

3.11.6.2 Measurement

It shall be done in square metre of the area done. It shall be paid in sq.m. Rate shall be for all the works including all labour and materials complete.

3.11.7 Granite Flooring

Providing and laying 16 -18mm thick Granite (floor & wall skirting) (approved color and pattern) in 1:2 green mortar including the cost of cutting, grinding, polishing, groove making, moulding, placing and filling with grout and screeding of required thickness in 1:6 cement mortar as required all complete

3.11.7.1 Materials

Granite stone floor shall be used for specified areas. The Granite slabs shall be of selected quality, hard, sound, dense, and homogeneous in texture free from cracks, decay, weathering and flaws. The Sample shall be approved by Engineer before supplying and laying.

The thickness of the granite slab shall be 16 mm and shall be machine cut to required dimensions. The bedding mortar for the granite slab shall be minimum 12-38 mm thick 1:2 cement: sand mortar. Before laying granite floor it is essential that a level surface is required. The joints shall be as fine as possible. The flooring shall be cured for a minimum period of seven days. Slight unevenness at the meeting of edges of granite slabs shall be removed by chiselling. The surface shall be ground evenly with machine fitted with finest grade grinding stones. Then oxalic acid shall be dusted over the surface sprinkled with water and rubbed hard with pad and woollen rags to give smooth and shining finished surface.

3.11.7.2 Measurement

It shall be done in square metre of the area done. It shall be paid in sq.m. Rate shall be for all the works including all labour and materials complete.

3.11.8 Slate stone cladding

Providing and Laying 15-20mm thick slate stone cladding in 20mm thick cement sand 1:2 mortar on floor, skirting etc. including polishing and finishing work all complete as per specification and instruction of site engineer.

3.11.8.1 Materials

Slate stone cladding shall be used for specified areas. The slate stone shall be of selected quality, hard, sound, dense, and homogeneous in texture free from cracks, decay, weathering and flaws. The Sample shall be approved by Engineer before supplying and laying.

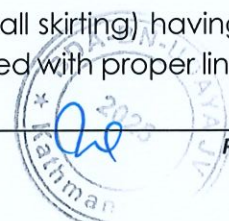
The thickness of the Kotastone slab shall be 15-20 mm and shall be machine cut to required dimensions. The mortar for the slate stone shall be minimum 20 mm thick 1:2 cement: sand mortar. Before laying granite floor it is essential that a level surface is required. The joints shall be as fine as possible.

3.11.8.2 Measurement

It shall be done in square metre of the area done. It shall be paid in sq.m. Rate shall be for all the works including all labour and materials complete.

3.11.9 Machine Made Brick Telia Tile**3.11.9.1 General**

Machine made brick telia tile (20-25 mm thick) on roof terrace (floor & wall skirting) having gap 10 mm between two tiles including 12mm thick 1:2 Cement sand mortar bed with proper line and



level including the joint filler on floors, fittings and grouting of joints with red oxide as per drawing, BOQ and Engineer's instruction.

Telia tiles are to be uniform in size, shape and colour and free from twist and other defects, in every respect equal to samples to be deposited with and approved by the Engineer In-charge.

3.11.9.2 Measurement

Measurement of works will be made in m² of plan area of works.

3.11.9.3 Payment

Payment for work will be made on the basis of contract unit price indicated in the BOQ. The payment will be full and final compensation for all material, labour, and equipment to complete the works as specified.

3.11.10 Concrete Interlocking Tiles

The cement concrete interlocking tiles of approved shape size and color shall be provided in cement sand mortar. These shall be either pre-cast concrete blocks or cast-in-situ concrete. Cement sand mortar used for bedding and joint shall be in 1:4 ratio.

3.11.10.1 Laying

The tiles shall be laid on either concrete or compacted sand-gravel as indicated in the Drawing.

In the case of cement sand base, it shall be 1 part cement; 4 parts sand and mixing shall be done as per specification for mortar mixing of brick masonry work laid to the dimensions, lines and levels shown in the Drawing and well compacted by ramming or other means. Before laying the foundation of lean concrete, the base shall be leveled and slightly watered to make it damp.

In the case of sand gravel it shall consist of a material approved by the Engineer. The tiles shall then be laid out and bedded on 12 mm thick cement sand mortar of 1:4 ratios. The gaps between the block/slabs shall not be more than 12 mm and shall be filled with 1:4 cement sand mortar.

3.11.10.2 Tests and Standard of Acceptance

Concrete shall be tested in accordance with specification for concrete and shall meet the specified criteria. All tiles shall be laid true to the lines and levels shown on the Drawing or as instructed by the Engineer.

3.11.10.3 Measurement

The work shall be measured in square meter of the area. Concrete and/or sand-gravel foundation shall be measured in cubic meters. Excavation for foundation shall not be measured. It is deemed included in the measurement of the tiles.

3.11.10.4 Payment

The tiles measured as above shall be paid at the contract unit rate which shall be the full and the final compensation to the Contractor. Concrete and/or sand-gravel foundation shall be paid for separately, as provided under respective Sections of these Specifications.

3.11.11 Wooden Planking

The seasoned and aldrin treated Timber Planks of finished size of 450mm x 65mm x 15mm of specified hardwood or as directed by the consultant shall be used and laid in approved type of pattern over levelled cement punned surfaces and fixed to the floor with Dendrite glue or water-repellent Glue and each tile is screwed to ground with two nos. sheet metal screws and grip. At the edges, of floor the plank should have minimum of 8mm gap for the expansion and contraction. The top surface shall be finished in perfect line and level. The planks shall be painted

with chapra paints as per the specifications and finished with 2 coats of Polyurethane paints as wearing coat. The texture of the floors shall be in mat or as instructed by the Project In-charge.

3.11.11.1 Measurement

The measurement shall be done in square metre of the work done including epoxy resin and hardener, skilled/unskilled labour all complete and ready for use. Rate shall be for the material and labour complete. This shall be paid in sq.m.

3.11.12 Wood Composite Panel Flooring Works

3.11.12.1 Scope of Work

This work shall consist of the supply and installation of WPC (Wood Plastic Composite) Co-Extrusion Decking for outdoor spaces. The scope includes the provision of all decking panels, necessary clips, hardware, labor, and equipment required to complete the installation as per the Drawings and the approval of the Architect/Engineer

3.11.12.2 Material Requirements

The decking panels shall be high-class Wood Plastic Composite matching the following exact specifications:

Dimensions: 2800 mm (Length) x 138 mm (Width) x 23 mm (Thickness).

Composition: 55% Wood, 35% High-grade polymer (HDPE), and 10% Additives (including bonding stabilizers, UV stabilizers, etc.).

Physical Properties: The decking section must have a bulk density of 1.35 g/cm³. It must be strictly weatherproof and suitable for outdoor temperature fluctuations ranging between -10 °C to 60 °C.

Performance Standards: The material must comply with the following testing standards:

Moisture Resistance: Conforming to EN15534-1:2014.

Abrasion Resistance: 37.9 mg/1000r as per ASTM D4060-14.

Artificial Weathering Resistance: Minimum 4.5 grades of colorfastness.

Bending Strength: 26.8 MPa as per EN15534-1:2014.

Anti-Slip Property: R10 rating as per DIN 51130-2014.

Accessories: The system shall include all necessary proprietary installation clips, specifically DBK-16 and DBK-18, functioning as starter clips and gap clips.

3.11.12.3 Installation and Execution

The WPC decking shall be installed on a prepared sub-frame or base as approved by the Engineer.

Installation must strictly utilize the specified DBK-16 and DBK-18 starter and gap clips to ensure proper spacing, thermal expansion accommodation, and a secure fit.

The finished deck must be true to line, level, and plumb, without uneven gaps or surface irregularities.

3.11.12.4 Measurement

The WPC Co-Extrusion Decking shall be measured in square meters (sq.m) of the net area successfully installed, finished, and accepted by the Architect/Engineer.



3.11.12.5 Payment

This rate shall be the full and final compensation for the supply of all materials (decking panels, DBK-16/DBK-18 clips, and fasteners), labor, tools, equipment, surface preparation, and all other incidental operations necessary to successfully complete the work to the satisfaction of the Architect/Engineer.

3.11.13 Flag Stone Paving

Flag stone of specified thickness shall be of uniform colour free from cracks and other defects. Each of the four edges shall be trimmed to four straight lines with right angle to other edge unless otherwise stated. The size of the flagstone shall be of uniform in width of 45cm and the variable length not less than 30cm. Thickness of the slab shall not exceed more than 50mm nor be less than 30mm.

3.11.13.1 Laying

Stone slab of specified thickness shall be laid on sand bed or 1:4 cement sand bed as specified by engineer. Joints shall be kept as thin as possible and shall not exceed 6mm and all the joints are pointed with 1:1 Cement sand mortar unless specified otherwise by engineer.

Laying shall start from one side in the slope as indicated in drawing or instruction. Under no circumstances shall the contractor insert small stone chips underneath the slab to raise its level to desired level. After the slabs of stone are laid, the mortar in the joints shall be raked to a depth of 12.5mm to 20mm. Joints flush pointed with 1:1 cement sand mortar. Special care shall be taken to protect the floor from walking over it before it is completely dry or in any event not earlier than 3 days.

Sample of floor stone shall be produced before site In-charge for approval and the contractor shall procure only those stone slabs that clearly and definitely confirm with the approved sample. At any case, the procured slabs shall be exhibited before using as floor slab.

3.11.13.2 Measurement

It shall be measured in square meter for specified thickness.

3.12 PLASTERING**3.12.1 Cement Plastering Walls**

Providing and laying 20mm thick cement plaster on walls with 1:6 cement sand mortar in perfect line and level including the cost of scaffolding, curing etc. all complete

3.12.1.1 Materials

Cement shall conform to as specified under cement concrete work. Sand shall conform to as specified under cement concrete work and 50 % fine sand shall be mixed.

The cement mortar shall be in 1:4 (1 cement: 4 sand) by volume. The ingredients shall be accurately gauged and be well and evenly mixed together in a mechanical pan mixture, care being taken not to add more water than is required. No mortar that has begun to set shall be used. If hand mixing is allowed, then it shall be done in brick tanks. The gauged material shall be put in the tank and mixed dry. Water will then be added and the whole mixed again until it is homogeneous and of uniform color. Not more than one bag of cement shall be mixed at one time which can be consumed within half an hour of its mixing.

The joints in the brick work shall be raked out to a depth of 12.5 mm or 20mm. minimum and the surface watered and cleaned of all dust and dirt. Concrete surfaces shall be properly raked to



get adequate key. Tip (makers) shall be provided on the surface for proper thickness and obtaining the finished plaster surface in plumb.

The finished surface shall be minimum average 12.5 mm. on ceiling or 20mm thick on inner wall and 12.5mm outer wall as specified in BOQ. The surface shall be finished at once by being rubbed over with trowel till the cement appears on the surface. All corners, angles and junctions shall be truly vertical and horizontal as the case may be and carefully and neatly finished. Rounding of corners and junctions as required and directed shall be without extra charge. The finished plaster shall be cured for 7 days and protected against damage. Sample of workmanship shall be approved prior to commencement of work.

3.12.1.2 Measurement

It shall be done in square metre of the surface over which the plaster has been done. The thickness of the plaster shall not be taken into account except for independent columns where the measurement shall be of finished surface allowing 12.5 mm. over the designed dimensions. Opening shall be deducted in full and jambs and soffits shall be allowed. Each opening less than 1 sq. m. shall neither be deducted nor extra be paid for jambs, soffits or the sides of such opening. The rate shall include rounding of all corners, junctions, making grooves and forming drip course wherever required materials, scaffolding and curing. Unless otherwise specified nothing extra shall be allowed for plaster on independent columns and beams, any short width or on curved surfaces and difficult location. It shall be paid in sq. m.

3.12.2 Plastering Soffits Of Slabs And Independent Concrete Surface

Providing and laying 12.5 mm thick cement plaster on ceiling/Independent Concrete surface with 1:3 cement sand mortar in perfect line and level including scaffolding, curing etc. all complete

Plastering the R. C. C. soffits/slab, column, shear wall with 12.5 mm. thick cement plaster 1 : 3 (1 cement : 3 sand 50 % coarse sand + 50 % fine sand).

The work shall be done as per specification of item No. 10.1. The plaster shall be composed of 1 : 3 (1 cement : 3 sand) cement mortar. Cement slurry shall be used as required. Care should be taken to ensure that the finished plaster surface shall be plump, plane, straight and true to line. All arises and corners shall be straight, clean and sharp. All plaster work be subjected to approval of the Engineer and work failing to meet the requirement shall be dismantled and replaced at the Contractor's expense.

3.12.2.1 Measurement

It shall be measured in square metre of the surface over which plaster has been done. The rate shall include rounding of all corners, junctions and forming drip course, making grooves, material, scaffolding and curing all complete. It shall be paid in sq. m.

3.12.3 Tile Shape Plaster

25mm thick tile shape plaster in cement sand mortar (1:4) in slope portion of slab in perfect line and level racking the joints, wetting the surface and curing the work all complete as per specification and construction of the consultant/engineer all complete.

The work shall be done as per specification of item No. 10.1. The plaster shall be composed of 1 : 4 (1 cement: 4 sand) cement mortar. Cement slurry shall be used as required. Care should be taken to ensure that the finished plaster surface shall be plump, plane, straight and true to line. All plaster work be subjected to approval of the Engineer and work failing to meet the requirement shall be dismantled and replaced at the Contractor's expense.

3.12.3.1 Measurement

It shall be measured in square metre of the surface over which plaster has been done. The rate shall include, material, scaffolding and curing all complete. It shall be paid in sq. m.

3.13 WATER PROFING TREATMENTS

3.13.1 Water Proofing Works in terrace and balcony

Elastocrete cementitious elastometric water proofing coating two components capacity per kg 6 sq.ft 2 coat including supply and applying all complete work as per drawing, specification and direction of the engineer.

3.13.1.1 Surface preparation

The substrate must be sound, clean and have an open capillary system, and feel like fine sand paper to insure mechanical bond (surface adhesion) and allow Elastocrete cementitious elastometric water proofing to penetrate. Horizontal surface should have a rough wood foot or broom finish. Smooth formed walls or smooth trowel led slabs must roughened.

Remove all dirt, cement laitance, form release agents, curing compounds, loose particles, paints etc. by means of acid etching, wet or dry sand-blasting or other suitable mechanical means.

Remove all protrusions, work back to sound concrete, chiselling out any honeycombed or damaged areas.

Stop active water leakage by using quick setting compound and grouting method, if required.

Thoroughly rinse the entire surface to be water proofed with clean water. Pre-water several times so that the concrete or masonry is saturated to control surface suction and ensure the growth of the crystalline formation deep within the pores of the substrate. When Elastocrete cementitious elastometric water proofing is applied, the surface should be damp, but not wet. Any surface water on horizontal surfaces must be removed.

3.13.1.2 Mixing

Add Elastocrete cementitious elastometric water proofing (3 parts) to water (1 part) and mix thoroughly until the mixture is completely free of lumps. Mix only as much material as can be used within 30 minutes.

3.13.1.3 Vertical/ Horizontal surface coating

Apply Elastocrete cementitious elastometric water proofing in slurry form to pre-watered concrete substrate with a masonry brush. Brush on the material evenly and work it well into the surface. Apply second while the first coat is still tacky (green).

3.13.1.4 Measurement

Measurement shall be in square metre of the actual covered area. Nothing extra shall be allowed for smoothing any rough surface by dressing cement mortar. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.13.2 Water Proofing Works in toilet wall and floor

Supplying and Applying 400gsm Polythene Polypropylene Polymer Compound Waterproof Membrane in toilet walls and floors all complete as per specification and instruction of the engineer. Polyethylene polypropylene polymer waterproof membrane is mainly polypropylene non-woven fabric and polyethylene as the main raw material, by adding the host to improve the performance of a reinforced protective layer, anti-aging layer, waterproof layer and sticky enhanced layer of four layers of sheet material as one of the conformities of waterproof rolling material.

3.13.2.1 Surface preparation

The application procedure for a polyethylene polypropylene polyester polymer waterproof membrane may include the following steps:

Prepare the base: Clean and level the base layer and repair any surface defects.

Prepare the membrane: Pre-lay the membrane and align it.

Apply the adhesive: Pour cement binder on the base and scrape it evenly.

Push the membrane forward: Push the membrane forward and remove any excess adhesive or air.

Create a protective layer: Apply a 2 cm thick cement mortar protective layer in two layers, staggering the layers by 20 cm.

Create overlaps: For roofs, toilets overlap the membranes by 10 cm. For basements, use a cover lap that is 10-15 cm wide and bond the cover with high polymer.

3.13.2.2 Membrane on Vertical/ Horizontal surface

Apply Polythene Polypropylene Polymer Compound Waterproof Membrane in toilet walls and floors properly following the specification.

3.13.2.3 Measurement

Measurement shall be in square metre of the actual covered area. Nothing extra shall be allowed for smoothing any rough surface by dressing cement mortar. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.14 PAINTING**3.14.1 Applying Priming Coat Of Approved Brand**

Cement primersq. m.

Wood primersq. m.

Metal primer sq. m.

Enamel primer.....sq.m.

The primers shall be in seal tins. These shall be of (Berger, Nerolac, Birla, KNP, Asian or Equivalent Brand) or equivalent as per BOQ and approved by the Engineer.

3.14.1.1 Preparation

All surfaces shall be papered by sandpaper rubbing and cleaned properly.

Description of Work		How measured	Multiplying Factor
i)	Panelled or Framed	Measured flat	1 for each side
ii)	Flush doors	-do-	1 for each side
iii)	Fully glazed or wire	-do-	½ for each side
iv)	Part panelled or part glazed or gauged	-do-	1 for each side
v)	Fully ventilated or louvered	-do-	1½ for each side
vi)	Trellis or Jeffri	Measured flat overall	2 for painting all over
		-do-	

Description of Work	How measured	Multiplying Factor
vii) Railing with guard bars, balusters, gratings	The height shall be taken from the lower end of the palisade upto the top of the palisade but not to the top of the standards if they are higher.	1 for painting all over
viii) Gates, open palisade fencing including standard braces, rails stay		all over

The surface for cement plaster shall be patched up with the thick paste of the same primer and smoothed after drying.

In case of timber having knots and nails holes, they should be filled with stopping and knotting materials. The knotting material shall consist of pure shellac dissolved in Methylated spirit. For stopping, Russian talc or gaskets shall be used. The stopping shall consist of two parts of whiting (powdered chalk), One part of white lead mixed together in double boiled linseed oil and well kneaded. The surface thus kneaded shall be allowed to dry up and then sand papered, or readymade approved gaskets may be used.

In case of metal, derusting shall be done and properly cleaned after sand papering.

3.14.1.2 Application

After preparing the surface, the priming coat shall be applied with hairbrushes and as per manufacturer's printed instructions.

3.14.1.3 Measurement

Measurement shall be done in square metre. The measurements shall be as follows:

Nothing extra shall be paid for short width and surface of any shape, size. This shall include for two or more coats inclusive of materials, scaffolding and labour complete.

3.14.2 Wall Putty

Providing and applying wall putty (Berger, Birla, KNP, Asian or Equivalent Brand) on wall and ceiling surface with two or more coats to give an even and uniform shade as per BOQ, drawing and specification.

3.14.2.1 Materials

Wall Putty shall be of Berger, Birla, JK, Asian or any other equivalent brand as per BOQ and approved by the Engineer in sealed tins.

3.14.2.2 Application

Before wall putty is commenced on surface, all dirt and foreign matter shall be completely removed. A vertical stroke with another horizontal stroke shall be termed one coat. Wall putty shall be applied to the surface with thin smooth steel plate in a number of coats to get uniform finish. After the first coat of the paint has hardened, the second coat is applied. Similarly required number of coats shall be given to get an even and uniform shade.

Sample of workmanship shall be approved by the Engineer prior to commencement of work.

3.14.2.3 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.14.3 Water Proof Cement Painting

Painting the plastered surface with water proofing cement paint of approved brand and of colour with two or more coats to give an even and uniform shade.

3.14.3.1 Materials

Water proofing cement shall be of (Berger, Nerolac, Birla, KNP, Asian or Equivalent Brand) as per BOQ and approved by the Engineer in sealed tins.

3.14.3.2 Application

Before painting is commenced on surface, all dirt and foreign matter shall be completely removed. The surface shall be wetted by sprinkling water with a fine spray. The surface shall be sprayed several times with a few minutes intervals between each spraying to allow the moisture to soak into the surface. A vertical stroke with another horizontal stroke shall be termed one coat. Paint solution to be applied to the surface with hair brushes in a number of coats to get uniform finish. After the first coat of the paint has hardened, It shall be cured with water at least for 24 hours before the second coat is applied. Similarly required number of coats shall be given to get an even and uniform shade. It shall be kept damp at least for seven days.

Sample of workmanship shall be approved by the Engineer prior to commencement of work.

