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

COMPETENCY BASED CURRICULUM

STONE MINING MACHINE OPERATOR

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3.5

SECTOR –MINING

Directorate General of Training

STONE MINING 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

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1. COURSE INFORMATION

During the one-year duration of "Stone Mining 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, extra-curricular activities and on-the-job training to build up confidence. The broad components covered under Professional Skill subject are as below: -

During the training period 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 calliper, micrometer and method of using drills taps and dies. The trainees will 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 and Energy meter. They will also acquire knowledge of characterization of dimensional stone i.e., marble, granite, sand stone, kota stone (flaggy limestone), slate etc. Identifying of the mineral by petrographic examination. They will also able to identify the operation of 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. The trainees will get knowledge of Separation of main block(overturning the bench)- Hydraulic jack, Jack Hammer, splitting bag, Air bag, pneumatic(water) bag, Hydraulic excavators sizing of block etc. The trainees will Study stone mining, analysis of deposits, manual mining, sand stone mining, slate mining and granite mining, flaggy limestone mining etc. They will identify different Types of manual and mechanized mining. They will apply manual and mechanized method of mining and various operations of marble mining. They will acquire knowledge of various machinery used for separation of main block like hydraulic jacks, splitting bags-air bags. They will also identify Machinery used for removal of waste rock hydraulic excavator, front end loader. They can apply block handling machinery-jib crane, derrick crane, mobile crane and front loaders. They will also apply service machinery-power generator, air compressor. They will Study on air pollution and water pollution control devices. They can apply Method of using mining safety devices in mines.

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 programmes of DGT for propagating vocational training.

Stone Mining 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 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 Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join stone mining industries as Stone Mining Machine Operator.
- 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 the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the 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 examining 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 should produce work which demonstrates attainment of an acceptable standard of	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment.

craftsmanship with occasional guidance, and due regard for safety procedures and practices.	• 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Marks in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices.	• 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. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Marks in the range of more than 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. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Stone Cutter, Mines; makes holes or cuts stone or rock faces in mine with machine or hand tools such as power drill, crowbar, chisel etc. for putting up support or constructing brick foundation. Marks portion of roof and footwall to be cut for insertion of prop. Cuts face of hitches underground and makes hole to desired depth according to diameter to prop, using power drill, crow bar, chisel hammer etc. Removes rubbish and erects roof supports. May drill shot holes for bringing down roof or blowing floor. May build roadways and pack walls of air ways.

Mine Cutting and Channeling Machine Operator; operates machinery, such as long wall shears, plows, and cutting machines to cut or channel along the face or seams of coal mines, stone quarries, or other mining surfaces to facilitate blasting, separating, or removing minerals or materials from mines or from the earth's surface. Cuts slots along working faces of coal, salt, or other non-metal deposits in order to facilitate blasting, by moving levers to start the machine and to control the vertical reciprocating drills. Determines locations, boundaries, and depths of holes or channels to be cut. Drives mobile, truck-mounted or track mounted drilling or cutting machine in mines and quarries or on construction sites. Moves controls to start and position drill cutters or torches, and to advance tools into mines or quarry faces in order to complete horizontal or vertical cuts. Moves planer levers to control and adjust the movement of equipment, the speed, height, and depth of cuts, and to rotate swivel cutting booms. Observes indicator lights and gauges, and listen to machine operation in order to detect binding or stoppage of tools or other equipment problems. Repositions machines and move controls in order to make additional holes or cuts. Signals that machine plow blades are properly positioned, using electronic buzzers or two-way radios. Charges and sets off explosives in blasting holes.

