

**Course Curricula**

***Under***

**Skill Development Initiative (SDIS) Scheme**

**Based on**

**Modular Employable Skill (MES)**

**on**

**Construction Equipment Sector**

**Government of India  
Ministry of Labour & Employment  
Director General of Employment & Training**

List of member attended the trade committee Meeting for designing the course curriculum underskill Development Initiative Skills (SDIS) based on **Modular Employable Skills (MES)** on **Construction Equipment Sector** held on 19<sup>th</sup> December 2012 at Women ITI Korba (C.G.).

**Shri S.J.Amalan, Director, C.S.T.A.R.I, Kolkata**

SL. NO.	NAME & DESIGNATION Shri/Smt.	REPRESENTING ORGANISATION	Remarks
1.	Mr. M.C. SHARMA, JDT	CSTARI, Kolkata	Chairman
2.	COL RAKESH CHOUDHARY GM Administrator	Spectrum Coal and Power ltd	Member
3.	S.P.NAMDEO	J.D. Office, ITI Bilaspur	Member
4.	M.F.ANSARI, Principal	Principal ITI, Koni Bilaspur	Member
5.	ABDUL RAHMAN	CETI GEVRA , Area SECL	Member
6.	O.P. SINGH	M/s Sainik Mining & Allied Services	Member
7.	N.C. SARKAR	ACBID Ltd	Member
8.	K.K. DAS	Spectrum Coal & Power ltd	Member
9.	R.P. VISHWAKARMA	Maruti Clean Coal & Poweer Ltd	Member
10.	S. M.ANSARI Training Superintendent	Women ITI Korba	Member
11.	U.K. SHARMA Nodal Officer	Nodal Officer .IMC,Korba	Member
12.	P.L. Chaudhary , Principal	Principal ITI, Korba	Member
13.	HF. SAIFY	ANM Consultants	Member
14.	KUNDAN SHANDILYA	Spectrum Coal and Power ltd	Member
15.	J.P. KHANDEY	Employment Office GO CG	Member
16.	JAGGU MASIH	M.C.C.P.L Ratija	Member
17.	S.S. PATEL	Principal Polytechnic Korba	Member
18.	ANITA SAYAL	Student Representative	Member
19.	AATMARAM KHERWAR	IMC Member	Member
20.	Smt. KUMUD PANDEY	IMC Member	Member
21.	PRATEEK PANDEY	CII-State Head (C.G)	Member

**Course Curricula under Skill Development Initiative Scheme (SDIS) Based on  
Modular Employable Skills (MES) on Mining Sector**

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## **Skill Development based on Modular Employable Skills (MES)**

### **1. Background:**

The need for giving emphasis on Skill Development, especially for the educated unemployed youth (both for rural & urban) has been highlighted in various forums. Unfortunately, our country's current education system does not give any emphasis on development of skills. As a result, most of the educated/uneducated unemployed youths are found wanting in this area, which is becoming their Achilles heel.

As India is on the path of economic development and the share of service sector's contribution to the GDP of the country is increasing (54% of GDP) it is becoming imperative that Government of India along with other nodal agencies play an important role in providing employable skills, with special emphasis on Skills.

Hence, need of the hour is some policy change at Apex level which will address the needs of the changing economy and look at providing mandatory skills training to all educated unemployed youths, with a view to have them gainfully employed. This shift in policy will ultimately benefit all the stake holders, namely the individuals, industry, Government and the economy by way of providing employment, increasing the output/productivity and ultimately resulting in a higher GDP for the nation.

### **2. Frame work for skill development based on 'Modular Employable Skills (MES)**

Very few opportunities for skill development are available for the above referred groups (educated unemployed youth). Most of the existing skill development programmes are long term in nature. Poor and less educated persons cannot afford long term training programmes due to higher entry qualifications, opportunity cost, etc. Therefore, a new framework for skill development has been evolved by the DGET to address the employability issues.

The **key features of new framework for skill development** are:

- Demand driven short term training courses based on modular employable skills decided in consultation with Industries.
- Flexible delivery mechanism (part time, weekends, full time)
- Different levels of programmes (foundation level as well as skill up gradation) to meet demands of various target groups
- Central Government will facilitate and promote training while vocational training providers (VTP) under the Govt. and Private Sector will provide training.
- Optimum utilization of existing infrastructure to make training cost effective.
- Testing of skills of trainees by independent assessing bodies who would not be involved in conduct of the training programme, to ensure that it is done impartially.

- Testing & certification of prior learning (skills of persons acquired informally)

The Short Term courses would be based on “Modular Employable Skills (MES)”.

The **concept for the MES** is:

- ✓ Identification of minimum skills set. Which is sufficient to get an employment in the Labour market.
- ✓ It allows skills up gradation, multi skilling, multi entry and exit, vertical mobility and lifelong learning opportunities in a flexible manner.
- ✓ It also allows recognition of prior learning (certification of skills acquired informally) effectively.
- ✓ The modules in a sector when grouped together could lead to a qualification equivalent to National Trade Certificate or higher.
- ✓ Courses could be available in different vocations depending upon the need of the employer organizations.
- ✓ MES would benefit different target groups like:
  1. Workers seeking certification of their skills acquired informally
  2. Workers seeking skill up gradation
  3. Early school drop-outs and unemployed
  4. Previously child Labour and their family

### **3. INTRODUCTION**

Economic growth in India is increasingly supported by robust industrial growth. “**Construction Equipment Sector**” is one of the relatively lesser known but significant sectors that support almost all industrial/ commercial activities. However, notwithstanding its importance and size (INR 4 trillion), it has traditionally not been accorded the attention it deserves as a separate sector in itself. The level of inefficiency in “**Construction Equipment Sector**” activities in the country has been very high across all modes.