3.14.3.3 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Measurement shall also be done as per 12.1.3. Nothing extra shall be allowed for painting any rough surface e.g. external sand - faced plaster or work in short width or surfaces in any shape. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.14.4 Plastic Emulsion Painting (Interior)

Providing and Applying Primer coat and two coats of the approved brand, colour & quality acrylic coat plastic Emulsion Paint low (VOC) on internal wall and ceiling surface (Nerolac, Burger, Asian Paints, Birla, KNP or equivalent for internal paint and silicon based weather coat 1st quality emulsion for exterior wall paint (Nerolac, Burger, Asian Paints, Birla or equivalent)) paint to achieve evenly shaded surface including the cost of scaffolding as per the specifications & instructions all complete.

3.14.4.1 Materials

Acrylic coat plastic emulsion shall be of Nerolac, Burger, Asian Paints, Birla, KNP or any other equivalent brand as per BOQ and approved by the Engineer in sealed tins.

3.14.4.2 Application

All surfaces shall be thoroughly planed and sand papered. Knotting and stopping as required shall be attended.

Sample of workmanship shall be approved by the Engineer prior to commencement of work.

3.14.4.3 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Measurement shall also be done as per 12.1.3. Nothing extra shall be allowed for painting any rough surface e.g. external sand - faced plaster or work in short width or surfaces in any shape. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.14.5 Enamel Painting

Providing and application of two or more coats paint with synthetic enamel paint of approved brand and colour to give an even and uniform shade all complete

3.14.5.1 Materials

The paints shall be of Nerolac, Burger, Asian Paints, KNP or any other equivalent brand as per BOQ and approved by the Engineer, in sealed tins.

3.14.5.2 Preparation of surface

All surfaces shall be thoroughly planed and sand papered. Knotting and stopping as required shall be attended.

3.14.5.3 Application

After preparing the surface and after the priming coat has been applied a top coat shall be applied. Another coat shall be applied after the previous coat is dry. Care should be taken that dust or other foreign materials do not settle; they will disfigure the various coats.

The same brand of materials will be used for various coats. The paints shall be used and applied as per manufacturer's printed instruction. The paint shall be applied with bristle brushes and not horse hair ones. The paints shall be applied in the thinnest possible layers with parallel drawings. No flowing down shall be allowed. Painting to false ceiling and acoustic tile, soft board etc. shall be done by spray painting only.

Sample of workmanship shall be approved by the Engineer prior to commencement of work.

3.14.5.4 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Measurement shall also be done as per 18.1.3. The rate shall include for two or more coats inclusive of materials, labour, scaffolding all complete. It shall be paid in sq. m.

3.14.6 Plastic Emulsion Paint (Exterior)

Providing and Applying Primer coat and two coats of the approved brand, colour & quality silicon-based weather coat 1st quality emulsion for exterior wall paint (Nerolac, Burger, Birla, KNP or equivalent)) paint to achieve evenly shaded surface including the cost of scaffolding as per the specifications & instructions all complete.

3.14.6.1 Materials

The paint shall be of Nerolac, Burger, Asian Paints, Birla, KNP or equivalent or equivalent brand as per BOQ and approved by the Engineer in sealed tins.

3.14.6.2 Application

Before painting is commenced on surface, all dirt and foreign matter shall be completely removed. The surface shall be wetted by sprinkling water with a fine spray. The surface shall be sprayed several times with a few minutes intervals between each spraying to allow the moisture to soak into the surface. A vertical stroke with another horizontal stroke shall be termed one coat. Paint solution to be applied to the surface with hair brushes in a number of coats to get uniform finish. After the first coat of the paint has hardened, It shall be cured with water at least for 24 hours before the second coat is applied. Similarly required number of coats shall be given to get an even and uniform shade. It shall be kept damp at least for seven days.

Sample of workmanship shall be approved by the Engineer prior to commencement of work.



3.14.6.3 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Measurement shall also be done as per 12.1.3. Nothing extra shall be allowed for painting any rough surface e.g. external sand - faced plaster or work in short width or surfaces in any shape. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.14.7 Frech/Chapra Polish

Applying five or more coats with French polish of approved brand and color to give an even and uniform shade including a shining polish of approved brand.

3.14.7.1 Materials

The material required for French polish shall be Chapra, Ramtilak, Sprit, Geru, sand paper, color, shining polish, etc.

3.14.7.2 Preparation of surface

All surfaces shall be thoroughly planed and sand papered. Knotting and stopping as required shall be attended.

3.14.7.3 Application

After preparing the surface and after the priming coat has been applied a topcoat shall be applied. Another coat shall be applied after the previous coat is dry. Care should be taken that dust or other foreign materials do not settle, they will disfigure the various coats. A number of coats of French polish shall be applied till the surface gives a shining appearance. Finally, shining coat shall be approved.

Sample of workmanship shall be approved by the Engineer prior to commencement of work.

3.14.7.4 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Measurement shall also be done as per 12.1.3. The rate shall include for five or more coats inclusive of materials, labour, scaffolding all complete. It shall be paid in sq. m.

3.14.8 Silicon Paint (Exterior)

Providing and applying two coats of the approved brand, colour & quality water-based silicon paint for exterior wall paint (Nerolac, Burger, Birla, KNP or equivalent)) paint to achieve evenly shaded surface including the cost of scaffolding as per the specifications & instructions all complete. Silicone masonry paint is specifically designed to be highly breathable, waterproof and highly durable in even the harshest weather conditions.

3.14.8.1 Materials

The paint shall be of Nerolac, Burger, Asian Paints, Birla, KNP or equivalent or equivalent brand as per BOQ and approved by the Engineer in sealed tins.

3.14.8.2 Application

Before painting is commenced on surface, all dirt and foreign matter shall be completely removed. The surface shall be wetted by sprinkling water with a fine spray. The surface shall be sprayed several times with a few minutes intervals between each spraying to allow the moisture to soak into the surface. A vertical stroke with another horizontal stroke shall be termed one coat. Paint solution to be applied to the surface with hair brushes in a number of coats to get uniform finish. After the first coat of the paint has hardened, It shall be cured with water at least for 24 hours before the second coat is applied. Similarly required number of coats shall be given to get

an even and uniform shade. It shall be kept damp at least for seven days. Sample of workmanship shall be approved by the Engineer prior to commencement of work.

3.14.8.3 Measurement

It shall be measure in square meter by multiplying length and width of actual covered area. Measurement shall also be done as per 12.1.3. Rate shall include all materials, tools, labour as well as scaffolding all complete. It shall be paid in sq. m.

3.15 ROOFING

3.15.1 Steel Tubular Trusses And Purlins

Steel tube roof trusses, and truss girders etc. with BS or IS steel tube sections including welding, hoisting and fixing with necessary M.S. bed plates, anchor bolts etc. as per detailed drawings all complete.

3.15.1.1 Material

Steel tubes used in the trusses shall be finished tubes conforming to the requirements specified in IS: 1161 & IS: 806-1968.

3.15.1.2 Fabrication

The fabrication of trusses using steel tubes shall be done in accordance with IS: 800-1962, welding shall be done with reference to the IS: 820 and IS: 816-1956. The component parts of the structure shall be assembled in such a manner that they are neither twisted nor damaged. The fabricator shall submit fabrication shop drawing for approval. The members of the truss shall be assembled and welding done according to the drawing. All materials before assembly shall be straight end, if necessary, unless required to be of a curvilinear form and shall be free from twist.

3.15.1.3 Bolting

Washers shall be specially shaped where necessary or other means used, to give the nuts and the heads of bolts a satisfactory bearing. In all cases where the full bearing area of the bolt is to be developed, the threaded portion of the bolt shall not be within the thickness of the parts bolted together and washers or appropriate thickness shall be provided to allow the nut to be completely tightened. Edges should be dressed to a neat workman like finish and be free from distortion where parts are to be in contact with metal.

3.15.1.4 Sealing to Tubes

Where the ends of a tube are not automatically sealed by virtue of its connection by welding to another member, the end shall be properly and completely sealed. Before sealing, the inside of the tube should be dry and free from loose scale.

3.15.1.5 Flattened Ends

In tubular construction, the ends of tubes may be flattened or otherwise formed to provide for welded, riveted or bolted connections provided that the methods adopted for such flattening do not injure the material. The change of section shall be gradual.

3.15.1.6 Erection

The contractor must see to it that the base plates are in one level as shown in drawing. The truss shall be erected only after the walls and columns have been constructed to the full height. The bolts shall be fitted loosely at first. The bolts shall be tightened hard only after two pieces of the truss have been closely fitted till then the truss should be supported fully from underneath by means of props. All the bolts in the truss for the whole building shall be tightened at one time. The contractor is to pay special attention so that bolts are not bent due to mishandling of the truss.

3.15.1.7 Painting

All tubes shall unless specified otherwise shall be painted with one coat of red oxide paint before erection at site and one coat of red oxide paint after erection.

3.15.1.8 Measurement

It shall be measured in weight and shall be paid in Kg. Rate shall include the strut, purlin, base plate, gusset plate, nut & bolts and other accessories, materials and labour all complete.

3.15.2 Gypsum Board M/F Suspended Ceiling/Wall (Regular Single Layer)

Providing and fixing suspended false ceiling and in wall, which should be included providing and fixing GI perimeter channels of size 0.55 mm thick having one flange of 20mm and another flange of 30mm and a web of 27mm along with perimeter of ceiling, screw fixed to brick wall/partition with the help of nylon sleeves and screws, at 610 mm centres. Then suspending GI intermediate channels of size 45 mm, 0.9 mm thick with two flanges of 15mm each with the help of a level adjuster made of zinc alloy 50 x 25 mm as per dress from the soffit at 1220mm centre with MS flat 25 x 3 mm thick fixed to soffit with GI cleat and metal expansion fastener, ceiling section of 0.55 mm thickness having knurled web of 51.5 mm and two flanges of 26mm each with lips of 10.5 mm are then fixed to the intermediate channel with the help of connecting clips and in direction perpendicular to the intermediate channel at 475mm centres.

3.15.2.1 Boarding

Providing and fixing 12.5mm thick Water Proof (aluminium foiled lining on one side) Gypsum board (Armstrong, Boral, SCG or equivalent) conforming to IS-2095-1982 is then screw fixed to ceiling section with 25mm drywall screws at 230mm centre. Screw fixing is done mechanically either with screw driver or drilling machine with suitable attachments.

3.15.2.2 Sealing of joints

Boards are to be jointed and finished so as to have a flush look. This should be included filling and finishing of the boards with jointing compound, paper tape and two coats of primer suitable for gypsum boards.

For Light fittings & cutout etc have to be made with the frame of perimeter channels of size 20mm x 27 mm x 30 mm x 0.55 mm thick supported suitable.

Angle bead is to be used at steps to get straight line finish.

Edge bead to be used to protect the exposed Gypsum core of board specially cut edges of the openings for light fittings, diffusers, etc.

Control joints to be used in excess of 10 Meter Long ceiling in both directions.

3.15.2.3 Measurement

It shall be done in square metre of the area done. Rate shall be for all the works including all labour and materials complete. It shall be paid in sq. m.

3.15.3 Synthetic tensile Roofing work**3.15.3.1 Scope of Work**

This work shall consist of providing and installing a PVC-coated tensile fabric roofing membrane over a prepared space truss structure. The scope encompasses the supply of the membrane, all necessary tensioning accessories, fixtures, labor, tools, and equipment required for a complete and secure installation in strict accordance with the manufacturer's specific instructions and the approval of the Engineer.

3.15.3.2 Material Requirement

The tensile roofing membrane shall be manufactured from a high-strength polyester (PES) base fabric and shall strictly conform to the following technical parameters:

Coating and Finish: PVC-coated with a double-sided PVDF protective finish (PVDF/PVDF S2).

Color: Off-white.

Weight: 950 gsm.

Thickness: 0.75 mm.

Tensile Strength (Minimum): 550/550 daN/5 cm (warp/weft).

Tear Strength (Minimum): 80/60 daN (warp/weft).

Adhesion Strength: 20–30 N/10 mm (10–15 daN/5 cm).

Optical Properties: Low visible light transmittance of approximately 4–8% and low solar transmittance of approximately 6%, tested in accordance with EN 410.

Fire Performance: Classified as C-s2,wd0 in accordance with EN 13501-1.

General Characteristics: The material must possess high durability, high dimensional stability, and low maintenance characteristics. It must be strictly weather-proof and highly resistant to UV exposure, heat, and cold.

3.15.3.3 Installation and Execution

Handling: The fabric membrane must be handled with care to avoid scratching, tearing, or creasing the PVDF coating during transit and lifting.

Erection: The membrane shall be correctly positioned and securely anchored over the supporting space truss system using the specified proprietary hardware and accessories.

Tensioning: Tensioning shall be carried out evenly to the manufacturer's required pre-stress levels to ensure the roof is taut, stable under wind loads, and free from wrinkles or ponding risks.

3.15.3.4 Measurement

The synthetic tensile roofing work shall be measured in square meters (sq.m) of the actual net surface area of the membrane successfully installed, tensioned, and accepted by the Engineer.

3.15.3.5 Payment

The work, measured as provided above, shall be paid at the contract unit rate per square meter (sq.m). This rate shall be the full and final compensation for the supply of all materials (including the PES fabric and all tensioning accessories/hardware), labor, tools, equipment, lifting arrangements, surface tensioning, and all other incidental operations necessary to successfully complete the item to the satisfaction of the Engineer.

3.15.4 25mm Thick Eaves Board**3.15.4.1 General**

The Supplying and fixing 25mm thick sal wood eaves board at edge of CGI/UPVC roof in order to prevent water toward structure as per instruction of engineer.

3.15.4.2 Laying and Fixing

They are laid at edge of roof by means of 10 mm dia. hooks or bolts passing through the sheets and 75 mm screws to the rafters.

3.15.4.3 Measurement

The eaves board shall be measured in Sqm. Rate shall include the Hilti screw/self-tapping screw and bolts, limpit, washer, bitumen washer, and other accessories, materials and labour all complete.

3.15.5 Rain Water Gutter**3.15.5.1 Quality**

Providing and installation of 1mm thick MS sheet of size 300x250mm. The surfaces of the sheets must be clean, bright and free from rust; any sheet showing a white powdery deposit should be rejected. Iron galvanized after and not before the process of corrugations should be used.

3.15.5.2 Measurement

The MS rain water gutter shall be measured in running meter. Rate shall include the manufacturing, installation and other accessories, materials and labour all complete.

3.15.6 Rockwool Insulation**3.15.6.1 Scope of Work**

This work shall consist of the supply and installation of aluminum foil-backed Rockwool insulation on concrete ceilings. The insulation is intended to provide thermal, acoustic, and fire safety compliance. The scope encompasses the provision of all insulation panels/rolls, adhesives, mechanical fasteners, tape, labor, tools, and scaffolding required to complete the installation successfully as per the Drawings, Technical Specifications, and the instruction of the Engineer.

3.15.6.2 Material

The Rockwool insulation must strictly comply with the following technical parameters and performance standards:

Base Material: Rockwool (mineral wool) designed for thermal, acoustic, and fire safety applications.

Dimensions & Density: The insulation shall have a thickness of 50 mm and a bulk density of 48 kg/m³.

Facing: The insulation shall feature an aluminum foil backing on one side.

Thermal Performance:

Thermal Conductivity: Maximum 0.035 W/mK at 20 °C mean temperature, tested in accordance with ASTM C518.

Thermal Resistance (R-Value): 1.47 m²K/W at 50 mm thickness.

Fire Safety & Performance:

Combustibility: Completely non-combustible, classified as Class A1 in accordance with EN 13501-1.

Melting Point: Greater than 1000 °C, tested in accordance with ASTM E794-06.

Surface Burning Characteristics: Flame Spread Index of 0 and Smoke Developed Index of 0, tested in accordance with UL 723.

Acoustic Performance: Noise Reduction Coefficient (NRC) of 1 at 50 mm thickness, tested in accordance with BS EN ISO 354:2003.



Moisture Resistance: Water absorption shall be less than 0.04% by volume, tested in accordance with ASTM C1104/C1104M.

3.15.6.3 Installation and Execution

Surface Preparation: The concrete ceiling surface must be clean, dry, and free from dust, grease, or any loose materials before installation begins.

Fixing: The insulation shall be firmly installed against the concrete ceiling with the aluminium foil facing the correct direction (usually downwards/towards the room) as specified by the Engineer. Installation shall be carried out using approved mechanical fasteners (insulation pins/anchors) and/or suitable adhesives as per the manufacturer's recommendations.

Jointing: All joints between insulation batts/rolls must be tightly butted to prevent thermal bridging or acoustic leaks. Foil tape matching the aluminium facing shall be applied over all joints and fastener penetrations to ensure a continuous vapor barrier.

3.15.6.4 Measurement

The Rockwool insulation work shall be measured in **square meters (sq.m)** of the actual net surface area of the ceiling successfully insulated, finished, and accepted by the Engineer. Overlaps and wastage shall not be measured for payment.

3.15.6.5 Payment

The work, measured as provided above, shall be paid at the contract unit rate per square meter (sq.m). This rate shall be the full and final compensation for the supply of all materials (Rockwool, aluminium foil backing, mechanical fasteners, adhesives, foil tape), labour, tools, equipment, scaffolding, surface preparation, and all other incidental operations necessary to successfully complete the item to the satisfaction of the Engineer.

3.15.7 25mm THICK EPS THERMOCOL

3.15.7.1 General

25mm EPS70 Insulation Boards can be used in floors, walls and roofs. It is common to see EPS Insulation used in both commercial and residential settings to satisfy building regulations. One of the most common uses of 25mm EPS Insulation Boards are below concrete slabs with concrete poured on top. In addition to this, 25mm EPS 70 boards feature high compression strength, which makes them great for load bearing applications. This is why you tend to see them used mostly as floor insulation. EPS works great in flooring applications as it can help to minimise the heat lost through flooring.

3.15.7.2 Material

Expanded Polystyrene is a tough, rigid, lightweight, closed cell insulation foam commonly known as EPS. Having densities in- between 8 Kg/M3 to 32 Kg/M3. Its close cell structure provides low water vapour permanence and hence it is widely used for thermal insulation.

Shape	Rectangular
Size	2.4 Mtr X 1.2 Mtr
Material	Expanded Polystyrene (EPS)
Thermal Conductivity	0.038W/mK
Density	15 kg/Cubic Metre
Fire Rating	Euroclass F
Edge Type	Square



Weight 0.37 kg/m²

3.15.7.3 Measurement

It shall be done in square metre of the area done. Rate shall be for all the works including all labour and materials complete.

3.15.8 10mm THICK CEMENT BOARD PARTITION

3.15.8.1 General

Supplying, fabrication, fixing of cement board in position for internal and external made with 10mm thick cement board fixed to C-stud fixed to U-track with spacing 300mm c/c of horizontal frame, including sealing joints with fibre tapes and joint sealing compound, filling screw heads as per manufacturer's installation guidelines, sealing perimeter gaps with silicon sealant etc. all complete.

3.15.8.2 Material

Fiber cement boards consist of a composite material comprising of reinforced fibres, cement, sand, and silica. Fiber cement boards provide non-combustible properties, rendering them suitable for a diverse range of applications. Various thicknesses and sizes are available for these materials, enabling them to be cut, moulded, and placed in a manner akin to conventional wood. These entities exhibit a significant degree of resistance to fire, water, moisture, and heat.

3.15.8.3 Measurement

It shall be done in square metre of the area done. Rate shall be for all the works including all labour and materials complete.

3.15.9 PUFF ROOF/WALL PANEL

3.15.9.1 General

Puff Roof and Wall Panel (Sandwich PUF Panel) typically consist of three layers: a core and two side skins, commonly used in prefabricated building construction. These panels are known for their lightweight nature, resilience to weather conditions, and eco-friendliness.

3.15.9.2 Material

PUF panels consist of three layers: a core material made of polyurethane foam, and two outer layers made of metal sheets. The metal sheets are usually made of steel or aluminum, and can vary in thickness depending on the intended use of the panel. The thickness of the metal sheets can range from 0.4 mm to 1.2 mm, with a standard thickness of 0.5 mm.

The core material of PUF panels is made of polyurethane foam, which is a type of plastic that is produced by reacting two chemical components, polyols and isocyanates. The polyols are typically derived from petrochemicals, while the isocyanates are derived from phosgene, a highly toxic gas. These two components are mixed together in a chemical reaction that produces polyurethane foam.

The polyurethane foam used in PUF panels is a closed-cell foam, which means that the cells are tightly packed together and do not allow air or moisture to penetrate. This makes PUF panels an excellent thermal insulator, as well as providing good sound insulation and fire resistance.

The outer layers of PUF panels are bonded to the core material using an adhesive. The adhesive used in PUF panels is usually a two-component polyurethane or epoxy resin that is applied to the metal sheets and the core material before they are bonded together. The adhesive helps to ensure that the metal sheets and the core material are firmly bonded together, and that the panel is able to withstand the stresses and strains of use.



Surface material	Exterior- 0.45-0.5mm PPGL (Prepainted Galvalume) Interior- 0.45-0.5mm PPGL PPGL (Prepainted Galvalume)
Thickness	Roof- 30mm, 40mm, 50mm, 75mm, 100mm Wall- 40mm, 50mm, 75mm, 100mm
Width	1000mm
Length	2-6.5m
Insulator	PUFF (Polyurathane Foam)
Density	45-50 kg/m ³
Thermal Conductivity	0.022-0.028 W/mK

3.15.9.3 Measurement

It shall be done in square metre of the area done. Rate shall be for all the works including all labour and materials complete.

