

Syllabus

For the trade of

MECHANIC LENS / PRISM GRINDING

Under

CRAFTSMEN TRAINING SCHEME

2005

Designed by

**Government of India
Ministry of Labour(DGE&T)
CENTRAL STAFF TRAINING & RESEARCH INSTITUTE
EN Block, Sector V, Salt Lake City
Kolkata- 700 091**

List of Members present in the Trade Committee Meeting for the Trade of
“ Mech. Lens / Prism Grinding under C.T.S.”

<u>Sl. No.</u>	<u>Name</u>	<u>Organization</u>	
1.	Sri. M.S. Lingaiah	Director, CSTARI, Kolkata	Chairman
2.	Dr.Sarup Sirkcar	Scientist, C.G.C.R.I., Kol-32	Member
3.	D .B. Dutta	Dy. Director(Glass & Ceramic) S.I.S.I. , Kolkata-108.	Member
4.	P.K. Sarkar	Dy. Director, Dte. of C&SSI West Bengal	Member
5.	D.K. Dubey	Asstt. Director of Indl. Trg. DIT., West Bengal	Member
6.	D.P.Ganguli	Ex-Director , RDAT., Kolkata	Member
7.	A.K.Paul,	Ex-Dy. Director, RDAT .,Kolkata	Member
8.	L.D’Souza	Lawrance & Mayo, Kolkata-69	Member
9.	K.N.Chatterjee	-do-	Member
10.	U.P.Datta	Ex-Employee, National Instrument	Member
11.	D.N.Sarkar	M/s. Sigma Instruments, Kolkata	Member
12.	T. Mukhopadhyay	Dy. Director, CSTARI., Kolkata	Member
13.	M.M.Gera	-do-	Member
14.	S. Kumar	-do-	Member
15.	A.Chakraborty	Asstt. Director, CSTARI, Kolkata	Member
16.	D.C.Roy	Trg. Officer, RDAT, Kolkata	Member
17.	S.C.Poddar	Trg. Officer, CSTARI., Kolkata	Member
18.	M.B.Karketa	-do-	Member
19.	S.B.Sardar	-do-	Member

GENERAL INFORMATION

- | | | | |
|----|--------------------------------|------|---|
| 1. | Name of the Trade | ... | Mechanic Lens/ Prism Grinding |
| 2. | N.C.O. | ... | |
| 3. | Duration of Craftsmen Training | ... | 1 Year |
| 4. | Entry Qualification | ... | Passed class 10 th Examination under 10+2 system of Education or its equivalent. |
| 5. | Space Requirement | ---- | 100 Sq.metre. |

SYLLABUS OF MECHANIC LENS/ PRISM GRINDING

(Period: 1 year)

Under - CTS

Week No.	Practical	Theory
1.	Familiarization with the Institute Importance of Trade training Different skills involved in the trade. Observing safety precautions in the job & precision/critical aspects in the job.	Importance of safety and general precautions observed in the Institute.
2.	<u>BASIC FITTING GRINDING & BENCH WORKING</u> Identification of different hand tools related to the trade and its uses.	Description of hand tools, type and uses, care & its maintenance.
3.	Marking and sawing practice Grinding of chisel.	Description of Diamond cutter, Hacksaw & Grinding Wheel, Trepanning Tools. Description of chisel, Hacksaw frame blade, types, method
4.	Filing practice, simple fitting works, marking practice with dividers, calipers and use of steel rule (circles, areas, parallel lines), use of vernier calipers and Micrometer, Depth gauge.....	Files specification, description, uses, measuring standards (English, Metric units) Description of dividers, calipers, uses and care & maintenance.
5.	Drilling different sizes of holes by hand and Machine	Familiarization of Drilling machine uses, types.
6.	Trepanning	Different types of Trepanning Tools & Tool Holder.
7.	Use of screw drivers, spanners, pliers, etc.	Description of screwdrivers, spanners.
8.	Use of Blow lamp, stoves and use of various types of Tongs	Description of Tongs, size, types, uses.
9.	Identification & Demonstration of materials of different Lenses	A) Optical materials and its composition 1. Idea about 'refractive index' & 'V value' 2. Types of glass 3. Use of glass/optics in different fields. B) Defects in Optical materials & detection of defects 1. Nature of defects (i.e. air bubbles, veins, In homogeneity etc.) 2. Adverse effects on products for these defects. 3. Instruments/Equipments used to detect these defects.

