SURVEYOR

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – CONSTRUCTION

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

SURVEYOR

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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ACKNOWLEDGEMENT

The DGT sincerely expresses appreciation for the contribution of the Industry, State Directorate, Trade Experts 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.

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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

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- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.

- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.

- Scope has been extended also to non-engineering occupations.

- Establishments have been permitted to outsource basic training in an institute of their choice.

- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

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

Surveyor trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

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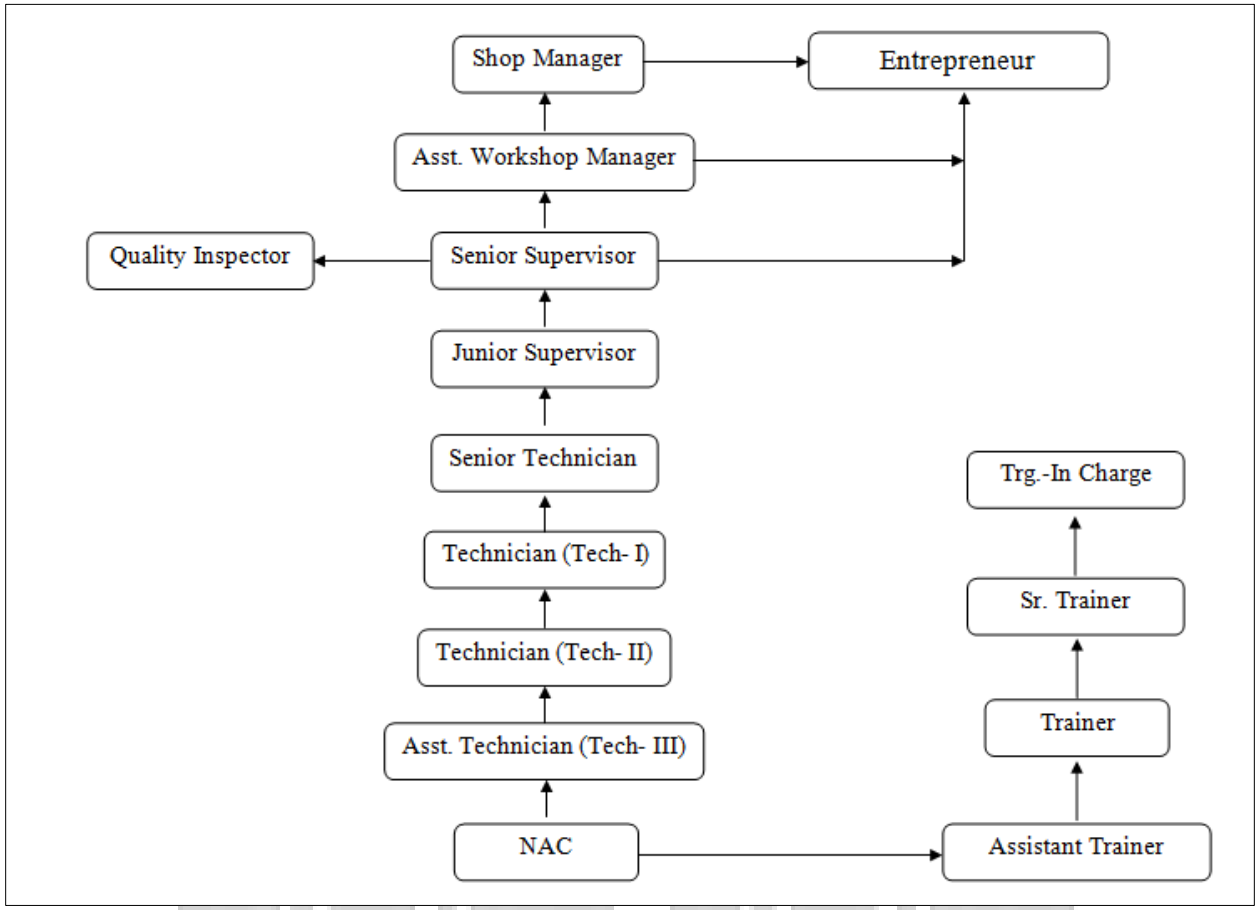
2.2 CAREER PROGRESSION PATHWAYS:

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

A. Basic Training

For 02 yrs. Course (Engg.):-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)
For 01 yr. Course (Engg.):-(**Total 03 months:** 03 months in 1st yr.)