3.15.10 EXTRUDED HOLLOW CLAY/TERRACOTTA VENTILATED RAINSCREEN FAÇADE TILES

3.15.10.1 General

Providing and fixing of Extruded Hollow Clay / Terracotta Ventilated Rainscreen Façade Tiles of grid dimensions 300 x 1000/1200mm (c/c) in a horizontal direction on the building facade. The extruded hollow clay tile cladding material shall be rigid and of adequate strength and shall have a minimum total thickness of 24 mm ($\pm 10\%$). The tiles shall be installed using the ventilated rainscreen principle, with provision for natural ventilation of the space between the façade tiles and the structural wall. The clay tiles shall be of the hollow type, fixed to a supporting aluminium framework (Alloy 6063 T5/T6) consisting of vertical 'T' / 'L' / Tube sections measuring 80x60x2mm/ 40x60x2mm/ 40x40x2mm respectively, spaced at maximum 1200mm c/c intervals matching to the tile vertical grid, and horizontal aluminium 'C'-clamps measuring 60 x 38mm x 150mm/ 75mm length fixed on top of the vertical sections at maximum 300mm c/c matching to the tile horizontal grid.

3.15.10.2 Measurement

It shall be done in square metre of the area done. Rate shall be for all the works including all labour and materials complete.

3.15.11 SHRERA FLEXING BOARD

3.15.11.1 General

Providing and cladding 8mm thick decorative Shera Flexy Board (teak texture) or equivalent on exterior walls of approved quality, design and shape with necessary m.s. battens, screws, fevicol, grips etc. with concealing the screws as per manufacturer's specification all complete with scaffolding in perfect line and level all complete as per drawing.

3.15.11.2 Material

Shera Board is a non-asbestos fibre-cement building board composed of Portland cement, cellulose fibre and refined sand. Using a manufacturing process called autoclave, Shera board acquires the strength, durability of cement plus easy workability and dimensional stability. Shera Boards come in various formats and can be used in a wide variety of building applications. These entities exhibit a significant degree of resistance to fire, water, moisture, and heat.

Shera boards have a pH value of 7–8, thermal conductivity of 0.15 W/m. K and moisture movement of + 0.04%. The standard size for SHERA boards is 1200 mm x 2400 mm.

3.15.11.3 Measurement

It shall be done in square metre of the area done. Rate shall be for all the works including all labour and materials complete.

3.16 SITE DEVELOPMENT WORK

3.16.1 Pre-Cast Interlocking Concrete Block

Providing and laying pre-cast Interlocking Concrete Blocks of 60mm thick over 50 mm thick stone dust as specified in the designed drawings of approved pattern and colour in the walkway, parking, road, etc.

3.16.1.1 Preparation of Sub-grade

Loose soil shall be removed up to a depth of 200mm then the surface shall be rammed in true line level by sprinkling water to achieve at least 90% of density.

3.16.1.2 Preparation of Sub Base

Providing and laying of 100mm crushed aggregate base course mixed with stone dust over prepared sub-grade, compacted with roller by sprinkling water to achieve 100% density all complete.

3.16.1.3 Preparation of Stone Dust Bed

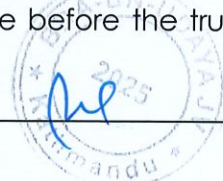
Providing and laying of 50mm Stone dust bed as specified in the design drawings over prepared base course. The stone dust bed shall be well compacted by sprinkling water.

3.16.1.4 Laying of Interlocking Concrete Paving Block

Providing and laying pre-cast interlocking concrete paving blocks 60 mm thick as specified in the designed drawings over stone dust bed. Interlocking units shall be laid in running or stretcher bond as their interlocking design resists the forces that cause creep. Each block is place against the adjacent units without disturbing the other units, developments are taking place at this time relative to mechanized placement of individual units or clusters of blocks that are tied together with break-away webs. The order of laying should be such that it is never necessary to force a block between those already laid.

Where whole units do not fit at the edges of a pavement, cut block are used to fill the spaces. Spaces left around manholes and drainage inlets are treated in the same manner. This is readily accomplished with a small hydraulic block splitter. Spaces less than about 40mm can be filled with sand.

Concrete or masonry sand should be spread over the installed paving blocks so that it may be vibrated into the joints. After enough area is laid to make vibration worthwhile, the blocks are vibrated to their final level to their final level with a plate vibrator. The vibrating action compact the sand and also forces some sand up between the joints. After the initial vibration, sand is brushed over the surface and is vibrated into the joints by additional two passes of the vibrator. This locks the block together so that they no longer act as individual units but as a group in distributing loads. Vibration also evens out any minor variations in level between units. The vibrator should not be passed closer than about one yard from and unrestrained edge. After surplus sand is removed the pavement is completed and ready for traffic. If heavy trucks are used to deliver materials close to the work, the sanding and vibrations should be done before the trucks are permitted to enter that section of the pavement.



Installation system in brief:

Pavers shall be clean and free of foreign materials before installing the interlocking blocks. Installation should start from corner or straight edge and proceed forward over the levelled stone dust course.

Paving work shall be plumb, level, and true to line and grade; shall be installed to properly coincide and align with adjacent work and elevations all edges must be retained to secure the perimeter stones and stone dust course.

Paving blocks should be installed hand tight and level on the undisturbed stone dust bed.

Concrete or masonry sand should be spread over the installed paving blocks so that it may be vibrated into the joints.

Roller or plate vibratos should be used to compact the base course and stone dust and to vibrate the sand into the stone joints.

Excess sand should be swept into the joints or disposed of from surface area.

The completed paving stone installation should be washed down and cleaned to provide a clean finished workmanlike installation.

3.16.1.5 Measurement

Measurement shall be in square metre of the actual covered area. Nothing extra shall be allowed for sand blending, small hydraulic block splitter, etc. Rate shall include all materials, tools, labour, etc., including

50 mm thick stone dust bed all complete. It shall be paid in sq.m. The crushed aggregate base course shall be paid separately in cum.

3.17 ASPHALT PAVEMENT

Providing and laying 40 mm thick asphalt concrete using crushed aggregates of specified grading, premixed with bituminous binder and filler all complete as per specification (SS-13.6), drawings and instruction of Engineer appointed by PCO.

3.17.1 Preparation of Sub-grade

Compacting original ground supporting sub-grade; Loosening of the ground upto a level of 200 mm below the sub-grade level, watered, graded and compacted in layers as per Drawing and Technical Specifications.

3.17.2 Preparation of Sub Base

Providing, laying, spreading, levelling and compaction of granular sub-base on prepared surface, mixing at OMC, and compacting to achieve the desired density, all complete as per drawings and Technical.

3.17.3 Preparation of Base

Providing and laying Crusher Run Macadam on a prepared surface, spreading and mixing, watering and compacting to form a layer of Base Course as per Drawing and Technical Specifications. [Mix in place method, 45 mm down].

3.17.4 Prime Coat

Providing and spraying bituminous Prime Coat MC30/MC70 including cleaning the road surface using compressor, wire brushes, broom etc. before applying Prime Coat, all complete as per specification and instruction of Engineer appointed by PCO.



3.17.5 Tack Coat

Providing and spraying bituminous tack coat including cleaning the road surface using compressor, wire brushes, broom etc. before applying tack coat, all complete as per specification (SS-13.2) and instruction of Engineer appointed by PCO.

3.17.6 Laying of 50mm thick asphalt concrete

Providing and laying 50 mm thick asphalt concrete using crushed aggregates of specified grading, premixed with bituminous binder and filler all complete as per specification, drawings and instruction of Engineer appointed by PCO. Hot mix asphalt is made up of a combination of aggregate and bitumen. The aggregate is heated until it reaches a temperature between 150 to 200 degrees Celsius. Once it reaches the desired temperature, the aggregate is mixed with the bitumen.

After being mixed, the material is then placed on the surface that needs to be paved. It's compacted using a heavy roller until it has cooled and hardened.

3.17.7 Opening to Traffic

It shall be ensured that the traffic is not allowed without the approval of the Engineer in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

3.17.8 Measurement

Warm mix asphalt shall be measured as finished work either in cubic meters, tons or by the square meter at a specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

The crushed aggregate base course shall be paid separately in cum. Prime coat and tack coat shall be paid in sqm.

3.18 PREMIXED CARPET

Providing and laying open-graded premix carpet of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates as wearing course on a previously prepared base as per drawing and Technical Specifications. [Mechanical Means using hot mix plant].

3.18.1 Preparation of Sub-grade

Compacting original ground supporting sub-grade; Loosening of the ground upto a level of 200 mm below the sub-grade level, watered, graded and compacted in layers as per Drawing and Technical Specifications.

3.18.2 Preparation of Sub Base

Providing, laying, spreading, levelling and compaction of granular sub-base on prepared surface, mixing at OMC, and compacting to achieve the desired density, all complete as per drawings and Technical.

3.18.3 Preparation of Base

Providing and laying Crusher Run Macadam on a prepared surface, spreading and mixing, watering and compacting to form a layer of Base Course as per Drawing and Technical Specifications. [Mix in place method, 45 mm down].



3.18.4 Prime Coat

Providing and spraying bituminous Prime Coat MC30/MC70 including cleaning the road surface using compressor, wire brushes, broom etc. before applying Prime Coat, all complete as per specification and instruction of Engineer appointed by PCO.

3.18.5 Tack Coat

Providing and spraying bituminous tack coat including cleaning the road surface using compressor, wire brushes, broom etc. before applying tack coat, all complete as per specification (SS-13.2) and instruction of Engineer appointed by PCO.

3.18.6 Laying of 20mm thick Premix Carpet

Providing and laying open-graded premix carpet of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates as wearing course on a previously prepared base as per drawing and Technical Specifications. [Mechanical Means using hot mix plant].

The premixed cationic bitumen emulsion and aggregates shall be spread uniformly by a paver within 10 minutes of applying the tack coat. All levelling, raking etc. shall be complete within 20 minutes of the time of mixing. The mix shall be spread uniformly to the desired thickness, grades and cross fall (camber). The cross fall shall be checked by means of camber boards and irregularities levelled out. Too much raking is to be avoided.

The rolling shall start immediately after laying the premix. A smooth wheeled tandem roller of 8-10 tons shall be used, unless other compaction methods are approved by the Engineer, based on the results of laying trials, if necessary. While rolling, wheels of roller shall be clean and kept moist to prevent the premix from adhering to the wheels. In no case shall fuel/ lubricating oil be used for this purpose. Use of water for this purpose shall be strictly limited to an absolute minimum. Rolling shall commence at the edges and progress towards the centre longitudinally

except in the case of super elevated and unidirectional cambered sections where rolling shall be carried out from the lower edge towards the higher edge parallel to the centre line of the road. After one pass of roller over the whole area, depressions or uncovered spots shall be correct by adding premix material. Rolling shall be continued until the entire surface has been rolled, to maximum compaction and all the roller marks eliminated. In each pass of the roller, the preceding track shall be overlapped uniformly by at least one-third width. Roller(s) shall not stand on newly laid material. Joints, both longitudinal and transverse to the road sections laid and compacted earlier, shall be cut vertically

to their full depth so as to expose fresh surface which shall be painted with a thin coat of binder before the new mix is laid.

3.18.7 Seal Coat

Providing and laying Coarse Sand Seal to fill the voids in a bituminous surface as per Drawing and Technical Specifications.

3.18.8 Painting lines, dash, arrows

Providing required material and Painting lines, dashes, arrows etc. on roads in two coats on new work with ready mixed road marking paint conforming to NS 408 / IS 164 on bituminous surface, including cleaning the surface of all dirt, dust and other foreign matter, demarcation at site and traffic control as per Drawing and Technical Specifications. Over 10 cm in width.



3.18.9 Opening to Traffic

It shall be ensured that the traffic is not allowed without the approval of the Engineer in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

3.18.10 Measurement

Premix carpet shall be measured as finished work either in cubic meters, tons or by the square meter at a specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

The crushed aggregate base course shall be paid separately in cum. Prime coat and tack coat shall be paid in sqm. Painting shall be paid in sqm.

3.19 TURFING/GRASS SLIPS

Providing and laying Turfing/grass slips with approved weed free turfs or grass Carpet, watering and maintenance of lawn for at least 30 days all complete

It shall be paid in sq. m.

Turfs shall be interpreted as grass carpet of size 30cmx 30 cm slip that is seasonally dormant during cold or dry seasons and is capable of renewing growth after the dormant period. The turfs shall be brought by the Contractor from areas where the top soil is reasonably fertile and contain a high percentage of loamy topsoil. Turfs shall be cut or stripped from living, thickly matted turf relatively free from weeds or other undesirable foreign plants, large stones, roots or other materials which might be detrimental to the development of the turf or to future maintenance. Turf including the soil containing the roots shall be planted in a neat and systematic way.

The top soil on which Turfing is to be done shall be free of admixture of sub-soil, stone, gravel, clay lumps, plants or their roots, sticks or other extraneous material exceeding 50 mm. diameter. It shall be clay loam. The top soil shall be approved by the Engineer before being placed.

The strips of turf shall be in uniform widths not less than 230 mm. and length not more than 460 mm. and such lengths should be readily lifted without breaking, tearing or loss of soil. The turfs shall be transplanted within 24 hours from the time it is stripped unless storing is necessary. If stored, turfs shall be stacked, kept moist and protected from exposure to sun. Turfs shall be cut and moved only when the soil mixture conditions are such that favorable results can be expected. Turfing shall be performed only during the seasons when satisfactory results can be expected. Turfing may be transplanted during drought free periods with the approval of the Engineer provided the turf bed is watered to moisten the soil to a depth of at least 100 mm immediately prior to laying the turf.

The turf shall be carefully placed by hand, edge to edge with staggered joints, in rows at right angle to the slopes, commencing at the base of the area to be turfed and working upward. The turf shall immediately be pressed firmly into contact with bed by tamping to provide a true and even surface. Screened soil of good quality shall be used to fill all cracks between turfs. The quality of fill soil shall not cause smothering of the grass.

The Contractor shall provide general care for the turfed area, protect against traffic and shall continue care until final inspection and acceptance of the work. If the surface become gullied or otherwise damaged during the period the affected area shall be repaved to stabilise grade and condition as directed.

3.19.1 Measurement

It shall be measured in square meter on the ground surface including materials and labour.



3.20 PLANTATION WORKS

3.20.1 Flower Plantation

Supplying and planting of seasonal flowering plants with a root height of 8" minimum. The work includes pitting, transplanting, composting, and mulching.

Execution: Pit size shall be 30 cm diameter x 30 cm depth. Mix compost with soil and backfill into the pit to 1/4 of the pit volume.

Materials: The size and type of flowers to be planted shall be approved by the Engineer prior to supply and plantation.

3.20.2 Colourful Planting Works

Providing and planting approved species of colourful ornamental plants/shrubs in prepared soil.

Execution: Plants shall be placed at 150 mm c/c spacing on the Buddha lotus pond area.

Inclusions: The work includes excavation, manure application, watering, staking, trimming, maintenance, and all necessary materials and labour complete.

3.20.3 Grass Turfing Works with Sods

3.20.3.1 General

This work shall consist of furnishing and laying of the live sod of perennial turf forming grass on embankment slopes, verges (earthen shoulders) or other locations shown on the drawings or as directed by the Engineer. Unless otherwise specified, the work shall be taken up as soon as possible following construction of the embankment, provided the season is favourable for establishment of the sod.

3.20.3.2 Materials

The sod shall consist of dense, well-rooted growth of permanent and desirable grasses, indigenous to the locality where it is to be used, and shall be practically free from weeds or other undesirable matter. At the time the sod is cut, the grass on the sod shall have a length of approximately 50 mm and the sod shall have been freed of debris. Thickness of the sod shall be as uniform as possible, with some 50 - 80 mm or so of soil covering the grass roots depending on the nature of the sod, so that practically all the dense root system of the grasses is retained in the sod strip. The sods shall be cut in rectangular strips of uniform width, not less than about 250 mm x 300 mm in size but not so large that it is inconvenient to handle and transport these without damage. During wet weather, the sod shall be allowed to dry sufficiently to prevent rearing during handling and during dry weather shall be watered before lifting to ensure its vitality and prevent the dropping of the soil in handling.

3.20.3.3 Construction Operations

3.20.3.3.1 Preparation of the earth bed

The area to be sodded shall have been previously constructed to the required slope and cross section. Soil on the area shall be loosened, freed of all stones larger than 50 mm size, sticks, stumps and any undesirable foreign matter, and brought to a reasonably fine granular texture to a depth of not less than 25 mm for receiving the sod. Where required, topsoil shall be spread over the slopes. Prior to placing the topsoil, the slopes shall be scarified to a depth which, after settlement, will provide the required nominal depth shown on the plans. Spreading shall not be done when the ground is excessively wet. Following soil preparation and top soiling, where required, fertilizer and ground limestone when specified shall be spread uniformly at the rate



indicated on the plans. After spreading, the materials are incorporated in the soil by discing or other means to the depths shown on the plans.

3.20.3.3.2 Placing the Sods

The prepared sod bed shall be moistened to the loosened depth, if not already sufficiently moist, and the sod shall be placed thereon within approximately 24 hours after the same had been cut. Each sod strip shall be laid edge to edge and such that the joints caused by abutting ends are staggered. Every strip, after it is snugly placed against the strips already in position, shall be lightly tamped with suitable wooden or metal tampers so as to eliminate air pockets and to press it into the underlying soil. On side slopes steeper than 2 (horizontal) to 1 (vertical), the laying of sods shall be started from bottom upwards. At points where water may flow over a sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over them followed by its thorough compaction.

3.20.3.3.3 Staking the Sods

Where the side slope is 2 (horizontal) to 1 (vertical) or steeper and the distance along the slope is more than 2 m, the sods shall be staked with pegs or nails spaced approximately 500 to 1000 mm along the longitudinal axis of the sod strips. Stakes shall be driven approximately plumb through the sods to be almost flush with them.

3.20.3.3.4 Top Dressing

After the sods have been laid in position, the surface shall be cleaned of loose sod, excess soil and other foreign material. Thereafter, a thin layer of topsoil shall be scattered over the surface of top dressing and the area thoroughly moistened by sprinkling with water:

3.20.3.3.5 Watering and Maintenance

The sods shall be watered by the Contractor for a period of at least four weeks after laying. Watering shall be so done as to avoid erosion and prevent damage to sodded areas by wheels of water tanks. The Contractor shall erect necessary warning signs and barriers, repair or replace sodded areas failing to show uniform growth of grass or damaged by his operations and shall otherwise maintain the sod at his cost until final acceptance,

3.20.3.4 Measurement and Payment

The measurement of turfing with sods shall be made as finished work in square metres, accepted on site by the Engineer. The quantities measured shall be paid at the unit rates shown in the Bill of Quantities. This payment shall be the full and final compensation to the Contractor for making arrangements for traffic control, providing and delivering sods, all labour, tools, equipment, safety harness and incidentals to complete the work as per these Specifications. Topsoil shall be paid separately, if applicable.

3.20.4 Site Planting and Sowing (Grass Hedging Works)

The Contractor shall plant or sow grasses, shrubs and trees as shown on the Drawing or required by the Engineer. This shall be done according to the specifications described hereunder, as and when required. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met.

(b) Due to the nature of bio-engineering works, they may also be undertaken by small local contractors with a range of agricultural skills, if so provided in the Contract. If provided in the Contract, any bio-engineering site activity may also be managed by direct employees of the Division Road Office.

(c) It shall be the Contractor's responsibility to ensure that all planting stock, whether provided from a nursery under a separate contract or through a separate instruction, is of high quality and is vigorous enough to grow on the site to be planted.

(d) All seeds and other planting stock shall be of species indigenous to Nepal unless otherwise specified. All species shall be covered in the current approved lists of species produced from time to time by the Geo-Environment and Social Unit of the Department of Roads. They shall be appropriate for the precise site conditions in which they are to be planted and the Contractor shall ensure that they apply to the specific altitude and other environmental characteristics of the site in question.

(e) Activities such as planting and seed sowing shall be carried out within the critical few weeks when they will yield the desired results. All other operations shall be carried out in a timely manner to permit this to happen. The Contractor shall be responsible to keep works to the strict schedule required and under no circumstances to permit delays.

3.20.4.1 Sowing of Grasses on Site

The Contractor shall be required to carry out the sowing of grass seeds according to the Engineer's specific instructions.

(a) If the site for sowing is to be prepared under a separate contract, then it shall be assumed that the site will already have been prepared for seed sowing.

Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of grasses.

(b) The Contractor shall be required to supervise all field operations very closely. The sowing of grass seeds is a delicate business and shall be approached in the same way as for agricultural crops. The Contractor shall employ experienced agricultural labourers for this work.

(c) If seeds have to be provided under a separate contract, then they shall be properly stored. However, it shall be the Contractor's responsibility to check that it has been carefully stored and remains fully viable.