Reference NCO-2015:

a) 8111.1200 – Stone Cutter, Mines
b) 8111.1400 – Mine Cutting and Channelling Machine Operator

Reference NOS: --

a) MIN/N1703
b) MIN/N9403
c) MIN/N9404
d) MIN/N9407
e) MIN/N9408
f) CSC/N0304
g) MIN/N4101
h) MIN/N4102
i) MIN/N4103
j) CSC/N9401
k) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**STONE MINING MACHINE OPERATOR**
Trade Code	DGT/1120
NCO - 2015	8111.1200, 8111.1400
NOS Covered	MIN/N1703, MIN/N9403, MIN/N9404, MIN/N9407, MIN/N9408, CSC/N0304, MIN/N4101, MIN/N4102, MIN/N4103, 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 with Science and Mathematics or with vocational subject in same sector or its equivalent.
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 Covered and 250 sq. m open space
Power Norms	10 KW
Instructors Qualification for	
1. Stone Mining 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 Mining Machine Operator" with three-year 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. Follow safety procedure, practices and achieve safety standards. (NOS: MIN/N1703)
2. Identify various types of stones, their commercial varieties and different types of textures in stones. (NOS:MIN/N9403)
3. Apply the methods of finding stonestrength, their properties and testing procedures and identify various types of tools used in stone mining. (NOS:MIN/N9404)
4. Perform basic fitting operations – marking, hacksawing, centre punching, filing, drilling, devices-fixing, Funner etc. Accuracy: ± 0.25mm. (NOS:CSC/N0304)
5. Set the different parameters to measure various physical and electrical components involving basic operations on different machines observing standard procedure and check for accuracy. (NOS: MIN/N4101, MIN/N4102)
6. Carry out Physico-Mechanical tests on stones for identifying minerals. (NOS:MIN/N9407)
7. Diagnose & rectify the defects in stone and stone masonry. (NOS:MIN/N9408)
8. Dismantle & assemble mining machineries from vehicle along with their accessories. (NOS: MIN/N4101, MIN/N4103)
9. Plan, execute commissioning and evaluate performance of manual and mechanized mining machines. (NOS: MIN/N4101, MIN/N4102, MIN/N4103)
10. Remove waste rock by using hydraulic excavator front end loader with safety measures. (NOS: MIN/N1703)
11. Read and apply engineering drawing for different application in the field of work. (NOS:CSC/N9401)
12. 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. Follow safety procedure, practices and achieve safety standards. (NOS: MIN/N1703)	Follow industrial discipline related to the trade.
	Identify various safety instruments.
	Execute personal safety and occupational health hazards.
	Plan work in compliance with standard safety norms.
	Observe safety procedure during operation as per standard norms and company guidelines.
	Identify basic hand tools for fitting, riveting, drilling etc. with due care and safety.
2. Identify various types of stones, their commercial varieties and different types of textures in stones. (NOS: MIN/N9403)	Ascertain various types 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.
3. Apply the methods of finding stonestrength, their properties and testing procedures and identify various types of tools used in stone mining. (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 mining.
	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, files, bench vice and hand vice.
4. Perform basic fitting operations – marking, Hacksawing, Centre punching, Filing, Drilling, devices-fixing, Funner etc. Accuracy: ± 0.25mm. (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 Hacksawing, chiselling, filing, drilling, devices-fixing, funner 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.
5. Set the different parameters to measure various physical and electrical components involving basic operations on different machines observing standard procedure and check for accuracy. (NOS: MIN/N4101, MIN/N4102)	Identify different electrical equipment viz. Ammeters, Voltmeter, Energy meter etc.
	Identify electrician hand tools like screw driver, pliers, tester etc.
	Ascertain safety precautions during operations of electrical hand tools.
	Prepare the job for cutting and fitting operations.
6. Carry out Physico-Mechanical tests on stones for identifying mineral. (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.
7. Diagnose & rectify the defects in stone and stone masonry. (NOS:MIN/N9408)	Check for cracks in stone and stone masonry.
	Prepare cement concrete proportion and lime concrete.
	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.
8. Dismantle & assemble mining machineries from	Identify the machineries and techniques for various mining operations.

