GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

STONE PROCESSING MACHINE OPERATOR

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3.5

SECTOR – MINING

Directorate General of Training

STONE PROCESSING MACHINE OPERATOR

(Engineering Trade)

(Revised in March 2023)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL – 3.5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,

Kolkata – 700 091

www.cstaricalcutta.gov.in

CONTENTS

1. COURSE INFORMATION

During the one-year duration of "Stone Processing Machine Operator" trade, a candidate is trained on Professional Skill, Professional Knowledge and Employability Skill related to job role. In addition to this, a candidate is entrusted to undertake project work, extracurricular activities and on-the-job training to build up confidence. The broad components covered under Professional Skill subject are as below:-

In this year the trainee will learn Industrial discipline and working environment, safety - including fire equipments and their uses. The trainees will identify different types of stones, their dimension & decoration, Commercial varieties and different types of textures in stones. They will also apply the Methods of finding stone strength, chemical composition and physical characteristics. They will be familiar with simple fitting operations, hacks awing, punching and filing. Marking instruments and their uses. Use of vernier caliper, micrometer, Method of using drills taps and dies. The trainees will be also able to identify Types of hack saw frames and blades, Vernier calliper and Micrometer and their use. The trainees will gain knowledge of Fundamental of electricity. Explanation of electrical measuring instruments Ammeters, Voltmeter, Energy meter. They will also acquire knowledge of characterization of dimensional stone i.e. marble, granite, sandstone, kota stone (flaggy limestone), slate etc. Identifying of the mineral by petrographic examination. They will be able to Demonstrate and Practice on lifting/moving block, Dressing, Cutting/sawing, Calibrating, Polishing, Edge cutting, Chamfering, Grooving. They will also Practice on Block handling, uses of unloading & loading the block, Uses of AT drive/CT drive. They will know Construction and Working principle of Gantry crane, explanation of major parts and their working procedure. They will acquire knowledge of maintenance procedure of Gantry crane.

The trainee will know Construction and working principle of diamond gang saw/steel gang saw, Mono blade dresser, Circular saws, Polishing machine, Calibrating machine, Edge cutting/cross cutting machine, Slicing machine- their types as per capacity, their working and maintenance procedure. They will be able to demonstrate, and practice operations of various machines used viz. diamond gang saw/steel gang saw, Mono blade dresser, Circular saws, Polishing machine, Calibrating machine, Edge cutting/cross cutting machine, Slicing machine, Abrasive. The trainees will be able to maintain safety measures during performing various jobs.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Stone Processing Machine Operator trade under CTS is delivered nationwide through a network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) impart requisite core skill, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read and interpret technical parameters/ documentation, plan and organize work processes, identify necessary materials and tools.
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations.
- Apply professional knowledge & employability skills while performing the job and modification & maintenance work.
- Check the task/job for functioning, identify and rectify errors in task/job.
- Document the technical parameter related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Stone processing Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join the apprenticeship program in different types of industries leading to a National Apprenticeship Certificate (NAC).
- Can join stone processing industries as Stone Processing Machine Operator.
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
3	Employability Skills	120
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

On the Job Training (OJT)/ Group Project	150
Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification or add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence
(a) Marks in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Marks in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Marks in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Crusher Attendant, Stone operates machine in which lumps of stone are crushed to reduce them to desired size. Starts machine and regulates flow of stones from conveyor chutes or bins, shovels or throws stones into hopper of machine; prods large sized stone pieces to force them between crusher jaws with bar; breaks oversize stones with hand hammer; loosens clogged material in machine with bar; places empty containers at delivery-end to receive crushed materials; cleans, lubricates and makes minor repairs to machine. May operate machine fitted with conveyor system and may sieve powder into different grades.

Grinder (Stone and Clay): tends and feeds grinding machine to grind pieces of rock or clay into fine dust. Adjusts clearance between rollers and bed stone (solid plate) of machine for fineness of grinding required; starts machine and feeds material into machine with shovel breaking loosens clogged material in machine with bar; large pieces with bar or hammer if necessary; regulates water valve to let out requisite water into machine to settle dust. May clean and oil machine.