(d) Immediately before sowing, the ground surface shall be lightly scarified using a rake to ease early root penetration. Seeds shall then be laid thinly over the surface. Under no circumstances shall they be broadcast, because the lightness of perennial grass seeds and the steepness of the slopes to be treated give a poor cover using such a technique. The Contractor shall be responsible for ensuring that the correct quantities of seeds are used, while giving a good, even cover.

(e) A cover of 25 grams of grass seed per square metre of surface shall be achieved unless otherwise specified.

(f) After sowing, a mulch of prepared and dried cut herbs shall be laid over the whole seeded area in a thin layer. If the mulch is too thick it will prevent light from getting to the seed and will inhibit germination. Herbs suitable for this and locally available in large quantities are:

- ☐ Tite pate (*Artemisia vulgans*);
- ☐ Tapre (*Cassia species*);
- ☐ Ban mara (*Eupatorium adenophorum*).

However, freshly cut herbs shall not be used because of the danger of resprouting and weeding.

(g) If specified, the mulch should be secured with jute netting of mesh size 300x 500 mm and the netting fixed in place using suitable live pegs or hardwood cuttings (e.g. Simali, Vitexnegundo) at one metre centres.

(h) Measurement and Payment: Work shall be measured in square meters on the basis of actual area of grass seeded and covered surface. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, providing seeds, collection and application of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein. If the seeds and mulch are supplied through a separate contract, costs for the supply of the same shall not be included herein. However, if the Contractor is responsible for the supply and storage of seeds and mulch no separate payment shall be made for these items.

3.20.4.2 Direct Seed Sowing of Shrubs and Trees on Site

The Contractor shall be required to carry out the sowing of shrub and tree seeds according to the Engineer's specific instructions.

(a) It is assumed that the site will already have been prepared for seed sowing, if this item has to be executed under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of shrubs and trees.

(b) The Contractor shall be required to supervise all field operations very closely. As the sowing of any seeds is a delicate business and, therefore, shall be approached in the same way as for agricultural crops. The Contractor shall employ experienced agricultural labourers for this work.

(c) Seed shall have been collected and stored well before the time of sowing, if they have to be supplied under a separate contract. However, it shall be the Contractor's responsibility to check that it has been carefully stored and remains fully viable.

(d) Sowing shall start at the top of the slope and the labourers shall work downwards. Care shall be taken not to disturb areas already seeded.

(e) To sow the seeds, a small hole shall be made in the slope. The tool used to do this shall depend on the size of the seed. For some seeds, a piece of gabion wire will be adequate; for others, a piece of mild steel with a flattened end is required.

(f) The hole shall be in the best soil available but if there is little real soil, then a crevice between two stones is acceptable. Two seeds should be placed in each hole and a covering of soil or whatever fines are available shall be placed over them. This covering shall never exceed 10 mm and shall preferably be about 5 mm; it shall never be less than and this. Seeds shall be placed at 200 to 250 mm centres, as ground conditions dictate.

(g) In some cases, the seed can be broadcast starting at the top of the site and working down slope as evenly as possible so that the whole site is lightly covered. This shall be used where the site is still active and only warrants minimum expenditure, or where the site is naturally rough, providing plenty of niches in which the seed can catch. Quantities of seed shall depend on the type of seed involved but are generally half that of the quantities used in the nursery unless otherwise instructed by the Engineer. With utis (*Alnusnepalensis*) seed it shall be at a rate of 1 gram of seed per square metre.

(h) Measurement and Payment: Work shall be measured in square meters on the basis of actual area of grass seeded and covered surface. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, providing seeds,

collection and application of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein. If the seeds and mulch are supplied through a separate contract, costs for the supply of the same shall not be included herein. However, if the Contractor is responsible for the supply and storage of seeds and mulch no separate payment shall be made for these items.

3.20.4.3 Site Planting of Grass Slips and Cuttings

The Contractor shall be required to carry out the planting of grass seedlings or rooted the cuttings, according to the Engineer's specific instructions.

(a) The configuration of planting shall be determined according to individual site conditions. It shall be either random, contoured or downslope, as instructed by the Engineer.

(b) It is assumed that the site shall already have been prepared for planting, if this is to be prepared under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of grasses, and accords with the specifications given in Clause 2806.

(c) Using appropriate tools (such as tape measures and spirit levels), planting lines shall be marked out with string as required.

(d) The Contractor shall be required to supervise all field operations very closely.

(e) The plants supplied to the Contractor from nursery (if so provided in the Contract) shall be prepared for planting by the Contractor as given below. The Contractor shall transport them from the nursery wrapped in hessian jute. At all times, plants shall be kept moist and as cool as possible, and should be wrapped in wet hessian between all operations such as extraction from the bed, pruning and planting. Under any circumstances, all plants supplied shall be planted within two days of that they are lifted from the nursery.

(f) Grass slips or cutting shall be carefully separated from the clumps to give the maximum viable planting material. Preparation of slips, cuttings or rhizomes shall be strictly followed as mentioned in Sub-clause 2803 (1).

(g) Planting shall be started at the top of the slope and under no circumstances shall new plants be walked on or otherwise disturbed. Using a small bar (usually made of mild steel and with a flattened end), a hole shall be made that is just big enough for the roots. The slip or cutting is inserted; care shall be taken that the roots are not tangled or bent back to the surface. Soil shall then be replaced around the roots and firmed with the fingers. The spacing of plants within rows shall be 100 mm unless otherwise specified. Two grass slips shall be planted in each drill.

(h) If the soil is dry and there is no rain within 16 to 24 hours of planting, the site shall be watered carefully with a fine spray. The Contractor shall be required to water for the first two weeks after planting in the event of inadequate rainfall.

(i) If it provided in the Contract that the plants are to be collected from locations other than nurseries then utmost care shall be taken to minimize disruption to neighbouring land, in the event that species are collected from areas surrounding the road. It shall be the Contractor's responsibility to collect the stock required from a wide area and not to give rise to any soil erosion through the excessive removal of plants in one locality.

(j) Measurement and Payment: The measurement shall be the actual area of grass planted and covered surface in square meters for the random planting and any other patterns of planting up to the 300 mm between the lines. The contour line planting in 500-1000 mm in any slopes shall be measured in linear meter. The payment shall be the full and final compensation to the Contractor

for making arrangements for traffic control, providing grass slips or rhizome, collection of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as per these Specifications. If the grass slips and mulch are supplied through a separate contract, costs for the supply of the same shall not be included herein. However, if the Contractor is responsible for the supply slips and mulch, no separate payment shall be made for these items.

3.20.4.4 Use of Fertilizer

Under certain circumstances, the use of chemical fertilisers may be specified in place of farmyard manure or mulching.

Levels of fertiliser application shall vary according to soil type and nutritional content. However, if nutritional data are not available, the following figures shall be used as a rough guide:

Nitrogen (N): 10 g/m²;

Phosphorus (P). 5 g/m²;

Potassium (K). 4 g/m².

3.20.5 Trees, Shrubs and Ground Cover Plantation

Providing, transporting, and planting trees, shrubs and ground cover of specified species in contract, types, and heights.

Execution: Excavation of planting pits of required size, backfilling with approved topsoil mixed with farmyard manure and fertilizers.

Inclusions: Watering, staking and tying with suitable supports, mulching, tree guards where specified, replacement of dead or defective trees, maintenance during the establishment period, and all labour, materials, tools, equipment, transportation, and incidentals, complete in accordance with the drawings, specifications, and the Engineer's instructions.

3.21 SIDE WALK KERBSTONE

3.21.1 General

Providing and laying M20 precast in situ concrete in kerbs with 12 mm thick 1:3 cement sand mortar bedding and joints including foundation excavation, levelling, Flat Brick Soling and 75mm thick/30cm wide 1:2:4 PCC works (DOR Norms ,kerb stone size 150*150*350) all complete.

3.21.2 Measurement

It shall be measured in Running meter of Kerb Stone so laid. No extra payment shall be done for stone soling and PCC works.

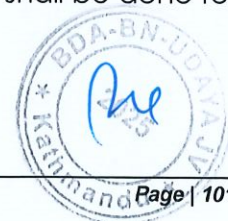
3.22 CARRIAGEWAY CONCRETE KERBSTONE

3.22.1 General

Providing and laying M20 precast in situ concrete in kerbs with 12 mm thick 1:3 cement sand mortar bedding and joints including foundation excavation, levelling, Flat Brick Soling and 75mm thick/30cm wide 1:2:4 PCC works (DOR Norms, kerb stone size 380*200*250) all complete.

3.22.2 Measurement

It shall be measured in Running meter of Kerb Stone so laid. No extra payment shall be done for stone soling and PCC works.



3.23 STONE MASONRY WORK

3.23.1 General

This Section covers the furnishing of materials and construction of different types of stone masonry works in accordance with the Drawing and this Specifications or as directed by the Engineer.

3.23.2 Materials

Stone

The stones to be used shall be durable and angular in shape. If boulders are used, they shall be broken into angular pieces. The stones shall be sound, hard, free from iron bands, spots, sand holes, flaws, shakes, cracks or other defects. The stone shall not absorb water more than 5 per cent. The specific gravity of the stone shall not be less than 2.50. Except otherwise described in the contract, the length of any stone shall not exceed three times its height. The breadth of the stone on the bed shall not be less than 150 mm nor greater than 3/4 the thickness of the wall. At least 85% of the stones used in masonry, except those used for chinking as chips or spalls of stones shall have individual volumes of more than 0.01 m³. The chips or spalls used including voids in the dry stone masonry shall not be more than 20% of the stone masonry by volume. In case of mortared masonry, the total volume of mortar and spalls taken together shall not be more than 30% of the mortared masonry. Representative samples of the stones intended for use in the works shall be submitted to the Engineer for prior approval. Further representative samples shall be submitted for approval whenever there is a change in the type or strength of the rock that the Contractor intends to use in masonry work.

Mortar

Mortar for masonry shall 1:6 (Cement: 1; Sand: 6).

3.23.3 Construction

The method of construction described herein shall hold in all Clauses of this Section, wherever applicable.

(1) General

Construction shall be carried out in accordance with I.S. 1597-1992, Code of Practice for construction of stone masonry, Part 1 Rubble stone masonry or Part 2 Ashlar Masonry as appropriate. All stratified stone possessing bedding planes shall be laid with its natural bed as nearly as possible at right angles to the direction of load. In the case of arch rings, the natural bed shall be radial. Face work groins shall be built to a height not exceeding one meter in advance of the main body of the work and adjacent walling stepped down on either side. Masonry face work between the groins shall then be built to a height not exceeding 500 mm above the backing which shall then be brought up level with the completed face work. At no time shall the backing be built up higher than the face work. for dry rubble walling, all joints (gaps) shall be sufficiently thick to prevent stone to stone contact and the gaps shall be completely filled with mortar. Stones shall be clean and sufficiently wetted before laying to prevent absorption of water from mortar. Placing loose mortar on the course and pouring water upon it to fill the gaps in stones shall not be allowed. Mortar shall be fluid, mixed thoroughly and then poured in the joints. No dry or hollow space shall be left anywhere in the masonry and each stone shall have all its faces completely covered with mortar of the thickness as specified for joints. The bed which is to receive the stone shall be cleaned, wetted and covered with a layer of fresh mortar. All stones shall be laid full in mortar both in bed and vertical joints and settled carefully in place with a wooden mallet immediately after placement and solidly embedded in mortar before it has set.

Clean and wet chips and spalls shall be wedged into the mortar joints and bed whenever necessary to avoid thick joints or bed of mortar. When the foundation masonry is laid directly on rock, the bedding face of the stones of the first course shall be dressed to fit into rock snugly when pressed down in the mortar bedding over the rock. For masonry works over rock, a levelling course of M15/40 or M15/20 concrete 100mm thickness shall be laid over rock and then stone masonry work shall be laid without foundation concrete block. In case, any stone already set in mortar is disturbed or the joints broken, it shall be taken out without disturbing the adjoining stones and joints. Dry mortar and stones thoroughly cleaned from the joints and the stones shall be reset in fresh mortar. Sliding one stone on top of another which is freshly laid, shall not be allowed. Shaping and dressing of stone shall be done before it is laid in the work. Dressing and hammering of the laid stones which will loosen the masonry, shall not be allowed. Building up face wall tied with occasional through stones and filling up the middle with stones spalls and chips or dry packing shall not be allowed. Vertical joints shall be staggered. Distance between the nearer vertical joints of upper layer and lower layer in coursed rubble masonry shall not be less than half the height of the course. Masonry in a structure between two expansion joints shall be carried up nearly at one uniform level throughout but when breaks are unavoidable the masonry shall be raked in sufficiently long steps to facilitate jointing of old and new work. The stepping of raking shall not be more than 45 degrees with the horizontal. Masonry shall not be laid when the air temperature in the shade is less than 3°C. Newly laid masonry shall be protected from the harmful effects of weather.

(2) Concreting Capping

Where masonry structures are to receive a concrete capping. The joints to the upper surface of the masonry shall be raked out to a depth of 10 mm prior to placing of the concrete to the capping. The concrete for capping shall be as per the Drawing or as directed by Engineer and shall conform to Section 2000.

(3) Pointing

Where external faces of the mortared masonry work will be backfilled or otherwise permanently covered up, the mortared joint shall be finished flush to the faces of the adjacent stonework. Where mortared masonry faces will remain exposed, the mortar joints shall be pointed to a consistent style as shown on the Drawing. Pointing shall be carried out using mortar 1:3 by volume of cement and sand or as shown on the Drawing. The mortar shall be filled and pressed into the raked-out joints before giving the required finish. The pointing, if not otherwise mentioned shall be ruled type for which it shall, while masonry work is still green, be ruled along the centre with half round tools of such width as may be specified by the engineer. The excess mortar shall then, be taken off from the edges of the lines and shall not be unnecessarily plastered over the exposed stone works. The thickness of the joints shall not be less than 3mm for Ashlar masonry. However, the maximum thickness of joints in different works shall be as follows:

Random Rubble: 20 mm

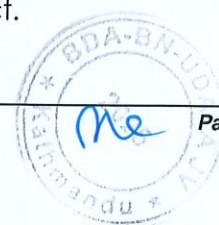
Coursed Rubble: 15 mm

Ashlar masonry: 5 mm

ASHLAR

All stones shall be dressed to accurate planes on the beds and joints and they shall be fair and neatly or fine tooled on the face unless otherwise described in the contract.

BLOCK-IN-COURSE



Beds and joints shall be squared and dressed for a distance of at least 220 mm from the exposed face. Bond stones shall form at least one sixth of the area of the exposed face and shall extend at least 900 mm into the wall or for the full thickness of the wall if the latter is less than 900 mm. Unless described in the contract as tooled or drafted, the exposed face of all stones shall be blocked and left rough. Arises shall be dressed square at all beds and joints.

SQUARE RUBBLE-COURSED OR BROKEN COURSE

All stones shall be truly squared and dressed for a distance at least 120 mm from the face of the wall. Bond stones shall be provided at the rate of at least one to every 0.8 m² of exposed face and shall measure not less than 150 mm x 150 mm on the face and not less than 450 mm in length or the full thickness of the wall, whichever is the less. Vertical joints in any layer shall be broken in the next layer and the horizontal lapping of the stones shall not be less than 100 mm.

RANDOM RUBBLE-COURSED OR UNCOURSED

All stones shall be carefully set with a bond stone provided at the rate of at least one to every 0.9 m² of exposed face. Bond stones shall measure not less than 150 mm x 150 mm on the exposed face and not less than 450 mm in length or the full thickness of the wall, whichever is the less.

DRY RANDOM RUBBLE

Dry random rubble masonry shall be constructed generally to the requirements of coursed random rubble masonry as specified in Clause 2607 but with the omission of mortar. All stones shall be carefully shaped to obtain as close as fit as possible at all beds and joints, any interstices between the stones being filled with selected stone spalls. The stones in courses shall be laid perpendicular to the batter face. The exposed tops or capings of dry rubble structures shall be formed as shown on the Drawing.

COMPOSITE RANDOM RUBBLE

Materials for composite random rubble shall comply with Clause 2602 and construction with Clause 2603. Mortar masonry shall be coursed and comply with Clause 2607 and the dry-stone insets with Clause 2608. The dry-stone insets shall be constructed when the level of the surrounding mortared masonry surround has reached the top of the dry stone inset.

3.23.4 Test and Standard of Acceptance

Before laying any mortar, the Contractor shall make three sets of mortar test cubes from each source of sand to demonstrate the compliance of the mix to the specified strength. Each set shall comprise two cubes, one to be tested at 7 days and the other to be tested at 28 days. During construction, the Contractor shall make and test mortar cubes at the rate of three cubes for every 10m³ of masonry to assess the strength subject to a minimum of 3 cubes samples for a day's work. Testing of cubes shall be in accordance with IS: 2250. The stones shall be tested for the water absorption as per IS: 1124 and it shall not be more than 5 percent. The stones shall also be tested for Specification gravity and it shall not be less than 2.65. Sand shall be tested as per Clause 613 or as directed by the Engineer. At least 3 set of

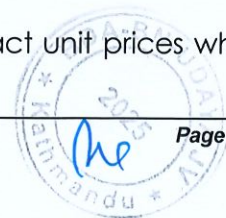
tests for stone and sand shall be conducted for every source.

3.23.5 Measurement

Stone masonry shall be measured in cubic metres. The pointing shall be measured in sq. m.

3.23.6 Payment

The stone masonry and the pointing shall be paid at the respective contract unit prices which shall be the full and the final compensation to the contractor.



3.24 GABION WORK

3.24.1 General

Providing, assembling and laying mechanically woven heavily zinc coated, double twisted 100 mm X 120 mm hexagonal mesh type gabion structure (mesh wire 3 mm, selvage wire 3.9 mm, lacing wire 2.4 mm) for retaining earth including stretching; forming compartments; tying the sides and diaphragms with binding wire in each mesh; tying with bracing wires and tie wires; filling stone/boulder in gabion boxes/mattress including dressing, bedding, bonding and tying down the lid all complete as per specifications. All wire used in the fabrication of gabions and wiring operations during construction shall comply with the requirements of NS: 163 – 2045. The wires shall be galvanized with heavy coating of zinc. The coating of zinc shall comply with NS: 163 (Heavy Coated Wire).

3.24.2 Measurement and Payment

Unless stated otherwise, no separate measurement and payment be made for sampling and testing of materials, trials and construction control/process control testing. The gabion work shall be paid at the respective contract unit prices which shall be the full and the final compensation to the contractor.

3.25 FILTER MATERIAL

3.25.1 Materials

Filter materials shall be either gravel with geo-textile/geo-membrane or appropriately graded sand/gravel material as shown on the Drawing or directed by the Engineer. Where geo textile/geo-membrane is provided or shown on the Drawing, the filter material shall consist of gravel.

3.25.2 Construction

The Surfaces receiving geo-textile/geo-membrane shall be free of loose or extraneous materials and sharp objects. Geo-textile/Geo-membrane shall be placed in accordance with the producer's instructions or as instructed by the Engineer. The minimum overlapping shall be 450 mm. If jointed in longitudinal direction by sewing or gluing, the joint shall have the same strength as the fabric itself. The filter material shall be compacted layer by layer to a minimum density of 93% of the MDD (Heavy Compaction).

3.25.3 Test and Standard of Acceptance

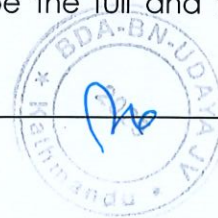
Copies of manufacturer's certificate for geo-textile/geo-membrane to be used shall be furnished by the Contractor. In addition, the Engineer may ask for testing in independent laboratories. All test results shall meet the specified requirements. Minimum one set of tests for gradation and compaction of filter material shall be executed for every 50 cu.m. and every change in source of material. The results shall meet the specified requirements

3.25.4 Measurement

Unless otherwise stated, Geo-textile/ Drainage composite/Geo-membrane shall be measured in square meter. Overlapping shall not be measured for payment. Filter material shall be measured in cubic meter.

3.25.5 Payment

Geo-textile/Geo-membrane/ drainage composite and filter material measured as provided above shall be paid the respective contract unit rates which shall be the full and the final payment to the contractor.



3.26 METAL (MILD STEEL-MS) GRATING

Providing, fabrication and fixing of MS iron works for grating with one coat of red oxide paint all complete

3.26.1 Measurement

It shall be measured in Kg. Rate shall be inclusive of all materials and labour complete.

3.27 ROLLING SHUTTER

Supplying and fixing 16/18-gauge M.S. rolling shutter including red oxide paint all complete as per instruction as per site engineer. These shall consist of MS laths 1.25mm thick and 80mm wide laths or as specified. The laths shall be machine rolled and straightened with an effective bridge depth of 16mm and shall be interlocked together throughout their entire length and jointed together at the end with end locks. These shall be mounted on specially designed pipe shaft. Each lath section shall be continuous single strip piece without any joint.

The springs shall be coiled type. The spring shall be manufactured from high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong mild steel brackets.

3.27.1 Guide Channel

The guide channels shall be of mild steel deep channel section and of rolled, pressed or built up (fabricated) construction. The thickness of the sheet used shall not be less than 3.15mm.

