

Name of Work: Providing, Supplying and Installing of Chlorination Plant at Different Head Works of BK-5 & SIPU RWSS Under M & R of Sipu RWSS. TA.Dhanera & DIST.BANASKANTHA.

Specification

Item No.1 Providing, installing & commissioning Chlorination plant as per design capacity with 5 kg/hr capacity

REQUIREMENT OF CHLORINATORS

1. Type	1. Chlorination Plant pressure fied.
2. Capacity and number of chlorinator required	2. 5000 gms/ Hr. capacity -1 no. working 5000 gms/ Hr. capacity -1 no. standby
3. Residual chlorine requirement consumers' end.	3. 0.5 mg/ l (minimum for available chlorine after 30 minutes of contact period.)
4. Require with chlorinators	1. Chlorine cylinder for supply of gas supplied with its own value fitting with liquid and gaseous chlorine under 35 kg/cm ² 2. a fusible plug for safety provide over all containers and designed to melt or soften between 700 to 750 C. 3. Pressure gauge one to indicate cylinder pressure and second to indicate delivery pressure. 4. Measurement device to measure flow of chlorine gas. 5. A desiccators or non-return valve containing concentrated sulphuric acid or calcium chloride.

TECHNICAL DATA FOR CHLORINE GAS AND THE CYLINDER

- Physical Classification:
Low pressure liquefiable, non-flammable but support combustion to corrosive gas.
- Critical Temperature: 1440 C
- Critical pressure: 78.6 Kgf/cm²
- Boiling point at 760 torr: 340 C
- Maximum permissible Toxicity: 1 ppm by volume. (This is maximum concentration in air to which nearly all workers may be exposed day without adverse effects. Concentration above 2 to 3 ppm in the air are readily detectible by normal person inhalation or air containing 40 to 60 ppm of chlorine for a period ranging from 30 to 60 minutes is quite dangerous)
- Use of safety device on gas cylinder : Prohibited
- Filling Rotation:- 1.19
- Vapor pressure at 650 C : 19.90 kgf / cm² (Gauge)
- Minimum Test Pressure:
1.50 times maximum working pressure = 29.85 kgf / cm²
- Type of valve outlet to be used: Ext. FP 5/8 A- RH
- Chemical reaction with metals:
Dry chlorine reacts with aluminium, tin, arsenic gold, mercury, selenium, tellurium, and titanium metals resistant to dry chlorine are steel, iron, copper, nickel, and lead. Even small amounts of moisture when mixed with chlorine from hypochlorous hydrochloric acids that are very corrosive to most of the metals. Only silver platinum and tantalum can resist attached by moist chlorine.
- Precaution to handling chlorine cylinder
Chlorine cylinder should not be stored next to cylinders containing other compressed gases. They should also not be stored in the vicinity decided metals hydrocarbons such as oil, grease and gasoline
- Solvents such as petroleum, hydrocarbons or alcohols should not be used for cleaning parts which come in contact with chlorine. The safe solvents are chloroform, and carbon tetrachloride. Grease should never be used where it can come in contact with chlorine as it forms a voluminous frothy substance on reaction with chlorine. Only special cement recommended by manufactures should be used.
- No direct flame should be applied to a chlorine cylinders when heating becomes necessary as this is hazardous. A water bath controlled not to exceed 270 C should be used.
- Before disconnecting flexible leads from containers to gas headers, the cylinder valves should be closed

VOLUME: II B, TECHNICAL SPECIFICATIONS

first and then the gas under pressure should be drawn from the header and flexible leads before the header valve closed. The exhaust system should be turned on and operated while the cylinders are being disconnected repairs being made

- The tender should provide necessary instruments to facilities the chlorination apparatus operators to observe the above-safety precautions.
- The tender Should Provide Necessary Maintenance (Repairing) for 3 Years With Necessary Material & Labour.

7.0 Requirement for chlorinator installation:

In general, the requirements for chlorinators, plant equipment accessories, including storage and safety measures to be adopted shall conform to IS 10553 (Part-1 / 1983 or its latest revision)

Object should be allowed to strike team with force. The protective hoods over the should always be kept in place except when the cylinder are in use. Flames should never be applied to chlorine or their valve.

Cylinders should not be stored in the open or in damp place. Empty cylinders should be stored away from full cylinders so that they do not get mixed up it would be desirable to tag the emptied as an additional independently, this will ensure prompt return of used cylinder.

In case the valve is found to be stuck the cylinder should be immediately returned to the suppliers. No attempt should be made to ease a stuck valve by hammering as this is very dangerous.

Only the spanners or scribed for use should be used as it is important not to put so much leverage on the valves.

Cylinders as well as the chlorinator should be tested at very shift period, for leaks, first by trying to detect to sharp imaging smell of chlorine, then by passing over each cylinder and round each valve and pipe connections a rod with a small cotton wool swab tied on the end, dipped in an aqueous solution of ammonia. If chlorine is present in the air, the swab will appear to smoke due to the formation of white colors ammonium chloride. If the leak appears to be heavy, All the persons not directly concerned should leave the area and the operator should put on his mask and make a thorough search for the leak. In tracking a leak, always work down along the line of flow until the leak is found. It Will save many valuable minutes over the practice of starting in the middle of the chlorinator and searching vaguely back and forth over the whole equipment.

Water Should never be applied to a chlorine leak to stop it, as it will only make it worse. If the leak is in the chlorinator the cylinder should be immediately shut off until the pressure has reduced. The joint or gasket should be repaired, replacing with new packing. If necessary if the leak cannot be stopped the cylinder should be taken out of doors to a safe place down wing of the water works and nearby habitation and the valve should be kept open till the containers is empty.

1.10. Pressure indicator in the system should have Teflon diaphragms.

4.11. Pressure reducing valves should be Monel metal with Teflon diaphragm.

5.0 Chlorination House:

The chlorine feeders should be housed in a fire resistant building or an isolated room easily accessible, close to the point of application and convenient for truck loading and safe container handling (Location plan of proposed chlorination room and arrangement of disinfections unit for water district No.3 & 4 are given in drawing. Feeding equipment in large installations and in buildings occupied by persons.

These enclosures should be vented to the upper atmosphere and equipped with positive means of exhaust (near the floor levels at the center of the room or opposite to the entrance) capable of a complete air change within 2 to 4 minutes in an emergency.

6.0 Safety Equipment :

Only trained personnel should be permitted to handle chlorine cylinders and chlorinating equipment they should be made aware of the hazards involved, the precautions to be observed and first aid to be rendered in emergencies. Rubber gloves aprons and suitable gas masks should be provided. These should be housed in an easily accessible (unlocked) cupboard placed outside the chlorination room. It is very important that the operating personnel are trained in the proper use of gas masks. A faulty gas mask is worse than none at all. Hence it is very important that these are tested frequently and the canisters are changed at proper intervals.