Reference NCO-2015:

a) 7315.2200–Crusher Attendant, Stone
b) 7315.2300 – Grinder (Stone and Clay)

Reference NOS: -

a) MIN/N9403
b) MIN/N9404
c) CSC/N0304
d) MIN/N9406
e) MIN/N9407
f) MIN/N9408
g) MIN/N9409
h) MIN/N9410
i) MIN/N9411
j) CSC/N9401
k) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**STONE PROCESSING MACHINE OPERATOR**
Trade Code	DGT/1121
NCO - 2015	7315.2200, 7315.2300
NOS Covered	MIN/N9403, MIN/N9404, CSC/N0304, MIN/N9406, MIN/N9407, MIN/N9408, MIN/N9409, MIN/N9410, MIN/N9411, CSC/N9401, CSC/N9402,
NSQF Level	Level-3.5
Duration of Craftsmen Training	One year (1200 hours + 150 hours OJT/Group Project)
Entry Qualification	Passed 10th class examination
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF
Unit Strength (No. Of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	100 Sq. m
Power Norms	10 KW
Instructors Qualification for	
1. Stone Processing Machine Operator Trade	B.Voc/Degree in Civil/Mining/Electrical /Mechanical/ Metallurgy Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Civil/Mining/Electrical/ Mechanical/ Metallurgy Engineering from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the trade of "Stone Processing Machine Operator" with three years' experience in the relevant field. **<u>Essential Qualification</u>:** Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. **NOTE: Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.**
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR**

	03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants NCIC in RoDA or any of its variants under DGT
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering/ Draughtsman group of trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade OR Regular/RPL variants NCIC in RoDA or any of its variants under DGT
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) OR Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES:

1. Identify various types of stones, their commercial varieties and different types of textures in stones following safety precautions. (NOS: MIN/N9403)
2. Find characteristics of stones, their properties, testing procedures and identify various types of hand tools used in stone processing. (NOS: MIN/N9404)
3. Perform simple fitting operations by using various hand tools and marking/ measuring instruments. (NOS: CSC/N0304)
4. Prepare electrical wire joints viz., Britannia, straight tee, western union etc. and use electrical measuring instruments & electrician hand tools. (NOS: MIN/N9406)
5. Carry out Petrographic analysis of concrete and Physico-Mechanical test on stones for checking compressive strength, impact strength, density, etc. (NOS: MIN/N9407)
6. Diagnose & rectify the defects in stone and stone masonry by fixing with cement and lime concrete. (NOS: MIN/N9408)
7. Perform Dressing, Cutting, Polishing, Chamfering, Grooving and Loading/ Unloading of blocks etc. (NOS: MIN/N9409)
8. Perform operation and maintenance of various stone processing machines viz., Circular saw, Multi-blade block cutter, Gang saw machine, Polishing machine, Calibrating machine, Edge cutting machine slicing machine, Hydraulic mono blade dresser, etc. with due care and safety. (NOS: MIN/N9410)
9. Carry out stone polishing using abrasives for quality finishing on marble. (NOS: MIN/N9411)
10. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/N9401)
11. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Identify various types of stones, their commercial varieties and different types of textures in stones following safety precautions. (NOS:MIN/N9403)	Ascertain various types of stones and their properties.
	Check the different textures in stones for geology and exploration
	Identify flaggy limestone, slate granite, sandstone etc.
	Differentiate between dimensional and decorative stones.
	Check the commercial varieties of different stones.
	Economical usage of stones.
	Evaluate the various textures in stones.
2. Find characteristics of stones, their properties, testing procedures and identify various types of hand tools used in stone processing. (NOS:MIN/N9404)	Find stones as per the methods available.
	Ascertain the properties of stones.
	Follow the methods and procedures of testing stones.
	Enlist the strength, chemical composition and physical characteristics of stones.
	Identify the various hand tools required for stone processing.
	Ascertain the safety precautions for handling tools.
	Prepare the job for chiselling, hammering and filling.
	Use hand tools of steel rule square, scriber and dividers, centre punch, chisels, hammer, different files, bench vice and hand vice.
3. Perform simple fitting operations by using various hand tools and marking/ measuring instruments. (NOS: CSC/N0304)	Plan & Identify tools, instruments and equipments for marking and make this available for use in a timely manner.
	Mark as per specification applying desired mathematical calculation and observing standard procedure.
	Prepare the job for chipping, chiselling, filing, drilling, tapping, making external threads etc.
	Observe safety procedure during above operation as per standard norms and company guidelines.
	Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
4. Prepare electrical wire joints viz., Britannia, straight tee, western union etc. and use	Identify different electrical equipment viz. Ammeters, Voltmeter, Energy meter etc.
	Identify electrician hand tools like screwdriver, pliers,tester etc.