The minimum depths for guide channels shall be as follows: Clear width of shutter

Depth of Guide Channel. Up to 3.5m 60mm

3.5m and above 75mm

The gap between the two legs of the guide channel shall be sufficient to allow the free movement of the curtain and at the same time - close enough to prevent the rattling of the curtain due to wind.

Each guide channel shall be provided with a minimum of three fixing elates or supports for attachment to the walls or column by means of bolts or screws. The spacing of cleats shall not exceed 0.75m. Alternatively, the guide channels may also be provided with suitable dowels, hooks or pins for embedding in the walls.

The guide channels shall be attached to the jambs, plumb and true, either in the overlapping fashion, projecting fashion or embedded in grooves, depending on the method of fixing.

The cover of shaft, spring etc. shall be of the same material as that of lath.

3.27.2 Fixing

Brackets shall be fixed on the lintel or under the lintel as specified with rawl plugs, and screws bolts etc. the shaft along with the spring shall then be fixed on the brackets. The lath portion (shutter) shall be laid on ground and the side guide channels shall be bound with it with ropes etc. the shutter shall then be placed in position and top fixed with pipe shaft with bolts and nuts. The sides guide channels and the cover and frame shall then be fixed to the walls through the plate welded to the guides. These plates and bracket shall be fixed by means of steel screws bolts, and rawl plugs drilled in the wall. The plates and screws bolts shall be concealed in plaster to make their location invisible. Fixing shall be done accurately in a workman like manner that the operation of the shutter is easy and smooth.



3.27.3 Painting

All surfaces are to be painted with primer coat and minimum two coats of enamel paints as per specification, after drying and thoroughly cleaned to remove all loose scale and loose rust. Surfaces not in contact but inaccessible after shop assembling, shall receive the full- specified protective treatment before assembling.

3.27.4 Measurement

It shall be measured in Sq.m. Rate shall be inclusive of all materials and labour complete.

3.28 BOUNDARY WALL USING MS GRILLS/ SQUARE HOLLOW PIPES

Supplying, fabrication and fixing in Boundary Wall with 20x20mmx2mm thick Square MS hollow pipe and 100x100x5mm MS square vertical post including the cost of materials, labour, fixing, fitting and primer works all complete as per Drawing, Technical Specification and instruction of Engineer.

3.28.1 Materials

The Mild Steel pipe of 20x20mm square and 2mm wall thickness shall be cut to shape, and size, properly welded to fill the gaps in every joint. The Pipe shall confirm the IS 4923:1997 Specification for structural Steels

3.28.2 Installation

The end of Hollow square pipe along the face of concrete Member shall be embedded for minimum of 6" inside the concrete or properly welded in structural steels or frames for firm finishing. Not any slots or holes in welded joints are permitted while preparing the grill of square pipe. Spacing, Size and Shape of the finished grill shall be as per the drawing or as instruction of Engineer. The top end of Vertical pipe shall be finished with minimum 50mm high pyramid of 20x20mm base. 100x100x5mm MS hollow pipe shall be erected at every 2 m interval between Concrete Pillars for framing the Grill from either Side. The Post shall be properly erected over the concrete block of 1:1.5:3 Cement concrete foundation. The cost of Concrete foundation shall be paid as separate item.

3.28.3 Measurement

The measurement shall be done in square meter (m²) of finished grill by multiplying the clear spacing between two concrete pillars with total height of grill from base of vertical 20x20x2mm square pipe with tip of square pyramid (20x20mm base). The rate shall include the vertical post from foundation to top, horizontal pipes, vertical pipes, semicircular design pipes, welding, joining, fixing, finishing and one coat of primer all complete.

3.29 BOUNDARY WALL USING MS ANGLE, POST, GI MESH AND FENCE WIRE

Supplying & fitting 50mm dia. Black iron pipe post c/c 2.0m, 20*20*4mm & 25*25*4mm size mid angle frame for 10 S.W.G.I chain link 2"*2" mesh size & 3*20 angle fabrication 0.15m fitting all complete.

3.29.1 Materials

The angle of 20x20mm 25x25mm and 4mm wall thickness shall be cut to shape, and size, properly welded to fill the gaps in every joint. The Pipe shall confirm the IS 4923:1997 Specification for structural Steels

3.29.2 Installation

The 50mm dia. 4mm thick MS Post shall be erected at every 2m spacing c/c. embedded in the concrete Block (1:1.5:3) from beneath the foundation. The top 70cm length of Post shall be bend

45 degrees for fencing works. Fencing shall be properly hooked in the post. The MS angles of specified size in BoQ shall be used as a frame for GI chain link mesh. Horizontal top of the Angle frame shall be welded with the 150mm height 3*20mm MS Strip with hook type design at top. The spacing of the strip shall not be more than 120mm c/c. 10 S.W.G.G.I chain link 2"*2" mesh size fence shall be fixed in the angled portion of post. The angle frame shall be properly welded in the Metal post or fixed with bolt in post as per instruction of Engineer. The MS frame and post shall be painted with aluminium paint all complete after installation.

3.29.3 Measurement

The measurement shall be done in square meter (m²) of finished grill by multiplying the C/C spacing between two Posts with total height of grill from Lower angle to upper angle. i.e. height of the vertical strips shall be excluded in measurement. The total length of Metal post from the foundation to the top end including the bend portion has been included in this item and no extra payment shall be done for this.

3.29.4 Payment

Payment of finished works shall be done in square meter of the above measured quantity. The Cost of Supplying, fabrication, fixing, painting all complete has been included.

3.30 MS GRILL WORKS

3.30.1 Scope of Works

This work shall consist of the supply, fabrication, fitting, and fixing of Mild Steel (MS) circular or square pipes (medium size/weight category) and MS grills, complete with necessary base plates. The scope includes cutting, welding, surface preparation, and the application of primer paint, executed strictly in accordance with the Drawings and the instructions of the Site Engineer.

3.30.2 Material Requirements

MS Pipes (Circular/Square): All MS circular and square hollow sections shall be of "Medium" class designation, conforming to IS: 1161 (for circular tubes) or IS: 4923 (for square/rectangular hollow sections), or equivalent approved standards. They must be free from rust, cracks, and surface flaws.

MS Grills and Base Plates: Mild steel flats, bars, angles, and plates used for grills and base plates shall conform to IS: 2062 (Standard Quality). The thickness and dimensions shall strictly follow the approved Drawings.

Welding Consumables: Electrodes used for welding shall conform to relevant IS or equivalent standards and shall be suitable for the grade of steel being welded.

Primer Paint: Primer shall be a premium quality anti-corrosive red oxide zinc chromate primer or as specified by the Site Engineer.

3.30.3 Fabrication and Erection

Fabrication: All cutting, bending, and welding shall be done meticulously to the exact dimensions and shapes shown in the Drawings. Joints shall be fully welded, providing structural rigidity.

Finishing: All welded joints must be properly ground using a mechanical grinder to achieve a smooth, flush finish without sharp edges or burrs.

Installation: Base plates shall be securely fixed to the concrete/masonry using approved anchor fasteners or embedded directly during concreting, as dictated by the Drawings. The pipes and grills shall be installed true to line, level, and plumb.



Surface Preparation and Painting: Before applying the primer, all steel surfaces must be thoroughly cleaned to remove rust, mill scale, dirt, oil, and welding slag using wire brushes or sandblasting as required. Immediately after cleaning, the surfaces shall receive at least one uniform coat of the approved anti-corrosive primer paint.

3.30.4 Measurement

The work shall be measured in Kilograms (kg) or Metric Tonnes (MT) of the total weight of the MS pipes, MS grills, and base plates successfully installed and accepted by the Engineer. The weight shall be calculated based on the standard theoretical weight of the sections used, excluding the weight of weld metal and primer paint.

3.30.5 Payment

This rate shall be the full and final compensation for the supply of all materials (MS pipes, grills, base plates, electrodes, primer), labor, tools, equipment, fabrication, hauling, erection, surface preparation, painting, and all other incidental operations necessary to successfully complete the work to the satisfaction of the Site Engineer.

3.31 STAINLESS STEEL WORKS

This work shall cover the supply, fabrication, and installation of Grade 304 Stainless Steel (SS 304) works. This comprises SS pipe columns, vertical posts, handrails, SS base plates, connectors, and brackets, executed in strict accordance with approved drawings, specifications, and the direction of the Engineer.

3.31.1 Materials

Stainless Steel: All pipes, columns, vertical posts, handrails, base plates, connectors, and brackets shall be exclusively manufactured from Grade 304 Stainless Steel.

Fixing Accessories: All anchor bolts and fasteners shall be of compatible stainless steel grade to prevent galvanic corrosion.

3.31.2 Fabrication and Construction Procedure

Fabrication: Components shall be precision-cut, aligned, and assembled as per the approved shop drawings.

Welding: Continuous and structurally sound welding shall be applied at all designated joints using SS 304 compatible consumables.

Grinding and Polishing: All welds shall be ground flush and smooth. The entire assembly shall undergo extensive mirror or satin polishing as specified in the drawings, ensuring a uniform, unblemished surface finish free of weld discoloration or mechanical marks.

Installation: The prefabricated components shall be securely erected in position using the specified anchor bolts and base plates, ensuring perfect plumb, line, and level.

3.31.3 Measurement

The work as fixed in place shall be measured in running meters (linear meters).

Measurement shall be taken along the centerline of the top handrail. Weight of cleats, brackets, packing pieces, bolts, nuts, washers, and base plates shall not be measured separately.

The work shall be measured in the unit specified in the BOQ (e.g., metric tons, kilograms, or square/linear meters depending on the specific application).

3.31.4 Payment

The contract unit rate shall be the full and final compensation for the supply of SS 304 materials, fabrication, welding, grinding, mirror/satin polishing, fixing accessories, labor, equipment, and workmanship complete.

3.32 STRUCTURAL STEEL WORK FABRICATION AND ERECTION

3.32.1 Scope of Works

This work shall consist of providing, fabricating, assembling, and erecting structural steel components and elements, including all necessary nuts, bolts, and gusset plates. The scope encompasses the preparation of detailed shop drawings, conducting trial assemblies, providing full facilities for inspection and testing, and executing the work strictly in accordance with the Drawings.

3.32.2 Materials

Structural Steel: All structural steel components (including gusset plates) shall comply with the relevant IS Codes (e.g., IS: 2062 for weldable structural steel, IS: 808 for rolled sections) or as explicitly specified in the Drawings.

Fasteners: All nuts, bolts, and washers shall conform to the required structural grades and standards as specified.

Acceptance: Manufacturer's test certificates shall be submitted for all steel and fasteners to confirm compliance with the specified grades before fabrication commences.

3.32.3 Shop Drawings

Before the commencement of any fabrication, the Contractor shall prepare and submit detailed shop drawings for the Engineer's approval. These drawings shall include all exact dimensions, material specifications, weld details, bolt hole layouts, and assembly configurations.

3.32.4 Fabrication and Trial Assembly

Fabrication: Fabrication shall be carried out strictly in accordance with the approved shop drawings. All cutting, drilling, and welding must be executed with precision to avoid distortion or stress concentration.

Trial Assembly: To ensure proper fit-up and alignment, a trial assembly of the structural components shall be conducted at the fabrication shop prior to dispatching the materials to the site. Any required adjustments shall be made during this stage.

3.32.5 Erection

The erection of structural steelwork shall be systematically carried out using appropriate lifting equipment to ensure safety and prevent damage to the components. The components shall be accurately aligned, leveled, and plumbed before final tightening of bolts or site welding. Temporary bracing shall be provided as necessary to secure the structure during the erection process.

3.32.6 Inspection and Testing

The Contractor shall provide all necessary facilities, equipment, and safe access for the Engineer to inspect the materials, fabrication processes, and erection. This includes facilities for testing welds (e.g., Non-Destructive Testing) and checking the tightness of bolted connections.

3.32.7 Measurement

Structural steel work shall be measured in Kilograms (kg) based on the calculated net weight of the steel structure successfully fabricated, erected, and accepted by the Engineer. Unless

otherwise specified, the weight of gusset plates, nuts, and bolts shall be included in the total weight calculation of the structural components.

3.32.8 Payment

The structural steelwork, measured as provided above, shall be paid at the contract unit rate for the respective item. This rate shall be the full and final compensation for the supply of all materials, preparation of shop drawings, fabrication, trial assembly, site erection, provision of inspection/testing facilities, and all labor, tools, equipment, and incidentals required to complete the work.

3.33 PIPE DRAINS, PIPE CULVERTS

3.33.1 Scope

This work shall consist of providing and laying Reinforced Cement Concrete (RCC) NP3 pipes for culverts, including flush jointing with 1:2 cement mortar. The work shall be executed true to the lines, levels, and dimensions shown on the Drawings and in accordance with Section 700 of the Technical Specifications of DoR.

3.33.2 Material Requirements

RCC Pipes: The 1200 mm internal diameter RCC pipes shall be of Class NP3 (medium duty, non-pressure) and shall strictly comply with the requirements of NS: 80 / IS: 458.

Cement Mortar: Cement mortar for jointing shall consist of one part by weight of Portland cement to two parts by weight of sand (1:2). The materials shall be accurately gauged, and any mortar that has begun to set or exceeds the initial setting time shall be rejected.

3.33.3 Laying and Jointing (Flush Joint)

Handling and Laying: Pipes shall be handled, lowered, and laid closely together against each other to obtain tight joints without suffering any damage. Each pipe must be in contact with the bed throughout the length of the barrel.

Flush Jointing: The ends of the pipes shall be spaced to form a self-centering joint with a joining space of 13 mm wide.

Mortar Application: The jointing space shall be filled with 1:2 cement sand mortar, ensuring all voids are completely filled. Any excess cement mortar must be neatly cleaned off while the joint is being made, ensuring the interior surface is smooth and consistent with the pipe's interior.

Curing: After finishing, the joints shall be kept covered and damp for at least four days. The trench must be kept free from water until the joints are thoroughly set.

3.33.4 Bedding and Backfilling

Bedding: The pipes shall be laid on a granular or concrete bedding as shown on the Drawing.

Backfilling: Backfilling shall be carried out simultaneously and equally on both sides of the culvert using suitable excavated or borrow material to avoid unequal lateral forces. Material shall be placed in layers not exceeding 150 mm of loose thickness and compacted to a minimum dry density of 93% of MDD (Heavy Compaction).

3.33.5 Measurement

The RCC pipes shall be measured along their center between the inlet and outlet ends in linear meters (lin.m.) of the completed and accepted pipeline in place

3.33.6 Payment

The pipes, measured as provided above, shall be paid for at the contract unit rate per linear meter. This rate shall be the full and final compensation to the Contractor for supplying the pipes,

handling, laying, and cement jointing. Ancillary works such as excavation, backfilling, and bedding (granular or concrete) shall be measured and paid for separately under their respective Specification Clauses.

D. ELECTRICAL WORKS

4 ELECTRICAL WORKS

4.1 GENERAL SPECIFICATIONS

All electrical installations must comply with the Nepalese Electricity Act, relevant Nepalese Electricity Regulations, and Nepalese Standards (NS).

Corresponding Indian Standards (IS) or British Standards (BS) shall be utilized for specific works where NS is unavailable.

Contractors are required to prepare and submit detailed Single Line Diagrams (SLD) and schematic drawings of the distribution system for approval prior to construction.

All materials and equipment must be new and bear the IS/NBC Standard mark.

The contractor must supply "as-built" electrical drawings and wiring diagrams indicating circuit numbers and controls upon completion of the works.

4.2 WIRING AND CONDUITS

Internal wiring shall utilize PVC insulated multi-stranded copper conductors of 650/1000V grade. Circuit wiring shall employ a looping-in system with no joints allowed along the length of the conductors.

Wiring for light circuits must be strictly separated from power, telephone, and data networking conduits.

Concealed wiring shall be housed in high-quality HDPE pipes embedded in RCC slabs or recessed in brick masonry using a chase cutting machine.

Phase wiring shall be color-coded Red, Yellow, or Blue, while neutral wires must be Black.

Earth continuity conductors must be Green or Yellow/Green.

Switch and outlet boxes shall be made of hot-dip galvanized mild steel with a minimum clear depth of 60 mm.

4.3 SWITCHGEAR AND DISTRIBUTION BOARDS

Moulded Case Circuit Breakers (MCCBs) must conform to IEC 60947-II or IS 13947-II and possess a short-circuit breaking capacity of not less than 25kA rms at 415V AC.

Miniature Circuit Breakers (MCBs) must have a minimum 10kA breaking capacity (Icn) as per IEC 60898.

MCBs for lighting circuits shall be "B" series, whereas circuits feeding power outlets or machinery shall use "C" series breakers.

Distribution Boards (DBs) must be constructed of powder-coated sheet steel and feature double doors with extended loose wire boxes.

Indoor DBs shall conform to IP-42 protection, while outdoor/wet location DBs must conform to IP-65.

Main Distribution Boards (MDBs) must be floor-mounted, extensible, and provide a minimum dust and damp protection rating of IP-54.

Distribution Board Configurations

DB Type	Configuration	Incomer Details
10 Way SPN	Double Door Glazed	1 No. 40 A DP, 2 No. 16 A DP
16 Way SPN	Double Door Glazed	1 No. 40 A DP, 10 No. 6 A MCB
8 Way TPN	Double Door Glazed	1 No. 32 A 4P, 10 No. 6 A MCB



DB Type	Configuration	Incomer Details
12 Way TPN	Double Door Glazed	1 No. 40 A 4P, 30 No. 6, 10, 16 Amp SP
Feeder Pillar Panel	63 A (FPP)	Suitable for 415 V, 3-phase, 4-wire, IP55 enclosure

4.4 OUTDOOR AND LANDSCAPE LIGHTING

- a) *7-metre Street Light Poles*: Single-arm and double-arm decorative spun tapered aluminum poles (Alloy 6063-T6) capable of withstanding 160 km/h winds, fitted with 90 W LED street light luminaires (IP66, IK08).
- b) *12-metre High Mast System*: Octagonal/tapered polygonal steel mast (IS 2062 Grade E250/E350) equipped with four 150 W LED flood lights (IP66, IK10).
- c) *3-metre Heritage Post-Top Poles*: Mild steel pipe poles with cast iron/aluminum bases, featuring single-lantern and 3-lantern designs, equipped with 30 W LED luminaires.
- d) *15 W LED Bollard Lights*: Extruded aluminum body (0.9-1.0m height) with a UV-stabilized polycarbonate diffuser. A specialized variant includes a decorative 15 W LED bollard light with an integrated 20 W RMS waterproof outdoor speaker.
- e) *Accent and Feature Lighting*: Includes IP66 LED Flexible Neon Lights, 18 W LED Brick-Size Foot Lights, decorative LED bauble lights for trees, 12 W and 15 W LED Outdoor Spotlights, and 20 W LED Profile Lights.
- f) *100 W LED Flood Lights*: Designed for outdoor sports courts and landscapes, featuring die-cast aluminum housings and a minimum luminous efficacy of 130 lm/W.

4.5 INDOOR LIGHTING AND ACCESSORIES

- a) *Recessed/Surface Mounted LED Luminaires*: Specified in 12 W, 15 W, and 18 W variants with die-cast aluminum housings, flicker-free drivers, and minimum luminous efficacy of 100 lm/W.
- b) *Spotlights and Strip Lights*: 5 W COB LED Spotlights for indoor accent lighting and 10 W/m IP65 LED Strip Lights.
- c) *Utilitarian Lighting*: 18/20 W (4 ft) IP65 LED non-corrosive polycarbonate tubular lights, 9/12 W LED Mirror Lights, 10 W LED Bulkhead Lights, and 15 W LED Up-Down Lights.
- d) *Fans*: 1200 mm sweep ceiling fans (230 V AC) with double ball bearings and aerodynamic blades, alongside 250/300 mm exhaust fans.
- e) *Switches and Sockets*: Modular plate-type rocker mechanism switches with silver contacts, including 6A for lighting and 16A for power outlets.

4.6 CABLING, NETWORK AND INFRASTRUCTURE

- a) Power cables for street lighting shall be 2 core, 4 sq.mm copper unarmored cables.
- b) Underground cabling must utilize Heavy Duty HDPE pipes, specifically in 110 mm, 75 mm, and 32 mm outer diameters (PN 10).
- c) Data networking requires Cat 6 RJ45 modular sockets and unshielded twisted pair (UTP) Cat 6 cables.
- d) Telephone systems require RJ11 modular telephone sockets wired with 2-pair copper cables.

- e) An outdoor IP PTZ Camera system (4 MP resolution, 250m IR distance, IP66) shall be mounted on a 12 m hot-dip galvanized octagonal steel pole and connected via a 24 Core Single Mode Armoured Optical Fiber Cable.