When a chlorine leak occurs, the mechanical ventilation system should be opened immediately before any person enters the chlorine room. It must be made a point that chlorine container valves are closed first before any investigation is started.

VOLUME: II B, TECHNICAL SPECIFICATIONS

Cylinders containing chlorine should be handled gently. They should not be bumped, dropped or rolled on the ground and no pumps with all other fittings, accessories like motors starts base plate with down bolts, pipe, jointing materials, valves etc. Necessary laboratory type weighing balance of appropriate capacities. Tool kits.

Operator's manuals:

Rubber gloves, aprons and suitable gas masks etc.

Chlorine cylinders (100) kg supply chlorine gas, supplied with their own valves and filled with liquid/gaseous chlorine, under pressure.

Tendered is required to give a list of spares required for operations and maintenance. The rates quoted include supply, delivery of spares for two years trouble free operations and maintenance.

A schedule should also be given as to normal fair wear tear of various parts so that preventive maintenance could be achieved.

4.0 Pipe and other fittings.

4.1 Pipelines, valves and other fittings through which dry chlorine passes should be tightly closed, when not in use to prevent absorption of the moisture from the air.

4.2 Dry chlorine gas or liquid under pressure should be conveyed through extra heavy wrought iron or steel pipe or flexible annealed copper tubing tested for 35kg / cm² of working pressure.

4.3 The discharge line from chlorine container should be flexible and sloping upwards, specially when chlorine is discharged in the liquid state.

4.4 long pipe line should be avoided

4.5 Hard rubber should be used for conveyance of aqueous chlorine solution at pressure

4.6 Chlorine line should preferably be located overhead rather than along the floor.

4.7 For pipe 35 mm dia and smaller, connection should be screwed type.

4.8 Gaskets should be made of asbestos sheet rubber gaskets should not be used.

4.9 screwed fittings should be of forged steel construction.

d) A plate of the same composition as the body of the cylinder with may be welded soundly on the cylinder.

1.4 The stamps used for formation shall radiused at changes of section to avoid the identified edges in the formation of sharp edges in the stamped marking.

1.5 Each cylinder shall be identified by four in accordance with IS 4379.1967.

1.6 Records.

A record shall be kept of all tests made at the cylinder manufacturer's work and copies shall be forwarded to the cylinder and to the inspecting authority.

1.7 Preparation for Dispatch:

Before being with valves all cylinders shall be thoroughly cleaned and dried internally to the satisfaction of the inspecting authority. The outside shall be given a suitable protective before dispatch.

2.0 Chlorinators:

General specification for Chlorinators (Pressure feed type) based on contractor's own designs.

2.1 Chlorinator Fittings:

The Chlorinators should be provided with. Fusible plugs for safety, provided over at containers and designed to melt or soften between 70.C to 75.C

Pressure reducing valve to bring the pressure of gas down to 0.70 to 0.30 kg\cm 2.

Two pressure gauges with each chlorinators one for indicating cylinder pressure and the other for demure pressure measurements

Chlorine gas flow measuring devices.

Dessicator valves or non return valve containing a concentrated sulfuric acid or calciuin chloride. Through which the chlorine must pass to fee it self from moisture to preclude the corrosive action of moist chlorine on the fittings.

::TECHNICAL SPECIFICATIONS::

Marking and color identification:

1.1 Each shall cylinder be permanently stamped with the following :

- a) Serial number and identification of owner and manufacture.
- b) The number of this stander and maximum working pressure in kgf/cm2.
- c) Total pressure and date of the hydrostatic test(such as 6/75 for June 1975)in kgf/cm2)
- d) The retare in kg and the water capacity in liters.
- e) Inspector's official mark.
- f) Name or chemical symbol of gas, and
- g) Material identification.

4.2 The cylinder should be marked with the ISI certification mark.

Note :-

The use of the 131 Certification Mark is governed by the provision of the Indian Standards institution (certification mark) Act and the Rules and Regulations made there under. The ISI mark on the products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under at well defined system of inspection testing quality control which is devised and supervised by ISI and operated by ISI conformity to that standards as a further safeguard Details of under which a license for the use of the ISI Certification Mark may be granted to manufactures or processor, may be obtains from the Indian Standards Institutions.

4.3 The marking may be made at any off the following places

- a) Foot-ring
- b) Any non Pressure.
- c) Dished and provided it can be demonstrated in the bursting test that fracture does not initiate in the markings and

33.3 The purchaser shall not grant permission to connect until he is satisfied that.

- a) the appliance is in good condition and is fitted with a suitable plug
- b) The appliance is fitted with a suitable cable has earth conductors, one of the which be an earthed metal sheet surrounding the cores.

33.4 No electrical cable is use by the contractor / owner will be disturbed without prior permission. No weight of any description will be imposed on any such cable and lidded for or similar equipment will rest against or be attached to it.

33.5 No work will be carried out on any live equipment. The equipment must be made safe by the purchaser and a permit to work issued before any work is carried out.

Technical Specifications : As per IS code

- Instrument Type: Portable Chlorine Test Kit/Chloroscope.
- Method: Ortho-Tolidine (OT) colorimetric method.
- Range: 0.05 - 5.0 PPM (Mg/L) or specialized 0.1-2.0 ppm/0-5 ppm models.
- Color Scale Markers: 0.0, 0.1, 0.2, 0.5, 1.0, 1.5, 2.0, 3.0, 5.0 PPM.
- Test Capacity: 1000 tests per kit (AE409) or 500 tests (AE419).
- Accuracy: High sensitivity, often noted as ± 0.5 ppm in some, or highly reliable for drinking water standards.
- Comparator Material: Durable, high-grade plastic with color disc.
- Visual Aid: Translucent rear white background for uniform, diffused light, allowing precise color matching.

Testing Material and Components As per IS code

A standard Chloroscope test kit comes complete with:

1. Chloroscope Comparator: A handheld body with a viewing window containing pre-set standard colour discs (0.0 to 5.0 PPM).
2. Test Tube: 2 Nos. high-quality square or cylindrical glass/plastic tubes with 5ml/10ml marks.
3. Reagent: Ortho-Tolidine (O-Tolidine) solution (usually 125ml or a dropper bottle).
4. Dropper: Glass dropper with rubber teat.
5. Cleaning Brush: For maintaining test tubes.
6. Instruction Manual/Card: For operational procedures.
7. Packaging: Packed in a compact, portable plastic carry case.

Operating Principle & Procedure As per IS code

- Principle: Ortho-tolidine reacts with free chlorine in water to produce a yellow color. The intensity of this yellow color, compared visually with standard discs, indicates the concentration of residual chlorine.
- Procedure:
 1. Fill the test tube with the water sample to the 5ml mark.
 2. Add 1-2 drops of O-Toluidine reagent.
 3. Shake well and wait 10 minutes for full color development.

4. Insert the tube into the middle slot of the comparator and compare with standard colors on the sides.
5. Note the reading.