	Identify and remove overburden, drilling, hole alignment, blasting wire saw cutting
	Plan to dismantle and replace parts as per requirement and collect necessary information.
	Perform dismantling and replacing of different components with accuracy applying range of skills and standard operating procedure.
	Assemble different components.
	Check functionality of the components.
9. Plan, execute commissioning and evaluate performance of manual and mechanized mining machines. (NOS: MIN/N4101, MIN/N4102, MIN/N4103)	Start mining operations work based on the concept of bench planning
	Perform drilling and channelling operation.
	Identify jobs for applying wire saw, flame cutting, water channelling, marble mining etc.
	Remove overburden during transportation and transportation of block
	Prepare hydraulic jacks, splitting, bags-air bags and hydraulic excavator.
10. Remove waste rock by using hydraulic excavator front end loader with safety measures. (NOS: MIN/N1703)	Identify waste rocks for removal.
	Operate block handling machinery-jib crane, derrik crane, mobile crane and front loaders for removing waste rocks.
	Identify service machinery- power generator, air compressor.
	Ascertain air pollution control devices.
	Observe water pollution devices.
	Follow mining health and safety measure
11. 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.
12. Demonstrate basic mathematical concept and	Solve different mathematical problems
	Explain concept of basic science related to the field of study

principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)	

SYLLABUS FOR STONE MINING MACHINE OPERATOR TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 25 Hrs; Professional Knowledge 06 Hrs	Follow safety procedure, practices and Achieve safety standards.	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 equipments and their uses. 5. Necessary guidance to be provided to the new corners to become familiar with the working of industrial training institute.	**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.
Professional Skill 45 Hrs; Professional Knowledge 08 Hrs	Identify various types of stones, their commercial varieties and different types of textures in stones.	6. Stone, an Introduction. 7. Its types - natural stone, sandstone. 8. Flaggy limestone, slate granite, marble etc. 9. Dimensional and decorative stones. 10. Commercial varieties of different stones. 11. 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 07 Hrs	Apply the methods of finding stone strength, their properties and testing procedures and Identify various types of tools used in stone mining.	12. Methods of finding stone strength, chemical composition and physical characteristics. 13. 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 80 Hrs; Professional Knowledge 18 Hrs	Perform basic fitting operations – marking, Hacksawing, Centre punching, Filing, Drilling, devices-fixing, Funner etc. Accuracy: ± 0.25mm.	14. Saw, centre punch, filing to line. 15. Filling a work-piece flat and training devices-fixing of mating nut. 16. Locking pins. 17. Hand tools: straight edge bloom bob, square etc.	Description of simple fitting operations, hacks awing, punching and filing. Types of files. Marking instruments and their uses. Use of vernier caliper, micrometer.
		18. Funner – its use. 19. Chipping, chisels, cold chisel, round nose threading and tapping, dieing, making external threads. 20. To prepare edges of stone on grinding machine and check.	Method of using drills taps and dies. Description of simple drilling machine-safety precautions-in handling grinding machines.
		21. Sawing filing to given diffusions-filing true and square notice different types of file operations-marking and clear and blind holes. 22. Opening of twist drills safety points to be	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.

		observed while operating a drilling machine.	
		23. 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 80 Hrs; Professional Knowledge 18 Hrs	Set the different parameters to measure various physical and electrical components involving basic operations on different machines observing standard procedure and check for accuracy.	24. Practice in using cutting pliers, screw driver. 25. Demonstration and practice bare conductor, joints such as Britannia, straight tee, western union joint.	Fundamental of electricity. Electron theory-free electron fundamental terms, definition, unit and effects of elastic units.
		26. Demonstration on elementary first aid, artificial respiration.	Various safety measure involved in the industry. Elementary first aid.
		27. Study and use of Ammeters, Voltmeter, Energy meter etc.	Explanation of electrical measuring instruments Ammeters, Voltmeter, Energy meter only explanation of work, power energy in DC circuit.
		28. Demonstration of electrician hand tools like screw-driver, pliers, tester and other hand tools.	Identification of electrician hand tools.
Professional Skill 45 Hrs; Professional Knowledge 08 Hrs	Carry out Physico-Mechanical tests on stones for Identifying mineral.	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, sand stone, kota stone (flaggy limestone), slate etc. for their correct use &marketability. Applications of all dimension stone products and their parameter. Introduction to petrographic, physical and mechanical properties of stones, testing of stones etc.
Professional Skill 45 Hrs;	Diagnose & rectify the defects in stone and stone masonry.	32. To repair crakes in stone, stone masonry and knowledge to pointing out	Defect in stones and their repair, precaution to be taken in stone fixing, restoration and