Power Cable Specifications

Cross-Section	Cores	Conductor Material	Insulation/Armouring
4 mm ²	3 Core	Copper	XLPE Armoured
6 mm ²	3 Core & 4 Core	Copper	XLPE Armoured
10 mm ²	4 Core	Copper	XLPE Armoured
25 mm ²	4 Core	Copper	XLPE Armoured
50 mm ²	3.5 Core	Aluminium	XLPE Armoured
95 mm ²	3.5 Core	Aluminium	XLPE Armoured
150 mm ²	3.5 Core	Aluminium	XLPE Armoured

4.7 EARTHING AND LIGHTNING PROTECTION

- Air terminal rods for lightning protection must be made of pure copper, with a minimum diameter of 12 mm and a length of 1.2 m.
- Down conductors shall consist of soft annealed 25x3 mm pure copper insulated strips, copper tape, or 50 mm² Yellow/Green cables.
- The maintenance-free chemical earthing system must utilize 99.9% molecularly bonded copper on low carbon steel rods with a minimum 100-micron copper coating.
- Electrolytic ground rods must be installed vertically with a minimum length of 2 m and a diameter of 102 mm.
- Earth resistance must be tested using an earth resistance tester and shall not exceed 5 ohms.
- Additional earthing components include 25x3 mm copper strips, 8 SWG copper wire, and 20 mm dia FRLS UPVC conduit.

4.8 SUBSTATION EQUIPMENT

- 11 kV/433 V, 300 kVA Outdoor Unitized Compact Substation (CSS): This package substation is fully factory-assembled and type-tested.
- It comprises an 11 kV Ring Main Unit (RMU) with Load Break Switches and earth switches.
- The transformer is a 300 kVA, 11/0.433 kV, ONAN cooled, copper wound, Dyn11 unit with off-circuit tap changers.
- The system includes an LT distribution panel, interconnecting busbars, metering, protection, and earthing.
- The enclosure must be dust-proof, vermin-proof, and tamper-resistant, suitable for outdoor installation.

4.9 SHOP DRAWINGS

Before initiation of electrical installation contractor shall submit detailed SLD and Schematic diagrams of electrical installations. After completion of electrical installation & commissioning contractor shall submit the Final executed SLD and Schematic Drawings of electrical installations (As Build drawings). Work Completion certificate shall be issued only after submission of above and to the full satisfaction. The electrical work not covered in BoQ or elsewhere but required for the completion of building shall be deemed to be covered in the scope of contractor at his own cost.

Works indicated shall include all civil and electrical works required to achieve a satisfactory electrical installation, whether or not such are specifically outlined in these specifications. The entire installation shall be suitable for a three phase, four wire, 400/230 VAC, 50 Hz system.

Prior to commencing the electrical works, the contractor shall provide the detail design of electrical installation for building to the Project Manager a set of drawings to appropriate scale showing detailed conduit layout and wiring drawings showing all details such as the route and size of the conduit, number and size of cables in the conduit, location of outlet boxes, openings or duct outlets in civil works if required, routing and dimensions of cable trenches etc. Materials used, standards specified for fabrication or procurement of items such as the main switchboard, distribution panels and other items for which custom design is necessary shall be shown.

This drawing shall be prepared in complete co-ordination with and understanding of the civil and architectural works, which will actually be undertaken. The drawing shall be immediately modified and approved if any changes in design are undertaken, and a record of such amendments shall be kept. A set of the up-dated and approved drawings shall always be available at the site for inspection by the Engineer.

4.10 SAMPLES

Prior to commencing procurement, the Contractor shall submit for approval technical description, related catalog/brochures and a recommended brands of sample item each of all cable, conduit accessories, switchgears, switches, power outlets, lamps, led light, flood lights, fluorescent tubes, fixtures etc., which are to be procured and installed.

4.11 LOCATION OF FIXTURES

Location of conduit, fixtures, switches, outlets, distribution boards and other electrical equipment and appliances shall generally be in accordance with the updated construction drawings; and in accordance with the specifications and mounting heights and location details mentioned herein. Notwithstanding the guidelines given in the drawings and specifications, the location of all electrical items, equipment and appliances in the buildings shall be approved by the Project manager prior to commencement of electrical installation works.

ABBREVIATION

NEA -	Nepal Electricity Authority
LT -	Low Tension
HT -	High Tension
AC -	Alternating Current
MPB -	Main Panel Board
MDB -	Main Distribution Board
KV -	Kilo Volt
KA -	Kilo Ampere
PVC -	Poly Vinyl Chloride
SWG -	Standard Wire Gauge (British)
IS -	Indian Standard
TP -	Three Pole
DP -	Double Pole
SP -	Single Pole
TPN -	Three Pole Neutral
MCB -	Miniature Circuit Breaker
MCCB -	Moulded Case Circuit Breaker
CT -	Current Transformer
SLD-	Singe Line Diagram
SMC-	Sheet moulding compound

E. WATER SUPPLY, PLUMBING AND SANITARY WORKS

5 WATER SUPPLY, PLUMBING AND SANITARY WORKS

5.1 GENERAL

5.1.1 Scope

This scope of work shall cover materials and workmanship required for installation of water, supply, sanitary and drainage system. Work under this section shall consist of furnishing all labor materials necessary and required to completely install all sanitary fixtures, chromium plated fittings and accessories required by the drawings and specified hereinafter or given in the schedule of quantities.

Without restricting to the generality of the foregoing the sanitary fixtures shall include all sanitary fixtures, CP fittings and accessories necessary and required for the buildings. Whether specifically mentioned or not, all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required. All exposed pipes within toilets and near fixtures shall be chromium plated unless otherwise specified.

All hot water pipes shall be lagged & properly insulated from the hot water storage tanks to the hot water taps & outlets.

Work for the water supply and sanitary consists of furnishing all labor, materials, equipment and appliances necessary and required to completely install the water supply system as required by the drawings, specified hereinafter and given in the schedule of quantities.

Without restricting to the generality of the foregoing, the water supply system shall include the following:

- a) Connecting the mains supply to the designed tanks as per the drawings.
- b) Control valve, masonry chambers and other appurtenances.
- c) Connections to all plumbing fixtures, pantries and overhead tanks.
- d) Excavation and refilling of pipe trenches.
- e) Pipe protection and painting.

Drainage lines shall be laid to the required gradients and profiles as directed by the Consultant. All drainage connections work shall conform to the local municipal bye-laws. All slopes and run off shall conform to the best standard of the IS Hydraulic engineering practices. The minimum bed slope for drainage works should be 1.5% unless otherwise directed by the consultant.

The Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority as shall be required by local ordinances. Location of all manholes, catch basins, etc, shall be confirmed by the Consultant before the actual execution of the work at site. All works shall be executed as directed by the Consultant and subject to the final approval of the Consultant.

Without restricting to the generality of the foregoing, the drainage system shall include:

Sewer lines including excavations, pipelines, manholes, drop connections, underground storm waterdrains, including pipes, manholes, catch basins, open drains and culverts.

5.1.2 Standards

- a. In case where the specification given is found to be inadequate, latest IS or NS specification shall hold good. Whether reference has been made to IS or NS the same shall

refer to the latest specification mentioned in the section. If type is not specified elsewhere the type of material and fixture shall be as directed by consultant. If any ambiguity or missed items the same shall be decided by the client in consultation with the consultancy.

- b. All materials shall be best of their kind and shall conformed to the latest IS or NS standards.
- c. All samples shall be approved by consultant regarding its quality as specified, prior to the procurement by the contractor. Each sample shall be accompanied by the manufacturer's specification, brochures, test certificates and guarantee statements for approval.
- d. All sets of specimen sample of approved materials shall be kept at Site Office by the contractor.
- e. The workmanship shall be the best of its kind and shall conform to the specification of IS or NS standard in every respect or latest trade practice. All defective or unsuitable materials and/or workmanship shall be removed immediately from the site and shall be substituted with proper materials and/or workmanship by the contractor in his own cost.
- f. Available Codes

Unless specifically mentioned otherwise, all the applicable codes and the standards shall be as the standard published by the Bureau of Indian Standard (IS) or Nepal Bureau of Standard (NS) and its subsequent revision in respect of design workmanship, quality and properties of materials and method of testing.

Some of these available standards are listed below:

IS:778-1984	Specification for gunmetal gate, check valves
IS:1172-1971	Basic requirements of water supply, drainage and sanitation
IS:1239-1982	Specification for M.S. or G.I. pipes
IS:2065-1983	Code of practice of water supply in buildings
IS:4985-2000	Specification for uPVC soil, waste and ventilating pipe and accessories
IS:1729-1974	Specification for cast iron manhole covers and frames
IS:1742-1983	Code of practice for building drainage
IS:2064-1973	Code of practice for selection, installation and maintenance of sanitary appliances
SP 35(1987)	Handbook on Water Supply and Drainage
IS: 2064 (2002)	Selection, Installation and Maintenance of Sanitary Appliances
NBC 208: 2003	Nepal National Building Code, Sanitary and Plumbing Design Requirements
IS: 15778- 2007	Chlorinated polyvinyl chloride (CPVC) pipes

5.1.3 Materials and Methods

All materials provided for the Contract will be in strict accordance with the latest version of the applicable Indian Standards. All manufacturer's data, specifications and relative information together with samples will be submitted to the Engineer for approval prior to being purchased, otherwise at the Contractor's own risk.

Sanitary fixtures shall be of the best quality approved by the Consultant. Wherever particular makes are mentioned, the choice of selection shall remain with the Consultant. The water supply and sanitary works are to be laid to alignments and grades shown on the drawings but subject to such modifications shall be as instructed by the consultant from time to time to meet the requirements of the work. All water supply and sanitary pipes, fittings, fixtures and appurtenances which are to be embedded into concrete, masonry, earth or any construction works shall be embedding only after approval of consultant. All fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned in the schedule of quantities, specifications or drawings or not.

All fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per Consultant's/interior designer's requirements. Wherever necessary, the fittings shall be centered to dimensions and pattern desired. Fixing screws shall be half round head chromium plated brass screws with CP washers wherever required as per directions of consultant. All fittings and fixtures shall be fixed in a neat workmanlike manner true to level at heights shown on drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor.

All CI brackets, fittings clamps and shall be painted with one coat of approved primer and 2 coats of Black Japan paint. All painting works shall be carried out to full satisfaction of the consultant. If directed, additional coats of paints shall be applied to get uniform and matching finish without any extra cost. In case of non-availability of specified sized fixtures in specified units the nearest size in FPS or Metric units shall be provided with prior approval of the consultant for which neither extra will be paid nor shall any rebate be recovered.

Wherever the word 'approved' is used it shall mean approved by the consultant.

Prior to casting any RCC structure the contractor shall put necessary sleeves through beam, slab and other structure to make easy water, waste and soil lines passing through the particular structure. At the proper elevations to give the desired slopes needed to meet the recognized standards for drainage.

Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner. Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections. As far as possible all bends shall be formed by means of hydraulic pipe bending machine for pipes up to 65mm dia. in case of GI/MS pipes.

Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages, etc. Pipes shall be securely levelled to the required slopes &

fixed to walls and ceilings by suitable clamps at intervals specified. Valves and other appurtenances shall be located to provide easy accessibility for operation, maintenance and repairs.

The rates quoted shall be for complete items as fixed in position and cover all costs of materials, labor, tools, equipment, supervision, cutting of holes, chases etc., excavation and satisfactory

backfill in anytype of soil, and also for providing fixing arrangements such as clamps, brackets, blocks etc. The rate shall also include restoration to original condition. All debris from demolishing shall be removed without any extra charge. Work shall be planned in such a manner that demolition and chipping are held to the very minimum. This form of installation shall not be recognized as the "norm" and if the consultant determines that excessive retro-fitting is being done he may instruct the contractor to remove sections and accomplish the work and replace the removed work at his (contractor's) expense.

Tenders shall be based upon complete installations. Products required which are not shown or mentioned, or not specified herein as to manufacturer, quality, etc. shall be furnished of the highest quality (commercial standard).

Materials shall be new and free from all defects.

All materials, apparatus or equipment called for on the Plans or in the Specifications by trade names, or the name of a particular manufacturer, or by catalogue reference are the materials, apparatus, or equipment which should be allowed for in the Tender, or qualification submitted at the time of Tendersubmission.

The work shall be carried out in accordance with all rules, regulations, by-laws and requirements of all authorities having jurisdiction. All changes and alterations required by an authorized inspector of any authority having jurisdiction shall be carried out at no cost to the employer.

5.1.4 Drawings and Specifications

These Specifications shall be considered as an integral part of the Drawings which accompany them. Neither the Plans nor the Specifications shall be used alone. Any item or subject omitted from one, but which is mentioned or reasonably implied in the other shall be considered as properly and sufficiently specified and therefore must be supplied by the Contractor.

Misinterpretation of any requirements of either the Drawings or Specifications shall not relieve the Contractor of his responsibility for properly completing his work.

The Contractor shall apply to the Engineer for any explanation which he may require in regard to the meaning and intent of any clause in the Specification and Contract. He shall be held responsible for any errors or losses consequent upon failure to obtain such explanation.

The Contractor shall consult with the Engineer to obtain detail drawings or instructions for exact location of equipment as work progresses, before installing fitting or equipment and will be responsible for coordination with all other work trades including finishes.

Drawings show general location and routes to be followed by pipes, ducts, etc. where not shown, or shown diagrammatically, the Contractor shall install them in accordance with best trade practices.

5.1.5 As built Record

The Contractor shall request a complete set of drawings, (white) from the Engineer and use these for "As Built" records.

"As Built" records shall be retained in the site office and kept up to date daily in regard to changes in actual installation from the Plans and Specifications. Alterations to duct work, piping services, etc. shall be noted and the revised arrangement drawn in accurately, complete with dimensions from column lines. Every precaution shall be taken to protect the Drawings from damage and loss.

The "As Built" records shall be made available to the Engineer upon request and made available at each site meeting. After no further alteration can be expected and the Contract is nearing completion, the records shall be submitted for final approval.

The Contractor shall include on "As Built" records the dimensions location of all buried piping and valves, and during construction plainly mark location of exterior services and valves to prevent damage to these until the Project is completed.

The contractor shall submit as built drawings of all water supplies, rain, waste and soil lines and installations based upon actual construction to consultant after completion and before handover of the project at his own cost.

5.2 INTERNAL WATER SUPPLY

5.2.1.1 Scope

The work shall cover all materials required for such pipes and fittings, clamps, long screws etc. The work shall include water supply external and internal, including line marking, jointing the pipes, fixing in position, paintings, excavation, groove cutting and reinstating to its original finish complete with testing and ready for operation.

Work under this section consists of furnishing all labour, materials, equipment and appliances necessary and required to completely install the water supply system as required by the drawings, specified hereinafter and given in the schedule of quantities. Without restricting to the generality of the foregoing, the water supply system shall include the following:

- Connecting the mains supply to the designed tanks as per the drawings.
- Control valve, masonry chambers and other appurtenances.
- Connections to all plumbing fixtures, pantries and overhead tanks.
- Excavation and refilling of pipe trenches.
- Pipe protection and painting

5.2.1.2 General Requirements

All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Engineer. Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner. Short or long bends shall be used on all main pipelines as far as possible. If HDPE, Ppr, Pvc, Cpvc, multilayer pipes are used then methods approved by the manufacturer shall be used. Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages, etc. Pipes shall be securely levelled to the required slopes & fixed to walls and ceilings by suitable clamps at intervals specified. Valves and other appurtenances shall be located to provide easy accessibility for operation, maintenance and repairs.

5.2.1.3 CPVC pipe for hot and cold water

All CPVC Schedule 40 and schedule 80 pipe shall be manufactured from a Type IV, Grade I Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM F441, consistently meeting the Quality Assurance test requirements of this standard with regard to material, workmanship, burst pressure, flattening, and extrusion quality. The pipe shall be produced in Nepal or India using domestic materials, by an ISO 9001 certified manufacturer, and shall be stored indoors after production, at the manufacturing site, until shipped from factory. This pipe shall carry the Nepal Standard or Indian Standard seal.

Chlorinated Polyvinyl Chloride (CPVC) water supply Pipes should be of standard dimensional ratios SDR 11(class 1). All CPVC Pipes and Fittings should be made from identical CPVC compounds having the same physical properties. Pipes and fittings should be product of SDR11 meet the requirement of ASTM D 2846, specific to Copper Tube Size dimension.

Pipe	Temperature (°C)	Pressure Rating (kg/sq cm)
SDR 11	27	27.6
	82	6.8

The joints should be same of Astm F-493 Solvent Cement Application. Horizontal and vertical pipes should be supported by pipe clamps or by hangers not less than 75 cm and as per requirements. Threaded CPVC fittings with tapered pipe threads should be used with a suitable thread sealant to ensure leak proof joints. The diameter and thickness corresponding as tabulated below.

Nominal Size(mm)	OD (mm)	Wall thickness (mm)
15	15.9	1.73
20	22.2	2.00
25	28.6	2.60
32	34.9	3.20
40	43.3	3.80
50	54	4.90

The joint of pipes and fitting shall be either threaded joint or solvent cement joint as directed in above codes

Complete installation of CPVC pipes include supply of pipes and necessary fittings such as Tees, Bends, Reducers, Crosses, Unions, socket, elbow, crossover, transition piece, transition joint, end cap, clamp etc. with both male and female of respective fittings, chasing in wall or floor and repair to original finish, laying and jointing of pipes and fittings and pressure testing. All water supply CPVC pipes, fittings and valves shall be tested by hydrostatic pressure of at least 10 kg/cm². Pressure shall be maintained for a period of at least 24 hours without appreciable drop in the pressure.

In addition to the testing carried out during the construction, the Contractor shall test the entire installation after connections to the plumbing systems. The Contractor shall rectify all leakage, and shall replace all defective materials in the system.

After commissioning of the water supply system, the contractor shall test each valve by closing and opening it a number of times to observe if it is working efficiently. The valves, which do not operate effectively, shall be replaced by new ones at the Contractor's cost and tested as above. Upon completion of all the test and necessary replacements, all water pipings shall be disinfected as below:

After thoroughly flushing the system with clean water, the system shall be filled with a measured quantity of sodium hypo chloride solution to the water to give free residual chlorine of 5 mg/litre. After 1 hour of retention, the system shall be drained, re-flushed and returned to service.

5.2.1.3.1 Measurement

Measurement for the Contract Item CPVC pipes will be made per running meter of complete installation. The rate shall include for all labour and materials required. The measurement shall be done for running meters, fittings etc. not payable separately.

5.2.1.4 Clamps

CPVC pipes in shafts and other locations shall be supported by MS clamps of design approved by Engineer. Pipes at ceiling level shall be supported on structural clamps fabricated on MS structural brackets as described in relevant sections of this specification. Pipes in typical shafts shall be supported on slotted angles/channels as specified.

5.2.1.5 Unions

The Contractor shall provide adequate numbers of unions/flanges on all pipes to enable dismantling later. Unions shall be provided near each gunmetal valve, stop cocks or check valves and on straight runs as necessary at appropriate locations and required and/or directed by the Engineer.

5.2.1.6 Gate, Globe, and Check Valves

Stop Valves shall be gunmetal wedge gate valves, rising stem, hand-wheel operated with screwed female ends: conforming to IS 778-1984 Class 1 or equivalent. Valves 65mm dia. and below shall be heavy gunmetal full-way valves or globe valves conforming to IS 778-1971 class I. Valves shall be tested at the manufacturers with test results and their name stamped on it.

The Engineer shall approve all valves before they are allowed to be used in the works. For the cold and hot water distribution pipe lines unless otherwise specified by the engineer, the contractor shall use the valves and pipes of same brand, preferably from same manufacturer.

5.2.1.7 Air valves

Air valves shall be provided at all high points in the system. Each air valve shall be isolated by a c. I. double flanged sluice valve. Air valves shall be of approved make conforming to Indian standard. The valve shall conform IS 14845 (2000).

5.2.1.8 Scour valves

Scour valves shall be provided at all low points in the system. Each air valve shall be isolated by a c. I. double flanged sluice valves as specified and discharged into the nearest storm water drains.

5.2.1.9 Ball valves

Ball valves shall be of brass with float of copper sheet 0.58 mm. thick for float up to 115 mm size. The body of the valves shall withstand pressure of 14kg/sq m. and shall conform to I.S: 1708-1962.

5.2.1.10 Pressure Reducing Valves

The Water Pressure Reducing Valve shall be installed to reduce static and flowing pressures in water distribution systems. The unit shall be a diaphragm/balanced piston type with integral stainless-steel strainer and a built-in bypass to relieve pressure build-up downstream of the assembly. The valve shall be spring loaded to open and shall be diaphragm actuated to close under pressure conditions. The valve shall be suitable for supply pressure up to 400 psig and water temperatures from 33° to 180°F. The valve's internal parts such as the cartridge assembly, strainer, diaphragm, and spring shall be accessible for inspection, repair or replacement without

disconnecting the device from the pipeline. In addition, the valve shall have a clean-out feature to allow for removal of the strainer and seat disc without disturbing the pressure setting. It shall meet the requirements of the following standards:

- Materials: Invest Cast Stainless Steel Materials
- Pressure Setting and Flow Rate of Direct – Activated Pressure Reducing Valve
- Direct – Activated Pressure Reducing Valve Directly Opens and Close Valve gate by the outlet Pressure.
- When outlet pressure is under setting pressure, Valve gate automatically opens, to make valve gate fully open, Adjustable pressure range and setting pressure are relative points.

The PRV shall be of AIRA brand of high-pressure range that can allow minimum 40 kg/sqcm water head at inlet and outlet can be adjusted to 20 kg/sqcm water head or equivalent.