Key Features As per IS code

- **Instant Result:** Provides quick, on-site results without laboratory setup.
- **User-Friendly:** Suitable for non-scientific staff, such as shop floor workers or site technicians.
- **Long Shelf Life:** Reagents are stable for over a year.
- **Applications:** Drinking water systems, Swimming pools, Cooling towers, RO pre-treatment.

Item No.3 Providing & Supplying of Digital Chlorine gas leak detector monitor meter - 0 to 20 ppm Capacity including all taxes, transportation, loading, unloading, conveyance to departmental stores, stacking etc. complete.

Sensor

Flammable	-	Catalytic Bead Detector
Toxics / Oxygen	-	Electrochemical Sensor

Accuracy

+ 2% of the range

(However it also depends on the accuracy of the calibration gas)

Response Time (T 90)

Generally less than 30 seconds

Gas Sampling

Diffusion

Display

3 ½ digit Liquid Crystal Display (LCD) with Low BAT indication

Alarms

Low alarm : Visual

High alarm : Audio & Visual

Power Supply

Flammable : Rechargeable battery

Toxic / Oxygen: 9V Alkaline (Dry Cell)

Environment

Temperature : 0-50 C

Humidity : 0 to 95% R.H. non-condensing

Pressure : Ambient + 10%

Physical Properties

Weight : 230 g

Dimensions : 175 x 85 x 30 mm

Rate shall be paid per number basis.

Rate shall be paid per Set basis.

Item No.4 & 5. Providing & Supplying of Chlorine Gas safety kit for 900 kg & 100 kg cylinder including loading, unloading, carting, stacking, insurance , all taxes, octroi etc. fixing at H/W complete

- **Kit Type:** Emergency Kit "B" (designed for 900 kg Chlorine Ton Containers). As per IS code

VOLUME: II B, TECHNICAL SPECIFICATIONS

- Leakage Capacity: Specifically for 900 kg/1000 kg tonners (horizontal cylindrical vessels).
- Components: Approximately 35-40+ items including Yoke clamps, hood with vent valve, steel patch plates, pressure plate bolts, taper pins, rubber gaskets, spanners, hammers, valve caps, copper tubes, and ammonia solution bottle for leak detection.
- Material: Heavy-duty Mild Steel/Stainless Steel components, powder-coated to be corrosion-resistant.
- Gasket Material: Butyl rubber, resistant to chlorine, suited for sealing leaks on the tonner shell.
- Storage Box: Galvanized Steel (GI) rectangular box (approx. size 36"x16"x11" or similar) with compartments.
- Approx. Weight of Kit: 40 kg - 60 kg.
- Operation: Designed to be operated by a single person to seal leaks.

2. Scope of Work (Supply & Installation) As per IS code

The item rate shall include the following activities at the client's site (Hand-over/Headwork):

- Supply: Providing the complete 900 kg Chlorine Emergency Kit B.
- Loading/Unloading: Safe handling of the kit from the supplier's warehouse to the destination site.
- Transportation (Karting): Proper packaging and transport to prevent damage to specialized tools, including safe handling to the storage area.
- Stacking/Storage: Placing the kit in a designated, accessible area (e.g., Chlorination Room).
- Fixing/Installation: The supplier shall demonstrate and ensure the kit is properly assembled and ready for immediate use.
- Training (Optional but recommended): Demonstration of the emergency tools by a qualified technician.

3. Taxes, Insurance, and Statutory Levies : As per IS code

- Insurance: Transit insurance and insurance until the final handover at the client's site.
- Taxes: Inclusive of all applicable taxes (GST), duties, and octroi or entry taxes, if any.
- Compliance: The kit must comply with the standard safety norms (e.g., Chlorine Institute Emergency Kit B requirements).

4. Key Performance Requirements : As per IS code

- Rust Resistance: All tools must be made from non-corrosive materials or properly treated for a chlorine atmosphere.

VOLUME: II B, TECHNICAL SPECIFICATIONS

- Immediate Availability: The kit must be ready for immediate installation and operation upon delivery.
- Documentation: Manufacturer's test certificate must accompany the kit.

5. Essential Items Included in the Kit : As per IS code

- Control Sliding Hood: For mounting on the valve.
- Yoke Clamp: For securely holding the hood over the valve.
- Taper Pins/Patch Plates: For plugging leaks in the tonner body shell.
- Emergency Valve Leak Plugger.
- Hand Tools: Heavy-duty wrenches/spanners and hammer.
- PPE: Rubber goggles, PVC gloves (for emergency use).

Item No.6. Providing & Supplying of air breathing appartus for chlorine gas lekage as per IS:10245 Part-II including all taxes, transportation, loading, unloading, conveyance to departmental stores,stacking etc. complete.

SAVIOUR BASET

MODEL : SAVIOUR

Saviour standard Self Contained Breathing Apparatus with Natural Rubber Face Piece and Saviour easy flow Demand valve provides efficient, reliable and economical operation in hazardous Atmosphere. A ideal option for any organization with hazardous atmosphere and statutory compliance.

Specification

Saviour Self Contained Breathing Apparatus set with wide view panoramic ISI mark face piece, with rugged easy flow demand valve connected to Low pressure hose. Reducer with safety release valve connected t o high pressure hose with gauge and warning whistle. Complete assembly mounted on anti corrosive FRP back plate. Cushion padded 2000 kg resistant nylon harness attached to the ergonomic black plate. Designed to connect various cylinders with international and national valves on 9 and 6 liters. The complete set is packed in smart carrying case with instruction manual.

Advantages

Economical option for safe working in hazardous atmosphere

Best option for statuary compliance

Back plate to accommodate 6 liters of 9 liters cylinders

Demand valve with air bypass for extra airflow

Cylinder Durations

Liters	Bars	Duration	Approvals
Capacity		(Min)	
6	200	45 Min	CCE

Approval

Face Piece : ISI mark

Cylinder : CCE Approved

Hoses : As per EN Standards

Rate shall be paid per number basis.

Item No.7. Excavation for pipe line trenches incl. all safety provisions using site rails and stacking

excavated stuff up to a lead of 90 mts. cleaning the site etc. complete for lifts and strata as specified.

1. The whole work shall be carried out as per the description of the item and as per the specification laid down in P.W.D. handbook vol. I & II and moreover as per the specification of item No. 1 of this tender.
2. The trenches shall be vertically excavated and bottom shall be dressed as per the required gradient the extra excavation for jointing shall be done without any extra cost.
3. The contractor shall have to provide fencing, lighting side sille etc. without any extra cost.
4. The road surface excavated other unwanted materials shall have to be removed the disposed off as directed.
5. The surplus excavated stuff shall be removed and disposed as directed outside the town limit.
6. The contractor shall have to protect the water supply connection and drainage connection interrupting the excavation trenches the damage shall be rectified by the contractor without any extra cost for labour and materials. The contractor shall be fully responsible for any damage down. During excavation to the private properties as well as Government property.
7. Payment shall be made on Cum basis.