electrical measuring instruments and electrician hand tools. (NOS:MIN/N9406)	Ascertain safety precautions during operations of electrical hand tools.
5. Carry out Petrographic analysis of concrete and Physico-Mechanical test on stones for checking compressive strength, impact strength, density etc. (NOS:MIN/N9407)	Check for compressive strength, impact strength, specific gravity etc. for stones.
	Follow petrographic examination for testing stones
	Identify dimensions of stone products and their parameters.
	Observe the physical and chemical properties of stones.
	Test stones based on their properties for their correct use and marketability.
6. Diagnose & rectify the defects in stone and stone masonry by fixing with cement and lime concrete. (NOS:MIN/N9408)	Check for cracks in stone and stone masonry.
	Prepare cement concrete proportion and limeconcrete.
	Use the cement concrete proportion and lime concrete to plaster given stone surface.
	Fix any sorts of defects in stones.
	Ascertain safety measures for doing the repairing job.
7. Perform Dressing, Cutting, Polishing, Chamfering, Grooving and Loading/ Unloading of blocks etc. (NOS:MIN/N9409)	Identify the machineries and techniques for various stone processing operations.
	Prepare job for lifting/moving block, dressing, chamfering, edge cutting, grooving etc.
	Plan and execute gantry crane operation.
	Check functionality of gantry crane.
	Perform unloading & loading block and use AT/CT drive.
8. Perform operation and maintenance of various stone processing machines viz., Circular saw, Multiblade block cutter,Gang saw machine, Polishing machine, Calibrating machine, Edge cutting machine slicing	Identify Gang saw with horizontal frame and vertical frame.
	Prepare machine with rising stone car.
	Prepare job for diamond segment, ingredients, blending, moulding etc.
	Execute joining of blade end with end tabs with tensioning of blade.
	Operate and maintain diamond gang saw for marble, sandstone and granite with safety measures.
	Identify hydraulic Mono blade dresser Block.

machine, Hydraulic mono blade dresser, etc. with due care and safety. (NOS: CSC/N9410)	Prepare coolant for removal of the cutting.
	Operate and maintain Mono blade dresser with safety measures.
	Prepare job for using circular saw.
	Check Blade tensioning, setting of the blade, Flanges, Bore, Running true, spindle bearing and multiblade cutter.
	Maintain safety measures for operation of circular saw.
	Plan and perform lubrication of grindstone head
	Check Polishing dressing unit, belt holding plate, Oscillating sector head.
	Maintain Calibrating machines for easy operations.
	Ensure safety measures while using Calibrating machines.
9. Carry out stone polishing using abrasives for quality finishing on marble. (NOS:MIN/N9411)	Prepare blocks for polishing as per requirements.
	Check Abrasive no. for using in polishing blocks.
	Check grain structure before polishing blocks.
	Ensure quality finishing on marble.
	Operate and maintain Polishing machine with safety measures.
10. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/N9401)	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
11. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS:CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