5.2.1.11 Brass Fittings

All brass stop cocks and bib cocks shall be heavy type bright finished with renewable leather washers conforming to I.S. 781-1967. The weight shall be as follows:

Diameter (mm)	Stop Cock (kg)	Bib Cock(kg)
15	0.40	0.40
20	0.75	0.75
25	1.30	1.25

5.2.1.12 PPR pipe for External cold water

PPR pipes, also known as polypropylene random copolymer pipes, are a type of plastic piping used for hot and cold-water supply as well as for heating systems. PPR pipes are made from a type of plastic called polypropylene, which is known for its durability and resistance to corrosion. The pipe shall be produced in Nepal or India using domestic materials, by an ISO 9001 certified manufacturer, and shall be stored indoors after production, at the manufacturing site, until shipped from factory. This pipe shall carry the Nepal Standard or Indian Standard seal.

5.3 EXTERNAL WATER SUPPLY

The supplying, laying and installing of pipe and fittings for external water supply system shall be followed as per norms, standards and specification of Department of Water supply and Sewerage Management (DWSSM)

5.4 STAINLESS STEEL TANK

Providing and fixing in position a vertical or horizontal cylindrical Stainless Steel (S.S.) water tank as per the standard engineering practices and Site Engineer's approval.

General Details:

Capacity: 1000 Liters

Orientation: Vertical or Horizontal cylindrical (as per site requirements and drawings).

Approved Make/Brand: Syntex, Nepatop, or equivalent approved by the Site Engineer.

Scope of Work:

Hoisting and Positioning: Safe lifting, hoisting, and placement of the tank at the designated location (roof, staging, or ground) as specified in the structural/architectural drawings.

Supports: Providing and fixing all required structural supports, structural frames, or masonry platforms to ensure the tank is stable, level, and securely positioned.

Plumbing Connections: Making all necessary inlet, outlet, overflow, washout/drain, and air vent connections using appropriate fittings, unions, and valves to make the system fully functional.

Execution and Quality Control:

Installation: The installation must strictly adhere to the manufacturer's guidelines, approved drawings, and specifications.

Testing & Commissioning: Upon completion of fixing and connections, the tank shall be filled with water and tested for any leaks in the body or at the connection joints. The system must be fully water-tight and handed over ready for operation.

Approval: All materials, positioning, and final execution are subject to the inspection and prior approval of the Site Engineer.

5.5 SOIL, WASTE, VENT, AND RAIN WATER PIPES

5.5.1 Scope

Work under this section shall consist of furnishing all labour, materials, equipment and applications, necessary and required to completely install all soil, waste, vent and rain waterpipes as required by the drawings, specified hereinafter and given in the Bill of Quantities. Without being restricted to the generality of the foregoing, the soil waste and vent pipes system shall include:

- Vertical and horizontal soil wastes and vents pipes, rain water pipes and fittings, joints, clamps and connections to fixtures.
- Connection of all pipes to sewer and storm water lines as shown on the drawings at ground floor levels.
- Floor and urinal traps, clean-out plugs and inlet fittings.
- Waste pipe connection from all fixtures e.g. Washbasins, sinks, urinals, kitchen, equipment and plant room equipment.

5.5.2 General Requirements

All materials shall be of the best quality conforming to the specifications and subject to the approval of the Engineer. Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner. Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages, etc. Fitting positions shall in all cases line up with & conform to access panels for ease of maintenance. Pipes shall be securely fixed to walls by suitable clamps at intervals specified. Access doors for fittings and clean-outs shall be so located that they are easily accessible for repair and maintenance. All work shall be executed as directed by the Engineer.

5.5.3 PVC Pipes and Fittings: Soil, Waste and Vent Pipes

Where specified, soil, waste, vent and rain water pipes shall be confirmed to IS 4985: 1981 of 4 kg/cm² and 6 kg/cm² as specified in BOQ. uPVC pipe should have length of 3m or 6m with molded. Fittings for uPVC pipes shall be of thickness not less than 3.2mm. Pipe color shall be as specified by the consultant.

Before use at site, all pipes shall be tested by filling up with water for at least 10 minutes. After filling, pipes shall be struck with a hammer and inspected for blowholes and cracks. All defective pipes shall be rejected and removed from the site.

Pipes shall be further tested after installation by filling up the stack with water as per manufacturer's specification. All opening and connections shall be suitably plugged. Any joint found leaking shall be re-laid and joined. All pipes shall be fixed in gradient towards the outfall drain. Pipes inside toilets shall be concealed or otherwise as per drawings and instruction. uPVC pipe lines through basement ceiling shall be clamped as per drawings and instruction.

Complete installation of uPVC pipes includes supply of pipes and necessary fittings such as Tees, Bends (with or without door), single and double Y (with or without door), Reducers, Crosses, Couplers, Solvent cement, NC putting, rubber, rings, clip etc. It also includes trench excavation in any type of soil and backfilling with proper compaction, chasing in wall or floor and repair to original finish, laying and jointing and pressure testing.

The buried pipe shall be bedded with a soil free from rock or sharp-edged objects (preferably sand) with a minimum of 75 mm at all sides.

Measurement:

Measurement for uPVC Pipes will be made per running meter of complete installation.

5.5.4 UPVC Pipes

All Soil, waste, vent and rain water pipes shall be unplasticized rigid Poly Vinyl Chloride (UPVC) pipes conforming to IS: 4989-1958. Pipes shall be of following specifications:

Normal diameter (mm)	Working pressure kgf/cm ²
50	6
75	4
110	4
160	4

Pipes shall be of colour specified by the Engineer. Fitting for UPVC pipes shall include couplings, tees, bends, elbows, unions, reducers, nipples and plugs. Outlets of suitable diameter for connection to the appliance shall be provided. Contractor shall use pipes and fittings of matching specifications. Fittings shall be of the required degree of curvature with or without access door. Access door shall be screwing type with neoprene gaskets as shall be approved by the Engineer.

5.5.5 Clamps

Holder bat clamps shall be of standard design and fabricated from M.S. flat 40 mm x 3 mm thick and 12 mm dia. rod and 6 mm nuts bolts. They shall be painted with two coats of black bitumen paint before fixing. Holder bat clamps shall be fixed in cement concrete of 1:2:4 mix.

Where holder bat clamps are to be fixed on RCC column, wall or beam they shall be fixed with 40mm x 3mm flat iron "U" type clamps with anchor fasteners of approved design. Rates for both types of clamps shall be the same and no addition or deduction shall be made.

Structural clamps shall be fabricated from MS structural members e.g., rods, angles, channels, flats as per detailed Drawing. Contractor shall provide all nuts, bolts, welding and paint the clamps with one coat of red oxide.

5.5.6 Pipe Supports and Hangers

Spacing for supports & hangers of fixing for internal piping shall be as given in the following table.

Type of Pipe (mm)	Size of Pipe (mm)	Horizontal Run (m)	Vertical Run (m)
UPV C	50	2	2
	75	2.5	2.5
	100	2.5	2.5

5.5.7 Waste Pipe from Appliances

Waste pipe from appliances e.g. wash basins, sinks, urinals, bath tubs, water coolers shall be of UPVC pipes with proprietary fixtures & fittings of the approved make conforming to all relevant ISS & also to IS 4984-1978. All pipes shall be fixed in gradient towards the out-falls of drain. Spacing for clamps for such pipes shall be as follows:

Type of Pipe	Horizontal Run (m)	Vertical Run (m)
PVC Pipes	300 cm	240 cm
HDPE Pipes	180 cm	120 cm

5.6 SANITARY WARES

5.6.1 General

5.6.1.1 Scope

Work under this section shall consist of furnishing all labour materials necessary and required to completely install all sanitary fixtures, chromium plated fittings and accessories required by the drawings and specified hereinafter or given in the schedule of quantities. Without restricting to the generality of the foregoing the sanitary fixtures shall include all sanitary fixtures, CP fittings and accessories, etc, necessary and required for the buildings. Whether specifically mentioned or not, all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required. All exposed pipes within toilets and near fixtures shall be chromium-plated brass or copper unless otherwise specified. All hot water pipes shall be lagged & properly insulated from the hot water storage tanks to the hot watertaps & outlets.

Sanitary ware, accessories and chrome plated CP fittings shall be of the best quality, as approved. Wherever particular quality is mentioned, the choice or selection shall remain with the consultant.

All fittings and fixtures shall be fixed in a neat workmanship manner to correct level at heights shown on Drawings, Instruction and in accordance with the manufacturer's recommendations.

5.6.1.2 General Requirements

Sanitary fixtures shall be of the best quality approved by the Engineer. Wherever particular makes are mentioned, the choice of selection shall remain with him. All fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned in the schedule of quantities, specifications or drawings or not. All

fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per Engineer/interior designer's requirements. Wherever necessary, the fittings shall be centered to dimensions and pattern desired. Fixingscrews shall be half round head chromium plated brass screws with CP washers wherever required as per directions of Engineer. All fittings and fixtures shall be fixed in a neat workmanlike manner true to level at heights shown on drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor.

5.6.2 Commode and Water Closet

Commode and Water closet shall be of white vitreous or another colour as specified with wash down flushing cistern and 100 mm diameter double symphonic close porcelain P or S trap without vent horn. The set shall be conforming to IS 2556. Commode shall be provided with Bakelite black heavy solid plastic seat cover and lid. WC shall be flushed by means of matching earthenware, ceramic cistern.

The WC shall be fixed in level in a neat workmanlike manner. The WC and trap shall be set in cement concrete 1:2:4 mix (1 cement 2 coarse sand 4 stone aggregate 20mm nominal size). Joints between WC and flush pipe shall be made with a putty of white lead and linseed oil and caulked well or with an approved rubber joint. A proper procedure of water proofing, water sealant shall be applied in order to prevent leakage.

Valve shall be of 12.7mm diameter CP brass with inlet connection of required length with union and CP brass cap.

5.6.2.1 Measurement:

Measurement for the commode and water closet shall be made per unit set of complete installation. Nothing extra shall be provided for the water proofing sealant, water proofing works that shall be carried out as per the instruction.

5.6.3 White Glazed Wash Basin

Wall mounted and counter types wash basin shall be of white vitreous of first-class quality conforming to IS 2556 and of specified size. Wash basin shall be fitted with the heavy CP bottle trap below.

Basins shall be supported on a pair of CI brackets of metal angles and channels cantilevering from wall face. All brackets shall be installed in such a way as to be hidden from view. They shall be provided & fixed in place early so that the built-up vanity may be installed in sufficient time to comply with completion dates. Each basin shall be provided with 32mm dia CP waste with overflow, popup waste or rubber plug and chain 32mm dia CP brass bottle trap with CP pipe wall and flange as given in the schedule of quantities.

Each basin shall be provided with mixing fitting or pillar tap as specified in the Bill of Quantities and/or as approved by the Consultant. Basins shall be fixed at proper heights as shown on drawings. If heights are not specified, the rim level shall be 70cms or as directed by the Consultant.

5.6.3.1 Measurement

Measurement for the white glazed wash basin shall be made per unit set of complete installation.

5.6.4 Mixing Fittings

Mixing fittings shall be C.P. brass of approved quality with modern head for hot and cold for spray and rim with diverter.

5.6.4.1 Measurement

Measurement for the mixing fittings shall be made per unit set of complete installation.

5.6.5 Angle valve

Angle Valve shall be of 12.7mm dia. C.P. brass with C.P. cap and c.p. nipple. The connection between angle valve and supply line laid in chase shall be made in a manner so that the union is flush with finished face of the wall and no threaded portion of the angle valve or supply line is visible.

5.6.5.1 Measurement

Measurement for the Angle Valve shall be made per unit set of complete installation.

5.6.6 Urinals

Urinals shall be lipped type half stall white glazed vitreous china of size 610 x 400 x 380 mm size. Flat back urinals shall be provided with 15 mm dia. spreader, 32 mm dia. PVC bottle trap with pipe and wall flange, and shall be fixed to wall by one CI bracket and two CI wall clips complete as recommended by manufacturer's directives with approval by Engineer. Urinals shall be fixed with CP brass screws. Flush pipes shall be GI pipes concealed in wall chase but with chromium-plated bends at inlets and outlets wherever they are visible.

Urinals may be flushed with flush valves, if given in the schedule of quantities and as described in the item

Waste pipes shall be concealed by chasing into the walls as directed by the Engineer. Specifications for waste pipes shall be same as given in the relevant section of this specification.

Urinals shall be fixing to wall by concealed hangers, brackets, C. P. screws as required and recommended by manufactures.

Each range of urinals shall be provided with an automatic flushing cistern with cover of vitreous china with brackets as specified. The size of the cistern, main flush pipe and spreader pipes shall be as follows:

No of Urinals In range	capacity of cistern litres	size of main flush pipe mm	size of branch pipe mm	size of distribution pipe mm
One	5	-	-	15
Two	10	20	-	15
Three	10	25	-	15
Four	12.5	25	20	15

Painting: the brackets shall be painted with 2 coats of white synthetic enamel paint of approved manufacture over and including a priming coat or red lead.

Measurements: shall be per urinal set for different ranges as specified in the schedule of quantities.

5.6.7 Sinks

Sinks shall be stainless steel as specified in the schedule of quantities. Each sink shall be provided with RS or CI brackets and clips and securely fixed. Counter top sinks shall be fixed with suitable angle iron clips or brackets as recommended by the manufacturer. Each sink shall be provided with 32 mm dia CP waste coupling with chain and rubber plug, 32mm dia. Bottle trap with clean

out hole and plug 15mm dia CP Sink Cock. Fixing shall be done as directed by the consultant and shall be coordinated with the interior fit-out program. Supply fittings for the sinks shall be fittings of CP cock/mixer as specified.

Fixing of the sink: It shall be laid in wall in a workman like manner care being taken not to damage the sink in the process of fixing. If damaged in any way, it shall be replaced at no cost to the Employer. The sink shall be fixed on a proper base of cement concrete 1:2:4 mix (1 cement: 2 coarse sands: 4 stone ballast 20mm. nominal size) taking care that cushion is uniform and even without having any hollows between the concrete base and sink. Joining between the sink and wall shall be neatly done and no hair cracks shall be visible. Joining between the outlets of sink shall be made leak proof.

5.6.7.1 Measurement

Measurement shall be made per unit set of complete installation.

5.6.8 Flush Valves

CP flush valve shall be fitted to the urinal. The flush valve shall include 25mm diameter control cock and elbow set complete with adjustable sleeve and wall flange.

5.6.8.1 Measurement

Measurement for the stainless flush valve shall be made per unit set of complete installation.

5.6.9 Mirrors

Mirrors shall be of approved quality. All edges shall be rounded off. Mirrors shall be fixed to wall with brass chromium plated screws and washers. The approval shall be taken from the Engineer prior to installation.

Mirrors shall be electro-coated copper 5.5mm thick of guaranteed quality of float glass and reputed make. The size shall be as specified in the schedule of quantities & the drawings. The image shall be clear and without waviness at all angles of vision. Mirrors shall be provided with blacking of 12 mm thick marine plywood fixed with CP brass semi-round headed concealed screws and cup washers or CP brass clamps as specified or instructed by the Consultant.

5.6.9.1 Measurement

Measurement for the Mirror shall be made per unit set of complete installation.

5.6.10 Towel Rails and Rings

Towel rails and rings shall be Jaguar quality of heavy-duty CP brass with two brackets. The size of the rail shall be as specified. The brackets shall be firmly fastened by means of CP brass screws and nylon grip plugs firmly embedded in the wall.

5.6.10.1 Measurement

Measurement for the Towel Rail shall be made per unit set of complete installation.

5.6.11 Robe Hook, Toilet Paper, and Soap Dish

Robe hook, toilet paper holder and soap dish shall be heavy grade Jaguar quality. All fixtures shall be fixed in a neat workmanship manner with CP brass screws, where required.

5.6.11.1 Measurement

Measurement for the robe hook, toilet paper holder and soap dray shall be made per unit set of complete installation.

5.6.12 CP Fittings

All CP fittings sink tap, basin tap, bib cock, surgical valve, scrub/sink spout, basin mixer, shower mixer, shower rose, spray, flush valve, conceal stop valve, push flush cock and spreader etc. shall be Jaguar as specified in BOQ and approved by consultant The fittings shall be installed with necessary accessories at correct levels in a neat workmanship. All the CP fittings shall comply with IS 8931 (1993) or its latest revisions.

5.6.12.1 Measurement

Measurement for each CP fittings shall be made per unit set of complete individual installation.

5.6.13 Multi Floor Trap and Gratings

Multi floor trap shall be made of uPVC Panchkanya or equivalent quality with water seal. The floor trap shall be covered with 3mm thick heavy CP brass grating. The floor finish around the trap shall be carefully executed by skilled workmanship to provide perfect finish with slope.

5.6.13.1 Measurement

Measurement for the multi floor trap and grating shall be made per unit set of complete installation.

5.7 SUBMERSIBLE PUMP

5.7.1 Material

Supply and installation of Electric Submersible water pump of capacity 350 lpm head 33m. 1 Working and 1 Standby set with Three phase Motor of approx 1.5 Hp, automatic pump control panel. Cables etc complete set.

5.7.2 Measurement

Measurement for the submersible pump shall be made per unit set of complete installation.

5.8 OUTDOOR PIPE INSTALLATIONS, MANHOLE, SEPTIC TANK, AND SOAK PITS

5.8.1 Valve chambers

All underground sluice valves, scour valves and fire hydrants shall be located in brick masonry chambers of size as given in the bill of quantities conforming to the drawings.

5.8.2 HDPE /PVC Pipe System

HDPE pipes shall conform to IS: 4984/72. The high-density polyethylene shall be of medium quality and of wall thickness conforming to a working pressure of 6 kg/sq cm. the pipes shall be manufactured using virgin GM 5010 T2 raw materials as manufactured by Nepal polythene and plastic industrial or their equivalents.

Fitting shall high density polythene pipe of series II, made at site their form shall be true to shape, smooth and cylindrical, their inner and outer surface being as far as practicable concentric. These shall be sound and cast so as to be free from cracks, pin holes or other imperfections.

The floor traps and other such HCl fittings indicated in the schedule are to be jointed with the HDP pipes after being heated so as to cause the required expansion and laid in position.

Jointing, laying and testing shall be as per the manufacturer's specifications.

Pipes shall be of color specified by the engineer. Fitting for P.V.C. pipes shall include couplings, tees, bends, elbows, unions, reducers, nipples, and plugs. Outlets of suitable diameter for connection to the appliance shall be provided. P.V.C. pipes shall be jointed with P.V.C. pipes shall be done in the best workmanship.

No joints shall be covered until these are checked and tested by the engineer. Inlet and outlet levels of the soil pipes, waste pipes line shall be strictly followed (peg marking to be approved). Fitting where specified as HCL shall be used, and no alternative HDP fabricated shall be used unless specifically approved by the resident engineer.

The contractor shall ensure that only workman experienced in HDP pipe work are used. The resident engineer shall reject any and all works found to be not up to the standards required and request replacement of workman if found necessary.

5.8.2.1 Measurement

P.V.C. / H.D.P. pipes shall be measured per running meter and include meter and include items as stated in the bill of quantities.

5.8.3 Manholes

The internal size of manholes shall be of as specified in BOQ and depth depends upon gradient of waste or soil or rain water lines and wall thickness depending upon depth and site conditions. The RCC foundation, benching, wall, finishing, levels of inlet and outlet, cover with frame etc. for manholes shall be constructed as per drawing and instruction. The soil manholes shall not retain any night soil in it.

Bed Concrete: Manholes shall be built on a bed of 150mm thick cement concrete 1:2:4 mix (1 cement:2 coarse sand: 4 graded stone ballast 20 mm. nominal size).

Plaster: - Inside and outside of wall shall be plastered with 20 mm thick cement plaster 1:4 (1 cement: 4 coarse sand) finished with a floating coat of neat cement. In wet ground, outside plaster, shall be water proofed with addition of any other equal and approved waterproofing compound. The water proof plastering shall be done 300mm. above wet ground.

Measurement: - Manholes shall be measured in numbers. Depths of manholes shall be measured from top of the cover to the bottom of channel. Manholes will depth greater than the specified shall be paid as extra depth per meter depth or part thereof.

CI manhole covers shall be Swastika or equivalent heavy as per instruction. All manhole covers shall be of double seal and the frame of manhole shall be embedded firmly on RCC coupling. All surfaces of frames and cover shall be painted with coal tar. Manhole frames and covers shall be of clean well-defined castings (i.e. key slots and edges shall be smooth and easy to access). Depth of manholes shall dictate size variations as per safety requirements. Manholes shall be integrated with the materials surrounding them in a manner which is aesthetically pleasing.

RCC precast manhole covers may be instructed. In which case they shall be 3" thick with 1½" x 1½" squares holes set in a neat pattern between the rebars and conforming to the drainage volume required to pass through the set of holes into the sink. The rebars shall be adequate to withstand rolling loads of motor trucks fully loaded. The size shall conform to the manhole or sink sizes.