Item No.8. Providing and casting in situ mass cement concrete in grade M-10 (approx. corresp. To prop. 1:3:6) using granite quatzite trap metal of size 12mm to 25mm incl. consolidation curing etc. complete.

1. The work shall be carried out as per the description of the item and as per the specification laid down in P.W.D. handbook vol. I & II.
2. The coarse aggregate shall be 12mm to 50 mm size trap metal free from any foreign materials such as dust, dirt etc.
3. The sand shall be coarse angular, hard and free from impurities such as dust, dirt or any other foreign materials.
4. The Portland cement shall be supplied by the contractor as per IS 269 or latest relevant IS with ISI mark and make as approved by E.I.C.
5. The ingredient shall be well mixed on water tight platform in dry condition and require quantity of potable water shall be added and mixed it throughly to get required workability by machine mix. or Hand mixing.
6. The payment shall be made on Cum basis.

Item No.9. C.C. M-25 Control Concrete for water retaining structures Providing and cast in situ C.C. in grade M-25 Proportions of ingredients as per mix design by weigh batching using granite, quatzite trap metal of size 12mm to 20mm and or 6mm to 12mm including scaffolding centering formwork, needle vibrated consolidation, curing and hydraulic testing etc. completed (excluding cost of reinforcement) with centering and shuttering/deshuttring etc. comp. up to 6mtr. height/depth Av. G.L. for all water retaining structure Flat bottom slab/floor slab/slab with shuttering

1.0. Materials :

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8 Coarse aggregate shall conform M-12 B.

2.0. General :

2.1 The relevant specifications of item No. 5.4.1. of ordinary concrete shall be followed except that the concrete mix shall be designed from preliminary tests, the proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350, & M-400, with prefix controlled added to it.

2.2 The proportion of cement, sand and coarse aggregates shall be determined by weight, the weight batch machine shall be used for maintaining proper control over the porportion of aggregates as per mix design. The strength requirements of different grades of concrete shall be as under: In all cases, the 28 days compressive strength specified in above table above be the criteria for acceptance or rejection of the concrete. Where the strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes-as concrete belonging to the lower of the two grades between

which its strength lies.

3.0. Workmanship :

3.1. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that the supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate shall be controlled by obtaining the coarse aggregates, in different sizes and being in them in the right proportions as required. Aggregate of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.

3.2. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted from bulk stocks at site and not by bags, it shall be weighted separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment's shall be maintained in clean, and serviceable condition. Their accuracy shall be periodically checked.

3.3. It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge, according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For determination of moisture, content in the aggregates, I.S. 2389 (Part-III) shall be referred to. Suitable adjustments also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement used in concrete shall not be less than 220 Kg./M³ in plain concrete and not less than 250 Kg/M³ in reinforced concrete.

4.0. Mode of payment:

4.1. The rate shall be for a unit of one cubic meter.

Item No.10. Supplying,Cutting, Bending, Binding & Placing in Position steel as per plan & Design & as per ISS 2502 including cost of steel & Binding wire for reservoirs/Structures only including lift upto 6 mt. height or depth below GL for all diameters.TMT Bars Fe-415 Grade.

2.0. Workmanship :

2.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed.

2.2. Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.

2.3. Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified, a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of straight part of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.

2.4. All the reinforcement bars shall be accurately placed in exact position shown on the drawing and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm. in size, and by using stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently-close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices.

Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout. .

- 2.5. Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm. in such manner that they do not slip over each other at the time of fixing and concreting.
- 2.6. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending movement is maximum.
- 2.7. Whenever indicated on the drawings or desired by the Engineer-in-charge, bars shall be joined by couplings which shall have a cross-section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than normal cross-section of the bar. Threads shall be standard threads. Steel for coupling shall conform to I.S. 226.
- 2.8. When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points where steel will not be subject to more than 75 per cent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. electrodes used for welding shall conform to I.S. 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed.
- 3.0. Mode of measurement and payment:
- 3.1. For the purpose of calculating consumption, wastage shall not be permitted beyond 5 percent. Excess consumption over 5% will be charged at penal rate.
- 3.2. Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to, in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the same basis as per M-18 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.
- 3.3. The rate for reinforcement includes cost of steel binding wires its carting from Department store to work site., cutting, bending, placing; binding and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost

Item No.11. Providing 15mm thick cement plaster in single coat on fair side brick/concrete wall for upto floor two level finishing with a floating coat of neat cement slurry .Cm 1:4 .

1. The work shall be carried out as per the description of the item and as per specification laid down in PWD hand book vol. I & II.
2. The surface shall be cleaned washed thoroughly. The materials shall be brushed off before plastering.

3. The mortar shall be in proportion as per item specified in Schedule-B. The cement shall be of approved quality portland cement & shall be of I.S.I marked. The sand shall be clean sharp angular free from dust dirt and any other foreign materials.
4. The ingredient shall be mixed on water tight platform before adding water. The required quantity of water shall be added & mixed it thoroughly to get workable mortar. The mortar shall be used up within half an hour after it is mixed. The surface shall be well watered before plastering. The mortar shall be applied in uniform thickness as per Schedule - B. it shall be pressed and finished as per requirement. The plaster shall be curried for 10 days. Rate includes necessary scaffolding T & P articles required for the job.
5. Payment shall be made on sqmt. basis.

Item No.12. Providing & Casting in situ mass cement concrete in 1:4:8 proportion using granite quartzite metal of size 25 mm to 40 mm including consolidation curing etc. complete.

1. The work shall be carried out as per the description of the item and as per the specification laid down in P.W.D. handbook vol. I & II.
2. The course aggregate shall be 12mm to 25mm size trap metal free from any foreign materials such as dust, dirt etc.
3. The sand shall be coarse angular, hard and free from impurities such as dust, dirt or any other foreign materials.
4. The Portland cement shall be supplied by the contractor as per IS 269 or latest relevant IS with ISI mark and make as approved by E.I.C.
5. The ingredient shall be well mixed on water tight platform in dry condition and require quantity of potable water shall be added and mixed it throughly to get required workability by machine mix. Hand mixing is not permitted.
6. The payment shall be made on cum basis.

Item No.13. Brickwork using common brunt clay building brick having crushing srength not less than 35 kg/cm2 in foundation & Plinth in Cm 1:6.(b)conventional

1. The work shall be carried out as per the description of the item and as per the specification laid down in PWD Hand book Vol-I & II
2. The brick shall be of approved quality available best. It shall be uiform in colour, well burnt regular in shape free from bricks having lumps of kind of impurities.
3. The bricks shall not absorb water more than 1/6 of tender weight after on hour of socking by immerses in water. it shall be of standard size. the bricks shall be done inclement mortar as per Schedule-B.
4. The sand shall be course and angular and free from dirt or any foreign materials.
5. The proportion mentioned in Schedule-B indicate first figure is for cement second figure is four sand and the in gradient shall be measured by plume according to the Schedule-B
6. The mortar shall be mixed on water tight platform in dry condition toughly and required quantity of water shall be added in get workable mixture shall be used within half an hour after it is mixed.
7. The rate including placing in position proper ramming consolidation & etc. complete.

