

SYLLABUS FOR THE TRADE
of
STONE PROCESSING MACHINES 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 PROCESSING MACHINE OPERATOR**” under CTS held on 11th September 2012 at Udaipur and on 12th 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 Vikram Rastogi, CEO	Stone Technology Centre	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	Member
29.	R.K. Gupta	R.K. Marble	Member
30.	Guru Shastrimath, Chairman	Natural Stonage	Member
31.	Prakash Pokharia	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 6th to 10th 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.	Nilotpall 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 PROCESSING 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. mtr.covered
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 with Mechanical/ Metallurgy Engineering One year experience.
OR
Diploma in Civil/Mining/Electrical/ Mechanical/ Metallurgy Engineering with Two year experience.
OR
NTC/NAC in the trade with three years experience.
OR
A person having 8 years practical experience in the field of Stone Processing Machines 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 Mechanical Engineering.

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

FIRST SEMESTER

Code: SPO – Sem-I

Week No.	Trade Theory	Trade Practical	Engineering Drawing	Workshop Calculation & Science
1.	<p><u>Introduction</u> 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. 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><u>Geology and exploration</u> 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</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>

	Physico mechanical properties of stones Chemical properties of various stones			
4-5	Properties of stones. Stone testing procedure.	Methods of finding stone strength, chemical composition and physical characteristics.	Freehand sketching of parallelogram, rhombus, polygon, circles and ellipse.	Units and dimensions. Properties of materials. Common fraction to decimal and vice versa.

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.
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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.	Identifying of the mineral by petrographic examination. Physico-Mechanical Test for selection of natural stone. Checking of compressive strength, impact strength,	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
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	Application of all dimension stone products and their parameter. Introduction to petrographic, physical and mechanical properties of stones, testing of stones etc.	elastic constant, density/specific gravity.		related problems. Stress, Strain Modulus of elasticity water absorption , density etc.
18	Defect in stones and their repair, precaution to be taken in stone fixing, restoration and conservation, merit and demerits in stone masonry / uses	To repair cracks in stone, stone masonry and knowledge to pointing out the defects.	Code of practice for general engineering drawing as published by ISI.	
19	Concept of water cement ratio work ability. Tools required for fixing, and repairing of stones and for plastering.	To prepare cement concrete proportion and lime concrete to plaster given stone surface and fixing of stones.	Preparation of free hand sketching in plan elevation 4 and 4.5 feet wall straight and junction.	

STONE PROCESSING MACHINERIES

20-21	Introduction to Flow chart of processing plant. Explanation of each block and operating principle.	Demonstration and Practice on lifting/moving block, Dressing, Cutting/sawing, Calibrating, Polishing, Edge cutting, Chamfering, Grooving	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.
22-24	Construction and Working principle of Gantry crane. Types of gantry crane as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Gantry crane.	Practice on Block handling, Uses of unloading & loading the block, Uses of AT drive/CT drive.	Same as above	Algebra –algebraic symbols-addition, subtraction, multiplication and division .
25	Project Work / Industrial Visit (Optional)			
26	Examination			

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DURATION – SIX MONTH**

SECOND SEMESTER

Code: SPO – Sem-II

27-29	Construction and Working principle of diamond gang saw/steel gang saw. Types of diamond gang saw as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of diamond gang saw for marble, sandstone and granite). Concept of Trolley loading principles.	Demonstration and Practice on of Gang saw with horizontal frame, Machine with rising stone car, Gang saw with vertical frame. Diamond segment, Ingredients, Blending, Moulding, Sintering, Deburing, Down feed, Step of manufacturing gang saw blade- Cutting blade, Joining of blade end with end tabs, Tensioning of blade, Brazing of diamond segment on blades, Checking of blade for any error, Fixing/mounting the blade in frame, Camber for gang saw blade. Trolley loading.	Simple isometric scale drawing, isometric views of simple object such as quips, square and rectangular prism and pyramids.	Mechanical properties of metals
30-33	Construction and Working principle of Mono blade dresser, Types of Mono blade dresser as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Mono blade dresser	Demonstration and practice of hydraulic mono blade dresser Block to be dressed , Uses as coolant as well as removal of the cutting.	Sketching of Air Compressor and power generator	Algebra – expression involving algebraic symbols simple equation transposition problem.
34-36	Construction and Working principle of Circular saws, Types of Mono blade dresser as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Circular saws.	Demonstration and Practice on circular saw - Construction, Blade tensioning, Setting of the Blade, Flanges, Bore, Running true, Parallelism, Spindle bearing play, Cutting parameters, Multiblade block cutter	Sketching of stone Processing tools .	Standard algebraic formulae e.g. $(a + b)^2$, $(a - b)^2$, $a^2 - b^2$ and their application
37-40	Construction and Working principle of Polishing machine, Types of Polishing machine as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Polishing machine	Demonstration and Practice on line polishing m/c –Construction, Fixed steel beams, Heads, Cross beam travelling speed, Guide unit for slabs, Automatic polishing compound dispenser, Polishing dressing unit, Belt holding plate, Oscillating sector head,	Sketching of stone Processing tools.	Speed, velocity, acceleration retardation equation of motion-related simple problem.