10- 11	<p><u>PARAMETERS OF LENSES</u> Determination of Radius of curvature & Focal length of different lenses by different methods</p>	<p>Reflection, Refraction Refractive Index, Dispersion Concept & understanding of the lens maker's formula, different types of lenses focal length Vs Radius of curvature ,Linear & angular magnification , Power of different lenses unit of Power (Dioptre). Different terminology. Defects of Lenses/images Spherical aberrations, Chromatic aberrations, Astigmatism, Coma etc. Methods of overcome aberration. Different applications of Lenses. Concept of 'A spherical Lens' for corrections spherical aberration and idea of 'Extra Dispersion Lens (ED)' and Polarize Glass</p>
12-15	<p><u>MAKING OF LENSES ,MIRRORS & PRISMS</u> Practice on use of spherical block 60 mm dia Lens setting on spherical block setting of lens Heating pitch, placing on block with power glass (Bio-Focal) , setting axis. Lens setting on cylindrical block Working process: (Trepanning) (a) Shaping (b) Rubbing (3) finishing (4) Polishing by Cerium oxide and White oxide. Setting Cylindrical die (Tool) Operate cylindrical m/c. /spherical m/c.</p> <p><u>Practice on different operations involved in manufacturing of Lenses.</u> 1 Curve generation. 2 Grinding</p>	<p>Manufacture of optical components from Material available in market</p> <ol style="list-style-type: none"> 1. Material in the form of glass slab/glass mould 2. Machines used in manufacture of optics (i.e. slicing, Trepanning, Milling, Curve generating, Grinding, Smoothing Polishing, Centering & edging etc. 3. Tools & Cutters used for manufacture of Optics. 4. Abrasives and its grades used for grinding & polishing of optics. 5. Process for manufacture of lenses, prisms & other types of optical components. <p>Description of Gala (Dammar) Types & uses in grinding of Lenses</p>

	3 Smoothing 4 Polishing & Hand Polishing 5 Centering & Edging 6 Inspection of various parameters 7 Cementing of lenses 8 Fusion of Lenses 9 Antireflection coatings	Method of Heating pitch for fixing agents Familiarization with cylindrical block Method of finishing and polishing and use of cerium oxide and white oxide. Use of different abrasives of different grades Description of dies (optical glass) Types of die, sizes and their uses Uses of cylindrical and spherical m/c.
16-36	<p><u>SPECTACLES LENSES</u></p> <ol style="list-style-type: none"> 1. Selection of glass moulds 2. Polishing & Profiling to suit in frame 3. Measurement of power and axis 4. Bi-focal lenses manufacturing process 5. Transmission measurement <p><u>Lens fitting:</u></p> <p>Lens fitting on frame by grinding, edging and sizing according to the required frame. Mounting of lens in frame.</p>	Familiarization of edging machine and uses Diamond coated wheel and uses.
	<p><u>Inspection & Quality Control</u></p> <ol style="list-style-type: none"> 1. Use of test plates /proof plates 2. Measurement of curvature & use of instruments (optical spherometer) 3. Measurement of Focal Length for +Ve & -Ve & -Ve Lenses & Mirrors 4. Use of optical measuring devices such as 'Angle Dekkor', Lensometer, Refractometer, Spherometer, Collimator. Interferometer, Strain viewer etc. <p>Idea about optical aberrations.</p>	Defects of eye and correction using lenses Different parameters of spectacles. Methods of testing of parameters of a spectacles.
37-39	<p><u>Prism & other flat surfaces</u></p> <p>Practice on different operations For manufacturing of prisms and other flat surfaces</p> <ol style="list-style-type: none"> 1. Profiling 2. Blocking 	Principle of manufacturing of prisms & other flat surfaces