8. The brick shall be laid after it shall be soaked in water with upward frog so as to form the key in masonry. All the joint of brick masonry shall be excavated 10 mm. The joints shall be thoroughly filled with cement mortar.
9. The use of brick lesser than half bricks shall be minimised. The joint shall be properly raked out into 12 mm depth.
10. The progress of masonry work shall be in uniform not exceeding more than one meter a day work. The work shall be carried out in best workman like manner.
11. Masonry work shall be have to be in plumb line a level.
12. The masonry shall be kept constantly wet during execution and whole work shall be kept wet during for seven days.
13. The rate includes the cost of necessary scaffolding T & P articles etc. complete.
14. The payment shall be made on Cum. basis.

Item No.14. Providing & Casting in situ C.C. in grade M-15 (Proportion Revealent IS Code)using granite. Quartzite trap metal of size 6mm to 20mm for RCC work,including Scaffolding, Centering, foam work, needle vibreted consolidation, curing comp. up to 6mt. Depth or Height (excluding cost of reinforcement & neat finishing) with centering & Shuttering etc. complete for structure for other than water retaining(2) Footing for Column or Foundation with form work.

- 1.1 Water, sand, cement, metal shall comply with the requirement of relevant material specification.
- 2.0 Workmanship
- 2.1 General
- 2.1.1 Before starting concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed.
- 2.2 Proportion of Mix :
- 2.2.1 The proportion of cement, sand and coarse aggregate shall be one part of cement, 2 parts of sand and 4 parts of stone aggregates and shall be measured by volume.
- 2.3 Mixing :
- 2.3.1 The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed of smaller quantity of work if approved by the Engineer in charge. When hand mixing is permitted by the Engineer in charge in case of break down of machineries and in the interest of the work. It shall be carried out a water tight platform and care shall be taken to ensure the mixing is continued, until the mass is uniform in colour and consistency. However in such cases 10% more cement than otherwise required shall have to be used, without any extra cost. The mixing in mechanical mixer shall be done for a period 1 ½ to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete or required workability for the purpose.
- 2.4 Transporting & placing the concrete :
- 2.4.1 The concrete shall be banded from the place of mixing to the final position in not more than 15 minutes by the method of as directed and shall be placed in to its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences the concrete shall be laid in layers of 15 cm. to 20 cm.
- 2.5 Compacting :
- 2.5.1 The concrete shall be rammed with heavy iron rammers and rapidly to get required compaction and to allow all the interstices to be filled with mortar.
- 2.6 Curing :
- 2.6.1 After the final set, the concrete shall be kept continuously wet, if required by pounding for a period of not less than 7 days from the date of placement.
- 2.7 Mode of measurements & Payments :
- 2.7.1 The concrete shall be measured for its length, breadth and depth. limiting dimensions to those specified on plan or as directed.

The rate shall be for a unit of one cubic meter.

Item No.15. Brickwork using common burnt clay building brick having crushing strength not less than 35 kg/cm² in Super Structure above plinth level upto floor Cm 1:6.(B)Conventional

1. The work shall be carried out as per the description of the item and as per the specification laid down in P.W.D. handbook vol. I & II.
2. The bricks shall be of approved quality table mould. It shall be uniform in colour, well burnt, regular in shape and free from cracks, ship flow and lumps of any kind. The brick shall not absorb water more than 1/6 of the weight after one hour of soaking by immersion in water. It shall be of standard size. The bricks shall be of metallic sound.
3. The brick work shall be done in cement mortar as specified in schedule “ B “ and cement shall be of approved quality portland cement & shall be of I.S.I Marked. The sand shall be coarse angular and free from dust or any foreign materials.
4. The mortar shall be mixed on water tight platform in dry condition thoroughly and required quality of water shall be added to get workable mix. Mixture shall used up within half an hour after it is mixed.
5. The brick shall be laid after well soaked in water with upward frog so as to form key in masonry. All the joints of bricks masonry shall not exceed 10mm. The joints, of the bricks shall be properly raked out upto 20mm depth.
6. The masonry work shall be in progress in uniform height not exceeding more than one mt. in a day work. The work shall be carried out in best workman like manner. The fresh work shall be of selected bricks. masonry work shall be in plumb line and level.
7. The masonry shall be kept constantly wet during the execution and whole work shall be cured for 10 days.
8. The rates includes the cost of necessary scaffolding, T&P articles etc. complete.
9. Payment shall be made on cumt. basis.

Item No.16. Providing & Casting in situ C.C. in grade M-20 (Proportion Revert IS Code)using granite,Quartzite trap metal of size 6mm to 20mm for RCC work,including Scaffolding, Centering, foam work, needle vibreted consolidation, curing comp. up to 6mt. Depth or Height (excluding cost of reinforcement & neat finishing) with centering & Shuttering etc. complete for structure for other than water retaining.

materials specification narrated in MSP. The proportion of the mix shall be M-200(Approximate corresponding prop. 1:11.5:3) 1 cement, 1.5 sand ,3 parts graded stone aggregate 12 to 20 mm nominal size by volume. Or proportion shall be as per mix design shall be carried out by the contractor and shall be approved before concreting shall be carried out.

The quantity of dry aggregate and water per 50 Kg. bag of cement (i.e. 0.0342 cum shall be 300 litres of dry aggregate and 34 lits. of water respectively. The workability of concrete shall be controlled by maintaining a water cement ration i.e. found to be give a concrete which is just sufficiently wet to be placed and compacted without difficulty with means available or as directed. The maximum size of all aggregate shall be based on thickness of members reinforcement spacing etc. maximum size shall be as per the instruction of Engineer- in-charge. Looking to the size of coarse and fine aggregate if Engineer in charge find necessary of contractors design then contractor shall have to carry mix design in Govt. laboratory at his own cost. Mix design shall be allowed for this work but minimum consumption of cement shall be 8.50 bags per cmt. The mixing of concrete should be done in concrete mixer. first dry mixing shall be done for 1/2 minutes then after addition of required quantity of water. Mixing shall be done for 1 1/2 to 2 minutes or till the uniform mixture of cement, sand, aggregate is

observed in mixture. The Consistency of concrete shall be checked by slump test in accordance with I.S. 1199 - 1959.

Contractor shall give the Engineer in charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, all alignment and general fitness, immediately after inspection all forms shall be cleaned and wetted.