7. TRADE SYLLABUS

SYLLABUS FOR STONE PROCESSING MACHINE OPERATOR TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 50 Hrs.; Professional Knowledge 10 Hrs.	Identify various types of stones, their commercial varieties and different types of textures in stones following safety precautions.	1. Introduction of the trade in the development of Industrial economy of the country. 2. Industrial discipline and working environment. 3. Familiarization with shop layout. 4. Introduction to safety - including fire equipment and their uses. 5. Necessary guidance to be provided to the new corners to become familiar with the working of industrial training institute. 6. Demonstration on elementary first aid, artificial respiration.	**Introduction** 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. Various safety measure involved in the industry. Elementary first aid.
		7. Stone-An Introduction. 8. Its types - natural stone, sandstone. 9. Flaggy limestone, slate granite, marble etc. 10. Dimensional and decorative stones. 11. Commercial verities of different stones. 12. Different types of textures in stones.	**Geology and exploration** 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 Different types of textures in stones.
Professional Skill 25 Hrs.; Professional Knowledge 05 Hrs.	Find characteristics of stones, their properties, testing procedures and identify various types of hand tools used in stone processing.	13. Methods of finding stone strength, chemical composition and physical characteristics. 14. Tools: use of steel rule, square, scriber and dividers, centre punch, chisels, hammer, different files, bench vice and hand vice.	Properties of stones. Stone testing procedure. Safety precautions and elementary first aid, common hand tools of fitter trade-their name description and material.
Professional Skill 100 Hrs.; Professional Knowledge 14 Hrs.	Perform simple fitting operations by using various hand tools and marking/ measuring instruments.	15. Saw, centre punch, filing to line. 16. Filling a work-piece flat and training devices-fixing of mating nut. 17. Locking pins. 18. Hand tools: straight edge bloom bob, square etc. 19. Funner – its use. 20. Chipping, chisels, cold chisel, round nose threading and tapping, dieing, making external threads. 21. To prepare edges of stone on grinding machine and check. 22. Sawing filing to given diffusions-filing true and square notice different	Description of simple fitting operations, hacks awing, punching and filing. Types of files. Marking instruments and their uses. Use of vernier caliper, micrometer. Method of using drills taps and dies. Description of simple drilling machine-safety precautions-in handling grinding machines. 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.

		types of file operations-marking and clear and blind holes. 23. Opening of twist drills safety points to be observed while operating a drilling machine. 24. Measuring internal and external dimensions by the use of vernier caliper and micrometer.	Vernier caliper and Micrometer - uses, least count, vernier scale main scale and function of vernier caliper and micrometer.
Professional Skill 50 Hrs.; Professional Knowledge 07 Hrs.	Prepare electrical wire joints viz., Britannia, straight tee, western union etc. and use electrical measuring instruments & electrician hand tools.	25. Demonstration of electrician hand tools like screwdriver, pliers, tester and other hand tools. 26. Practice in using cutting pliers, screwdriver. 27. Demonstration and practice bare conductor, joints such as Britannia, straight tee, western union joint. 28. Study and use of Ammeters, Voltmeter, Energy meter etc.	Fundamental of electricity. Electron theory-free electron fundamental terms, definition, unit and effects of elastic units. Explanation of electrical measuring instruments Ammeters, Voltmeter, Energy meter only explanation of work, power energy in DC circuit. Identification of electrician hand tools.
Professional Skill 50 Hrs.; Professional Knowledge 07 Hrs.	Carry out petrographic analysis of concrete and Physico-Mechanical test on stones for checking compressive strength, impact strength, density, etc.	29. Identifying of the mineral by petrographic examination. 30. Physico-Mechanical Test for selection of natural stone. 31. Checking of compressive strength, impact strength, elastic constant, density / specific gravity.	Introduction to characterization of dimensional stone i.e. marble, granite, sandstone, kota stone (flaggy limestone), slate etc. for their correct use &marketability. Application of all dimensions stone products and their parameter. Introduction to petrographic, physical and mechanical properties of stones, testing of stones etc.
Professional	Diagnose & rectify	32. To repair crakes in stone,	Defect in stones and their

Skill 50 Hrs.; Professional Knowledge 07 Hrs.	the defects in stone and stone masonry by fixing with cement and lime concrete.	stone masonry and knowledge to pointing out the defects. 33. To prepare cement concrete proportion and lime concrete to plaster given stone surface and fixing of stones.	repair, precaution to be taken in stone fixing, restoration and conservation, merit and demerits in stone masonry / uses. Concepts of water cement ratio work ability. Tools required for fixing, and repairing of stones and for plastering.
Professional Skill 75 Hrs.; Professional Knowledge 10 Hrs.	Perform Dressing, Cutting, Polishing, Chamfering, Grooving and Loading /Unloading of blocks etc.	34. Demonstration and Practice on lifting/moving block. 35. Dressing, Cutting/sawing, Calibrating, Polishing, Edge cutting, Chamfering, Grooving. 36. Practice on Block handling, uses of unloading & loading the block, Uses of AT drive/CT drive.	Introduction to Flow chart of processing plant. Explanation of each block and operating principle. 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.
Professional Skill 415 Hrs.; Professional Knowledge 100 Hrs.	Perform operation and maintenance of various stone processing machines viz., Circular saw, Multi-blade block cutter, Gang saw machine, Polishing machine, Calibrating machine, Edge cutting machine slicing machine, Hydraulic mono blade dresser, etc. with due care and safety.	37. Demonstration and Practice on of Gang saw with horizontal frame, Machine with rising stone car, Gang saw with vertical frame. 38. Diamond segment, Ingredients, Blending, Moulding, Sintering, Deburing. 39. Down feed, Step of manufacturing gang saw blade- Cutting blade. 40. Joining of blade end with end tabs. 41. Tensioning of blade, Brazing of diamond	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. Construction and Working principle of Mono blade dresser, Types of Mono blade dresser as per capacity. Explanation of major parts and