	3. Grinding 4. Smoothing 5. Polishing 6. Removal from block 7. Cleaning 8. Measurement of parameters 9. Anti-reflection coating 10. Cementing (if applicable) <u>Surface finish on optical components</u> 1. Manufacture of front surface & back surface mirrors. 2. Chemical silvering on optics 3. Vacuum deposition of different materials on optics 4. Anti-reflection coatings on optics 5. Cementing of optical components	Different applications of prism Blocking materials for prism making
40.	Silvering of Mirror & Prisms	Plane Mirror, Convex & Concave Mirror, Silvering of Mirror Basic Idea about special types of optical components <ol style="list-style-type: none"> 1. Graticules/Raticles 2. Cylindrical Lenses 3. Bi-Prism 4. Refraction Gratings
41-45	<u>Optical instruments & devices</u> Demonstration & practice on application of different optical instruments and devices	Optical instruments & its basic functions <ol style="list-style-type: none"> 1. Telescope 2. Microscope 3. Binoculars 4. Periscope 5. Range Finder 6. Theodolites 7. Night Vision devices
46-50	<u>Project work</u> <ol style="list-style-type: none"> 1. Making of spectacles 2. Making of a mirror for shaving, motor driving, Dentist 3. Making of prism & magnifying glass 4. Making of Periscope 	
51	Visit to some Industries /Test & Evaluation	
52	Revision & Test	

WORKSHOP CALCULATION & SCIENCE

1. Addition, subtraction, multiplication of decimals numbers and conversion of fraction to decimal.
2. Properties and use of carbon steel and alloy steel.
3. SI & MKS, & FPS Units – their conversion to related problems.
4. Mass, volume, density,; weight etc. velocity and acceleration, Newton's Laws of motions.
5. Power and root factor, square root by arithmetic.
6. Work, power and energy – their units and application.
7. Different types of loads, stress, strain, modular of elasticity, factor of safety.
8. Simple machine – Velocity ratio and mechanical advantage, efficiency.
9. Different optical materials – their properties and uses.
10. Laws of reflection, refraction, dispersion

ENGINEERING DRAWING

1. Importance of Engineering Drawing and its knowledge. Use of Drawing. Instruments, T-Square Drawing Board etc.
2. Letters, Numbers and Alphabets as per BIS.
3. Drawing of straight lines, rectangles, circles, polygons, etc.
4. Use of different types of line and symbols for drawing, Importance of dimensions on the drawing.
5. Reading of simple blue print drawing, isometric drawing, orthographic drawing, 1st angle projection and 3rd angle projection.
6. Exercise on ;orthographic view from isometric view.
7. Views of simple hollow and solid bodies with dimension.
8. Construction of orthographic projection from the given isometric view of shaped block.
9. Construction of orthographic view from the given isometric view of shaped block in first angle projection.
10. Construction of orthographic view from the given isometric view of shaped block in 3rd angle projection.
11. Exercise on the orthographic view related to mission line and missing view.
12. Drawing of different types of lenses.
13. Drawing of different types of symbols used on drawings.
14. Drawing of different types lenses with dimension.
15. Conventional representation of materials by B.I.S.
16. Methods of indicating surface roughness by B.I.S.

N.B : Social Studies is included as per the syllabus designed for the Approved Trades. .

TRADE- MECHANIC LENS/PRISMS GRINDING

List of tools & equipment for 12 trainees for 1 year course

HAND TOOLS

Sl.No.	Description	Quantity
1.	Steel rule 150 mm (Graduated both English and metric)	12 nos.
2.	Outside calipers	12 nos.
3.	Inside Calipers	12 nos.
4.	Odd leg caliper 150 mm	12 nos.
5.	Scriber 150x3 mm	12 nos.
6.	Pliers 150 mm	12 nos.
7.	Goggles (fiber plastic cup) safety glasses	12 nos.
8.	Hammer ball pein ½ lb.	12 nos.