Drop connections shall be provided between branch sewer and main sewer or in the main sewer itself in steep ground when the difference in invert level of the two exceeds 45 cms of the required sizes. Drop connections from gully traps to main sewers in rectangular manholes shall be made inside the manholes and shall have HCL special type door bend on top and heel rest bend at bottom connected by a HCL pipe. This pipe shall be supported by holder bat clamps at 180 cms intervals with at least one clamp for each drop connection. All joints shall be load caulked 25mm deep.

Drop connections from branch sewer to main sewer shall be made outside the manhole wall with cast iron LA pipe tee connections, vertical pipe and bend at the bottoms. The top of the tee shall be finished up to the surface level and provided with a CI hinged type frame and cover 30 x 30 cms. The connection shall be embedded in cement concrete 1:2:4 mix 15cms all-round the pipe and tee up to the surface chamber of the tee.

Drop connection made from vertical stacks directly into man holes shall not be considered as drop connections. They shall be paid for under the relevant soil and waste pipes.

5.8.3.1 Measurement

Manholes shall be measured in numbers. Depths of manhole shall be measured only inner dimension. Manhole with depth greater than 1.5m shall be paid as extra as per civil items.

5.8.4 Soak Pit

The soak pit work shall be done as per the Drawing. The earthwork in excavation shall be carried out to the exact dimensions given in the Drawing. The soak pit shall be constructed and honeycomb dry brick shaft as per the Drawing. Round the shaft and within the radius of given measurement shall be placed well-burnt brickbats. Brickbats of sizes 50 to 80 mm shall be packed round the radius of given measurement. The top of the slab shall be as per the Drawing or direction of the Project Engineer.

5.8.4.1 Measurement

Measurement for the Soak Pit shall be done as per the individual item of the civil works.

5.9 PERFORATED PIPE FOR DRAINAGE WORKS

This work shall consist of supplying High-Density Polyethylene (HDPE) PE 100 PN6 pipes, mechanically perforating them to the specified dimensions, and laying them in prepared trenches for sub-surface drainage. The work includes excavation, provision of granular bedding, aligning, jointing, and backfilling with filter material as per the approved drawings and the direction of the Engineer.

5.9.1 Material

Drainage Pipe: The pipe shall be HDPE of grade PE 100 with a nominal pressure rating of PN6. The pipe must conform to relevant standards (e.g., NS 40 or equivalent ISO/IS standards for HDPE pipes) and be free from blisters, shrinkage, cracks, or other manufacturing defects.

Filter/Bedding Material: The granular bedding and backfill around the perforated pipe shall consist of clean, hard, and durable crushed rock or gravel conforming to the specified filter gradation (typically 10mm to 40mm aggregate).

5.9.2 Perforation Specifications

For effective sub-surface groundwater collection without compromising the structural integrity of the PE 100 PN6 pipe, the following perforation geometry is recommended:

Hole Diameter: Perforations should be 5 mm to 8 mm in diameter. Holes smaller than 5 mm are prone to clogging, while holes larger than 8 mm may allow surrounding filter gravel to enter the pipe.

Spacing: Holes should be spaced at 75 mm to 100 mm intervals longitudinally along the pipe.

Rows and Angle of Perforation: Provide 3 to 4 longitudinal rows of holes.

Radial Placement: The rows should be arranged to cover the upper 240 degrees of the pipe, leaving the bottom 120 degrees (the invert) unperforated. This solid bottom acts as a channel to carry the collected water away efficiently without letting it seep back into the subgrade.

Example Configuration: If using 4 rows, place them at approximately 45 degrees and 135 degrees from the top-center vertical axis on both sides of the pipe.

Method: Perforations shall be neatly drilled. Punching or burning holes is strictly prohibited, as it creates burrs that trap debris and reduce flow capacity. All drill shavings must be completely removed from the inside of the pipe before laying.

5.9.3 Construction and Laying Procedure

Trench Preparation: The trench shall be excavated to the designated line, grade, and cross-section. A minimum of 100 mm to 150 mm of granular bedding material shall be placed and compacted at the bottom of the trench to establish the correct gradient.

Laying the Pipe: The perforated PE pipe shall be laid on the prepared granular bed with the unperforated section (the solid invert) facing strictly downwards. The pipe shall be laid starting from the lowest point (outfall) and working upwards.

Joining: Pipes shall be jointed using standard butt-fusion welding, electro-fusion, or approved mechanical HDPE couplers to ensure secure connections that will not pull apart during backfilling.

Backfilling: The granular filter material shall be placed carefully around the sides and over the top of the pipe to a minimum cover of 300 mm, ensuring the pipe is not displaced or crushed. The material must be placed in layers and lightly compacted to prevent damage to the pipe.

5.9.4 Measurement

The work shall be measured in running meters (linear meters) of pipe, measured along the centerline of the laid pipe, completed and accepted in place.

Unless specified as separate items in the BOQ, excavation, granular bedding, perforation labor, and backfilling shall not be measured separately but deemed included in the pipe laying rate.

5.9.5 Payment

The work measured as provided above shall be paid at the contract unit rate per linear meter. This rate shall be full compensation for supplying the PE 100 PN6 pipe, mechanical drilling of perforations, transportation, trench excavation, providing and placing granular bedding and backfill, jointing, equipment, tools, and all labor required to complete the operation.

5.10

5.11 ANAEROBIC SEWAGE TREATMENT PLANT

Supply of a prefabricated Anaerobic Sewage Treatment Plant as per the technical parameters.

Capacity: 6 KLD (Kilo Liters per Day)

Physical Dimensions & Connections:

Dimensions: 2070 mm (Diameter) x 2510 mm (Height)

Inlet/Outlet Size: 100 mm

Vent Size: 50 mm

Efficiency: Designed for a Biochemical Oxygen Demand (BOD) reduction of up to 70%.

The unit must be ISO Certified.

The unit must be UL Certified.

5.12 EXCAVATION & RELATED WORKS FOR EXTERNAL PLUMBING

5.12.1 Alignment and grade

The drainage, water supply and sewer lines are to be laid to alignment and gradients shown on the drawings but subject to such modifications as shall be ordered by the engineer from time to time to meet the requirements of the works. No deviations from the lines, depths of cuttings or gradients of sewers shown on the plans and sections shall be permitted except by the express direction in writing of the engineer.

5.12.2 Opening out trenches

In excavation the trenches, etc. the soling, road metalling, pavement, kerbing etc. and turf is to be placed on one side and preserved for reinstatement when the trench or other excavation shall be filled up. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the engineer. The contractor shall not cut or break down any fence or trees in the line of the proposed works but shall tunnel under them, unless the engineer shall order to the contrary.

The contractor shall grub up and clear the surface over the trenches and other excavations of all trees, stumps roots and all other encumbrances affecting execution of the work and shall remove them from the site to the approval of the engineer.

5.12.3 Obstruction of Roads

The contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and if insufficient space, he shall remove the materials excavated within a lead of the 200' and bring them back again when trench is required to be refilled. The contractor shall obtain the consent of the engineer in writing before closing any road to vehicular traffic and the foot-walks must be kept clear at all times.

5.12.4 Removal of filth

All night soil, filth or any offensive matter met with during the execution of the works immediately after it is taken out any trench, sewer or composts, shall not be deposited upon the surface of any street or where it is likely to be a nuisance or passed into any sewer or drain but shall at once be put into carts and remove to suitable place incontestable to the project & Employer.

5.12.5 Excavation to be taken to proper depths

The trenches shall be excavated to such a depth that the sewer lines shall rest on concrete as described in the items relating thereto and so that the inverts may be the levels given on the sections. In bad ground the Engineer may order the contractor to excavate to a greater depth than that shown on the drawings and to fill up the excavation to the level of the sewer with concrete, broken stone, gravel, or other materials. For such extra excavation and concrete broken stone gravel or other materials the contractor shall be paid extra if the works were ordered by the engineer, in writing, but if the contractor should excavate the trench to a greater depth than is required without specific order to that effect in writing of the Engineer the extra depth shall have to be filled up with concrete at the contractor's own costs and charges, to the requirements and satisfaction for the Engineer.

5.12.6 Refilling

After the sewer or other work has been laid and proved to be watertight, the trench or other excavations shall be refilled. Almost care shall be taken in doing so that no damage shall be

caused to the sewer and other permanent work. The filling in the haunches and up to 3" above the crown of the sewer shall consist of the finest selected materials placed carefully in 6" layers with materials taken from the excavation, each layer being watered to assist in the consolidation. Unless the Engineer shall otherwise direct. Turfing shall be laid over as instructed.

5.12.7 Contractor to restore settlements and damage

The contractor shall, at his own costs and charges, make good promptly during the whole period the works are in hand, any settlement that may occur in the surfaces of roads, berms, footpaths, gardens, open spaces, etc. whether public or private caused by his trenches or by his other excavations and he shall be liable for any accidents caused thereby. He shall also, at his own expenses and charges, repair and make good any damage done to buildings and other property. If in the opinion of the Engineer the contractor fails to make good such works with all practicable dispatch, the Employer shall be entitled to carry out by his own workmen or other contractor and Employer shall be entitled to recover from the contractor as per conditions of contract.

5.12.8 Disposal of Surplus Soil

The contractor shall at his own costs and charges provide, places for disposal of all surplus materials not required to be used on the works. As each trench is refilled the surplus soil shall be immediately removed, the surface properly restored and roadways and sides left clear.

5.12.9 Timbering of sewer and trenches

The contractor shall at all times support efficiently and effectively the sides of the trenches and other excavations by suitable timbering, piling and sheeting and they shall be closed, timbered in loose or sandy strata below the surface of the sub-soil water level.

- a. All timbering, sheeting and piling with their supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place.
- b. The contractor shall be held responsible and accountable for the sufficiency of all timbering, bracing, sheeting and piling used for, all damage to persons and property resulting from improper quality, placing, maintaining or removing of the same.

5.12.10 Shoring of buildings/structures

The contractor shall shore up all buildings and structures, walls and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all damages to persons or property resulting from any accidents to any of such buildings.

5.12.11 Dewatering of Trenches

The contractor shall at all time during the progress of the work keep the trench and excavations free from water which shall be disposed of by him in a manner as will neither cause injury to public health nor to the public or private property nor to the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use for the same by the public.

5.12.12 Cement concrete, brickwork and finishing

Wherever applicable in this section the materials for cement concrete, brick masonry and finishing like plaster required for the manhole, chambers, gully trap, septic tank and other works shall conform to the specifications works and materials for civil works. The works, sizes etc shall be as shown in the drawings.

5.12.13 Excess excavation

If any excavation is carried out at any point or points to greater width than the specified cross section of the sewer, or trench the full width the trench shall be filled with concrete by the contractor at his own expense and charges to the requirements of Engineer.

5.12.14 Increased Width, Depth of Trench

The Engineer shall have power by giving an order in writing to the contractor to increase maximum width or depth in respect of which payment will be allowed for excavation in trenches of sewer, manholes, and other works in certain lengths to be specifically laid down by him, on account of bad ground or other unusual conditions, he considers that such increase width is necessary in views of site conditions.

5.12.15 Measurement

Unless stated in the item the measurement and payment of excavation shall be as per the terms of civil specifications.

5.13 LIST OF APPROVED MAKES OF MATERIALS

S.No.	Description	IS No.	Recommended Brand Name
1.	Sanitary ware	IS 2556-4 (2004)/ IS 2556-1 (1994)	Hindware/ Parryware/ Jaquar/American Standard
2.	CP Fittings (inc Grab Bars)	IS 8931 (1993)	Jaquar/Grohe/Schell/Hindware, Parry ware
3.	SWR Pipes		Aajaya, Marvel, Supreme (or Equivalent)
4.	Water Supply Pipes & Fittings		Aajaya, Raksya, Astral, Ashirbad (or equivalent)
5.	Looking Mirrors		Modiguard (or equivalent)
6.	Water Tanks (S.S. Cylinder)		Syntex, Nepatop (or equivalent)
7.	Anaerobic Sewage Treatment Plant		Sintex (or equivalent)
8.	GI Pipes/Black steel pipe	IS 1239-2 (2011)	HIPCO/Jindal
9.	Plastic Tanks	IS: 12701 - 1996	Hilltake/Rijalco/Nepatop
10.	High density polyethylene (HDPE PIPES)	IS 4984 (1995)	Supreme/Pancha Kanya
11.	GI Fittings (malleable cast iron)	IS 1879 (Part II to X)	Sun/UNIK/Essar
12.	Gunmetal Valves (Full way)	IS 778 (1984)	SANT/Swastik/LEADER

S.No.	Description	IS No.	Recommended Brand Name
	check and globe valves)		
13.	Bib and Stop cocks (Brass)	IS781(1984)	SANT/L & K/BS
14.	Ball cocks	IS 9890 (1981)	Do
15.	CI Manholes	IS 1726 (1991)	Himal/HEPCO
16.	Pressure Reducing Valve	IS9739(1981)	SANT/Bermad
17.	Solar Water Heater	IS 12976 (1990)	Hot- Pot /Sunking
18.	CPVC Pipe and Fittings	IS15778(2007)	Panchakanya, Marvel
19.	UPVC Pipe and Fittings	IS4985-2000	Panchakanya, Prince, Marvel
20.	Pump	IS4985-2000	KSB/ Willo/ Lubi/ Pedrollo

Note: Please follow required specification of Department of Irrigation/Department of Water Supply and Sewerage Management (DWSSM) for deep tube boring and Specification of DWSSM for external Water Supply work.

F. FURNITURE WORKS

6 FURNITURE WORKS

6.1 CUSTOMER SERVICE DESK/CSD (RT)

Fabrication and installation of Customer Care Desk: made up of 19 mm approved brand ply board, post forming top, granite top, Italian marble/Onex at front of desk, toughened glass, 1mm Greenlam/ Merinalam/ centurylam or equivalent Formica finish in all inner and outer part, chapra polish in side, Sallo wood lipping, best quality hardware and all complete a commercial ply for both vertical and horizontal supports and finished with 1mm thick laminates to be applied with Fevicol adhesive. The desk shall be provided with a portable Drawer with S. S. locks and handles on all shutters, a Laminated Wooden Keyboard Trey, and a metal slider CPU holder. There shall be high-quality S. S. locks and handles on all drawers, heavy-duty runners on all shutters. It should have a 12mm thick sisham wood edging finished with high quality melamine paint. All the interior surfaces shall be finished in high quality 140 board 140 polish (at least three coats) The dimension of the furniture shall be verified at site. Furniture all complete as per drawing, specification and direction of site Engineer. (Ply: Surya/Sagun and Greenply). Measurement shall be in square meter of exact length and height.

6.2 TELLER COUNTER (TC)

Fabrication and installation of Teller Counters made up of 19mm commercial ply on both vertical and horizontal supports. Postforming top, Top of the teller shall be high quality and polished 19mm jet Black Granite, Italian marble/Onex at at front of Desk, toughened glass. The teller shall be finished with 1mm Greenlam Laminates to be applied with Fevicol adhesive in all inner and outer surface. The each of the teller shall be provided with a fixed Drawer with S. S. locks and handles on all shutters, a Laminated Wooden Keyboard Trey, and a metal slider CPU holder. Each of the first drawers shall have partitions to hold cash of different denominations. There shall be high-quality S. S. locks and handles on all drawers, heavy duty runners on all shutters. It should have a 12mm thick sisham wood edging finished with high quality melamine paint. All the interior surfaces shall be finished in high quality 140 board 140 polish (at least three coats) The dimension of the furniture shall be verified at site. Furniture all complete as per drawing, specification and direction of site Engineer. Measurement shall be in square meter of exact length and height.

6.3 STAFF DESK (T1)

Supply and Installation of wooden modular Desk for staff made up of 25-75mm thk. Postforming top, 19mm commercial ply for both vertical and horizontal 140 board 140io with 1mm thick laminates; a Portable CPU holder, a portable Drawers; 12mm edge polished frosted glass on top held, clear rubber buffer below the glasses. It shall have a Portable metal CPU holder, a Metal Keyboard Trey. There shall be high quality S. S. locks and handles on all drawers, heavy duty runners on all Drawers. It should have a 12mm thick sisham wood edging finished with high quality French Polish. All the interior surfaces shall be finished in high quality 140 board 140 polish (at least five coats over sand finished wooden surface.) The dimension of the furniture shall be verified at site. Furniture all complete as per drawing, specification/schedule of finishes and direction of Architect. Measurement shall be done in number.

6.4 FILING CABINET

Supply and Installation of storage racks of dimensions stated below, made up of 25mm thk. Post forming top, 19mm commercial Ply for all vertical and horizontal supports and finished with with 1mm thick laminates to be applied with white adhesive in all inner and outer surface. There shall

be high quality S. S. locks and handles on all shutters, heavy duty runners on all shutters. Shutter shall be hold with autohinge. It should have a 12mm thick sisham wood edging finished with high quality French Polish. All the interior surfaces shall be finished in high quality 141oard141 polish all complete as per drawing, specification/schedule of finishes and direction of Engineer. Measurement shall be in square meter of exact length and height.

6.5 STAFF/MEETING CHAIR (RC1):

Provide Staff Chairs: revolving, adjustable height, Black PU cover with internal foam, stainless steel legs, all complete as approved and specification/schedule of finishes and direction of Engineer. Measurement shall be done in number.

6.6 OFFICE VISITORS CHAIR(C1):

Provide Visitor Chairs: SS Legs, Black PU cover with internal foam, all complete as per approval and drawing, specification/schedule of finishes and direction of Engineer. Measurement shall be done in number.

6.7 MEETING TABLE (MT)

Top Board: 19mm Plywood with Laminate top and polished pine wood edge lipping; Frame: wooden frame laminate finishes all complete. Measurement shall be done in number.

6.8 SOFA (1/2/3/5-SEATER)

Providing sofa using fabric with high density u-foam for the back and seat with necessary wooden frame work supported on 3" designed wooden members finished in three coats of melamine, all accessories all complete as per drawing, specification/schedule of finishes and direction of Architect. Measurement shall be done in number.

6.9 AIRPORT SOFA (C2) (4/8/12-SEATER)

Provide Waiting sofa for waiting: fixed, custom designed, artificial leather, stainless steel legs, cover -as approved, drawing, specification/schedule of finishes and direction of Engineer. Measurement shall be done in number.

6.10 CURTAINS

Window Curtains made from cotton fabrics (Base Price of Curtains not less than 400Rs/m) including wooden polished hanging rods, hooks and necessary accessories all complete as per drawings and instructions. (Samples to be approved by 141oard141ion141) (Height of window may vary upto 8ft) (measurement in installed net area of window). Measurement shall be in square meter of exact length and height.

6.11 ULTIMATE DOOR MAT

Supply and install graphic loop pile carpet of 450 gm/sq.m and 5mm thick of approved colour and pattern as per attached drawing, specification and direction of site Engineer. Measurement shall be in square meter of exact length and breadth.

6.12 PLANTER BOX

Supply and 141 board141ion141n of wooden modular planter box made with 19mm plywood, 1mm laminates finish at outer surface, 2mm aluminium sheet pasted at inner surface as per design all complete as per instruction of Engineer. Measurement shall be done in number.

6.13 HELMET RACK

Supply and fabrication of wooden modular helmet cabinet made with 19mm plywood, 1mm laminates at all inner and outer surface, 19mm postforming top, different color and pattern design of glossy/matt laminates design, salves as per design all complete as per instruction of Engineer. Measurement shall be done in number.

6.14 GUARD CHAIR

Provide guard Chairs: SS Legs, Black PU cover with internal foam, all complete as per approval and drawing, specification/schedule of finishes and direction of Engineer. Measurement shall be done in number.

6.15 GUARD TABLE

Supply and Installation of wooden modular guard table made up of 25-75mm thk. Postforming top, 19mm commercial ply for both vertical and horizontal 142board 142io with 1mm thick laminates; a Portable CPU holder, a portable Drawers; 12mm edge polished frosted glass on top held, clear rubber buffer below the glasses. It shall have a Portable metal CPU holder, a Metal Keyboard Trey. There shall be high quality S. S. locks and handles on all drawers, heavy duty runners on all Drawers. It should have a 12mm thick sisham wood edging finished with high quality French Polish. All the interior surfaces shall be finished in high quality 142 board 142 polish (at least five coats over sand finished wooden surface.) The dimension of the furniture shall be verified at site. Furniture all complete as per drawing, specification/schedule of finishes and direction of Architect.

6.16 TOUGHEN GLASS

Supplying, fabrication and fixing in position 12mm thick clear toughen glass with SS 304 readymade with all necessary fixtures and fitting such as SS caps, necessary hole cutting, metal grip, welding, jointing all complete as per drawing , BOQ, specification & approval of Engineer.

6.16.1 Measurement

It shall be measured in square metre of the finished work. The rate shall include handrail, balusters, caps, newel post, and other accessories including hole cutting, fixing of handrail, and balusters in position, labour, materials all complete. It shall be paid in square metre.

6.17 LIST OF APPROVED MAKES OF MATERIALS

S. No.	Description	Brand
1.	Ply board	Surya, Sagun, Green, Duro
2.	Laminates	Greenlam, Century, merinolam
3.	Prelaminated MDF Board	Tesa, Green Panelmax
4.	Veneer	Green Decowood, Century Veneer
5.	Hardware	Hettich, Dorma, Godrej, Haffle
6.	Form	Everest, Dunlop

