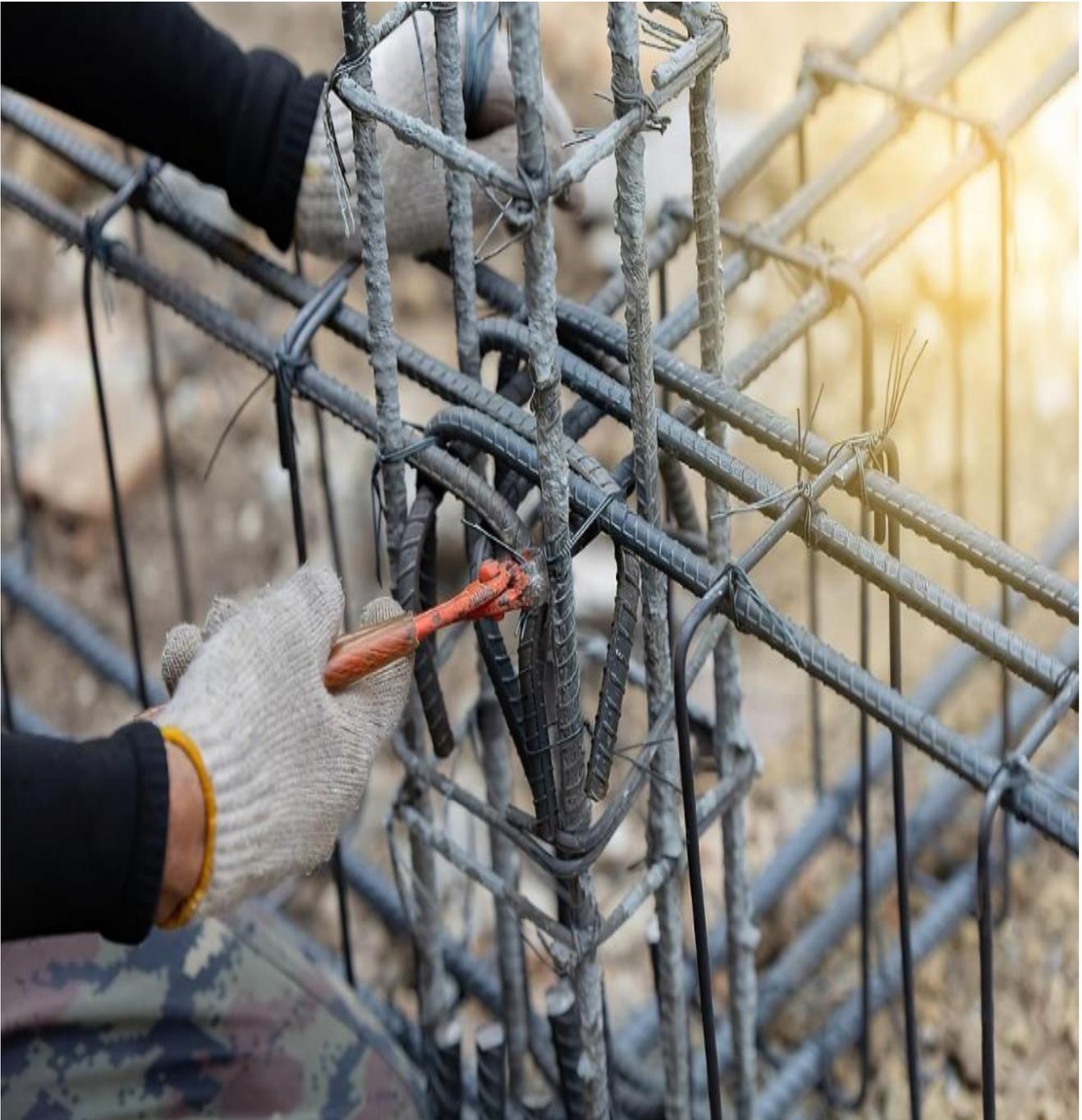




National Competency Standards for “Steel Fixer/Erector Supervisor”



**National Competency Standards Level-4
For
“Steel Fixer/Erector Supervisor”**



**National Vocational and Technical Training Commission
(NAVTTTC),
Government of Pakistan**



ACKNOWLEDGEMENT

National Vocational and Technical Training Commission (NAVTTTC) extends its gratitude and appreciation to many representatives of business, industry, academia, government agencies, Provincial TEVTAs, Sector Skill Councils and trade associations who spared their time and expertise to the development and validation of National Vocational Qualifications (Competency Standards, Assessments Packs and related material) for the trade of Steel Fixer & Erector. This work would not have been possible without the technical support of the personnel of the above said organizations. The core team for Qualification Development is Skill Standard Wing of NAVTTTC.

NAVTTTC initiated development of CBT&A based qualifications for 200 traditional / hi-tech trades under the Prime **Minister’s Hunarmand Pakistan Program**, focusing on Development & Standardization of 200 Technical & Vocational Education & Training (TVET) Qualifications. NAVTTTC efforts have received full support from the Ministry of Federal Education and Professional Training, which highly facilitated progress under this initiative.

It may not be out of place to mention here that all the experts of Industry, Academia and TVET experts of TEVTAs, BTEs and PVTC work diligently for making this qualification worthy and error free for which all credit goes to them. However, NAVTTTC accepts the responsibility of all the errors and omissions still prevailing in the Qualification document.

It is also noteworthy that development of Skill Standards is a dynamic and ongoing process, and the developed skill standards needs periodic review and updating owing to the constant technological advancements, development in scientific knowledge, and growing experience of implementation at the grass root level as well as the demand of industry. NAVTTTC will ensure to keep the qualifications abreast with the changing demands of both national and international job markets.