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg.) :-(**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg.) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. Course (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. Course (Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training

institute have to maintain individual *trainee portfolio* as detailed in assessment guideline (section-2.4.2). The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline (section-2.4.2) before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

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 team work, 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 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

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

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Performance Level	Evidence
(a) Weightage 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 • Below 70% tolerance dimension/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)Weightage 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% tolerance dimension/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) Weightage 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% tolerance dimension/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

Brief description of Job roles:

Surveyor, Topographical surveys land to determine out line, contours and relative position of control points (land marks) on tract of land, cost, harbour, etc. for preparing topographical and other maps and records. Establishes control points and pillars to do instrumentation work on ground to prepare maps. Provides identification marks on ground for photographs taken in aerial survey. Fixes position of control points on ground in relation to some permanent position and with reference to celestial bodies using astrolabes (for lat. And long), transit telescopes (for time and longitudes), field magnate instruments (for magnetic forces and elements), theodolites and precise levels, tellurometers (electronic distance measuring instruments) barometers for atmospheric pressure, etc. Adjusts and sets theodolites, compasses, plane tables, levelling and other instruments for surveyor, observes and records measurements and angles from three determined points (triangulation), locations to scale on proper sketch. Corrects margin of error due to worn-out tapes which become incorrect, andreadings on instruments which are affected by light, sound, heat, tension, environments and gravitational changes due to varying reserves underneath ground. May be known as Superintendent Surveyor Officer Surveyor or Surveyor according to degree of authority.

Plain Tabler; Ground Surveyor prepares topographical and cadastral (ground) maps based on control points fixed by Surveyor, Topographical by plane tabling method (field operations involving use of plane-table, clinometers, magnetic compass, sight rule, etc.). Plots points in drawing conforming to points on ground using plane table and sight rule, in hills and planes with accuracy. Registers colour and light traces in drawings, project maps, flood surveys, cadastral surveys, etc. Visits area to be surveyed and carries out plotting, sketching, contouring, drawing etc. of territory on basis of control data and other relevant available material. Collects, records and interprets air photographs which lack in such details as small bridges, streams, rivulets, tracks or pillars on account of no visibility from photographic distances.

Topographical Auxiliary participates in field survey by traversing (computing direct distances) leveling, rectangulation (determining a point from 4 ends) recording angular and liner measurements and comparing readings with 100 ft. and 66 ft. chains, (Gunter chains) theodolites levels, etc. Carries out rectangulation for permanently identifying ground marks. Computes measurements using log tables, traverse tables. Makes astronomical observation such as sum azimuth, arc of heaven to know about magnetic meridian. Determines elevation and slope using leveling instruments such asdumpy level, eye level, tilting level, etc. Uses vernier type theodolites for large-scale drawings. Completes all circuits and applies checks to ensure accuracy. May identify or pick points on aerial photographs. May be known as Traverser or Leveler, Theodolite Surveyor according to degree of responsibility.Plan and organize assigned

work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.Perform TPM (Total Production Management), TQM (Total Quality Management) and record keeping system.

Reference NCO:

i) 2165.0200- Surveyor
ii) 3112.0300- Plain Tabler
iii) 3112.0400- Topographical

4. NSQF LEVEL COMPLIANCE

NSQF level for Surveyor trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. Professional knowledge,
c. Professional skill,
d. Core skill and
e. Responsibility.

The Broad Learning outcome of Surveyor trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	SURVEYOR
NCO-2015	2148.0200,3112.0300,3112.0400
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprentices	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related Trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for Surveyor Apprenticeship	1.Surveyor 2. Civil Engineer Assistant

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the Surveyor course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. [Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. [Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Draw plane figure applying drawing instruments with proper layout and the method of folding drawing sheets.
2. Construct plain scale, comparative scale, diagonal scale and vernier scale.
3. Draw orthographic projections of different objects with proper lines, lettering and dimensioning.
4. Perform site survey with chain / tape and prepare site plan.

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5. Perform site survey with prismatic compass and prepare site plan.
6. Prepare cadastral map showing Dag No.Using.
7. Plane Table Survey.
8. Perform site survey with plane table and prepare site plan.
9. Prepare Road Project with leveling instrument and showing Long & Cross section.