		segment on blades. 42. Checking of blade for any error. 43. Fixing/mounting the blade in frame. 44. Camber for gang saw blade. Trolley loading. 45. Demonstration and practice of hydraulic mono blade dresser Block to be dressed. 46. Uses as coolant as well as removal of the cutting. 47. Demonstration and Practice on circular saw – Construction, Blade tensioning, Setting of the Blade, Flanges, Bore, Running true, Parallelism, Spindle bearing play, Cutting parameters, Multi-blade block cutter. 48. 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, Lubrication of the grindstone head, Pneumatic system, Hydraulic system, Water system, Safety device.	their working procedure. Maintenance procedure of Mono blade dresser. Construction and Working principle of Circular saws, Types of Circular saws as per capacity. Explanation of major parts and their working procedure. Maintenance procedure of Circular saws. 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 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. 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. Construction and Working principle of Slicing machine, Types of Slicing machine as per capacity. Explanation of major

		49. Demonstration and practice on calibrating machine- sawn strips, types of strips and uses of strips. 50. Demonstration and Practice on Edge cutting/cross cutting machine-Sizing, chamfering & Grooving. 51. Demonstration and Practice on Slicing machine- Sizing block of marble as horizontally, Reverse &Forward, Chamfering & Grooving.	parts and their working procedure. Maintenance procedure of Slicing machine.
Professional Skill 25 Hrs.; Professional Knowledge 06 Hrs.	Carry out stone polishing using abrasives for quality finishing on marble.	52. Demonstrations and operation of polishing sizing block. 53. Uses as abrasives No. and grain structure as per quality finishing on marble.	Construction and Working principle of Abrasive, Different types of abrasive and their working recommendation numbers as per stone polishing.
ENGINEERING DRAWING (40 HRS.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work.	**Engineering Drawing:** Introduction to Engineering Drawing and Drawing Instruments – • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument Lines- Types and applications in drawing Free hand drawing of – • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the freehand sketches. • Freehand drawing of hand tools and measuring tools. Drawing of Geometrical figures: • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. • Lettering & Numbering–Single Stroke. Dimensioning • Types of arrow head	

		• Leader line with text • Position of dimensioning (Unidirectional, Aligned) Symbolic representation– • Different symbols used in the related trades. Concept and reading of Drawing in • Concept of axes plane and quadrant • Concept of Orthographic and Isometric projections • Methodoffirstangleandthirdangleprojections(definitionanddifference) Reading of Job drawing of related trades.
WORKSHOP CALCULATION & SCIENCE (34 HRS.)		
Professional Knowledge WCS- 34 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION & SCIENCE:** **Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, substraction, multiplication & division Decimal fractions - Addition, subtraction, multilipication & division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and suare root Simple problems using calculator Applications of pythagoras theorem and related problems Ratio and proportion Percentage Precentage - Changing percentage to decimal and fraction **Material Science** Types metals, types of ferrous and non ferrous metals Physical and mechanical properties of metals Introduction of iron and cast iron Difference between iron & steel, alloy steel Properties and uses of insulating materials **Mass, Weight, Volume and Density** Mass, volume, density, weight and specific gravity **Speed and Velocity, Work, Power and Energy** Work, power, energy, HP, IHP, BHP and efficiency **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Scales of temperature, celsius, fahrenheit, kelvin and conversion between scales of temperature

		Concept of pressure - Units of pressure **Basic Electricity** Introduction and uses of electricity, Ohm's law, relation between V.I.R & related problems Electrical power, HP, energy and units of electrical energy **Mensuration** Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels **Levers and Simple machines** Lever & Simple machines - Lever and its types **Trigonometry** Measurement of angles Trigonometrical ratios Trigonometrical tables
In-plant training / Project work Visit to stone mines to study the construction and operation of the machines.		

