

**SYLLABUS FOR THE TRADE**  
of  
**STONE MINING MACHINE OPERATOR**  
(SEMESTER PATTERN)

Under  
Craftsman Training Scheme (CTS)

Designed in: 2013

By  
Government of India  
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE  
Directorate General of Employment & Training  
Ministry of Labour & Employment  
EN-Block, Sector-V, Salt Lake  
Kolkata-700 091

List of members of Trade Committee meeting for the trade of “**STONE MINING MACHINE OPERATOR**” held on 11<sup>th</sup> September 2012 at Udaipur and on 12<sup>th</sup> September 2012 at Centre for Development of Stones (CDOS), Jaipur.

Sl. No.	NAME & DESIGNATION S/Shri./Smt.	REPRESENTING ORGANISATION	REMARKS
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata	Chairman
2.	L.K. Mukherjee, Dy. Director of Trg.	CSTARI, Kolkata	Member
3.	Mohan Bohar, Chief Editor	DGPIT Publications, Udaipur	Member
4.	R.K. Bapna, Mining Engineer	Mining Consultant, Udaipur	Member
5.	Dr. Anupam Bhatnagar, Head	CTAE, Udaipur	Member
6.	Dr. Manoj Khandelwal, Asst. Prof.	CTAE, Udaipur	Member
7.	Murlidhar Shan, Executer	Ganpati Tiles (P) Ltd. Udaipur	Member
8.	Ramesh Jain, Partner	Alankar Mining, Udaipur	Member
9.	Pravin Kothari, Director	Karnavati Stones Pvt. Ltd. Udaipur	Member
10.	Saty Maray Choudhry	Arti Marbel, Udaipur	Member
11.	Narendra Bagrecha, Director	Dhanlaxmi Marwra & Tiles Pvt. Ltd.	Member
12.	Narayan Das, Exe. Manager	UMP Samith, Udaipur	Member
13.	Dr.S.C. jain, Asstt. Prof.	CTAE, Udaipur	Member
14.	Kapil Surana, Manager	Amit Munca Pvt. Ltd.	Member
15.	Hitesh Patel, Director	Shri Banarasi Marble Stone P. Ltd.	Member
16.	Dr. Anil Kumar Kataria, Director	Manohar Marble & Minerals	Member
17.	Vijay Godha, Gen Sec.	Udaipur Marble Processer Samithe	Member
18.	R.K. Gupta, CEO	CDOS, Jaipur	Member
19.	P.K. Rajgariha, President	Udaipur Marble Prosaswas Samiti.	Member
20.	Sharat Kataria, Director	Deejay Neetan Marble Ind. Ltd.	Member
21.	Nakeshatra Talesara, Director	Millennium Diamond Tools Pvt. Ltd.	Member
22.	Prakash Pokhara, Manager	CDOS, Jaipur	Member
23.	Sanjay Purohit, Proprieter	Stone Paradise	Member
24.	Vikrant Rastogi, CEO	Stone Technology Centre, JAIPUR	Member
25.	Suresh Gehlot, Proprieter	Suresh Sandstones, Jodhpur	Member
26.	Sunil Joshi, Dy. Director	Regional off. of Tech. Education, Jaipur	Member
27.	Munish K. Sharma, ADT. (DTE)	Directorate of Tech. Education, Udaipur	Member
28.	Dinesh Saini, Manager(Prod. Centre)	Directorate of Tech. Education, Jaipur	Member
29.	R.K. Gupta	R.K. Marble, Jaipur	Member
30.	Guru Shastrimath, Chairman	Natural Stonage, Jaipur	Member
31.	Prakash Pokharana	CDOS, Jaipur	Member
32.	Anil Kumar Verma, Geologist	CDOS, Jaipur	Member

**List of members attended the Workshop to finalize the syllabi of existing CTS into Semester Pattern held from 6<sup>th</sup> to 10<sup>th</sup> May'2013 at CSTARI, Kolkata.**