Block – II

10. Make topography map / contour map with leveling instrument.
11. Perform site survey with Theodolite and prepare a site plan
12. Prepare Simple curve by linear and angular methods.
13. Prepare Road Project with leveling instrument and showing Long & Cross section computation of earth work.
14. Perform site survey with Digital Theodolite and prepare site plan.
15. Prepare a map using Total station.
16. Locate the station point using GPS and obtain a set of co-ordinates.
17. Prepare a Single Storied Residential Building Plan using CAD

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

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
	1.12 Identify environmental pollution & contribute to avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner
	1.14 Avoid waste and dispose waste as per procedure
	1.15 Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain different mathematical calculation & science in the field of study including basic	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.

	electrical andapply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	2.2 Measure dimensions as per drawing
		2.3 Use scale/ tapes to measure for fitting to specification.
		2.4 Comply given tolerance.
		2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
		2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
		2.7 Explain basic electricity, insulation &earthing.
3.	Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	3.1 Read & interpret the information on drawings and apply in executing practical work.
		3.2 Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
		3.3 Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4.	Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier calipers, dial gauge, bevel protector and height gauge (as per tool list).
		4.2 Ascertain the functionality & correctness of the instrument.
		4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5.	Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
		5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.

productivity & quality.	5.3 Knows benefits guaranteed under various acts
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7.1 Explain personnel finance and entrepreneurship.
	7.2 Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8.1 Use documents, drawings and recognize hazards in the work site.
	8.2 Plan workplace/ assembly location with due consideration to operational stipulation
	8.3 Communicate effectively with others and plan project tasks
	8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.

SPECIFIC OUTCOME

Block-I & II (Section:10)

*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	Familiarization with Institute, importance of trade training, instrument &equipments used, nature of job done by Surveyor. Drawing different types of lines, printing letters & figures. Construction of plane scales.	Importance of safety, general safety, precautions-introduction to trade. Use of different instrument &equipments used by surveyor, their types and uses. Lettering using stencils. Scales-different types.
2	Conventional signs & symbols used in survey (Topography and building drawing). Map reading practice, contour, drainage.	Classification of survey. Accuracy and speed in field & office work. Common terms used and definitions. Conventional signs and symbols.
3-4	Chain survey-practice in unfolding & folding chain, errors & adjustment of chains, alignment, chaining lines, measurement of distances and booking. Practice in chaining, taking offset, uses of optical square and cross staff. Setting out right angles and booking. Testing a chain, tape, optical square & cross staff.	Linear measuring instrument, their description & uses. Types of chain. Principles of chain surveying. Instrument used & and their description.
5	Procedure in conducting chain survey. Chain survey of an area plots by triangulation, locating details, booking and plotting.	Field book-types, methods of entry of check lines & its importance. Types of offsets and their limit, procedure in plotting.
6	Taking horizontal measurement on sloping ground, overcoming obstacles, measuring distance between two points invisible from each other. Inking and coloringthe plotted map. Surveying of tank, a rout or obstructed field bychain traverse, method of finding height of inaccessible objects.	Care & maintenance of chain & accessories. Types of obstacles in chaining and methods of overcoming them. Errors in chain survey &their remedies, problems in chain survey, degree of accuracy required, procedure of inking & coloring.
7	Showing plot no (dag no.) of cultivation land or houses from the cadastral map.	introduction of C.S. & R.S. cadastral map
8-9	Practice in setting up compass & checking its accuracy taking bearings &calculating angles.	Technical terms used in compass survey, difference between angles& bearings,

	Determining the bearings of a given line & establishing lines of given bearings, laying out rectilinear & polygonal plots of ground using compass & tape. Conducting closed traverse of built up fields and plotting the same.	magnetic & true meridians, declination and its variations, local attraction, its detection & elimination. Locating details by bearing, compass survey methods, traversing methods, methods of determining true meridians & declination, methods of plotting closed compass traverse - adjustment of closing errors, limits of precision required, field book entries.
10	practice in setting up a level & performing temporary adjustment - practice in reading staff, practice of permanent adjustment of Dumpy & Auto level,	Leveling parts, types- Dumpy level & Auto level, types of staff, technical terms used in leveling, permanent adjustment of leveling instruments
11	Practicing simple leveling, differential leveling, reciprocal leveling, fly leveling, longitudinal sectioning, cross sectioning and check leveling. Reduction of levels, Preparation of sections & working profiles. Setting out gradients.	Methods of observation, booking reduction of levels, types of field book, working out problems on reduction, various methods of leveling namely simple leveling, differential leveling, reciprocal leveling, fly leveling, check leveling, longitudinal sectioning, cross sectioning etc. plotting of sections & working profiles, establishment of gradient, effects of earth's curvature & refraction in leveling, common errors & their elimination, degree of accuracy
12-13	Setting up plane table, leveling, centering & orientation. Surveying an area with plane table by radiation & Intersection methods. Traversing with plane table of built up areas, running & open traverse with plane table & fixing details. Inking, finishing, coloring & tracing of plane table maps. Practice in finding the position of table resection methods.	Plane table survey - merits & demerits, equipments use, methods of plane tabling. Errors in plane tabling & their elimination - others instruments used in combination with plane table, their construction & uses. Tangent clinometers & telescopic alidade. Survey maps - care & maintenance of plane table accessories, procedure of plane tabling
	Internal Assessment/Examination 03days	