The required pace of efficiency and quality improvement will demand rapid development of capabilities of service providers. And with these “**Construction Equipment Sector**” activities being a service oriented sector, skill development will emerge as a key capability.

This lack of focus on developing manpower and skills for the sector has resulted in a significant gap in the numbers and quality of manpower in the “**Construction Equipment Sector**” . This gap, unless addressed urgently, is likely to be a key impediment in the growth of the sector in India and in consequence, could impact growth in industry and commercial/ manufacturing sectors as well. This underscores the

need identifying areas where such manpower and skill gaps are critical, and developing focused action plans to improve the situation.

A look at the required initiatives for manpower development in the “**Construction Equipment Sector**” makes it clear that sustainable development of the sector’s manpower requires a collaborative public private effort. The level of commitment demonstrated by each stakeholder would largely determine the direction that the sector heads towards.

#### **4. Age of Participants**

The minimum age limit for persons to take part in the scheme is 14 years.

#### **5. Curriculum Development Process :**

Following procedure is used for developing course curricula

- Identification of Employable Skills set in a sector based on division of work in the Labour market.
- Development of training modules corresponding to skills set identified so as to provide training for specific & fit for purpose
- Development of detailed curriculum and vetting by a trade committee and by the NCVT  
(Close involvement of Employers Organizations, State Governments and experts, vocational Training providers and other stakeholders are ensured at each stage).

#### **6. Development of Core Competencies:**

Possession of proper attitudes is one of the most important attributes of a competent person. Without proper attitudes, the performance of a person gets adversely affected. Hence, systematic efforts will be made to develop attitudes during the training programme.

The trainees deal with men, materials and machines. They handle sophisticated tools and instruments. Positive attitudes have to be developed in the trainees by properly guiding them and setting up examples of good attitudes by demonstrated behaviors and by the environment provided during training.

Some important core competencies to be developed are:

#### **Core Competencies:**

The core competencies developed by the candidates in Level - I are :

- (i) Safety Consciousness and safe working practices
- (ii) Learn continuously
- (iii) Ability to work in a team
- (iv) Proper Communication Skills
- (v) Ability to Analyze and take decisions from GAD
- (vi) Ability to identify the right materials for installation
- (vii) Care for tools and equipments
- (viii) First Aid proficiency
- (ix) Ability to co-ordinate work from other agencies to ensure smooth progress of work at site
- (x) Mechanical Proficiency
- (xi) Punctuality, discipline and honesty
- (xii) Respect for rules and regulations
- (xiii) Quality Consciousness
- (xiv) Positive Attitude and Behavior
- (xv) Responsibility & Accountability
- (xvi) Technical proficiency in installation of elevators
- (xvii) Enhancing the Ride Comfort
- (xviii) Troubleshooting Issues with ease
- (xix) Site Management
- (xx) Leadership
- (xxi) Motivating the work force and ensuring maximum productivity
- (xxii) Identifying and developing the skills of the work force under him.

### **7. Duration of the Programmes:**

Time taken to gain the qualification will vary according to the pathway taken and will be kept very flexible for persons with different backgrounds and experience. Duration has been prescribed in hours in the curriculum of individual module, which are based on the content and requirements of a MES Module. However, some persons may take more time than the prescribed time. They should be provided reasonable time to complete the course.

### **8. Pathways to acquire Qualification:**

**Access to** the qualification could be through:

An approved training Programme.

### **9. Methodology**

The training methods to be used should be appropriate to the development of competencies. The focus of the programme is on “performing” and not on “Knowing”. Lecturing will be restricted to the minimum necessary and emphasis to be given for learning through practical on-site training for the installation of elevators & escalators.

The training methods will be individual centered to make each person a competent one. Opportunities for individual work will be provided. The learning process will be continuously monitored and feedback will be provided on individual basis. Demonstrations using different models, audio visual aids and equipment will be used intensively.

#### **10. Instructional Media Packages**

In order to maintain quality of training uniformly all over the country, instructional media packages (Imps) will be developed by the National Instructional Media Institute (NIMI), Chennai

#### **11. Assessment:**

DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programme. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view, the target of providing training/testing of one million persons throughout the country and to avoid monopoly, more than one assessing bodies will be appointed for a sector or an area.

#### **12. Certificate:**

Successful persons will be awarded competency-based certificates issued by **National Council for Vocational Training (NCVT)**.