Sl. No.	Name & Designation	Organisation	Remarks
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata-91	Chairman
2.	K. L. Kuli, Joint Director of Training	CSTARI, Kolkata-91	Member
3.	K. Srinivasa Rao, Joint Director of Training	CSTARI, Kolkata-91	Member
4.	L.K. Mukherjee, Deputy Director of Training	CSTARI, Kolkata-91	Member
5.	Ashoke Rarhi, Deputy Director of Training	ATI-EPI, Dehradun	Member
6.	N. Nath, Assistant Director of Training	CSTARI, Kolkata-91	Member
7.	S. Srinivasu, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
8.	Sharanappa, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
9.	Ramakrishne Gowda, Assistant Director of Training	FTI, Bangalore	Member
10.	Goutam Das Modak, Assistant Director of Trg./Principal	RVTI, Kolkata-91	Member
11.	Venketesh. Ch. , Principal	Govt. ITI, Dollygunj, Andaman & Nicobar Island	Member
12.	A.K. Ghate, Training Officer	ATI, Mumbai	Member
13.	V.B. Zumbre, Training Officer	ATI, Mumbai	Member
14.	P.M. Radhakrishna pillai, Training Officer	CTI, Chennai-32	Member
15.	A.Jayaraman, Training officer	CTI Chennai-32,	Member
16.	S. Bandyopadhyay, Training Officer	ATI, Kanpur	Member
17.	Suriya Kumari .K , Training Officer	RVTI, Kolkata-91	Member
18.	R.K. Bhattacharyya, Training Officer	RVTI, Trivandrum	Member
19.	Vijay Kumar, Training Officer	ATI, Ludhiana	Member
20.	Anil Kumar, Training Officer	ATI, Ludhiana	Member
21.	Sunil M.K. Training Officer	ATI, Kolkata	Member
22.	Devender, Training Officer	ATI, Kolkata	Member
23.	R. N. Manna, Training Officer	CSTARI, Kolkata-91	Member
24.	Mrs. S. Das, Training Officer	CSTARI, Kolkata-91	Member
25.	Jyoti Balwani, Training Officer	RVTI, Kolkata-91	Member
26.	Pragna H. Ravat, Training Officer	RVTI, Kolkata-91	Member
27.	Sarbojit Neogi, Vocational Instructor	RVTI, Kolkata-91	Member
28.	Nilotpal Saha, Vocational Instructor	I.T.I., Berhampore, Murshidabad, (W.B.)	Member
29.	Vijay Kumar, Data Entry Operator	RVTI, Kolkata-91	Member

## GENERAL INFORMATION

1. Name of the Trade : STONE MINING MACHINE OPERATOR
2. N.C.O. Code No. :
3. Duration of Craftsman Training : One Year (2 Semesters)
4. Power Norms : 10 Kw
5. Space Norms : 100 Sq. meter Covered and 250 sq. meter open space
6. Entry Qualification : Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
- 7 Unit Size( no. of student) : 20
8. Instructor's/ Trainer's Qualification (A) : BE/B-Tech in Civil/Mining/Electrical/ Mechanical/ Metallurgy Engineering with One year experience.  
OR  
Diploma in Civil/Mining/Electrical/ Mechanical/Metallurgy Engineering with two year experience  
OR  
NTC/NAC in trade with three years experience.  
OR  
A person having 8 years practical experience in the field of Stone Mining Machine Operator  
  
(B) Desirable qualification:  
: Preference will be given to a candidate with Craft Instructor's Certificate.

\* **Note:** At least one Instructor must have Degree/Diploma in Civil/Mining/Electrical/ Mechanical/ Metallurgy Engineering.