Professional Knowledge 08 Hrs		the defects.	conservation, merit and demerits in stone masonry / uses
		33. To prepare cement concrete proportion and lime concrete to plaster given stone surface and fixing of stones.	Concepts of water cement ratio work ability. Tools required for fixing, and repairing of stones and for plastering.
Professional Skill 80 Hrs; Professional Knowledge 18 Hrs	Dismantle & assemble mining machineries from vehicle along with their accessories.	34. 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. 35. Uses of Drilling Operating system Such as vertical, horizontal and their uses of different types of stone tool, Prevention operations and coolant uses.	Introduction to mining machineries. Selection of mining machineries. The factors for selecting of mining machineries. Machineries used for various operations such as cutting, drilling, removing, sizing, transportation etc. Brief concept of mining and bench planning Drilling-Description, working principal, Construction & Major parts, alignment of holes etc. Safety & Precaution of drilling. Uses of drill the stone sector
		36. Demonstration and Practice on dragging winch, Use of dragging block of granite, marble and other natural stones. Various components of air compressor, Defects and brief demonstration of types of power generator.	Dragging winch: Description, working principal, Construction of Major Parts. Compressor-Description & various types of compressor. such as pneumatic, hydraulic system & jack for stone
		37. Uses of stone mining machineries and their preventive operation, such	Different types of stone mining machinery uses: Construction & working principal of quarry front

		as quarry front cuts-Chain saws, Diamond belt saw, Diamond wire saw, Jiri M/c (kotah stone),Flame jet burner, water jet technique, Drilling – 38. Performatic drilling: Slot drill/quany master, drill for coplanar holes, Quarry bar m/c, Jack Hammer. 39. Separation of main block(overturning the bench)- Hydraulic jack, Jack Hammer, splitting bag, Air bag, pneumatic(water) bag, Hydraulic excavators sizing of block –diamond wire saw, jack hammer, Feather &wedges Removal waste block-Hydraulic excavators, Tippers, Front & Loader Other service machinery- Power generator, Air compressor, hole finder (Cercafori).	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 Perform aticdrilling : Slot drill/quany master, drill for coplanar holes, Quarry bar m/c, Jack Hammer Construction & working principal of separation of main block (overturning the bench)- Hydraulic jack, splitting bag, Air bag, pneumatic(water) bag, Construction working principal of Hydraulic excavator. Construction & working principal of sizing of block –diamond wire saw, jack hammer, Feather &wedges, air pillows. Construction & working principal of removal waste block Construction & working principal of Block handling machinery- Jib crane, Derrick crane, Mobile crane, Front & Loader. Construction & working principal of other service machinery Power generator, Air compressor, hole finder (Cercafori).
Professional Skill 230 Hrs; Professional Knowledge 42 Hrs	Plan, execute commissioning and evaluate performance of manual and mechanized mining machines.	40. Concept of bench planning and how to start mining operations. 41. Drilling and channeling operation. 42. Separation of block application of blasting technique.	Study of stone mining, analysis of deposits, manual mining, sand stone mining, slate mining and granite mining, flaggy limestone mining etc. Types of manual and mechanized mining. Manual method of mining and

		43. Diamond wire saw cutting technique. 44. Application of wire saw, flame cutting, water channeling, marble mining. 45. Removal of overburden. 46. Preparation of free faces. 47. Preparation of block and transportation of block and overburden. 48. Application of diamond wire saw, chain saw and belt saw. 49. Application of machinery used for separation of main block. 50. Hydraulic jacks, splitting, bags-air bags. 51. Hydraulic excavators.	various operations. Mechanized method of marble mining and operations. Description of various machinery used for separation of main block like hydraulic jacks, splitting bags-air bags. Hydraulic excavators. (42 hrs)
Professional Skill 185 Hrs; Professional Knowledge 35 Hrs	Remove waste rock by using hydraulic excavator front end loader with safety measures.	52. Application of machinery used for removal of waste rock. 53. Hydraulic excavator front end loader.	Description of machinery used for removal of waste rock hydraulic excavator, front end loader.
		54. Application of block handling machinery-jib crane, derrick crane, mobile crane and front loaders.	Description of block handling machinery-jib crane, derrick crane, mobile crane and front loaders.
		55. Application of service machinery-power generator, air compressor.	Description of service machinery-power generator, air compressor.
		56. Study on air pollution control devices.	Impact of stone industry on, environment and environmental pollution.
		57. Study on water pollution devices.	Water pollution, quarry waste and its application environmental problem due to marble slurry.
		58. Mining health and safety	Method of using mining safety