## **Course Matrix :**

### **1. Construction Equipment Sector :**

Module-1

Maintenance Mechanic Mining & Road Equipment
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**MODULE – 1**

**Name : Maintenance Mechanic Mining & Road Equipment**

**Sector : Construction Equipment Sector**

**Code : CEQ 101**

**Entry Qualification : 10<sup>th</sup> Pass**

**Age : Minimum 16 years**

**Terminal Competency : On successful completion of training one should be able to carry out Maintenance & repair of mining machineries and road constructions equipments.**

**Duration : 500 Hrs.**

<b>Sr. No.</b>	<b>PRACTICAL</b>	<b>THEORY</b>
1.		<b>INDUCTION &amp; SAFETY TRAINING</b> <ul style="list-style-type: none"><li>• Description of safety equipment, their use, safety rules to be observed in an Auto-mobile repair shop. Accident their causes. Up keep of fire extinguishers. Familiarization of the tools and machinery available in the shop and machinery available in the shop there use and keep. Importance of cleanliness of work spot, tools jacks. Trays and horses etc.</li><li>• Importance of safety &amp; general precautions to be observed in the shop. Fire extinguisher used for different types of fires. Storing and handling of inflammable materials. Elementary First Aid.</li></ul>
2.	<b>STUDY OF TOOLS, MEASURING INSTRUMENTS &amp; HARDWARE</b> <ul style="list-style-type: none"><li>• Learn to use Scale, Vernier caliper, Micrometer, Bore Gauge, Pr. Gauge, Torque Wrenches etc.</li></ul>	<b>STUDY OF TOOLS, MEASURING INSTRUMENTS &amp; HARDWARE</b> <ul style="list-style-type: none"><li>• Ability to identify &amp; use the right kind of Tools, Measuring Instrument &amp; Measuring.</li><li>• Purpose, Types, Correct use &amp; application of various Fasteners, Tools &amp; Special Tools, Measuring Instruments (Electrical &amp; Mechanical), Seal, Seal kits, O-</li></ul>

		<p>Ring, Lubricants, Fuels, Coolants &amp; Sealants, Gear, Gear Boxes, Bearings, Springs, V-Belts, Hoses.</p> <ul style="list-style-type: none"> <li>• Study of measuring units.</li> </ul>
3	<p><b><u>BASIC HYDRAULICS</u></b></p> <ul style="list-style-type: none"> <li>• Demonstration on basic hydraulic system and relate them to the machine Measure flow and pressure in different circuits. Procedure for troubles shoot in hydraulic systems, and different applications.</li> <li>• Identification of Different types of Hydraulic Components &amp; Circuits, Closed and Open Principles of pumps, Motors, Control Valves, Cylinders in Hydraulic System, Actuators, Pressure / Flow Valves, Scheduled and Preventive Maintenance practices in Hydraulic Systems, reading &amp; understanding of Hydraulic Circuit diagrams, Symbols and application to equipment.</li> </ul>	<p><b>Basic hydraulics</b></p> <ul style="list-style-type: none"> <li>• Basic Hydraulics</li> <li>• Different Components/ Parts and their applications with specific reference.</li> <li>• Reading Hydraulic Circuit Diagrams and relating them to the Machine</li> <li>• Load Sensing and Negative Control Systems.</li> <li>• Different Hydraulic Pumps and their repairs.</li> <li>• Difference Between closed loop and open loop Hydraulic Systems.</li> <li>• Troubleshooting procedure and tips.</li> <li>• Use of special tools – Flow Meter.</li> </ul>
4	<p><b><u>BASIC ELECTRICALS</u></b></p> <ul style="list-style-type: none"> <li>• Understand the meaning of current, voltage, resistance, electric power and be able to measure those using multimeter and special tools available.</li> <li>• Understand the significance of electric symbols with the aid of the symbol compendium and Service Manual and translate that to components on the machine.</li> <li>• Work with VCADS Pro and service display.</li> <li>• Use Matrixs reading in a more discerning manner.</li> </ul>	<p><b><u>BASIC ELECTRICALS</u></b></p> <ul style="list-style-type: none"> <li>• Basic electrical and how to read circuit diagrams from the Service manuals</li> <li>• Basic knowledge on different electrical sensors.</li> <li>• Usage of different electrical troubleshooting and repair tools.</li> <li>• VCADS Pro and service display.</li> <li>• Maris and its interpretation</li> <li>• Information on wire harness and data busses.</li> <li>• Identification of different types of Electrical components &amp; Circuit, Operating Principles of Relays, Fuses, Wires, Solenoids, Battery, alternators, starters, switches etc. Systems, Symbols, Schematic drawing use of measuring instrument.</li> </ul>
5	<b><u>BASIC ENGINE</u></b>	<b><u>BASIC ENGINE</u></b>