The methods of transporting and placing concrete shall as approved. Concreting shall proceed continuously over the area between constructions joints concrete shall be deposited in horizontal layers of 0.10 m. and shall be well compacted within 30 minutes from time of its discharge from mechanical mixture.

Concrete shall be not dropped in to form from a height exceeding 2 Mt. to avoid segregation.

All concrete shall be well compacted, by mechanical vibrations as directed in its final position.

After placing of concrete and initial set concrete shall be covered by gunny bags and kept continuously wet for minimum 10 days. The curing shall be done as per instruction of Engineer- in-charge.

For removal of form work contractor shall have to take permission from Engineer-in charge. After removal of forms contractor shall have to filled with rich amount of mortar in damage course due to removal of forms quality of concrete after casting shall be checked by Engineer in charge and if be found honey comb spots, rack pockets broken edges of other defect that may effect strength of structure. Contractor shall have to demolish the same and to be replaced with out any claim.

The rate includes cost of all materials labours, tools and plant required for mixing, placing in position vibrating and complicating finishing, curing form work including all other incidental expenses for producing concrete of specified strength. The rate shall be for a unit of one cubic meter.

Item No.17. Providing 15mm thick cement plaster in single coat on fair side brick/concrete wall for upto floor two level finishing with a floting coat of neat cement slurry CM 1:4 .

1. The work shall be carried out as per the description of the item and as per specification laid down in PWD hand book vol. I & II.
2. The surface shall be cleaned washed thoroughly. The materials shall be brushed off before plastering.
3. The mortar shall be in proportion as per item specified in Schedule-B. The cement shall be of approved quality portland cement & shall be of I.S.I marked. The sand shall be clean sharp angular free from dust dirt and any other foreign materials.
4. The ingredient shall be mixed on water tight platform before adding water. The required quantity of water shall be added & mixed it thoroughly to get workable mortar. The mortar shall be used up within half an hour after it is mixed. The surface shall be well watered before plastering. The mortar shall be applied in uniform thickness as per Schedule - B. it shall be pressed and finished as per requirement. The plaster shall be curried for 10 days. Rate includes necessary scaffolding T & P articles required for the job.
5. Payment shall be made on sqmt. basis.

Item No.18. Filling in plinth with sand under floors including watering ramming, consolidating & dressing etc. complete.

1.0. Workmanship:

- 1.1. The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.
- 1.2. As soon as the work in foundation has been completed and measured, the site of foundation shall be cleared of all debris, brick bats, mortar dropping etc; and filled with earth in layers not exceeding 20 Cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the butt ends of crow-bars, where rammer cannot be used.
- 1.3. The plinth shall be similarly filled with earth in layers not exceeding 20 Cms. adequately watered and consolidated brammung with iron or wooden rammers. When filling reaches finished level, the surface shall be flooded with water for atleast 24 hours and allowed to dry and then rammed and consolidated.
- 1.4. The finished level of filling shall be kept to shape intended to be given to floor.
- 1.5. In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.
- 1.6. The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no circumstances black cotton soil be used for filling the plinth.
- 2.0. Mode of measurement and payment:
- 2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- 2.2. The rate shall be for a unit of one cubic metre.

Item No.19. Finishing wall with water proofing cement paint on wall surface three coat to give an approved brand & manufactured & of required shape even shade after thoroughly brushing the surface to remove all dirts & remains of loose powdered material.

- 1.0. Materials :
- 1.1. The water shall conform to M-l. Cement water proofing shall conform to I.S. 5410-1969.
- 2.0. Workmanship :
- 2.1. Scaffolding: The relevant specifications of item No. 18.11 shall be followed.
- 2.2. Preparation of surface: The relevant specifications of item No. 18.11 shall he followed except that the word white wash colour wash shall be substituted with water proofing cement paint. The surface shall be thoroughly wetted with clean water before cement water proofing paint is applied.
- 2.3. Preparation of paint: Portland cement shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, the manufacture's instructions shall be followed. The paint shall be mixed in such quantities as
can used up within an hour of mixing as otherwise the mixture will set and thickness, affecting flowing and finish. The libs of cement paint drums shall be kept tightly when not in use.
- 2.4. Application of Paint:
- 2.4.1. No painting shall be done when the paint is likely to be exposed to a temperature of below 7°C within 48 hours after application.
- 2.4.2. When weather conditions are such as to cause damage the work shall be carried out in the shadow as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.
- 2.4.3. To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.
- 2.4.4. For undercoated surfaces, the surfaces shall be treated with minimum two coats of water proof cement paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started untill the proceeding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be allowed between two coats. Next coat shall not be started untill the proceeding coal has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be slightly moistened before applying the subsequent coat.
- 2.4.5. The finished surface shall be even and uniform in shade, without patches, brush masks, paint drops etc.

VOLUME: II B, TECHNICAL SPECIFICATIONS

- 2.4.6 The cement paint shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessive heavy brush marks. The lamps shall be well brushed out.
- 2.4.7. Water proof cement paint shall not be applied on surfaces already treated with white wash colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.
- 2.5. Curing : Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for atleast two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by me sprinkling of water say about 12 hours after the application.
- 2.6. Protection measures shall be taken as per item No. 18.11 para 2.6.
- 3.0. Mode of measurements & payment:
- 3.1.The relevant specifications of item No. 18.11 shall be followed.
- 3.2. The rate shall be for a unit of one sq. metre.

Item No.20. Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 95mm x 24mm x 1.17mm @ wt.of 0.738 Kg/mt , horizontal Three track member size 92mm x 31.75mm x 1.30mm,@ Wt.1.07Kg/mt , vertical member of size 92mm x 31.75mm x 1.50mm@ Wt. 1.06 Kg/mt with sliding shutters of horizontal membersize 40 mmx18mm x1.29mm @ wt.of 0.456 Kg/mt, vertical member of size 40mm x 18mm x 1.29 mm @ wt.of 0.456Kg/mt/ with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc.

1.1.1Aluminium Sections

Aluminiumsectionsusedforfixed/openablewindows,ventilators,partitions,framework&doorsetc. shallbesuitableforusetomeetarchitecturaldesignstorelevantworksandshallbesubjecttoapproval oftheEngineer-in-Charge fortechnical,structural,functionalandvisualconsiderations. Thealuminium extruded sections shall conform to IS 733 and IS 1285 for chemical composition and mechanical properties.ThestainlesssteelscrewshallbeofgradeAISI304.

Thepermissibledimensionaltolerancesof theextrudedsectionsshallbeasperIS 6477andshallbe such as not to impair the proper and smooth functioning/operation and appearance of door and windows.