NOTE: -

More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	Locating contour lines, directs & indirect methods, interpolation of contours, contour gradient, preparation of sections from contour map - computation of volume by prismoidal & trapezoidal formula. Establishment of gradient using abney level, Ceylon ghat tracer and by using boning rods.	Contouring - Contour interval - section of contour interval - characteristics of contours - uses of contours - contouring by various methods - interpolation of contours by various methods – drawing of contours - computation of volume prismoidal formula & trapezoidal formula. Construction & Use of boning rods. Establishment of gradient using Ceylon ghat tracer, Abney level
2	Practice to set up the theodolite & to read the verniers, booking performing of permanent adjustment of theodolite. Measurements of horizontal angles by various method, setting out angles, measurement of vertical angles, deflection angles & prolongation of lines by various methods.	Introduction of Theodolite, types of theodolite, parts of theodolite, terms used in theodolite surveying, temporary adjustment of theodolite, reading of verniers, booking readings, permanent adjustment of theodolite, Measurement of horizontal angles by repetition methods, reiteration methods, setting out angles by repetition methods, measurement of vertical angles, measurement of deflection angles, measurement of bearings, prolongation of lines & locating the intersection point of directions.
3-4	Traversing (closed & open) using theodolite and steel tape, measurement of horizontal angles, bearings of lines- computation of coordinates from the bearing, angle and length. Preparation of Gale's traverse table, plotting of traverse by coordinates, computation of area using coordinates. Omitted measurements.	Traversing using theodolite (closed & open), traverse computation, determination of consecutive coordinates, independent coordinates, check of traverse, balancing of traverse closing errors, preparation of Gale's table, computation of area using coordinates, omitted measurement
5	Simple curve, computation of elements of simple curve, set out of simple curves by linear and angular methods.	Curves- purpose- types of curves- simple- compound- reverse- transition-elements of simple curve - computation of simple curve, various method for setting out simple curve.
6	Road project reconnaissance., preliminary and final location survey including preparation of route map, traversing, leveling, preparation of sections, computation of earth work and other	Types of surveys for the location of a road, points to be considered during reconnaissance, preliminary and final location survey. Classification of roads and

	materials for laying the road.	termed used in road engineering. Alignments of roads - relative importance of length of road, height of embankment and depth of cutting-road gradients- foundation, drainage, camber, super elevation, road surfaces such as earth road, water bound macadam and concrete pavements.
7-8	Determination of horizontal and vertical distances by tacheometric method. Enlargement and redacting of plans and proportionate compass.	Introduction of tacheometry- advantages and disadvantages- constants of tacheometer and its determination- various method of tacheometry- determination of horizontal and vertical distances by various methods. Technical terms in connection with simple triangulation-base line measurements & its correction.
9	Setting up of digital theodolite, measurements of horizontal and vertical angles-traversing using digital theodolite.	Modern survey instrument-Digital theodolite, study of parts, adjustments, measurement of angles by various methods, traversing using digital theodolite (closed& open)
10-11	Temporary adjustment of Total Station. Measurements angles, measurements of coordinates, determination of height, determination of an area, traversing (Closed & open) using total station, determination of the coordinates of the points using GPS.	Familiarization of modern survey equipments, study of the parts of total station-temporary adjustment, measurements of angle and coordinates – setting out of angles and lines. Traverse survey of closed and open field, determination of enclosed areas using total station. introduction to GPS and uses, adjustment , determination of coordinates
12-13	Working with Cad- use of commands such as DRAW MODIFY etc. Adding dimension and text. Development of 2D drawing. Preparation of drawings of simple building.	Introduction to Computer Aided Drafting (CAD)- working with CAD, setting limits, drawing lines, using grid and snap, saving work, drawing simple shapes, exit and quit commands. Editing, adding dimension and text. Editing drawing using various modify commands. Developing simple building with CAD.
	Internal Assessment/Examination 03days	