	<ul style="list-style-type: none"> <li>Understand the fundamental differences between electronically controlled engines used on construction equipments.</li> <li>Repair and troubleshoot engines using Service manual.</li> <li>Know the correct usage of the special tools.</li> </ul>	<ul style="list-style-type: none"> <li>Basic Diesel Engine Theory</li> <li>Differences between conventional engines and electronic Injection Diesel Engines.</li> <li>Exposures to D5, D6, D7D, D9A and D12 type of Engines.</li> <li>Advance Combustion Technology – VACT</li> <li>Troubleshooting of these engines.</li> <li>Basic and operating principles, Engine parts, various systems, Advanced fuel Injection Technology and their effectiveness for fuel Consumption.</li> <li>Description of Internal and External Combustion Engine, Different types of I.C Engine, Important working parts, Electronically Manage Engine, Identification &amp; use of different types of Components.</li> </ul>
6	Demonstration on Torque converter & Control Valve in Hydraulic Transmission, functions of Differentials, and Differential Lock in Power Train.	<p><b><u>TRANSMISSION</u></b></p> <ul style="list-style-type: none"> <li>Basic and Operating Principles, Identification &amp; function of different types of Hydraulic Transmission in the Construction Equipment Industry.</li> <li>Basic and operating principles of different types of engines, hydraulic pumps and hydraulic aggregates used in mining industry.</li> </ul>
7	<p><b><u>ENGINE</u></b></p> <ul style="list-style-type: none"> <li>The correct Procedures and Selection of Proper Tools/Special Tools for Dismantling, Inspection, assembling, Replacing Seals, Seal kits and O rings.</li> <li>Dismantling and Assembling of Electronically control Engine, Identification of Parts, and Checking of Components as per Specification.</li> </ul>	
8	<p><b><u>TRANSMISSION</u></b></p> <ul style="list-style-type: none"> <li>Dismantling and Assembling of Hydraulic Pump, Identification of Parts, Checking of Components as per Specification.</li> </ul>	
9	<p><b><u>HYDRAULIC PUMP</u></b></p> <ul style="list-style-type: none"> <li>Dismantling and Assembling of Hydraulic Pump, Identification of Parts, Checking of Components</li> </ul>	

	as per Specification.	
10	<p><b><u>HYDRAULIC AGGREGATES</u></b></p> <ul style="list-style-type: none"> <li>• Dismantling and Assembling of Motors, Gear Box, &amp; Cylinders, Identification of Parts, Checking of Components as per Specification.</li> </ul>	
11	<p><b><u>ON SITE TRAINING</u></b></p> <ul style="list-style-type: none"> <li>• Safety at Site / Working on Machines.</li> <li>• Candidate will be able to carry out Periodic Maintenance, Trouble Shooting in Electrical and Hydraulic System; will be assisting Experienced Technicians in Major Overhauls of Components.</li> <li>• M/c Inspection, Commissioning, Mandatory Services (100/500/1000/2000 Hrs)</li> <li>• Replacement of Mechanical, Hydraulic Electrical Components/ Parts</li> <li>• M/c Performance analysis, productivity Calculation.</li> <li>• Using of electrical measuring instruments, faultfinding and rectification.</li> <li>• Electronic Data Download and analysis.</li> <li>• Report Making</li> <li>• Communicating with customers, Operators, and representatives.</li> <li>• Information and Gathering</li> <li>• Understanding and Reading Manuals. ( Electronics &amp; Text)</li> <li>• Using of Advances Electronic Diagnostic Tools.</li> <li>• Identifying Error Codes on Equipments.</li> </ul>	
12	<p><b><u>EXCAVATOR TRAINING STEP – 1</u></b></p> <ul style="list-style-type: none"> <li>• Detailed knowledge of the excavator’s design, systems and function.</li> <li>• Describe the make-up of the</li> </ul>	<p><b><u>EXCAVATOR TRAINING STEP – 1</u></b></p> <ul style="list-style-type: none"> <li>• This training include operation and maintenance of the machine, and the design of their Hydraulic and electrical systems. Description of</li> </ul>

	<p>electronic systems.</p> <ul style="list-style-type: none"> <li>• Perform all available test and calibration as well program control units.</li> <li>• Use the special tools like VCADS pro when applying repair and troubleshooting strategies from Service literature.</li> </ul>	<p>electronic control systems and software functions, reading of diagram. Also, Practical training in adjusting pressure and troubleshooting in the electrical systems. Description and function of optional equipment.</p>
13	<ul style="list-style-type: none"> <li>• Practical training in adjusting pressure and trouble shooting of electrical and vibration system. Use of special features on compactors and their application in Soil and Asphalt.</li> <li>• Perform all available tests and calibration as well as program EVM unit.</li> </ul>	<p><b><u>ROAD MACHINERY</u></b></p> <ul style="list-style-type: none"> <li>• Operation and maintenance of the machine. The concept of vibration system and design. Description of Electronic vibration control unit features and functions. Electrical and hydraulic system. Reading of schematic diagram and electronic displacement.</li> </ul>
14	<ul style="list-style-type: none"> <li>• Trouble shooting with simulation of problems on the machine related to hydraulic and electrical system.</li> <li>• Follow –up classroom review session for detailed understanding on “What how and Why” Concept.</li> </ul>	<p><b><u>COMPACTOR STEP 1 TRAINING</u></b></p> <ul style="list-style-type: none"> <li>• Diagnose and rectify faults in logical manner using circuits to minimize down time.</li> <li>• Enhance technical skill and problem solving competence level.</li> <li>• Intimate knowledge on hydraulic, Electrical and Mechanical Systems.</li> </ul>

**List of Tools :-**

<b>TOOLS LIST</b>			
Sr. No.	Name	Specification	Qty
1.	Open Spanner	5mm to 46 mm Full Set	2 Nos.
2.	Ring Spanner	5mm to 46 mm Full Set	2 Nos.
3.	Combination Spanner	5mm to 46 mm Full Set	2 Nos.
4.	Allen Key	.5mm to 22 mm Full Set	2 Nos.