Engr. SajidBalouch
Executive Director,
NAVTTTC



Table of Contents

1. Introduction	5
2. Purpose of the Qualification	6
3. Leveling of Core Competencies of the Qualification	6
4. Date of Validation	7
5. Date of Review.....	7
6. Codes of Qualifications	7
7. Members of Qualification Development Committee	8
8. Members of Qualification Validation Committee.....	8
9. Entry Requirements	9
10. Regulation of the qualification and schedule of units	9
11. Qualification Levelling and Packaging	10
11.1 Generic Modules with respective levels	10
12. Detail of Competency Standards	11
0732CM-19 Plan & Supervise work	11
CS 4.1 Manage Safety at Construction Site	14
0732CM-20 Prepare Bar Bending Schedule	18
0732CM-21 Perform 2D Engineering Drawings using CAD Software	19
0732CM-22 Fabricate Steel Reinforcement for Box Culverts/Bridges.....	20
CS 4.2 Perform Basic Green Skills for Steel Fixing	23
CS 4.3 Perform Computer Applications	24
0732CM-23 Execute Steel Work in Confined Spaces.....	25
0732CM-24 Fabricate Steel Reinforcement for Pre Stressed Structure Member	27
0732CM-25 Execute Splicing and Anchoring using Mechanical Methods	29



National Competency Standards for “Steel Fixer/Erector Supervisor”



CS 4.4 Practice entrepreneurial skills31



1. Introduction

The Construction Industry is the 2nd largest industry of the country after agriculture. The manpower of this industry produces a lot of foreign exchange to share the economy of the country. However, contrary to its share in local economic market, the development in this sector is not at par with market demand through the use of various new technologies. Though the use of various new technologies and deployment of project management, strategies has made it possible to undertake projects of mega skill. Yet direly needs a development strategy that could maintain its competitiveness in local as well as global scenario.

The role of concrete work in construction technology is above board. The most of the concrete work is complement to steel fabrication. The importance of fabrication can never be denied for mega projects at local and international level.

The objective of this course is to impart theoretical and practical knowledge about steel fixing so that the trainees may be able to work and do job of steel fixing for civil work and earn their livelihood by offering their skill. The mission of NAVTTC and TEVTA is to train and transform young men and women into responsible thinking technologist to motivate them to attain professional excellence and to inspire them to proactively engage themselves for the betterment of the society at country level as well as at global level.

Therefore, the importance of knowledge related to Steel fixer/Erector through the latest techniques makes this qualification more valuable. Market demands for qualified workers are therefore a need of time and can only be addressed by developing specific skills standards in partnership with all stakeholders and industry experts. Recognizing this fact, the National Vocational and Technical Training Commission (NAVTTTC) has developed the National Vocational Qualifications Framework (NVQF) for Steel Fixer/Erector. These competency standards have been developed by the Qualification Development Committee (QDC) and validated by the Qualification Validation Committee (QVC) with representation from the country's leading departments, NPSL, PU Lahore, PCSIR, TEVTA, NESPAK and C&W.



2. Purpose of the Qualification

The aim of this qualification is to set high and applicable professional standards for all stake holders in construction sector. The basic goals of establishing these credentials are as follows:

1. Equip with the latest techniques used by steel erector/fixers
2. Improve trainees' professional competency in construction industry.
3. Provide opportunities for recognition of non-formal or informal skills
4. Raise standard and efficacy of scientific training and assessment
5. Improve the method and techniques in the realm of steel structure and fabrication.
6. Enable the existing workforce to learn new technologies and methods in field of construction.

3. Leveling of Core Competencies of the Qualification

Code	Competency Standard	Level	TH	PR	TL	Credits	Category
0732CM-19	Plan and supervise work	4	28	42	70	7	Technical
CS 4.1	Manage safety at construction Site	4	17	63	80	8	Functional
0732CM-20	Prepare bar bending schedule	4	42	118	160	16	Technical
0732CM-21	Perform 2D Engineering Drawings using CAD Software	4	19	81	100	10	Technical
0732CM-22	Fabricate steel reinforcement for box culverts/bridges	4	29	141	170	17	Technical
CS 4.2	Perform basic green skills for steel fixing	4	12	48	60	6	Generic
CS 4.3	Perform Computer Applications	4	25	75	100	10	Generic
0732CM-23	Execute steel work in confined spaces	4	20	90	110	11	Technical
0732CM-24	Fabricate steel reinforcement for pre stressed Structure Member	4	28	132	160	16	Technical
0732CM-25	Execute Splicing and Anchoring using Mechanical Methods	4	25	105	130	13	Technical
CS 4.4	Practice entrepreneurial skills	4	12	48	60	6	Generic
Total		4	255	945	1200	120	



4. Date of Validation

The level 4 of National qualification on Steel Fixer/Erector Supervisor has been validated by the Qualifications Validation Committee (QVC) members on Nov 01, 2021 to Nov 05, 2021 at PITAC, Lahore and will remain valid for ten years i.e. Nov 05, **2031**

5. Date of Review

The level 4 of National qualification on Steel Fixer/Erector Supervisor has been validated by the Qualifications Validation Committee (QVC) members on Nov 01, 2021 to Nov 05, 2021 at PITAC, Lahore and shall be reviewed after three years i.e. 05 Nov, 2024.