Aluminium glazed doors, windows etc. shall be of sizes, sections and details as shown in the drawings.Thedetailsshownin thedrawingsmaybevariedslightlytosuitthestandardsadoptedbythe manufacturersofthealuminiumwork,withtheapprovalofEngineer-in-Charge. Beforeproceedingwith any fabrication work, the contractor shall prepare and submit, complete fabrication and installation drawingsforeachtypeof glazingdoors,windows,ventilatorsandpartitionetc.forthetheapprovalofthe Engineer-in-Charge. Ifthesectionsarevaried,thecontractorshallobtainpriorapprovalofEngineer-in-Chargeandnothingextrashallbepaidonthisaccount.

1.1.2 Anodising

Standardaluminiumextrusionsectionsaremanufacturedinvarious sizesandshapesinwiderange ofsolidandhollowprofiles withdifferentfunctionalshapesforarchitectural, structuralglazing,curtain walls, doors, window &ventilators and various other purposes. The anodizing ofthese products is required to be done before the fabrication work by anodizing/electro coating plants which ensures uniformcoatinginuniformcolourandshades.Theextrusionsareanodizedupto 30 micronindifferent colours. The anodized extrusions are tested regularly under strict quality control adhering toIndian Standard.

1.2 PANELING MATERIAL

1.2.1Pre-laminatedParticleBoard

Aparticlesboardlaminatedonbothsurfacesbysyntheticresinimpregnatedbasepapersunderheat and pressure.
GWSSB

Pre-laminated particle boards shall be of two grades, namely, Grade I and II corresponding to IS 3087 & 12823.

Each of the grades specified shall be of four types, namely, Types-I,

II, III, and IV classified by the surface abrasion characteristics as per specified.

1.2.1.1 Particle Board: Synthetic resin bonded flat pressed three layers, multilayer and graded particle board defined in IS 3087 having superfine surfaces shall be used for production of pre-laminated particle board. For ECOMark the particle boards shall also conform to the requirements of ECOMark specified in IS 3087.

1.2.1.2 Impregnated Base Paper: Printed or plain coloured absorbent base paper having a weight of 60-140 g/m² impregnated in a suitable synthetic resin and dried to a volatile content of 4-8 per cent shall be used for pre-lamination on both surfaces of particle board.

1.2.1.3 Impregnated Overlay: An absorbent tissue, paper having a weight of 18-40 g/m² impregnated in a suitable synthetic resin and dried to a volatile content of 4-8 per cent shall be used for the manufacture of pre-laminated particle board.

1.2.1.4 Manufacture: Particle boards having superfine and closed surface with high face strength and steep density gradient across the thickness is used for making pre-laminated particle boards.

Impregnated base papers rich in synthetic resin are placed on either side of the particle board and the assembly is taken inside a short cycle single opening lamination press or a multi-day light press. Under heat and pressure the resin flows and forms a permanent bond with particle board.

The top surface of impregnated paper comes in contact with special surface chromium plates or steel caul plates and takes the impression of surface finish of these cauls. Hot boards are extracted out of the short cycle press and cooled in air, whereas cooling of boards is done inside the dress in multi-day light type. Care should be taken to keep cycle times slow in the press to avoid heat penetration to the centre of the board edge.

The impregnated overlay paper may be used by placing it over the impregnated base paper (IBP) on one surface while using a normal IBP on the other surface and pressure. The impregnated overlay becomes transparent after pressing. Such boards are used for high surface abrasion application. In case of finished foil particle boards, the finished foil is pasted on both surfaces of particle board after spreading a suitable synthetic glue on board's surface and passing the assembly in a roller press or a flat press under the influence of pressure and/or heat depending on the type of binder used.

1.2.1.5 Finish:

The finish of the paper overlaid board depends on the surface of caul plates used.

Common surface finishes in use are glossy, matt textured (soft, Swede, wood pore and leather), etc.

The surface finish of the foil finished boards depends on the original finish of the foil used.

1.2.1.6 Dimensions and Tolerances:

Dimensions and tolerances shall conform to IS 12049.

1.2.1.7 Testing:

One sample for every 100 sqm. or part thereof shall be taken and testing done as per IS 12823.

For quantity less than 100 sqm, the test certificate from manufacturer shall be relied upon. The Engineer-in-charge may ask for testing even if the quantity is less than 100 sqm.

1.2.3 Float Glass

1.2.3.1 The glass shall be clear float glass and should be approved by the Engineer in Charge. It shall be clear, float transparent and free from cracks subject to allowable defects. The float glass shall conform to IS 14900.

1.2.3.2 Thickness:

The thickness of float glass shall depend on the size of panel.

1.3 EPDM-GASKETS

The EPDM Gasket shall be of size and profile as shown in drawings and as called for, to render the glazing, doors, windows, ventilator etc. air and water tight. Samples of gasket shall be submitted for approval and the EPDM gasket approved by Engineer-in-Charge shall only be used. The contractor shall submit documentary proof of using the above material in the work to the entire satisfaction of Engineer-in-Charge.

1.4 SEALANT

1.4.1 These sealants of approved grade and colour shall only be used. The silicone for perimeter joints (between Aluminium section and RCC/Stone masonry) shall be of make approved by the Engineer in Charge.

1.4.2 Method of Application

Surface Preparation : Clean all joints and glazing pockets by removing all foreign matter and contaminants such as grease, oil, dust, water, frost, surface dirt, old sealants or glazing compounds and protective coatings.

1.4.3 Masking

Areas adjacent to joints shall be masked to ensure neat sealant lines. Masking tapes shall not be allowed to touch clean surface to which the silicone sealant is to adhere. Tooling shall be completed in one continuous stroke immediately after sealant application and before skin forms and maskings shall be removed immediately after tooling.

1.4.4 Application

Install backer rod of appropriate size and apply silicone sealant in a continuous operation using a positive pressure adequate to properly fill and seal the joint. The silicone sealant shall be tooled with light pressure to spread the sealant against backing material and the joint surfaces before skin forms. A tool with convex profile shall be used to keep the sealant within the joint. Soap or water shall not be used as a tooling aid. Remove masking tape as soon as silicone joint is tooled.

Tolerance: A tolerance of +3mm shall be allowed in the width of silicone joints. The depth of the joints at throat shall not be less than 6mm.

1.5 FITTINGS

1.5.1 Stainless Steel Friction Stay

The stainless steel friction stays of make approved by the Engineer-in-Charge shall be used. The SS friction stays shall be of grade AISI-304 and of size specified in nomenclature of item.

1.5.2 Lockable Handles

The lockable handles shall be of make approved by the Engineer-in-Charge and of required colour to match the colour of powder coated / anodized aluminium window sections.

1.5.3 Hydraulic Floor Spring

The hydraulic floor springs shall be heavy duty double action floor springs of make approved by the Engineer-in-Charge suitable for door leaf of weight minimum 100kg. The top cover plates shall be of stainless steel, flushing with floor finish level. The contractor shall cut the floor properly with stone cutting machine to exact size & shape. The spindle of suitable length to accommodate the floor finish shall be used. The contractor shall give the guaranteed duly supported by the company for proper functioning of floor spring at least for 10 years.