NOTE: -

- *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation (Duration: - 20 hrs.)**	**Workshop Science (Duration: - 20 hrs.)**
1.	**Fraction: -** Fraction, Decimal fraction, L.C.M., H.C.F., Multiplication and division of fraction and decimal, Conversion of fraction to decimal and vice versa.	**Mass, Weight and Density:-**Mss, Unit of mass, Weight, Difference between mass and weight, Density, Unit of density, Specific gravity of metals.
2.	**Square Root:-**Square and square root, Method of finding out square roots.	**Work, Power and Energy:**-Work, units of work, Power, Unit of power, Horse power of engines, Mechanical efficiency, Energy, Use of energy, Potential and Kinetic energy, Example of potential and kinetic energy.
3.	**Unit: -** System of units-FPS, MKS, CGS, SI unit - Unit of length, mass and time. Conversion of units.	**Speed and Velocity: -** Rest and motion, Speed, Velocity, Acceleration, Retardation, Equation, of motion, Simple related problems.
4.	**Ratio And Proportion:-** Simple calculation on related problems	
5.	**Percentage: -** Introduction, Simple calculation, changing percentage to decimal and fraction and vice versa.	

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Block – II		
Sl. No.	**Workshop Calculation (Duration: - 20 hrs.)**	**Workshop Science (Duration: - 20 hrs.)**
1.	**Algebra:-** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear Equations (with two variables)	**Heat and Temperature: -** Definition of het and temperature and their units, difference between heat and temperature. Scale of temperature, boiling point, melting point, relation between different scales of temperature.
2.	**Mensuration: -** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semicircle Volume of solid - cube, cuboid, cylinder, and sphere. Surface area of solid - cube, cuboid, cylinder, and sphere.	**Basic Electricity:-** Introduction, Use of Electricity, How electricity is produced, Types of currents, AC, DC, their comparism, Voltage, Resistance, their units, Conductor, Insulators, Types of connection - series, parallel, electric power, energy, unit of electrical energy.
3.	**Trigonometry:-**Trigonometrical ratio, measurement of angles, Height & distance.	**Levers and Simple Machines:-** Levers and its types, Simple machines, Efforts and load, Mechanical advantage, Velocity ratio, Efficiency of machine, Relationship between efficiency, Velocity ratio and Mechanical advantage.

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy	Duration: 20 Hrs. Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy	Duration: 20 Hrs. Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.

Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cybercrimes.
4. Communication Skills	Duration: 15 Hrs. Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II Duration – 55 hrs.	
5. **Entrepreneurship Skills**	Duration: 15 Hrs.

	Marks : 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	Duration: 10 Hrs. Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. **Occupational Safety, Health and Environment Education**	Duration: 15 Hrs. Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.

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Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. Safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
E**nvironment**	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation	Duration: 05 Hrs. Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. **Quality Tools**	Duration: 10 Hrs. Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR SURVEYOR TRADE:

1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)
2. Housekeeping, Record keeping and documentation
3. Prepare a map by using Chain / Compass/ Plane Table/ Theodolite/ Total Station.
4. Prepare a contour map by using Levelling instrument.
5. Prepare Road Survey using Levelling instrument.
6. Prepare Road Curve using Digital Theodolite.
7. Prepare a One Storied Residential Building Plan using CAD.

Note: Actual training will depend on the existing facilities available in the establishments.

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below using CAD: -

Block – I

1. Chain Survey.
2. Compass Survey.
3. Leveling.
4. Plane Table Survey.

Block – II

5. Contouring
6. Surveying with Theodolite.
7. Traversing using Theodolite.
8. Road Survey.
9. Determination of distances by Tachometric method.
10. Determination of angles – traversing using digital Theodolite.
11. Survey with Total Station.
12. Preparation of plan drawing with CAD.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.