6. Codes of Qualifications

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education and training. ISCED codes assigned for these qualifications are as follows:

ISCED Classification for Steel Fixer/Erector Supervisor Level 4	
ISCED Code	Description
Steel Fixer/Erector Supervisor(Level 4)	
0732CM-19	Plan and supervise work
CS 4.1	Manage safety at construction Site
0732CM-20	Prepare bar bending schedule
0732CM-21	Perform 2D Engineering Drawings using CAD Software
0732CM-22	Fabricate steel reinforcement for box culverts /bridges
CS 4.2	Perform basic green skills for steel fixing
CS 4.3	Perform Computer Applications
0732CM-23	Execute steel work in confined spaces
0732CM-24	Fabricate steel reinforcement for pre stressed Structure Member
0732CM-25	Execute Splicing and Anchoring using Mechanical Methods
CS 4.4	Practice entrepreneurial skills



7. Members of Qualification Development Committee

The following members participated in the qualification development process on 9th to 13th August 2021 at PITAC, Lahore.

S#	Name	Designation
1.	Mr. Azhar Iqbal Shad	Principal, GCT Raiwind Road Lahore
2.	Mr. Nadeem Zaigham	Sr. Instructor, GCT Raiwind Road Lahore
3.	Mr. Muhammad Shafiq	Sr. Instructor, GSTC Mughalpura Lahore
4.	Mr. Sikandar Hayat	Instructor, GCT Raiwind Road Lahore
5.	Mr. Riaz Ahmed	Instructor, GCT Multan, P-TEVTA
6.	Mr. Muhammad Abid	Sr. Instructor, GCT Railway Road Lahore
7.	Mr. Tahir Mehmood	Sr. Instructor, GTTI Mughalpura Lahore
8.	Engr. Danish Khan	DACUM Facilitator
9.	Mr. Muhammad Yasir	Deputy Director/ Coordinator –(Skills Standards and Curricula) NAVTTC HQ

8. Members of Qualification Validation Committee

The following members participated in the qualification validation process on 01-11-2021 to 05-11-2021 at PITAC, Lahore.

S#	Name	Designation
1.	Mr. Tariq Saeed	Sr. Instructor, GTTI Mughalpura Lahore
2.	Mr. Azhar Iqbal Shad	Principal, GCT Raiwind Road Lahore
3.	Mr. Shoaib Anwar Sherazi	Principal TTC Quetta, Representative of B-TEVTA
4.	Engr. Habiba Mohsin	Lecturer UOL, Lahore
5.	Ms. Noorheen Amina	Design Engineer, Allied Engineering & Consultants Lahore
6.	Mr. Muhammad Asim	Lab Technologist UOL, Lahore
7.	Mr. Muhammad Shafiq	Sr. Instructor, GSTC Mughalpura Lahore
8.	Ms. Hira Ishtiaq	Lecturer, UOL, Lahore
9.	Ms. Fatima	System Analyst, PBTE Lahore, Representative of PBTE
10.	Engr. Liaqat Jamro	Director Academics, Representative of S-TEVTA
11.	Muhammad Qasim	Sr. Instructor, GCT Multan, Representative of P-TEVTA



National Competency Standards for “Steel Fixer/Erector Supervisor”



12.	Engr. Mahmood Ullah	Principal GPI Peshawar, Representative of KP-TEVTA
13.	Ms. Saima Asghar	CBT Expert & Certified Assessor, Lahore
14.	Engr. Danish Khan	DACUM Facilitator
15.	Mr. Muhammad Yasir	Deputy Director/ Coordinator –(Skills Standards and Curricula) NAVTTC HQ

9. Entry Requirements

The entry requirement for this qualification would be Level 3(Steel Fixer & Erector).

10.Regulation of the qualification and schedule of units

Not Applicable



11. Qualification Levelling and Packaging

OCCUPATIONS AND LEVELS DESCRIPTOR



S #	Occupations	No of CS	Level	Occupation Credit Hours	Training duration
1.	Assistant Steel Fixer & Erector	12	2	600	6 Months
2.	Steel Fixer & Erector	11	3	600	6 Months
3.	Steel Fixer & Erector Supervisor	11	4	1200	12 Months

11.1 Generic Modules with respective levels

- Health and Safety **LEVEL 2 & 3**
- Digital Skills **LEVEL 3 & 4**
- Entrepreneurial Skills & Green Skills **LEVEL 4**



12. Detail of Competency Standards

0732CM-19 Plan & Supervise work

Overview: This competency standard covers the skills and knowledge required to arrange for the placement of materials at a construction site, confirming the construction site requirements and OHSE protocol testing, liaising with supervisors of allied works and organising the steel fixing activities. Collecting reliable data and reporting result, provide reliable advice to construction personnel, recognise and rectify obvious errors or unexpected results and troubleshoot common problems.

Competency Units	Performance Criteria
CU1. Plan for on-site operations.	You must be able to: P1. Consult with the client or site in-charge and obtain relevant information, including the level of supervision required, drawings and specifications P2. Recognize the quality standards and the requirements stipulated within the standards to perform the particular job, like equipment, personals, physical facilities and storage capacity etc. P3. Prepare the process flow diagram in order to achieve Quality outcome. P4. Identify site hazards and the personal protective equipment (PPE) and safety procedures specified for job P5. Organize site induction for self and support personnel as required P6. Clarify allocated work targets and timelines set by Management. P7. Prepare Break down work of activities into small achievable components and efficient sequences P8. Plan housekeeping activities prior to and post completion of work
CU2. Supervise work activities to achieve desired results	You must be able to: P1. list and arrange required resources prior to commencement of work P2. Identify the areas of work, which could result in a delay