5.	Toxy Allen Key	.5mm to 22 mm Full Set	2 Nos.
6.	Socket box	3/8" drive	2 Nos.
7.	Socket box	1/2" drive	2 Nos.
8.	Toxy Allen Key	3/8" drive	2 Nos.
9.	Toxy Allen Key	1/2" drive	2 Nos.
10.	Torque Wrench	14NM To 68 NM	2 Nos.
11.	Torque Wrench	72 NM To 340 NM	2 Nos.
12.	Inner Plier	Different Size	2 Nos.
13.	Outer Plier	Different Size	2 Nos.
14.	Nose Plier	Different Size	2 Nos.
15.	Monkey Plier	Different Size	2 Nos.
16.	Grip Plier	Different Size	2 Nos.
17.	Adjustable Plier	Different Size	2 Nos.
18.	Circlip outer Plier	Different Size	2 Nos.
19.	Circlip inner Plier	Different Size	2 Nos.
20.	Hammer	Different Size	2 Nos.
21.	Chisal	Different Size	2 Nos.
22.	Pipe Wrench	Different Size	2 Nos.
23.	Screw Driver Plus	Different Size	2 Nos.
24.	Screw Driver Minus	Different Size	2 Nos.
25.	Puller	Different Size	2 Nos.
<b>MEASURING TOOLS</b>			
1.	Micro Meter	0mm to 25 mm	2 Nos.
2.	Micro Meter	25mm to 50 mm	2 Nos.
3.	Micro Meter	75mm to 100mm	2 Nos.
4.	Vernier Caliper	0mm to 150mm	2 Nos.
5.	Vernier Caliper	0mm to 300mm	2 Nos.
6.	Bore Gauge		2 Nos.
7.	Magnetic Stand		2 Nos.
8.	Dial Gauge		2 Nos.
9.	Filler Gauge		2 Nos.
10.	Protector Gauge		2 Nos.
11.	Digital Milimeter		2 Nos.
<b>Special Tools</b>			
1.	Ring Compressor	D6D	2 Nos.
2.	Ring Compressor	D7D	2 Nos.
3.	Pressure Gauge	0 bar to 60 bar	2 Nos.
4.	Pressure Gauge	0 bar to 600 bar	2 Nos.

### **List of the Equipments**

Sr. No.	Name	Remarks
1.	Excavator	*

2.	Wheel Loader	*
3.	Articulated Hauler	*
4.	Compactor	*
5.	Paver	*

**\*Practical may be conducted in the industry.**

List of the members attended the Trade Committee meeting for designing the course curriculum under **Skill Development Initiative Skills (SDIS)** based on **Modular Employable Skills (MES)** on “**Construction Equipment Sector**” held at KITCO LTD,Kochi on 07<sup>th</sup> August’ 2013.

Sl. No.	Name & Designation S/Shri	Representing Organisation	E-Mail/Fax No/Phone
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11.	Aby Joseph	JCB India Ltd.,Seaport Airport Road Kochi-21	9995445253
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13.	Rajesh , Deputy Manager	TV S india Ltd. N.H. Road Kochi	9446575149
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15.	Mr. Ramani	L&T Channai	

**COURSE MATRIX**

<b>Level-I</b>	<b>Code No.</b>	<b>Module</b>	<b>Remarks</b>
		Maintenance and repair of Backhoe Loader Front end Loader/ Wheel Loader	
		Wheel Tractor Backhoe Loader Machine Operator	
		Excavator operator	

## SYLLABUS

Name of course : Maintenance and repairs of Backhoe Loader & front end loader/wheel

Sector : Construction Equipment

Code : CEQ 102

Entry Qualification : Minimum 10<sup>th</sup> Std + LMV license

Age : 18 years

Terminal competency : On successful completion of training one should be able to carry out operation of Wheel Tractor Backhoe Loader Machine.

Duration : 250 hrs

Space required : 500 sq.Mtr.. open space

Qualification of Trainer : Diploma in Mechanical/ Automobile Engineering or ITI Auto Mobile with minimum of three years experience in operation of Wheel Tractor Backhoe loader Machine

The candidate is expected to possess theoretical and practical knowledge on the following topics

Sl No.	PRACTICAL COMPETENCIES	UNDERPINNING KNOWLEDGE (THEORY)
1	<p>SAFETY PRACTICES -</p> <ul style="list-style-type: none"> <li>• Recognized safety information</li> <li>• Understand safety equipments, signal words safety rules in the workshop / site.</li> <li>• Familiarization of the tools</li> </ul>	<p>SAFETY PRACTICES - AND SAFETY TRAINING</p> <ul style="list-style-type: none"> <li>• Description of safety equipment, their use safety rules to be observed in the workshop / site</li> <li>• Recognized safety information.</li> <li>• Understand safety equipments, signal words safety rules in the workshop</li> </ul>