		Lubrication of the grindstone head, Pneumatic system, Hydraulic system, Water system, Safety device.		
41-43	Construction and Working principle of Calibrating machine, Types of Calibrating machine as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Calibrating machine	Demonstration and practice on calibrating machine- sawn strips, types of strips and uses of strips.	Same as above	Transmission of heat-conduction, convection and radiation. Different form of energy-thermal, electrical, mechanical. Expansion of solid, liquid and gases and their related problems
44-45	Construction and Working principle of Edge cutting/cross cutting machine, Types of Edge cutting machine as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Edge cutting/cross cutting machine.	Demonstration and Practice on Edge cutting/cross cutting machine-Sizing, chamfering & Grooving	Properties of lines and angles, triangles and circle	Measuring of Horse Power, simple problem on work, power and energy. Measuring of BHP, FHP and applied shop problems.
46-47	Construction and Working principle of Slicing machine, Types of Slicing machine as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Slicing machine	Demonstration and Practice on Slicing machine- Sizing block of marble as horizontally, Reverse & Forward, Chamfering & Grooving	Freehand isometric sketching of simple object with dimensions.	Knowledge of computer operating, components of computer. Practice on computer.
48-50	Construction and Working principle of Abrasive, Different types of abrasive and their working recommendation numbers as per stone polishing.	Demonstrations and operation of polishing sizing block, Uses as abrasives No. and grain structure as per quality finishing on marble.	Drawing of isometric views of different object with dimensions.	Practice on computer.
51	Revision			
52	Examination			

STONE PROCESSING MACHINES OPERATOR

Tools & Equipments for 20 trainees + one

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

ALLIED TRADE : FITTER

SL.NO.	NAME OF THE ITEMS	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 outside 0 to 25 mm	2 No.
3.	Dial micrometer outside 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.	NAME & DESCRIPTION OF MACHINES	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 portable 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.

ALLIED TRADE: MASONARY

SL.NO.	NAME & DESCRIPTION OF MACHINES	QUANTITY
1.	Wooden Straight Edge 300, 600, 900, 1200mm	20 No.
2.	Pick Axes	2 No.
3.	Bar Bending Tools and Cutting Tools	2 No.
4.	Four Fold Foot Rule	4 No.
5.	Plumb Bob	2 No.
6.	Mason to Plaster work	20 No.

STONE PROCESSING MACHINES

SL.NO.	NAME & DESCRIPTION OF MACHINES	QUANTITY
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	Hydraulic Jack	1 No.
8	Mobile Crane	1 No.
9	Front end loader	1 No.
10	Power Generator	1 No.
11	Air Compressor	1 No.
12	Gang saw Machine	1 No.
13	Stripping Machine	1 No.
14	Calibrating Machine	1 No.
15	Polishing Machine	1 No.
16	Champhring Machine	1 No.
17	Artificial respirator	4 No.

C. Furniture and teaching aids

SL.NO.	NAME & DESCRIPTION OF ITEMS	QUANTITY
1.	Wall charts	10 No.
2.	LCD projector	1 No.
3.	WHITE Board	1 No.
4.	Adjustable 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.	NAME & DESCRIPTION OF ITEMS	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