	<p>of work, wastage of material or damage to tools.</p> <p>P3. Allocate appropriate responsibility to appropriate team member to avoid conflicts.</p> <p>P4. Review work plan in response to new information, urgent requests, changed situations or instructions from appropriate personnel</p> <p>P5. Arrange the facilities of team member’s Capacity development and training.</p> <p>P6. Provide guidance to the subordinates to obtain desired outcome</p> <p>P7. Cooperate with team members to negotiate and achieve agreed outcomes, timelines and priorities</p>
<p>CU3. Perform on-site inspection.</p>	<p><i>You must be able to:</i></p> <p>P1 Conduct physical inspection of processes & materials in accordance with the inspection plan.</p> <p>P2 Identify the defects and deficiencies in product & processes and record with evidence.</p> <p>P3 Perform test as per standard procedure for determining the physical properties of materials and product.</p> <p>P4 Collect the samples of materials & products for lab testing as per sampling procedure & rules.</p> <p>P5 Pack and seal the sample & sub-samples in the presence of witnesses according to sampling rule and procedure</p> <p>P6 Complete the sampling document; fill in the sample date, time, and weight/volume, sample ID, preservative used, sample location and sampler name etc.</p> <p>P7 Ensure activities at site are as per approved method statement such as material storage, tools & plants conditions, workmanship and safety measures etc.</p>
<p>CU4. Prepare the inspection report</p>	<p><i>You must be able to:</i></p> <p>P1 Ensure evidence of inspection , observations and findings</p> <p>P2 Verify the integrity of information supplied by other party as a part of the inspection process.</p> <p>P3 Collect and review the information relevant to inspection activities for recoding inspection results</p>



	P4 Suggest the necessary corrective actions for tackling the identified problems.
CU5. Organize project data and report	<i>You must be able to:</i> P1. Document the site results in accordance with workplace practices P2. Maintain security and confidentiality of workplace information P3. Prepare and issue a final project report detailing supervision and statement of compliance and relevant tables and plans as required.

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

- K1)** Principles of planning and project management
- K2)** Engineering properties of civil construction materials
- K3)** Roles and responsibilities for different levels of site supervision.
- K4)** Collect and review the information relevant to inspection activities and work document preparation for recoding inspection results.
- K5)** Documentation and record system of the inspection body.
- K6)** Different types of defect for inspection activities.
- K7)** Typical site problems and recommended corrective actions.
- K8)** Awareness of environmental sustainability issues as they relate to the work task.
- K9)** Legal, ethical and work health and safety (WHS) requirements specific to the work task including traceability, confidentiality and security requirements of all client information, and laboratory data and records.
- K10)** Different types of contracts
- K11)** Different types of SOPs relating to work

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Plan and design effectively the supervision and inspection program in accordance with specifications



- Prepare work documents fit for practical use in conducting inspection efficiently.
- Handle inspection items and samples by appropriate methods to meet the traceability requirements.
- Collaborate with the contractor of allied works, at a construction site.

CS 4.1 Manage Safety at Construction Site

Overview: This competency standard covers the skills and knowledge required to comply with regulatory and organizational requirements for occupational health and safety at construction site

Competency Units	Performance Criteria
CU1. Evaluate hazards and risk at work place	<p>You must be able to:</p> <p>P1. Identify physical hazards at work place</p> <p>P2. Check noise level at work place</p> <p>P3. Check adequacy of ventilation at work place</p> <p>P4. Examine the illumination level at work place</p> <p>P5. Examine the storage of hazardous materials as per MSDS</p> <p>P6. Adopt preventive / corrective measures in accordance with HSE Policy</p>
CU2. Maintain safety at height.	<p>You must be able to:</p> <p>P1. Identify anchorage as per standard safety procedures.</p> <p>P2. Select the suitable lanyard (shock absorbing, self-retaining and positioning) according to situation.</p> <p>P3. Fix the connectors (snap hook and lanyard) with anchorage and body harness.</p> <p>P4. Wear full body harness and check the connections.</p>
CU3. Ensure electrical safety at workplace	<p>You must be able to:</p> <p>P1. Check earthing of power equipment.</p> <p>P2. Determine safest supply and route for electrical supply.</p> <p>P3. Check and select leads & switch boards accordingly.</p> <p>P4. Check the overhead electrical wires (10 feet away from worker)</p> <p>P5. Report electrical hazards</p>
CU4. Maintain safety for confined spaces	<p>You must be able to:</p> <p>P1. Select& wear PPEs</p> <p>P2. Mark check list includes:</p> <ul style="list-style-type: none"> • Oxygen level • Humidity • Illumination • Communication equipment Temperature • Escape Plan • Emergency Plan



<p>CU5. Take Safety Measures in Trenches</p>	<p>You must be able to:</p> <p>P1. Identify soil type for working site</p> <p>P2. Locate all buried services (electricity, gas, water, telecommunication lines)</p> <p>P3. Identify ground water table</p> <p>P4. Ensure access points (when the depth greater then 5ft)</p> <p>P5. Apply bracing (when soil is loose, width greater than 3ft,heavy vibration nearby)</p> <p>P6. Mark check list includes:</p> <ul style="list-style-type: none"> • Oxygen level • Humidity • Illumination • Communication equipment Temperature • Escape Plan • Emergency Plan <p>P5. Apply barrication around the work area as per requirement</p>
<p>CU6. Handle heavy load by chain hoist (Chain Pully)</p>	<p>You must be able to:</p> <p>P1. Judge the weight of load to be lifted</p> <p>P2. Select lifting equipment accordingly</p> <p>P3. Assemble the lifting equipment</p> <p>P4. Clamp the load with sling</p> <p>P5. Check load balance.</p> <p>P6. Operate chain pulley block without jerk</p> <p>P7. Use hand signal while lifting and placing load</p>
<p>CU7. Perform emergency response activity</p>	<p>You must be able to:</p> <p>P1. Identify nature of emergency</p> <p>P2. Raise fire alarm</p> <p>P3. Control fire by fire extinguishers</p> <p>P4. Evacuate the workplace</p> <p>P5. Follow the emergency plan.</p> <p>P6. Gather in assembly point</p> <p>P7. Perform head count</p> <p>P8. Rescue the trapped injured person</p> <p>P9. Provide first aid to the rescue person</p>
<p>CU8. Report and Investigate the accident at construction site.</p>	<p>You must be able to:</p> <p>P1. Check there is no immediate risk of danger at work place.</p> <p>P2. Ensure that victim of accident received the first aid.</p> <p>P3. Report to the manager.</p> <p>P4. Secure the accident site by shutting down or blocking the area.</p> <p>P5. Collect the information about the incident before the</p>