SYLLABUS FOR THE TRADE OF “STONE MINING MACHINE OPERATOR” UNDER C.T.S.  
DURATION – SIX MONTH

FIRST SEMESTER

CODE: SMO – Sem-I

Week No.	Trade Theory	Trade Practical	Engineering Drawing	Workshop Calculation & Science
1.	<p><b><u>Introduction</u></b> Brief introduction about the trade. Environmental aspect of stone industry. Impact of stone industry on environment. Environment and environmental pollutions. Personal safety and occupational health hazards.</p> <p>Importance of safety and general precaution observed in the institute.</p>	<p>Introduction of the trade in the development of Industrial economy of the country. Industrial discipline and working environment. Familiarization with shop layout. Introduction to safety - including fire equipments and their uses. Necessary guidance to be provided to the new corners to become familiar with the working of industrial training institute.</p>	<p>Use of drawing instrument, mini drafter, Tee square and drawing boards.</p>	<p>Importance of work shop calculation and science</p>
2-3	<p><b><u>Geology and exploration</u></b> Geology of dimensional stone resources in India: Explanation of the deposits of marble, granite, sandstone, flaggy limestone, slate etc. are occurring in various parts of India Geology and graphical distribution of different dimensional stones deposits in India viz. marble, granite, sandstone, limestone, slate etc. Characteristics of various stones Commercial verities of different stones Textures in different stones Physico mechanical properties of stones Chemical properties of various stones</p>	<p>Stone-An Introduction. Its types – natural stone, sandstone. Flaggy limestone, slate granite, marble etc. Dimensional and decorative stones. Commercial verities of different stones. Different types of textures in stones</p>	<p>Free hand sketching of straight line, rectangles, squares and triangles.</p>	<p>Common fraction, addition, subtraction, multiplication and division of common fraction.</p>
4-5	<p>Properties of stones. Stone testing procedure.</p>	<p>Methods of finding stone strength, chemical composition and physical characteristics.</p>	<p>Freehand sketching of parallelogram, rhombus, polygon, circles and ellipse.</p>	<p>Units and dimensions. Properties of materials. Common fraction to decimal and vice versa.</p>

**ALLIED TRADE FITTER**

6	Safety precautions and elementary first aid, common hand tools of fitter trade-their name description and material.	Tools: use of steel rule, square, scribe and dividers, centre punch, chisels, hammer, different files, bench vice and hand vice.	Lettering practice	Simple workshop problems involving addition, subtraction, multiplication and division of whole numbers.
7	Description of simple fitting operations, hacksawing, punching and filing. Types of files. Marking instruments and their uses. Use of vernier caliper, micrometer.	Saw, centre punch, filing to line. Filing a work-piece flat and training devices-fixing of mating nut. Locking pins. Hand tools: straight edge bloom bob, square etc.	Printing of letters and numbers.	Metric system, metric weight and measurement unit conversion. F.P.S. and C.G.S. system metric weight and measurement conversion factor, S.I.unit
8	Method of using drills taps and dies. Description of simple drilling machine-safety precautions-in handling grinding machines.	Funner – its use. Chipping, chisels, cold chisel, round nose threading and tapping, dieing, making external threads. To prepare edges of stone on grinding machine and check.	Free hand sketching with dimension to scale and proportionate sketching of hacksaw, centre punch, chisel, hammer, calipers, files, vices, taps and dies. Sketching of view of simple bodies.	Units of force, mass and weight. Solving of problems related to the trade.
9.	Types of hack saw frames and blades- their selections and uses-types of files and their uses. Care and maintenance of files. Types and sizes of drills-cutting angles and speeds of drills-calculation of tap drill sizes.	Sawing filing to given dimensions-filing true and square notice different types of file operations-marking and clear and blind holes. Opening of twist drills safety points to be observed while operating a drilling machine.	Drawing of circles rectangles squares parallelograms. Rhombus, polygons.	Newton Laws of motions. Problems on Newton laws of motion.
10.	Vernier caliper and Micrometer - uses, least count, vernier scale main scale and function of vernier caliper and micrometer.	Measuring internal and external dimensions by the use of vernier caliper and micrometer.	Free hand sketching of simple solids such as cubes, rectangular blocks, cylinders and the views of the objects viewed perpendicular to their surfaces or axes.	Law of friction, coefficient of friction simple related problems.