	<p>and machinery in the workshop / site.</p> <ul style="list-style-type: none"> <li>• Important of safety and general precautions to be observed in the shop.</li> <li>• Prepare for emergencies.</li> </ul>	<p>site.</p> <ul style="list-style-type: none"> <li>• Familiarization of the tools and machinery in the workshop / site.</li> <li>• Important of safety and general precautions to be observed in the shop.</li> </ul>
2	<p>FAMILIARIZATION OF WORKSHOP MANUALS MEASURING TOOLS AND INSTRUMENTS.</p> <ul style="list-style-type: none"> <li>• Measuring, disassembling, machining, installing new or service parts assembling and adjusting.</li> <li>• Measurements - wire gauges, micro meters, vernier caliper, dial indicators, pressure gauges, flow tester, torque wrenches, hand and power tools.</li> </ul>	<p>FAMILIARIZATION OF WORKSHOP MANUALS MEASURING TOOLS AND INSTRUMENTS.</p> <ul style="list-style-type: none"> <li>• Ability to identify and use the right kind of tools, measuring instruments.</li> <li>• Study the measurements - wire gauges, micro meters, vernier caliper, dial indicators, pressure gauges, flow tester, torque wrenches, hand and power tools</li> </ul>
3	<p>ENGINE</p> <ul style="list-style-type: none"> <li>• Engine components identifications.</li> <li>• Dismantling and assembling procedure of engine components with proper tools.</li> <li>• Dismantling and assembling fuel</li> </ul>	<p>ENGINE</p> <ul style="list-style-type: none"> <li>• Diesel engine working</li> <li>• Basic engine principal - engine components.</li> <li>• Various engine systems – fuel, lubrication, cooling, starting and charging systems.</li> <li>• Engine parts - Dismantling and assembling procedure with proper tools.</li> <li>• Trouble shooting of engine.</li> </ul>

	system, cooling systems, lubrication systems	<ul style="list-style-type: none"> <li>• Electronically manage engine</li> </ul>
4	<p><b>BASIC ELECTRICALS</b></p> <ul style="list-style-type: none"> <li>• Understand the meaning of current, voltage and be able to measure those using multi meter and special tools.</li> <li>• Understand engine starting and charging system.</li> <li>• Basic knowledge on different electrical sensors.</li> <li>• Basic mechatronic and microprocessor controls</li> <li>• Charging of lead acid battery.</li> </ul>	<p><b>BASIC ELECTRICALS</b></p> <ul style="list-style-type: none"> <li>• Basic electrical and how to read electric diagrams / symbols</li> <li>• Study of different electrical repair tools</li> <li>• Identification of different type of electrical components and circuit, relays, fuses, wires, solenoids, switches etc.,</li> <li>• Study of lead acid battery</li> </ul>
5	<p><b>BASIC HYDRAULIC SYSTEMS</b></p> <ul style="list-style-type: none"> <li>• Inspections and maintenance of hydraulic systems – change hydraulic oil filter, clean suction filter identification of hydraulic hoses and pipe fittings.</li> <li>• Dismantling and assembling of hydraulic pump, valve banks, and cylinders with proper tools.</li> <li>• Maintenance of Steering</li> </ul>	<p><b>BASIC HYDRAULIC SYSTEMS</b></p> <ul style="list-style-type: none"> <li>• Study of basic hydraulics</li> <li>• Different components / parts and their application with specific reference.</li> <li>• Reading hydraulic circuit diagrams and relating them to the machine.</li> <li>• Dismantling and assembling hydraulic pump, valve banks, cylinders.</li> <li>• Different types of hydraulic pumps</li> <li>• Pumps and control valve</li> <li>• Inspection and maintenance of hydraulic systems.</li> <li>• Study hydraulic oil filters, hoses and pipes replacing procedure.</li> </ul>

	<p>system</p> <ul style="list-style-type: none"> <li>• Check and understand hydraulic system pressure, oil flow rate.</li> <li>• Scheduled and preventive maintenance of hydraulic systems.</li> </ul>	<ul style="list-style-type: none"> <li>• Trouble shooting and purpose of special tools in the hydraulic systems.</li> </ul>
6	<p>TRANSMISSION, AXLE AND BRAKE</p> <ul style="list-style-type: none"> <li>• Dismantling and assembling transmission unit – check the torque convertor, transmission pump.</li> <li>• Repair electrical controlled FNR unit.</li> <li>• Change transmission Oil and filter.</li> <li>• Dismantling and assembling rear axle unit check differential unit. reduction gears and axle shaft.</li> <li>• Understand brake systems check the factions of brake plates.</li> <li>• oscillating front axle, knuckle pin&amp; bush changing, wheel hub bearing and grease changing</li> </ul>	<p>TRANSMISSION, AXLE AND BRAKE</p> <ul style="list-style-type: none"> <li>• Basic and operating principals of transmission unit.</li> <li>• Transmission unit – check the torque convertor, transmission pump.</li> <li>• Repair electrical controlled FNR unit.</li> <li>• Change transmission Oil and filter.</li> <li>• Study the Dismantling and assembling rear axle unit check differential, reduction gears and axle shaft.</li> <li>• Understand brake systems check the factions of brake plates.</li> </ul>
7	<p>STRUCTURE</p> <ul style="list-style-type: none"> <li>• The correct procedures and selection of proper tools / equipments for dismantling</li> </ul>	<p>STRUCTURE</p> <ul style="list-style-type: none"> <li>• The study the correct procedures and selection of proper tools / equipments for dismantling and assembling, inspection,</li> </ul>