SYLLABUS FOR CORE SKILLS
1. Employability Skills(Common for all CTS trades) (120Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in/ dgt.gov.in

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
STONE PROCESSING MACHINE OPERATOR (For batch of 24 Candidates)			
A. TRAINEES TOOL KIT (For each additional unit, trainees tool kit S no. 1-20 is required additionally)			
S No.	**Name of the Tool &Equipment**	**Specification**	**Quantity**
1.	Steel Rule	300mm	(24+1) Nos.
2.	Try Square	150mm	(24+1) Nos.
3.	Spring caliper, outside	150mm	(24+1) Nos.
4.	Spring caliper, inside	150mm	(24+1) Nos.
5.	Caliper, hermaphrodite	150mm	(24+1) Nos.
6.	Spring divider	150mm	(24+1) Nos.
7.	Scriber	150mm	(24+1) Nos.
8.	Centre punch	100mm	(24+1) Nos.
9.	Dot punch	100mm	(24+1) Nos.
10.	Chisel flat cold	20mm	(24+1) Nos.
11.	Chisel crosscut	20mm	(24+1) Nos.
12.	Hammer ball peen	500gram	(24+1) Nos.
13.	Hammer cross pein	250gm	(24+1) Nos.
14.	File flat Bastard	250mm	(24+1) Nos.
15.	File flat second cut	200mm	(24+1) Nos.
16.	File smooth	200mm	(24+1) Nos.
17.	Hacksaw frame adjustable	250-300 mm	(24+1) Nos.
18.	Scraper flat	150mm	(24+1) Nos.
19.	Scraper half round	150mm	(24+1) Nos.
20.	Scraper triangular	150mm	(24+1) Nos.
B. General Shop Outfit			
21.	Bench vise	120 mm	12 Nos.
22.	Vernier micrometer outside	0 to 25 mm	02 Nos.
23.	Dial micrometer outside	50 to 75 mm	02 Nos.
24.	Vernier calipers	200mm	02 Nos.

25.	Vernier height gauge	300 mm	02 Nos.
26.	Inside micrometer	50 mm to 100	02 Nos.
27.	Depth micrometer	0 to 100 mm with extension	02 Nos.
28.	Taps and dies course series	6 to 25 mm	02 Set
29.	Surface plate	400 and 400 mm grade 2mm	02 Nos.
30.	Universal marking block		02 Nos.
31.	Wooden Straight Edge	300, 600, 900, 1200mm	20 Nos.
32.	Pick Axes		02 Nos.
33.	Bar Bending Tools and Cutting Tools		02 Nos.
34.	Four Fold Foot Rule		05 Nos.
35.	Plumb Bob		02 Nos.
36.	Mason to Plaster work		24 Nos.
37.	Neon Tester	500 Volts	04 Nos.
38.	Test lamp	200 volt 25 watt	04 Nos.
39.	Hand techometer with male and female above rubber plug resin case		02 Nos.
40.	Moving iron and ammeter portrable type		02 Nos.
41.	Multimeter (AVO)		02 Nos.
42.	Insulator screw driver	150mm, 200mm	24 Nos.
43.	Insulator combination cutting plier	200 mm side	05 Nos.
44.	Connector	100 mm	05 Nos.
C. General Machinery			
45.	Drilling Machine	0 to 200mm Capacity Motorised with Chuck and key	01 Set
46.	Drill HSS	6mm to 12mm in steps of 1 mm	02 Set
47.	Drill Angle Gauge		02 Set
48.	Drilling Machine Motorized pillar	20mm Capacity	01 Set
49.	Steel Tape one Meter		01 No.
50.	Direct Reading vernier caliper	200mm	01 No.
51.	Hydraulic Jack		01 No.
52.	Mobile Crane		01 No.
53.	Front end loader		01 No.
54.	Power Generator		01 No.
55.	Air Compressor		01 No.
56.	Gang saw Machine		01 No.
57.	Stripping Machine		01 No.
58.	Calibrating Machine		01 No.