1.5.4 Tubular Handle

The tubular handle bar shall be aluminium polyester powder coated minimum 50 micron to required colour / anodized AC15. Outer dia of tube shall be 32mm, tube thickness 3.0mm and centre to centre

1.5.5 LOUVERS

Aluminium extruded sections (anodized or power coated) are used for providing Louvers in aluminium door, window & partition for ventilation.

1.6 Measurements

The Rate shall be for a unit of one sq. metre.

Item No.21. Steel work, riveted in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint. (A) In beams and joists, channels angles Tees, flats, with connecting plates or angle cleats as in main and cross beams. Hip and jack rafters, purlins connected to common rafters and the like.

1.0. Materials: The structured steel work shall conform to M:22. Red lead paint primer shall conform to I.S.: 102-1962.

2.0. Workmanship:

2.1. The steel sections as specified or required shall be cut, square and to correct lengths, as per drawings and design. The **cut ends exposed** to view shall be finished smooth; No. two pieces shall be welded or other wise jointed to make up the required length of member, except as indicated in the drawing or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in such a manner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed/permitted.

2.2. Steel riveted or bolted in built up section, frame work.

2.2.1. The steel structure as shown in the drawings or as per direction of the the Engineer-in-charge shall be laid out on level platform to full scale and to full size or in parts. A steel **tape shall** be used for measurements to ensure maximum accuracy.

2.2.2. Wooden templates 12 mm. to 19 mm. thick or metal sheet template shall be made to correspond to each connecting gusset plate and rivet holes shall be accurately marked on them and drilled. The templates shall be laid on the steel members, and holes of the steel members shall also be marked for cutting. The base of steel columns and the position of Anchor bolts shall be carefully set out.

2.2.3. All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these. In major works or where so specified, shop drawings giving complete details and information for the fabrication of the component parts of the structure, including location type size, length and details of rivets, bolts, or weld shall be prepared in advance of the actual fabrication and as approved. The drawings shall indicate the shop and field rivets and bolts. The steel members shall be distinctly marked or stencilled with paint with the identification mark as given in the shop drawings. The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normal section. Great accuracy shall be observed in fabrication of various member, so that these can be assembled without being unduly packed, strained or forced into position and when built up, shall be true and free from twists, knicks, buckles, or open joints. Before making holes individual members for fabrication, the steel work intended to be rivetted or bolted together shall be assembled or clamped properly and tightly so as to ensure close abutting or lapping of the different members. All stiffeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight

and fitted close together. Web splice plates and fillers under stiffeners shall be cut to fit within 3 mm. or flange Angles, web plates of Girders shall have not cover plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spiced shall have clearance of more than 6 mm. The erection, clearance for cleared ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm. at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided. Pins and rollers shall be accurately turned to gauge. These shall be straight and smooth and free from flaws. The roller bearing shall be provided with adequate arrangement for holding the girders or truss resting on it. In columns caps and bases, the ends of shafts together with the attached gussets Angles, channels etc., after rivetting together shall be accurately machined so that the parts connected butt against each other over the entire surfaces of contact connecting angles or channels shall be fabricated and placed in position, with greater accuracy so that they are not unduly reduced in thickness by machining. The ends of bearing stiffeners shall be machined or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at required position. Sub punching shall be permitted, provided it is done 3 mm. or less in diameter and reamed thereafter to the required size. The holes for rivets and bolts shall be larger by 0.4 to 6 mm. than the nominal diameter of rivets or black bolts depending upon the diameter of rivets. Holes shall have their axis perpendicular to the surface-bored through. The drilling or reaming shall be free from butts, and the holes should be clean and accurate. Holes for counter sunk bolts shall be made in such a manner that their heads fit flush with the surface after fixing. The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, as shown in the drawings or as directed. Generally the following principles shall govern the use of rivets turned and fitted bolts, and black bolts.

- (i) Rivets and turned and fitted bolts shall be used where the connection is such that slip under load has to be avoided.
- (ii) Black bolts may be used very sparingly where a force is carried through a connection without impact, vibration or reversal of stresses.

2.2.4. Rivetting : The parts assembled for rivetting shall be in close contact with each other and the bearing stiffeners shall bear lightly both at top and bottom without being drawn or caulked. Members to be rivetted shall be properly pinned or bolted and rigidly held together while rivetting. Drilling of holes shall not be permitted except to draw the parts together and the drifting tools so used shall have maximum diameter not exceeding the nominal diameter of rivets or bolts Drifting done during assembling shall not distort the metal or enlarge the holes. The shanks of rivets shall project beyond the plate-surface sufficiently so as to fill the hole thoroughly and from the required head after rivetting. The rivetting shall be done by hydraulic or pneumatic process. However, where such facilities are not available, hand riveting may be permitted. The rivet shall be heated red hot, care being taken to control the temperature of heating so as not to burn the steel. Rivets of diameter less than 10 mm. may be fitted cold. Rivets shall be of heat finish with heads full and of equal size. All loose, burnt or badly formed rivets with concentric or diffident heads shall be cut out and replaced. The heads of rivets shall be central to shanks and shall grip the assembled members firmly. In cutting out rivets, care shall be taken so as not to injure the assembled members, caulking or

recuppying shall not be permitted. For testing rivets, hammer weighing approximately 0.25 kg. shall be used. Both heads of the rivets shall be tapped, slack rivets will give a hollow sound and a jar. All rivet heads shall be palinted with red lead paint within a week of their fixing.

- 2.2.5. Bolting all bolt heads and nuts shall be hexagonal and of equal size unless specified otherwise. The screwed heads shall conform to I.S.: 1363-1960 and the threaded surface shall not be tapered. The bolts shall be of such length so as to project two clear threads beyond the nuts when fixed in position and these shall fit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly. Where turned and fitted bolts are required to be used in place of rivets they shall be provided with washers not Jess than 6 mm. thick so that the nut when tightened shall not bear on the unthreaded body of the bolt. Tappered washers shall be provided for all heads and nuts bearing on levelled surfaces. The threaded portion of the bolts shall not be within the thickness of the parts bolted together. The faces of the bolt heads and nuts abutting against steel members shall be machine finished. Where there is a risk of the nut being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of locknuts, spring washers cross-cutting or harmerring down of threads as directed. Bolts, nuts and washers shall be thoroughly cleaned and dipped in double bolied linseed oil before use. The whole steel work shall be painted with a coat of priming coat of red lead, as per relevant specifications of painting.

3.0.Mode of measurements & payment:

- 3.1. The rate includes cost of all material, labour, erection, hoisting, scaffolding protective measure, required for proper completion of the item of work. This shall also included conveyance and delivery handling, loading, unloading and storing etc. required for completing the item described above including necessary wastage involved.
- 3.2. The rate shall be for a unit of one kg.

Sign of Contractor

**Executive Engineer
P.H. Works Division Palanpur**