## ALLIED TRADE ELECTRICIAN

11.	Fundamental of electricity. Electron theory-free electron fundamental terms, definition, unit and effects of elastic units.	Practice in using cutting pliers, screw driver. Demonstration and practice bare conductor, joints such as Britannia, straight tee, western union joint.	Introduction to engineering drawings and Drawing of straight lines. Rectangles square and circles.	Areas of triangles rectangles, square, circle, regular polygons etc. and problem.
12.	Various safety measure involved in the industry. Elementary first aid.	Demonstration on elementary first aid, artificial respiration.	Properties of lines, angles, triangles, circles, drawing as language of communication different types of lines and symbols used in building drawing.	Electricity and its uses-positive and negative terminals. Use of switch, fuse, conductor and insulators.
13.	Explanation of electrical measuring instruments Ammeters, Voltmeter, Energy meter only explanation of work, power energy in DC circuit.	Study and use of Ammeters, Voltmeter, Energy meter etc.	Reading of plain scale, reading of tape and foot rule.	Calculation of volume and waste of simple solid bodies, cubes, solid and hollow cylinder and related problems.
14.	Identification of electrician hand tools.	Demonstration of electrician hand tools like screw-driver, pliers, tester and other hand tools.	Free hand sketching of pictorial view of an object.	Units of heat, problems of power and energy and units horsepower, watt, simple problem

## CHARACTERSTIC OF DIMENSIONAL STONE

15-17	Introduction to characterization of dimensional stone i.e. marble, granite, sand stone, kota stone (flaggy limestone), slate etc. for their correct use & marketability. Application of all dimension stone products and their parameter. Introduction to petrographic, physical and mechanical properties of stones, testing of stones etc.	Identifying of the mineral by petrographic examination. Physcio-Mechanical Test for selection of natural stone. Checking of compressive strength, impact strength, elastic constant, density/specific gravity.	Free hand sketching of pictorial view of an object.  Introduction of Isometric view of an object.	Heat and temperature different thermometric problem  Strength of materials and related problems. Stress, Strain Modulus of elasticity water absorption , density etc.
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**STONE MINING**

18	Introduction to mining machineries. Selection of mining machineries. The factors for selecting of mining machineries. Machineries used for various operation such as cutting, drilling, removing, sizing, transportation etc. Brief concept of mining and bench planning	Machineries and techniques used for various mining operations such as removal of over burden, drilling, hole alignment, blasting wire saw cutting, rock mass separation, block sizing, material handling, block excavation transportation etc. for different stones, Prevention operations and coolant uses.	Simple isometric scale drawing, isometric views of simple object such as quips, square and rectangular prism and pyramids. Code of practice general engineering drawings as published by I.S. to be understood following national building code.	L.C.M. & H.C.F., square root and cube root.
19	Drilling-Description, working principal, Construction & Major parts, alignment of holes etc. Safety & Precaution of drilling. Uses of drill the stone sector	Uses of Drilling Operating system Such as vertical, horizontal and their uses of different types of stone tool, Prevention operations and coolant uses.	Same as above	Algebra –algebraic symbols-addition, subtraction, multiplication and division .
20	Dragging winch: Description, working principal, Construction of Major Parts.	Demonstration and Practice on dragging winch, Use of dragging block of granite, marble and other natural stones.	Simple isometric scale drawing, isometric views of simple object such as quips, square and rectangular prism and pyramids.	Algebra –algebraic symbols-addition, subtraction, multiplication and division .
21	Compressor- Description & various types of compressor. such as pneumatic, hydraulic system & jack for stone	Various components of air compressor, Defects and brief demonstration of types of power generator.	Sketching of Air Compressor and power generator	Mechanical properties of metals
22-24	Different types of stone mining machinery uses : Construction & working principal of quarry front cuts-Chain saws, Diamond belt saw, Diamond wire saw, Jiri M/c (kotah stone),Flame jet burner, water jet technique.  Construction & working principal of drilling – Performatic drilling : Slot drill/quany master, drill for coplanar holes, Quarry bar m/c, Jack Hammer  Construction & working	Uses of stone mining machineries and their preventive operation, such as quarry front cuts-Chain saws, Diamond belt saw, Diamond wire saw, Jiri M/c (kotah stone),Flame jet burner, water jet technique,  Drilling – Performatic drilling : Slot drill/quany master, drill for coplanar holes, Quarry bar m/c, Jack Hammer  Separation of main block(overturning the	Sketching of stone mining tools .	Algebra –algebraic symbols-addition, subtraction, multiplication and division of expression involving algebraic symbols simple equation transposition problem.