TOOLS FOR GENERAL SHOP OUT FIT

1.	Hammer copper 0.50 kg	06 nos.
2.	Oil cane	06 nos.
3.	Drill Chuck 12 mm cap. Taper shanks	06 nos.
4.	Diamond wheel dressing (single stone mounted)	12 nos.
5.	Files, Hand flat 200 mm smooth	12 nos.
6.	Files 150 mm Half round	12 nos.
7.	Files- Triangular, Dead smooth 200 mm and 150 mm	06 nos.
8.	Hacksaw frame 200 to 300 mm adjustable	06 nos.
9.	Oil stone carborandum, coarse on one side and fine on the other 200x50x25 mm	06 nos.
10.	Screw Driver 200 mm	06 nos.
11.	Screw Driver 300 mm	06 nos.
12.	Spanner D.E. (both Metric & English)	03 sets each
13.	Fitter vice 4" Jaw (100 mm)-2 nos.	06 nos.
14.	Center punch 150x6 mm dia-2 nos.	06 nos.
15.	Chisel cold flat 12 mm –2 nos	06 nos.
16.	Taps M 10 M8, M6, M5, M4, M3, M2, M1	2 sets.
17.	Die – M1 to M10	2 sets.
18.	Hand drill 6 mm-cap	2 nos.
19.	Drill Twist 1 mm to 12 mm, in step of 1 mm	2 nos.
20.	Set of Morse sockets (0-1), (1-2) and (2-3)	2 nos.
21.	Wooden working Bench 340x120x75 cms	1 no.
22.	Fire Extinguisher	2 nos.
23.	Fire Buckets with stand	2 nos.
24.	Steel lockers with 6 drawers (cup board) (for trainees)	2 nos.
25.	Metal Rack 180x150x45 cms	1 no.
26.	Steel Table for Instructor	1 no.
27.	Stool	4 nos.
28.	Black board with Easel	1 no.
29.	Adjustable wrench 250 mm size	4 nos.
30.	Grease Gun	2 nos.

GENERAL MACHINERY / EQUIPMENT

(A) For Glass Spherical

1.	Drilling Machine Pillar 0-12 capacity with motorized	1 no.
2.	Bench Grinder 250 mm dia. (Lighter type)	1 no.
3.	Spherical Generator	1no.
4.	Two Spindle Spherical Smoother & Polisher	2 nos.
5.	Single Spindle Hand Operator Machine	1 no.
6.	Spherical Tools (C.I.Casting)	150 nos.
7.	Spherical Aluminum Runner	40 nos.
8.	Thickness Glass	1 no.
9.	Spherometer Set (+ & -)	1 no.
10.	Glass Tray	4 nos.

(B) For Cylindrical

1.	Toric Generator	1 no.
2.	Pneumatic Auto System Cylindrical Smoother & Polisher	2 nos.
3.	Alloy Blocker	1no.
4.	Cylinder Tools (Aluminum)	800 nos.
5.	Cylindrical Aluminum Block	50 nos.
6.	Torometer	1 no.
7.	Evalue Gauge (0 – 25)	1 no.
8.	Diameter Reducer	1 no.
9.	Tap Applicator	1 no.
10.	Tool Rack	1 no.
11.	Chiller Unit (with Chiller Tank	1 no.
12.	Thickness Gauge	1 no.
13.	Fabrication Items	----
14.	Alloy for CR	2 Kgs.
15.	Diamond for CR	1 no.

(C) Measuring / Checking Devices

1	Optical Spherometer	1 no.
2	Angle Dekkor	1 no.
3.	Lenso Meter	1 no.
4.	Refractro Meter	1 no.
5.	Collimator	1 no.
6.	Index Ferometer	1 no.
7.	Strain Viewer	1 no.
8.	Spherometer	1 no.

(D) For Spectacle Fittings

1.	Auto Edger M/C	1 no.
----	----------------	-------

2.	Hand Edger M/C	1 no.
----	----------------	-------