	<p>witnesses begin to forget details.</p> <p>P6. Trace the lacking in work procedure and deficiencies in safety measures.</p> <p>P7. Analysis by step-by-step recounting of the incident and to root cause of accident.</p> <p>P8. Develop the incident report along with corrective measures to avoid future accident.</p>
<p>CU9. Implement safe work practice at site</p>	<p>You must be able to:</p> <p>P1. Carry out special tool box talks which require discussion on highly critical safety related matters, hazardous site conditions pertaining to particular work etc.</p> <p>P2. Ensure appropriate use of Personal Protective Equipment (PPE)</p> <p>P3. Implement safe handling and stacking methods at workplace / store</p> <p>P4. Confirm that all required signs are posted, and bulletin boards are maintained in clear and legible condition.</p> <p>P5. Ensure all un-protected openings are adequately guarded or barricaded.</p> <p>P6. Encourage workers to identify unsafe or unhealthful workplace conditions and report the every near-miss.</p> <p>P7. Ensure safe access is available at work place for movement of workers & materials.</p> <p>P8. Conduct emergency response drill for assessing the deficiencies and review the emergency response plan & procedures.</p>

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1** emergency safety control measures and actions to be taken under emergency situation
- K2** Identification of unsafe act and unsafe conditions
- K3** Standard procedure of handling, storing and stacking material
- K4** Reporting procedures in cases of breaches or hazards for site safety, accidents, and



emergency situations as per guidelines

- K5** PPEs equipment to used based on various
- K6** Use of hazardous material, in a safe and appropriate manner as per applicability
- K7** Tolerance levels for site environment to monitor levels of dust, air pollution, noise pollution etc.
- K8** Develop the OHSE personal records such as Health records, Incident reports, Accident reports, OHSE-related training.
- K9** Types of soil
- K10** Knowledge of safety construction signs
- K11** Types of anchorage
- K12** Components of fall arrest system

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Identify safety risks that affect the health, safety and environment for self and others working in the vicinity, tackle it if within limit or report to appropriate authority
- Respond to emergency
- Perform safety measures for trenches/confined places

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Desktop computer
2.	Printer
3.	Application software.
4.	PPEs
5.	barrication tape
6.	barricades
7.	Sound level meter
8.	Oxygen moniter
9.	Hygrometer
10.	Board of Safety instructions.
11.	First aid Box
12.	Stretcher
13.	Fall arrest system
14.	Various hand / power tools



15.	Chain Hoist
16.	Hooks / Anchors
17.	Slings
18.	Lux meter

0732CM-20 Prepare Bar Bending Schedule

Overview: This competency standard covers the skills and knowledge required to interpret drawings, specifications and standards for preparation of Bar Bending Schedule

Competency Units	Performance Criteria
CU1. Interpret drawing	You must be able to: P1. Identify direction and position of rebars from the drawing P2. Calculate number of chairs and spacer rebars P3. Identify size and type of cover block
CU2. Prepare schedule	You must be able to: P1. Identify types, diameter & shape of rebars P2. Calculate cutting length of straight rebars, bent up rebars, stirrups, rings and ties of concrete structure P3. Calculate the number of each shape of rebars P4. Calculate unit weight for each dia. of rebar P5. Calculate the total length of each type of rebars P6. Calculate the total weight of rebars for each dia of rebars P7. Fill the measurement in the relevant columns of table

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard.

- K1.** civil structural drawings
- K2.** Terminology used in reinforcement works
- K3.** Codes for Reinforcement.
- K4.** Basic principal of measurement, arithmetic and geometric calculations
- K5.** Units weight of reinforcement steel of different diameter
- K6.** Different types of cover block and their uses
- K7.** Different types of steel rods, length and diameter
- K8.** Different types of binding wire, thickness and uses
- K9.** Computation of number of rebars, stirrups, chairs, spacer bar based on the spacing
- K10.** Computation of cutting length for various shapes of rebars (L-shape, U-Shape) from sketches, drawings
- K11.** Computation of cutting length for Stirrups of various shape (Square, Rectangle, Circle)
- K12.** Minimizing wastage of reinforcement steel

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



- Interpret drawings, specifications and standards for bar bending schedule.
- Prepare bar bending schedule of given structure member

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Computer
2.	calculator
3.	Paper
4.	Pen

0732CM-21 Perform 2D Engineering Drawings using CAD Software

Overview: This competency standard covers the skills and knowledge required to create 2D drawings by using various tools and commands in computer. You can create and modify objects and drawings in CAD software to meet specific intentions according to job requirements. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Draw 2D shapes	You must be able to: P1. Setup user interface settings for required drawing. P2. Create different 2D shapes with given measurements. P3. Edit different 2D shapes to meet requirement. P4. Insert dimensions and symbols as per requirement P5. Save the file in different drawing formats
CU2. Prepare final sets of 2D drawings	You must be able to: P1. Develop 2D Drawing with given project specification and measurements. P2. Plot drawing on scale according to required size & orientation.