		measure.	devices in mines.
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 free hand sketches. Free hand drawing of hand tools and measuring tools. Drawing of Geometrical figures: Angle, Triangle, Circle, Rectangle, Square, Parallelogram. Lettering & Numbering – Single Stroke. Dimensioning Types of arrowhead Leader line with text Position of dimensioning (Unidirectional, Aligned) Symbolic representation – Different symbols used in the Stone Mining / Stone Processing Machine Operator trades. Concept and reading of Drawing in Concept of axes plane and quadrant Concept of Orthographic and Isometric projections Method of first angle and third angle projections (definition and difference) Reading of Job drawing related to Stone Mining / Stone Processing Machine Operator trades.	
WORKSHOP CALCULATION & SCIENCE: (32 Hrs.)			
Professional Knowledge WCS - 32 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and	**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	

	explain basic science in the field of study.	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
Project work/ Industrial Visit: - a) 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) (120 Hrs)

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

25.	Vernier height gauge	300 mm	2 Nos.
26.	Inside micrometer	50 mm to 100	2 Nos.
27.	Depth micrometer	0 to 100 mm with extension	2 Nos.
28.	Taps and dies course series	6 to 25 mm	2 Set
29.	Surface plate	400 and 400 mm grade 2mm	2 Nos.
30.	Universal marking block		2 Nos.
31.	Neon Tester	500 Volts	4 Nos.
32.	Test lamp	200 volt 25 watt	4 Nos.
33.	Hand techometer with male and female above rubber plug resin case		2 Nos.
34.	Moving iron and ammeter portable type		2 Nos.
35.	Multimeter (AVO)		2 Nos.
36.	Insulator screw driver	150mm, 200mm	24Nos.
37.	Insulator combination cutting plier side	200 mm	4 Nos.
38.	Connector	100 mm	4 Nos.
C. GENERAL MACHINERY			
39.	Drilling Machine	0 to 200mm Capacity Motorised with Chuck and key	1 Set
40.	Drill HSS	6mm to 12mm in steps of 1 mm	2 Set
41.	Drill Angle Gauge		2 Set
42.	Drilling Machine Motorized pillar	20mm Capacity	1 Set
43.	Steel Tape one Meter		1 No.
44.	Direct Reading vernier caliper	200mm	1 No.
45.	Diamond Wire-Saw/ Chain Saw		1 No.
46.	Slot Drill		1 No.
47.	Jack Hammer		1 No.
48.	Hydraulic Jack		1 No.
49.	Air Bag / Pillow		1 No.
50.	Water Bag		1 No.
51.	Jib Crane		1 No.
52.	Mobile Crane		1 No.
53.	Front end loader		1 No.

54.	Power Generator		1 No.
55.	Air Compressor		1 No.
56.	Artificial respirator		4 Nos.
C. FURNITURE AND TEACHING AIDS			
57.	Wall charts		10 Nos.
58.	LCD projector		1 No.
59.	WHITE Board		1 No.
60.	Adjustable steel Pointer		2 Nos.
61.	Dual desk		12Nos.
62.	Instructor Table		1 No.
63.	Instructor chair		1 No.
64.	Almirah (cup board)		2 Nos.
65.	Steel rack		2 Nos.
66.	Computer table		2 Nos.
67.	Computer chair		4 Nos.
68.	Lockers with 8 Drawers (standard size)		3 Nos.
69.	Water dispenser		1 No.
D. COMPUTER HARDWARE AND SOFTWARE			
70.	Computer	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.	12Nos.
71.	Laser Printer (B/W)		01 No.
72.	Scanner		01 No.
73.	Software package for stone design (latest version) educational version		01 No.
74.	Designing books and CD		As required

Note: -

1. *All the tools and equipment are to be procured as per BIS specification.*

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 Mining 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,	Member

		Jaipur	
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