	<p>and assembling, inspection, fabricate, replacing structures.</p> <ul style="list-style-type: none"> <li>• The correct procedure of pin and bushes replacing with proper tools.</li> <li>• Know the correct tools and equipments for dismantling and assembling with proper safety procedure.</li> </ul> <p>CABIN, falling object protection system, roll over protection system. bucket types, loader bucket parallelogram link geometry, centre tilt link. structural welding, hard facing process</p>	<p>fabricate, replacing structures.</p> <ul style="list-style-type: none"> <li>• Learn correct procedure of pin and bushes replacing with proper tools.</li> <li>• Know the correct tools and equipments for dismantling and assembling with proper safety procedure.</li> </ul>
8	<p><b>ONSITE TRAINING</b></p> <ul style="list-style-type: none"> <li>• Prepare machine for inspection / maintenance.</li> <li>• Safety at site / working on machines.</li> <li>• Candidate will be able to carry out daily or periodic maintenance and new machine commissioning.</li> <li>• Replacement of machine components.</li> <li>• Report making</li> <li>• Communication with customers, operators and company representatives.</li> <li>• Understanding and reading manuals (Electronic and</li> </ul>	<p><b>ONSITE TRAINING</b></p> <ul style="list-style-type: none"> <li>• Study the preparation of machine for inspection / maintenance.</li> <li>• Safety at site / working on machines.</li> <li>• Candidate will be able to carry out daily or periodic maintenance and new machine commissioning.</li> <li>• Procedure for replacement of machine components.</li> <li>• Study of report making</li> <li>• Communication with customers, operators and company representatives.</li> <li>• Understanding and reading manuals (Electronic and Text Book)</li> </ul> <p><b>BACKHOE LOADER TRAINING</b></p> <ul style="list-style-type: none"> <li>• Detailed study of knowledge of the</li> </ul>

	<p>Text Book)</p> <p><b>BACKHOE LOADER TRAINING</b></p> <ul style="list-style-type: none"> <li>Detailed knowledge of the excavators design, systems and function.</li> </ul> <p>Follow up class room review session for detailed understanding on what how and why concept.</p>	<p>excavators design, systems and function.</p> <ul style="list-style-type: none"> <li>Follow up class room review session for detailed understanding on what how and why concept.</li> </ul> <p>Brief introduction of different Backhoe Loaders available in India</p>
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Equipments Required: Wheel Tractor Backhoe loader Machine

Note: Do the daily maintenance as per the manufacture's recommendation mentioned in the service Manuel

**Tool List:**

SI.No	ITEMES	SPECIFICATIONS	QTY
1	Double – ended set spanner	5 to 46 mm	1 No
2	Combination spanner	5 to 46 mm	1 No
3	Rings spanner	5 to 46 mm	1 No
4	Hammer sledge / ball peen hammer	1 / 10 kg	1 No
5	Pair of pliers (combination type)		1 Set
6	Cir clip pliers		1 Set
7	One adjustable wrench		
8	Socket set with ratchet type handle	5 to 46 mm	1 No
9	Hacksaw		
10	Screwdriver		1 Set
11	Allen key	5 to 22 mm	1 Set
12	Torque wrenches		1 No
13	Pressure gage and oil flow tester		1 No
14.	Portable grease gun		1 No

## SYLLABUS

Name of course	:	Wheel Tractor Backhoe Loader Machine Operator
Sector	:	Construction Equipment
Code	:	CEQ 103
Entry Qualification	:	Minimum 10 <sup>th</sup> Std + LMV license
Age	:	18 years
Terminal competency	:	On success full completion of training one should be able to carry out operation of Wheel Tractor Backhoe Loader Machine.
Duration	:	250 hrs
Space required	:	500 sq.Mtr. open space
Qualification of Trainer	:	Diploma in Mechanical/ Automobile Engineering or ITI Auto Mobile with minimum of three years experience in operation of Wheel Tractor Backhoe loader Machine

The candidate is expected to possess theoretical and practical knowledge on the following topics

PRACTICALCOMPETENCIES	UNDERPINNING KNOWLEDGE(THEORY)
<ul style="list-style-type: none"> <li>• Practice health, safety and safety signs</li> <li>• Identify different controls, switches, gauges, warning lamps in the Equipments/ cabin</li> <li>• Familiarise components as operators Manuel</li> <li>• Checking pre start inspections of the equipments</li> <li>• Checking lubrications charts of the equipments</li> <li>• Identify different components of the equipment</li> <li>• Identify operating controls and other components in the operator cabin</li> <li>• Practice different types if working of Backhoe Loader</li> <li>• Driving precautions of the backhoe loader- public roads/ work sites</li> <li>• Precautions for traveling on slopes/gradients</li> <li>• Practice loader bucket operation – loading , leveling, dozing and leading</li> <li>• Practice stabilizers / butterfly stabilizers operations</li> <li>• Practice Backhoe(Excavator) operation – excavation above and below ground level, loading, digging, backfilling</li> <li>• Practice side shifting mechanism</li> </ul>	<ul style="list-style-type: none"> <li>• General health and safety aspects to be observed in the equipment, work site, care and maintenance of equipment as per manual</li> <li>• Familiarization of operator Manuel</li> <li>• Introduction of construction equipments</li> <li>• Knowledge on types of constrictions projects</li> <li>• Driving rules on public roads</li> <li>• Study the use of Backhoe Loader</li> <li>• Study the pre start inspections- engine and machine</li> <li>• Lubrication system – lubrication chart, oils and grease</li> <li>• Working principle of hydraulic system including hydrostatic drive</li> <li>• Working principle of FNR lever, Gear Shifting mechanism</li> <li>• Working of Loader and Backhoe</li> <li>• Study of major components – its use and working</li> <li>• Machine operation controls – its working and use</li> <li>• Study of service refill capacities – of oils, cooling liquids and grease</li> <li>• Description of bucket capacity and equipment dimensions</li> </ul>