Knowledge & Understanding.

The candidate must possess underpinning knowledge and understanding required to carry out tasks covered in this competency standard. Therefore he/she must be able to;

- K1.** Perform 2D CAD drawings
- K2.** Dimensioning techniques and drawing symbols
- K3.** Insert Standard parts from CAD library



Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Portfolio
- 2D Drawings with given project specification and measurements

0732CM-22 Fabricate Steel Reinforcement for Box Culverts/Bridges

Overview: This competency standard covers the skills and knowledge required to fabricate steel reinforcement work for bridges in civil structures.

Competency Units	Performance Criteria
CU1. Prepare the reinforcement for foundation of abutment/pier.	<p>You must be able to:</p> <p>P1. Identify sizes of piers and its location</p> <p>P2. Interpret drawing for length and diameter of rebar</p> <p>P3. Measure and mark the required cut length of main and spiral tie bar</p> <p>P4. Bind the pile reinforcement with spiral at specified spaces</p>
CU2. Prepare the reinforcement for pile and pile cap.	<p>You must be able to:</p> <p>P1. Identify length, width and depth of pile and pile cap and its location.</p> <p>P2. Mark and cut rebars of required length</p> <p>P3. Bend the spirals and tie bars as per bending dimension</p> <p>P4. Make the bundle of prepared spirals, tie bars, rebar, and mark the bar code by using tag for reference.</p> <p>P5. Bind the rebar with pile and pile cap mould.</p> <p>P6. Prepare pile reinforcement as per drawing</p> <p>P7. Fix concrete spacer in bottom, sides of pile cap.</p> <p>P8. Insert dowel bars on pile cap</p>
CU3. Prepare reinforcement for wing wall, abutment of bridge.	<p>You must be able to:</p> <p>P1. Mark and cut the required length on rebars, as per bar bending schedule</p> <p>P2. Make the bundle of prepared rebars and mark the bar code using tag for reference.</p> <p>P3. Bind/assembled wing wall rebars and abutment rebars with dowel on pile cap as per bar bending schedule.</p> <p>P4. Fix concrete spacer in sides, of wing wall and abutment.</p>
CU4. Prepare the reinforcement for pier	<p>You must be able to:</p> <p>P1. Identify sizes and diameter of pier and its location.</p> <p>P2. Determine length and dia of main vertical rebars, diameter of spiral ties.</p> <p>P3. Prepare spiral ties of required dia.</p> <p>P4. Cut the vertical main rebars for piers as per bar bending schedule.</p> <p>P5. Make the bundle of prepared rebars and mark the bar code using tag for reference.</p> <p>P6. Bind the pier reinforcement with spiral ties, having round</p>



	concrete spacers, with dowels bars on pile cap.
CU5. Prepare the reinforcement for pier cap.	You must be able to: P1. Identify length, width and depth of pier cap P2. Mark and cut rebars of required length P3. Bend the stirrups as per bending dimension P4. Make the bundle of prepared stirrups, rebars and mark the bar code by using tag for reference. P5. Bind the bottom and top rebars with stirrups in the pier cap mold. P6. Fix concrete spacer in bottom, sides of pier cap P7. Insert dowel bars on pier cap
CU6. Prepare the reinforcement for transom	You must be able to: P1. Mark and cut the required length on rebars as per bar bending schedule P2. Bend the end hooks of rebars as per bending dimension P3. Make the bundle of prepared rebars and tag rebars P4. Place the bundle of prepared rebars of structural members to the required central place P5. Separate the rebars of different sizes of beams P6. Put all stirrups in bottom and top rebars of the transom P7. Put extra rebars at the top of the transom P8. Bind the stirrups with bottom and top rebars P9. Bind curtailed rebars with in the top and bottom rebars P10. Spread the rebars for transom P11. Bind rebars with one another with binding wire P12. Add spacer according to bar bending schedule
CU7. Prepare the reinforcement for deck slab over post-tensioned girder	You must be able to: P1. Mark and cut the required length on rebars as per bar bending schedule P2. Bend the end hooks of rebars as per bending dimension P3. Make the bundle of prepared rebars and tag rebars P4. Place the bundle of prepared rebars of structural members to the required central place P5. Separate the rebars of different sizes of beams/slabs P6. Spread the main and distribution rebars for slab in two direction P7. Bind rebars with one another with binding wire



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| | <p>P8. Add spacer according to bar bending schedule</p> <p>P9. Assemble the components of bridge according to the drawing</p> <p>P10. Add bearing pads under the deck slab as shock absorbers</p> |
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Knowledge & Understanding.

The student must be able to demonstrate steel fixing in bridges, knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1.** Structural drawings.
- K2.** Fix steel reinforcement in piles, pile cap, piers, pier cap, abutment wall and wing wall of bridge.
- K3.** Fix/erect steel reinforcement deck slab.
- K4.** Operating procedure of various bar cutting tools.
- K5.** Types and components of bridges
- K6.** Reinforcement details of piles, pile cap, piers, pier cap, transom, abutment wall, deck slab and wing wall of bridge.
- K7.** Bearing pads
- K8.** Soil investigation

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform measure and mark the cut length on rebars.
- Perform cutting and bending procedure to prepare spiral for piers.
- Perform binding of main rebars, holding rebars with stirrups in pile and pier caps.
- Prepare reinforcement for wing wall, abutment wall of bridge.
- Prepare the reinforcement for deck slab over post-tensioned girder
- Prepare the reinforcement for transom over post-tensioned girder

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Chisels(for cutting rebars)



2.	Different types of hammer(Light, sledge, etc)
3.	Cutting base
4.	Calipers
5.	Measuring tape(100’)
6.	Measuring tape 18’
7.	Pliers
8.	Bending bar
9.	Bar bending table
10.	Disc cutter
11.	PPEs
12.	Lifting device

CS 4.2 Perform Basic Green Skills for Steel Fixing

Overview: This competency standard covers the skills and knowledge required to perform basic green skills in construction, including selection of appropriate steel, manage steel waste and use of water efficiently at construction site.