2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

SURVEYOR			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**		**Quantity**
1.	Protractor	15 cm full circular	21
2.	Card board/ plastic metric scale	set- A to H	21
3.	Diagonal scale, electroplated		10
4.	Erasing shield small size		21
5.	Architect's & builder's template		10
6.	Chisel- steel	80 mm blade	10
7.	French curve	set of 12	10
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
1.	Abney level		1
2.	Box sextant		2
3.	Boning rod		1 set
4.	Binocular		4
5.	Chalk board/White board		1
6.	Cupboard (Big)		4
7.	Ceylon ghat tracer with stand & target		2
8.	Scientific calculator		21
9.	Computing scales two hectares		4
10.	Computing scales five hectares		4
11.	Wooden cross staff- box type		2
12.	Wooden cross staff- open type		2
13.	Engineer's chain		2
14.	Engineer's level		6
15.	Dumpy level		6
16.	Auto level		5
17.	Tilting level		1
18.	Fire extinguisher		1
19.	Gunter's chain		2
20.	Hand press for numbering & lettering		2
21.	Canvas bag		8
22.	Height indicators		8
23.	Hold all canvas for instruments		8
24.	Hones in case		1
25.	Tracing board with lamp		2

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26.	Leveling staff - telescopic type		10
27.	Metric chain	30 m & 20 m	5 each
28.	Magnifying glass		2
29.	Magnet bar (for magnetizing through compass needles)		2
30.	Plastic tubes for keeping drawings		21
31.	Pen knife		5
32.	Pentograph		2
33.	Prismatic compass		5
34.	Planimeter (digital)		2
35.	Proportionate compass		21
36.	Plane table with stand , accessories & water proofing cover		8
37.	Telescopic alidade		8
38.	Indian pattern clinometers		8
39.	Ranging rod	4 m	40
40.	Offset rod		5
41.	Optical square		5
42.	Railway curve	Set of 50 in a box	4
43.	Steel almirah (Big)		4
44.	Survey plotting scale-8 scales with offset scale in box		21 sets
45.	Stencil set		5
46.	Substance bar		2
47.	Metallic tape	30 m	10
48.	Metallic tape	20 m	10
49.	Steel tape	30 m	10
50.	Steel band	30 m & 20 m	2 each
51.	Surveyor's umbrella		6
52.	Theodolite transit		5
53.	Digital Theodolite		2
54.	Rules ebonite plain for drawing lines		21
55.	Wooden set square, T square & Compass in a box (for chalk board)		1
56.	Total station -Leica		2
57.	Hand GPS-latest version		2
58.	Computer table		5
59.	Computer chair		5
60.	Printer table		1
61.	UPS	5KVA	1
C : GENERAL MACHINERY INSTALLATIONS			
62.	Ammonia printing machine with box		1
63.	Computer & software		5 sets

64.	Printer-colour	A3 size	1
D. LIST OF TOOLS & EQUIPMENTS FOR COMPUTER LAB			
65.	Personal computer with latest configuration min.	19 inch LED Screen and graphic card with latest operating system.	20 Nos.
66.	Laptop with latest configuration		02 Nos.
67.	Plotter	A1 size	01 Nos.
68.	Printer (Desk jet / Laser jel) with scanner (multipurpose)		01 Nos.
69.	Server work station with latest configuration		01 Nos.
70.	Broad Band connection		01 Nos.
71.	UPS	5 KV	02 Nos.
72.	Computer Table		20 Nos.
73.	Computer chair		20 Nos.
74.	furniture for server, printer, plotter		01 each
75.	While Board	6' x 4’	02 Nos.
76.	DLP Projector	2000 lumens or higher	02 Nos.
77.	first Aid Box		01 Nos.
78.	Screen for Projector	motorized	02 Nos.
79.	Fire Extinguisher		01 Nos.
80.	Air Conditioner	2.0 Ton	02 Nos.
81.	Wall Clock		01 Nos.
82.	Document Camera / Visualiser		02 Nos.
83.	Smart Board Inter Active Board		02 Nos.
84.	Steel Cupboard	I8O x 90 x 45 cm	02 Nos.
85.	Steel Cupboard	120x60 x 45 cm	02 Nos.

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: SURVEYOR

LIST OF TOOLS& EQUIPMENTS FOR -20 APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)
2) **Infrastructure:**

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		20+1 set
2.	Set square celluloid 45^o	250 X 1.5 mm	20+1 set
3.	Set square celluloid 30^o-60^o	250 X 1.5 mm	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board IS: 1444	700mm x500 mm	20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Drawing Board		20
2.	Models : Solid & cut section		as required
3.	Drawing Table for trainees		as required
4.	Stool for trainees		as required
5.	Cupboard (big)		01
6.	White Board	size: 8ft. x 4ft.	01
7.	Trainer's Table		01
8.	Trainer's Chair		01

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TOOLS &EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools &Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														