59.	Polishing Machine		01 No.
60.	Champhring Machine		01 No.
61.	Artificial respirator		05 Nos.
C. Furniture and teaching aids			
62.	Wall charts		10 Nos.
63.	LCD projector		01 No.
64.	WHITE Board		01 No.
65.	Adjustable steel Pointer		02 Nos.
66.	Dual desk		10 Nos.
67.	Instructor Table		01 No.
68.	Instructor chair		01 No.
69.	Almirah (cup board)		02 Nos.
70.	Steel rack		02 Nos.
71.	Computer table		02 Nos.
72.	Computer chair		05 Nos.
73.	Lockers with 8 Drawers (standard size)		03 Nos.
74.	Water dispenser		01 No.
D. Computer hardware and software			
75.	Computer with latest configuration	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch.) Licensed Operating System and Antivirus compatible with trade related software.	12 Nos.
76.	Laser Printer (B/W)		01 No.
77.	Scanner		01 No.
78.	Software package for stone design (latest version) educational version		01 No.
79.	Designing books and CD		As required

Note: -

1. Internet facility is desired to be provided in the classroom.

ANNEXURE - II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of Expert members participated for finalizing the course curriculum of Stone Processing Machine Operator Trade.

S No.	Name & Designation Sh/Mr/Ms	Organization	Remarks
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata	Chairman
2.	L.K. Mukherjee, Dy. Director ofTrg.	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.	RameshJain, 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, Propriter	Stone Paradise	Member
24.	Vikrant Vikram Rastogi, CEO	Stone Technology Centre	Member
25.	Suresh Gehlot, Propriter	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			
33.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata-91	Chairman
34.	K. L. Kuli, Joint Director of Training	CSTARI, Kolkata-91	Member
35.	K. Srinivasa Rao, Joint Director of Training	CSTARI, Kolkata-91	Member
36.	L.K. Muhkerjee, Deputy Director of Training	CSTARI, Kolkata-91	Member
37.	Ashoke Rarhi, Deputy Director of Training	ATI-EPI, Dehradun	Member
38.	N. Nath, Assistant Director of Training	CSTARI, Kolkata-91	Member
39.	S. Srinivasu, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
40.	Sharanappa, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
41.	Ramakrishne Gowda, Assistant Director of Training	FTI, Bangalore	Member
42.	Goutam Das Modak, Assistant Director of Trg./Principal	RVTI, Kolkata-91	Member
43.	Venketesh. Ch., Principal	Govt. ITI, Dollygunj, Andaman & Nicobar Island	Member
44.	A.K. Ghate, Training Officer	ATI, Mumbai	Member
45.	V.B. Zumbre, Training Officer	ATI, Mumbai	Member
46.	P.M. Radhakrishna pillai, Training Officer	CTI, Chennai-32	Member
47.	A.Jayaraman, Training officer	CTI Chennai-32,	Member
48.	S. Bandyopadhyay, Training Officer	ATI, Kanpur	Member

49.	Suriya Kumari K., Training Officer	RVTI, Kolkata-91	Member
50.	R.K. Bhattacharyya, Training Officer	RVTI, Trivandrum	Member
51.	Vijay Kumar, Training Officer	ATI, Ludhiana	Member
52.	Anil Kumar, Training Officer	ATI, Ludhiana	Member
53.	Sunil M.K. Training Officer	ATI, Kolkata	Member
54.	Devender, Training Officer	ATI, Kolkata	Member
55.	R. N. Manna, Training Officer	CSTARI, Kolkata-91	Member
56.	Mrs. S. Das, Training Officer	CSTARI, Kolkata-91	Member
57.	Jyoti Balwani, Training Officer	RVTI, Kolkata-91	Member
58.	Pragna H. Ravat, Training Officer	RVTI, Kolkata-91	Member
59.	Sarbojit Neogi, Vocational Instructor	RVTI, Kolkata-91	Member
60.	Nilotpal Saha, Vocational Instructor	I.T.I., Berhampore, Murshidabad, (W.B.)	Member
61.	Vijay Kumar, Data Entry Operator	RVTI, Kolkata-91	Member

ABBREVIATIONS:

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्