Competency Units	Performance Criteria
CU1. Manage sustainability of rebar fixing materials.	You must be able to: P1. Select sustainable materials as per requirement P2. Follow standard procedure to manage systems (waste, energy) P3. Perform impact quantification of used material in steel fixing
CU2. Manage Steel fixing waste	You must be able to: P1. Identify various types of steel fixing waste. P2. Sort and categorize reusable waste. P3. Dispose unusable waste as per set standards. P4. Place reusable material at designated storage area P5. Transport waste material to designated place

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- K1.** Environmental degradation
- K2.** Types of steel fixing materials
- K3.** Methods of oiling metallic components of steel
- K4.** Types of steel fixing waste
- K5.** Waste reduction techniques
- K6.** Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink)



- K7. Reusable materials
- K8. Recyclable materials
- K9. Methods for disposal of unusable materials
- K10. Just-in-time (JIT) approach
- K11. Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.)

Critical Evidence(s) Required

- Fill checklist of incorporating materials, wastage controls, and resources management as per instructions.

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Pencil
2.	Eraser
3.	Sharpner
4.	Calculator
5.	First aid Box
6.	Lubricants
7.	Rebars
8.	Waste disposal containers
9.	Different cutting tools
10.	Emery paper

CS 4.3 Perform Computer Applications

Overview: This competency standard covers the skills and knowledge required to perform Computer applications and troubleshooting. Trainee will be able to acquired skills in operating MS PowerPoint, and MS Excel. The underpinning knowledge regarding computer applications will be sufficient to provide the basis for trainee’s work.

Competency Units	Performance Criteria
CU1. Prepare Spreadsheet using MS Excel	You must be able to: P1. Develop a worksheet as per given data. P2. Format the worksheet according to given criteria. P3. Apply Formulas according to the requirement. P4. Generate Charts/Graphs according to the given data. P5. Print Worksheet according to requirements.



CU2. Prepare a presentation using MS Power Point	<p>You must be able to:</p> <p>P1. Insert Slides with different Layouts according to requirements of presentation.</p> <p>P2. Insert text, tables, images, etc. according to the requirement.</p> <p>P3. Apply a set of effects to animate the slide according to requirement.</p> <p>P4. Apply Slide Transitions on Slides according to requirement.</p> <p>P5. Apply Sound Effects on Objects/text/images according to requirement.</p> <p>P6. Present a presentation according to 7Cs of communication.</p>
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Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of

- K1)**Different types of Formulas
- K2)**Short Keys
- K3)**Types of presentation format

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Enter data and put formula into the respective columns and rows as per given instructions
- Apply any slide transition on entire presentation.

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Desktop computer
2.	Printer
3.	Application software.

0732CM-23 Execute Steel Work in Confined Spaces

Overview: This competency standard covers the skills and knowledge required for measuring, cutting and fixing of the steel in Confined Spaces, Entering, and Exiting confined spaces and cleaning up.

Competency Units	Performance Criteria
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CU1. Follow procedure of confined space entry	You must be able to: P1. Fill the safety check list for confined spaces P2. Select and wear PPEs P3. Select appropriate tools and equipments P4. Interpret bar bending schedule P5. Interpret structure drawings
CU2. Perform cutting and bending of rebars in confined spaces	You must be able to: P1. Straighten the rebars. P2. Measure and mark the required cut length on rebars P3. Cut the rebars P4. Make the bundle of prepared rebars and mark the bar code using tag for pre stressed girder for reference.
CU3. Perform fabrication of rebars in confined spaces	You must be able to: P1. Mark spacing of rebars on prepared bed P2. Place rebars according to drawing P3. Bind rebars P4. Place spacers as per requirement
CU4. Perform final inspection	You must be able to: P1. Recover tools, equipment and materials from the confined space P2. Clear work area and dispose of or recycle materials P3. Remove, clean and store barriers and signs

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of

- K1.** Different Types of confined space
- K2.** Confined space entry and exit procedures, risks and regulations
- K3.** Equipment types, characteristics, technical capabilities and limitations
- K4.** Air contaminants and toxic gases
- K5.** List materials safety data sheets

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare confined space
- Perform final inspection

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:



S. No.	Items
1.	Steel Measuring tape
2.	Measuring tape
3.	Marking Chalks/Marker etc.
4.	Different types of hammer (Sledge,light,etc)
5.	Spanner
6.	Chisel
7.	Paper Sheet
8.	Pencil/Ballpoint
9.	Safety Check list
10.	Emery paper
11.	PPEs
12.	First aid Box
13.	Emergency plan
14.	Bar bending plan
15.	Escape plan
16.	Disc cutter
17.	Plier
18.	Rebars
19.	Binding wires
20.	Bending rod

0732CM-24 Fabricate Steel Reinforcement for Pre Stressed Structure Member

Overview: This competency standard covers the skills and knowledge required to execute steel work for pre stressed girders in civil structure.

