sets
8.	Tonge (Sunhy)	10 Sets
9.	Bending Rods (Bari)	06
10.	Tool Sharpening machine	01
11.	Bending machine with table (4' x 6')	06
12.	Cutting machine with cutters	06
13.	Bench vice	01
14.	Gloves	30 Pairs
15.	Pincer	06
16.	Safety Helmet	30
17.	Dangri	30
18.	Safety Shoes	30
19.	Goggles	30
20.	First Aid Box	5
21.	Safety Belt	1
22.	First Aid Kit (Complete set)	1

EMPLOYABILITY OF PASS OUTS

After completion of course the trainee may find job / employment in the following areas/sectors:

1. Work as a steel fixer in R.C.C. structures with contractors.
2. Work as a steel fixer with public sector construction companies.
3. Work as a steel fixer with construction companies abroad.

REFERENCE BOOKS

1. Trainee Manual for Steel Fixer: By TEVTA Punjab, Lahore
2. Building construction: By Sheikh Muhammad Asif & Sajid Masood
3. Building construction: By Arura & Gupta