	<p>principal of separation of main block(overturning the bench)- Hydraulic jack, splitting bag, Air bag, pneumatic(water) bag, Construction working principal of Hydraulic excavator.</p> <p>Construction &amp; working principal of sizing of block –diamond wire saw, jack hammer, Feather &amp;wedges, air pillows.</p> <p>Construction &amp; working principal of removal waste block-</p> <p>Construction &amp; working principal of Block handling machinery- Jib crane, Derrick crane, Mobile crane, Front &amp; Loader.</p> <p>Construction &amp; working principal of other service machinery- Power generator, Air compressor, hole finder(Cerca fori).</p>	<p>bench)- Hydraulic jack, Jack Hammer, splitting bag, Air bag, pneumatic(water) bag, Hydraulic excavators</p> <p>sizing of block –diamond wire saw, jack hammer, Feather &amp;wedges</p> <p>Removal waste block- Hydraulic excavators, Tippers, Front &amp; Loader</p> <p>Other service machinery- Power generator, Air compressor, hole finder(Cerca fori).</p>		
25	<b>Project Work / Industrial Visit (Optional)</b>			
26	<b>Examination</b>			

**SYLLABUS FOR THE TRADE OF  
“STONE MINING MACHINE OPERATOR” UNDER C.T.S.  
DURATION – SIX MONTH**

SECOND SEMESTER

**Code: SMO – Sem -II**

1-2	Study of stone mining, analysis of deposits, manual mining, sand stone mining, slate mining and granite mining, flaggy limestone mining etc/	Concept of bench planning and how to start mining operations , Drilling and channeling operation, separation of block application of blasting technique, diamond wire saw cutting technique.	Sketching of stone mining tools.	Algebra –algebraic symbols-addition, subtraction, multiplication and division of expression involving algebraic symbols simple equation transposition problem.
3-4	Types of manual and mechanized mining.	Application of wire saw, flame cutting, water channeling, marble mining.	Properties of lines and angles, triangles and circle	Standard algebraic formulae e.g. $(a + b)^2$ , $(a - b)^2$ , $a^2 - b^2$
5-8	Manual method of mining and various operations.	Removal of overburden, preparation of free faces, preparation of block and transportation of block and overburden.		Finding of decimal values, use of approximation, speed velocity, acceleration retardation equation of motion-related simple problem.
9-11	Mechanized method of marble mining and operations.	Application of diamond wire saw, chain saw and belt saw.	-Do-	Expansion of solid, liquid and gases and their related problems.
12-15	Description of various machinery used for separation of main block like hydraulic jacks, splitting bags-air bags. Hydraulic excavators.	Application of machinery used for separation of main block. Hydraulic jacks, splitting, bags-air bags. Hydraulic excavators.	-Do-	
16-17	Description of machinery used for removal of waste rock hydraulic excavator, front end loader.	Application of machinery used for removal of waste rock, hydraulic excavator front end loader.	Freehand isometric sketching of simple object with dimensions.	Measuring of Horse Power, simple problem on work, power and energy.
18-19	Description of block handling machinery-jib crane, derrick crane, mobile crane and front loaders.	Application of block handling machinery-jib crane, derrick crane, mobile crane and front loaders.	-Do-	Measuring of HP, BHP, FHP and applied shop problems.
20-21	Description of service machinery-power generator, air compressor.	Application of service machinery-power generator, air compressor.	Interpretation of building drawing, preparation of plan, elevation and section of a simple building	Knowledge of computer operating, components of computer, practice on computer.

22	Impact of stone industry on, environment and environmental pollution.	Study on air pollution control devices.	-Do-	Transmission of heat-conduction, convection and radiation. Different form of energy-thermal, electrical, mechanical.
23	Water pollution, quarry waste and its application environmental problem due to marble slurry.	Study on water pollution devices.	Sketching of views of simple bodies.	Practice on computer.
24	Mining health and safety measure.	Method of using mining safety devices in mines.	Revision	Practice on computer.
25	<b>REVISION</b>			
26	<b>EXAMINATION</b>			