Competency Units	Performance Criteria
CU1. Prepare steel for the pre stressed girders	You must be able to: P1. Interpret bar bending schedule P2. Interpret structural drawings P3. Barricate the area P4. Select and wear PPE's P5. Straighten rebars. P6. Measure and mark required cut length on rebars P7. Cut the rebars P8. Make the bundle of prepared rebars and mark the bar code
CU2. Prepare mould	You must be able to: P1. Fix the steel sheets of required size P2. Place the flexible conduits in the mould
CU3. Place steel in mould and conduits	You must be able to: P1. Place top and bottom steel



	<p>P2. Fix the shear reinforcement with top and bottom steel</p> <p>P3. Place steel/strands in conduits</p>
CU4. Perform Pre stressing of structure member	<p>You must be able to:</p> <p>P1. Provide tension by pulling tendons from the anchorage points</p> <p>P2. Provide dead end anchors</p> <p>P3. Fill flexible conduits with cement mortar</p>

Knowledge & Understanding.

The student must be able to demonstrate steel fixing in pre stressed girders, knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of

- K1.** Structural drawings.
- K2.** Interpretation and use of bar bending schedule.
- K3.** Practice of cutting, bending binding of steel rebars.
- K4.** Marking of codes and numbers to the rebars using tags for reference.
- K5.** Operating procedure of various bar cutting tools.
- K6.** Pre stressing of concrete members (types, techniques etc)
- K7.** Injection methods
- K8.** Terms related to pre stressing

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform measure and mark the cut length on rebars.
- Perform cutting and bending procedure to prepare stirrups for pre stressed girder.
- Perform Pre stressing of girder
- Perform binding of main rebars, holding rebars with stirrups.

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Steel Measuring tape
2.	Measuring tape
3.	Marking Chalks/Marker etc.
4.	Differnt types of hammer (Sledge,light,etc)



5.	Spanner
6.	Chiesel
7.	Paper Sheet
8.	Pencil/Ballpoint
9.	different types of barrication
10.	Emery paper
11.	PPEs
12.	First aid Box
13.	Bar bending plan
14.	Disc cutter
15.	Plier
16.	Rebars
17.	Binding wires
18.	Bending rod

0732CM-25 Execute Splicing and Anchoring using Mechanical Methods

Overview: This competency standard covers the skills and knowledge required to mechanically splice and anchor for reinforcement in concrete. It includes planning and preparation for the work, splicing, anchoring and completing clean-up activities within a team.

Competency Units	Performance Criteria
CU1. Carry out mechanical splicing and anchoring	You must be able to: P1. Interpret drawing and specification. P2. Prepare material as per requirement P3. Thread reinforcement rebars as detailed in job specifications P4. Fit and secure splicing couplers to rebars in accordance with job specifications P5. Free coupler connections and rebars from mill scaling and residual debris P6. Locate and anchor reinforcement as prescribed in job specifications
CU2. Carryout reinforcement checks	You must be able to: P1. Fix ties to reinforcement P2. Check depth of coverage, clearance, spacing and overlap of reinforcement material according to drawing P3. Clean, maintain and store plant tools & equipment

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of



National Competency Standards for “Steel Fixer/Erector Supervisor”



- K1. Basic theory related to mechanical splicing and anchoring as a reinforcement technology
- K2. Construction and steel fixing tensioning terminology
- K3. Handling, storage and environmentally friendly waste management
- K4. Material safety data sheets (MSDS)
- K5. Materials storage and environmentally friendly waste management
- K6. Mechanical anchoring systems, materials and techniques
- K7. Mechanical splicing systems, materials and techniques
- K8. Interpretation of drawings and specifications
- K9. calculation of material requirements
- K10. Quality requirements

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard

- Perform splicing and anchoring cycle on a minimum of three occasions covering foundations, a slab and one other structure.
- Carryout reinforcement checks

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Drawing
2.	Measuring tape
3.	Bolt cutters
4.	couplers
5.	Nippers
6.	Tool belts
7.	Mechanical cutting equipment
8.	First aid box
9.	PPE's
10.	Rebars
11.	Hammers
12.	Fasteners



CS 4.4 Practice entrepreneurial skills

Overview: This competency standard covers the skills and knowledge required to apply entrepreneurial skills in workplace best practices and implement cost-effective operations consequently preparation of report of existing entrepreneurship.

Competency Units	Performance Criteria
CU1. Develop a business plan	You must be able to: P1. Conduct market survey to collect information P2. Select the best option in terms of cost, service, quality, sales, profit margin, overall expenses P3. Compile the information collected through the market survey, in the business plan format
CU2. Collect information regarding funding sources	You must be able to: P1. Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate P2. Choose the best available option according to investment requirement P3. Prepare documents according to the loan agreement requirement P4. Include the information of funding sources in the business plan.
CU3. Develop a marketing plan	You must be able to: P1. Collect information required to devise marketing plan P2. Prepare marketing plan for new business.
CU4. Develop basic business communication skills	You must be able to: P1. Communicate with internal customers and external customers P2. Use different modes of communication to communicate internally and externally e.g.: presentation, speaking, writing, listening, visual representation, reading etc. P3. Use specific business terms used in the market

Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1) Workplace best practices, policies and criteria
- K2) Resource utilization
- K3) Ways in fostering entrepreneurial attitudes:
- K4) Optimization of workplace resources
- K5) 5S procedures and concepts
- K6) Criteria for cost effectiveness
- K7) Workplace productivity
- K8) Impact of entrepreneurial mindset to workplace productivity
- K9) time management



Critical Evidence(s) Required

The candidate must demonstrate his ability to identify and sustain cost effective activities in the workplace as well as demonstrate ability to practice entrepreneurial knowledge, skills and attitudes in the workplace.

Report Case study of relevant entrepreneurship comprising of:

- Entrepreneurial workplace best practices.
- Communication of best practices
- Implementation of cost effective operations.

TOOLS AND EQUIPMENT

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Pencil
2.	Eraser
3.	Sharpner
4.	Calculator
5.	Notebook