<ul style="list-style-type: none"> <li>• Identify different optional attachments – bucket replacing, removing / fixing other attachments</li> <li>• Transporting the machine - trailer or truck loading &amp; unloading</li> <li>• Practice rectification of minor trouble shooting and breakdowns</li> <li>• Practice parking and storing the machine</li> <li>• Tyre pressure and condition of tyre</li> </ul>	<ul style="list-style-type: none"> <li>• Brief description of brake, steering and transmission systems, axles &amp; tires</li> <li>• Study of different attachments and their working and use</li> <li>• Transporting and parking the equipment</li> <li>• Log book writing</li> <li>• Instrument panel reading</li> <li>• Do's and Don'ts</li> <li>• Study operational parameters as per Manual</li> </ul>
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Equipments Required: Wheel Tractor Backhoe loader Machine

*Note: Do the daily maintenance as per the manufacture's recommendation mentioned in the service Manuel*

## SYLLABUS

Name of course	:	Excavator Operator
Sector	:	Construction Equipment
Code	:	CEQ 104
Entry Qualification	:	Minimum 10 <sup>th</sup> Std passed with LMV license
Age	:	18 years
Terminal competency	:	On Successful completion of training one should be able to carry out Operation of Excavator.
Duration	:	200 Hrs
Space required	:	500 sq Mtr open space
Qualification of Trainer	:	Diploma in Mechanical Engineering with three years experience in operation Excavator operation or ITI Auto Mobile / Diesel Mechanic with minimum of five years experience in operation of Excavator The candidate is expected to possess theoretical and practical knowledge on the following topics

PRACTICALCOMPETENCIES	UNDERPINNING KNOWLEDGE(THEORY)
<ul style="list-style-type: none"> <li>• Practice health and safety- familiarize safety information, signal words, equipments, alert on work site and clothing safety</li> <li>• Familiarization of operator manual</li> <li>• Identity different components in the operator cabin</li> <li>• Practice pre start inspections of the equipment</li> <li>• Checking lubrications charts of the equipment</li> <li>• Practice pre operation checking</li> <li>• Driving the machine – precautions for traveling</li> <li>• Driving in water or on soft ground</li> <li>• Precautions for traveling on slopes</li> <li>• Excavator operations – precautions for operate bucket, blade and swing movements</li> <li>• Practice excavation, digging, trenching, loading,, leveling and backfilling.</li> <li>• Practice avoid colliding boom cylinder with track</li> <li>• Identify optional attachments – bucket replacing / removing and fixing other attachments and operating</li> <li>• Transporting the machine – trailer or truck and loading &amp; unloading</li> <li>• Practice trouble shooting the machine</li> </ul>	<ul style="list-style-type: none"> <li>• Safety precautions on work site, safety information, care and maintenance of the machine</li> <li>• Study of signs and symbols used in the equipment safe operations</li> <li>• Description of operator manual</li> <li>• Study of controls and components name in the operator cabin</li> <li>• Study the use of tracked excavator</li> <li>• Study the pre start inspections- engine and machine</li> <li>• Lubrication system – lubrication chart, oils and grease</li> <li>• Working principle of hydraulic system</li> <li>• Study of major components – its use and working</li> <li>• Study of service refill capacities – of oils, cooling liquids and grease</li> <li>• Description operating weight, bucket capacity and equipment dimensions</li> <li>• Tips of fuel saving techniques</li> <li>• Study of under carriage – track tension, traveling mechanism</li> <li>• Brief introduction of pivot and spin turning</li> <li>• Precautions for excavator travelling on slopes or gradients</li> </ul>

<ul style="list-style-type: none"><li>• Practice parking and storing the machine</li><li>• Tyre pressures and condition of tyre</li></ul>	<ul style="list-style-type: none"><li>• Use of rubber crawler</li><li>• Study of different attachments and their working and usage</li><li>• Transporting by road – trailer or truck loading &amp; unloading</li><li>• Parking and storing the excavator</li><li>• Log book writing</li><li>• Instrument panel reading</li><li>• Study operational parameters as per the manual</li></ul>
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Equipments required: Tracked Excavator or Hydraulic Excavator

*Note: Do the daily maintenance as per the manufacture's recommendation mentioned in the service Manuel*