# STONE MINING MACHINE OPERATOR

Tools & Equipments for 20 trainees + one

## A. Trainees Kit – ( As per the below table)

### **ALLIED TRADE : FITTER**

Sl. No.	DESCRIPTION (Hand Tools)	QUANTITY
1.	Steel Rule 300mm	21 No.
2.	Try Square 150mm	21 No
3.	Spring caliper, out side 150mm	21 No
4.	Spring caliper, in side 150mm	21 No
5.	Caliper, hermaphrodite 150mm	21 No
6.	Spring divider 150mm	21 No
7.	Scriber 150mm	21 No
8.	Centre punch 100mm	21 No
9.	Dot punch 100mm	21 No
10.	Chisel flat cold 20mm	21 No
11.	Chisel cross cut 20mm	21 No
12.	Hammer ball pein 500gram	21 No
13.	Hammer cross pein 250gm	21 No
14.	File flat Bastard 250mm	21 No
15.	File flat second cut 200mm	21 No
16.	File smooth 200mm	21 No
17.	Hacksaw frame adjustable 250-300 mm	21 No
18.	Scraper flat 150mm	21 No
19.	Scraper half round 150mm	21 No
20.	Scraper triangular 150mm	21 No

## B. General Machinery Shop Outfit ( as per the table)

Sl. No.	NAME & DESCRIPTION OF MACHINES	QUANTITY
1.	Bench vise 120 mm	10 No.
2.	Vernier micrometer out side 0 to 25 mm	2 No.
3.	Dial micrometer out side 50 to 75 mm	2 No.
4.	Vernier calipers 200mm	2 No.
5.	Vernier height gauge 300 mm	2 No.
6.	Inside micrometer 50 mm to 100	2 No.
7.	Depth micrometer 0 to 100 mm with extension	2 No.
8.	Taps and dies course series 6 to 25 mm	2 Set
9.	Surface plate 400 and 400 mm grade 2mm	2 No.
10.	Universal marking block	2 No.

### **ALLIED TRADE ELECTRICIAN**

Sl. No.	DESCRIPTION (Hand Tools)	QUANTITY
1.	Neon Tester 500 Volts	4 No.
2.	Test lamp 200 volt 25 watt	4 No.
3.	Hand techometer with male and female above rubber plug resin case	2 No.
4.	Moving iron and ammeter portrable type 0 to ampere	2 No.
5.	Multimeter (AVO)	2 No.
6.	Insulator screw driver 150mm, 200mm	20 No.
7.	Insulator combination cutting plier 200 mm side	4 No.
8.	Connector 100 mm	4 No.

### **STONE MINING**

Sl. No.	DESCRIPTION (Hand Tools)	QUANTITY
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1.	Drilling Machine 0 to 200mm Capacity Motorised with Chuck and key	1 Set
2.	Drill HSS 6mm to 12mm in steps of 1 mm	2 Set
3.	Drill Angle Gauge	2 Set
4.	Drilling Machine Motorized pillar 20mm Capacity	1 Set
5.	Steel Tape one Meter	1 No.
6.	Direct Reading vernier caliper 200mm	1 No.
7.	Diamond Wire-Saw/ Chain Saw	1 No.
8.	Slot Drill	1 No.
9.	Jack Hammer	1 No.
10.	Hydraulic Jack	1 No.
11.	Air Bag / Pillow	1 No.
12.	Water Bag	1 No.
13.	Jib Crane	1 No.
14.	Mobile Crane	1 No.
15.	Front end loader	1 No.
16.	Power Generator	1 No.
17.	Air Compressor	1 No.
18.	Artificial respirator	4 No.

### C. Furniture and teaching aids

Sl. No.	DESCRIPTION (Hand Tools)	QUANTITY
1.	Wall charts	10 No.
2.	LCD projector	1 No.
3.	WHITE Board	1 No.
4.	Flexible steel Pointer	2 No.
5.	Dual desk	10 No.
6.	Instructor Table	1 No.
7.	Instructor chair	1 No.
8.	Almirah (cup board)	2 No.
9.	Steel rack	2 No.
10.	Computer table	2 No.
11.	Computer chair	4 No.
12.	Lockers with 8 Drawers (standard size)	3 No.
13.	Water dispenser	1 No.

### D. COMPUTER HARDWARE AND SOFTWARE

Sl. No.	DESCRIPTION (Hand Tools)	QUANTITY
1.	Computer with latest configuration	10 No.
2.	Laser Printer (B/W)	01 No.
3.	Scanner	01 No.
4.	Software package for stone design (latest version) educational version	1 No.
5.	Designing books and CD	As required