

## 1. PLASTER WORK

### 1.1 General

The works included in these specifications cover the complete supply, temporary storage and sheltering of all materials and the execution of the plastering work, its protection and final cleaning up.

All brickwork and, where necessary and indicated, concrete walls and ceilings shall be coated with plaster. Plaster work shall be carried out considering climatic particularities.

### 1.2 Plastering Materials

(1) Cement Rendering

(a) Surface Preparation

Surface to be rendered shall be free from grease and shall be thoroughly cleaned with wire brush soaked in water. Surfaces of reinforced concrete columns and beams shall be chipped and humidified to increase adhesion of the cement coating.

(b) Materials

The coats of rendering shall be composed of cement and sand mix in the ratio 1:3. An addition of 5Kg. of hydrated lime may be added per 50 Kg. of cement to make a more workable mix. The cement used shall be in according with the provisions of clause 122 of this specification.

The sand shall be hard, durable, clean and in accordance with the provision of clause 123 except that its grading shall be written the limits stated below:

B.S Sieve	Percentage by Weight	Passing B.S. Sieve
	First Coat	Finish Coat
3/16 " (4.8mm)	100	100
No. 7	90-100	90-100
No. 17	70-100	90-100
No.25	40-80	55-100
No. 52	5-40	5-50
No. 100	0-10	0-10

The above grading of sand for the finished coat may be modified to suit certain texture finishes.

(c) Application:

Two coats of cement rendering shall be applied. The first coat shall be applied to the clean, wet surface by means of a trowel, and be slightly combed with a wire or wooden scratcher. It shall be kept moist with a fog spray for two days, and then be allowed to dry out.



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The finished coat shall not be applied until the first coat has been seasoned for about 3 days. Just before the application of the finish coat the first coat shall again be wetted with fog spray. Where cement plasters with a smooth trowelled finish is specified or indicated on the drawing, the finished coat shall first be floated to a true and even surface then trowelled in manner that will force the sand particles down into the plaster, with a final trowelling to leave the surface burnished smooth and free from rough areas, trowel works, checks and other blemishes. In all other cases where a smooth finish is not specified, the finished coat shall be floated to true and even surface with a uniform texture.

The finished coats shall be kept moist with a fog spray for a least 2 days, and thereafter shall be protected against drying until it has properly and thoroughly cured. The total thickness of rendering shall be not less than 1.5 cm.

All adjacent of the finished work which could be stained or damaged shall be adequately masked.

(2) Cement Lime Plaster

(a) Surface Preparation

All surfaces to be plastered shall be free from grease and loose material and shall be thoroughly cleaned with wire brush soaked in water. Surface of reinforced concrete columns and beams shall be chipped and humidified to increase adhesion of the cement coating.

(b) Materials

The cement and sand shall conform to the description specified in sub-clause 148 (a).

The lime shall be of properly burned calcium carbonate, which shall be stored upon arrival at the site in dry sheds with raised floors and waterproof walls and roofs.

Any lime damaged as a result of exposure to moisture before or during storage will be rejected. The hydrated lime shall conform with B.S.S. No. 890.

(c) Application

A preparatory coating of 1:1 sand cement slurry shall first be applied to the clean wet surface by vigorous brushing and immediately stippling with a banister brush or similar to a close texture key. This preparatory coat shall be allowed to harden thoroughly for about 3 days, depending on water conditions.

Plastering shall then be carried out in three coat work, with mortar of 1 volume of cement 2 volumes of hydrated lime, 8 volumes of sand.

The first coat shall be about 8 mm. thick and shall be so applied as to maintain maximum adhesion and coverage. It shall then be combed with a wire brush or wooden scratcher to provide a key for the second



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coat. A minimum of 4 days interval shall be allowed before the application of the second coat.

The second coat shall be about 8 mm thick applied to obtain a plain surface with all internal angles plump and square. It shall be keyed as for the first coat and left for a minimum of 4 days before the application coat of the finish coat.

The finish coat shall be applied as thinly as possible with a thickness of about 5mm. and shall be brought to a smooth trowel finish and allowed to dry out to a uniform colour.

The total thickness of the finished plaster work shall be not less than 2 cm.

All cracks, blisters and other defects shall be out to a rectangular shape with edges undercut to from a key and shall be finished flush with faces of surrounding work.

The whole of the plaster work shall be brought to a smooth even surface.

(3) Gypsum Plaster

(a) Surface Preparation

Surfaces to be plastered shall be prepared as in sub-clause 148 (b).

(b) Materials

The cement and sand shall conform to the description in sub-clause 148(a).

The gypsum shall be pure calcium sulphate and supplied from an approved Mechanical Factory and shall be delivered to the site in sealed bags. All under burnt or over-burnt gypsum shall be rejected and the Contractor shall provide facilities for each batch of material to be checked and tested on the site to the satisfaction of the Engineer. The gypsum shall be kept in proper sheds on site exactly as described for lime in sub-clause 148(b).

(c) Application

A preparatory coat of 1:1 sand cement slurry shall be applied to the clean, wet surface by vigorous brushing and immediate stippling with a banister brush in order to form a close texture key.

Two coats of gypsum shall be applied. The first coat shall be applied evenly and with sufficient material and pressure to form a good bond with the underlying surface. The surface shall then be rodded and floated then roughened slightly with a stiff bristled brush.

The second coat of smooth white finish shall be applied by trowel as soon as the first coat is thoroughly dry, it shall be wetted evenly by brushing or spraying. As the finish coat set and shrinks, it shall be thoroughly and uniformly packed and compressed by heavy scouring with the trowel. The material shall be allowed to shrink between scouring operations, and additional water shall be brushed on as



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required. The scoring shall be continued until a smooth dense surface is obtained.

Total thickness of plaster should not be less than 2 cm.

## 2 PAINT WORK

### 2.1 General

All oil paints, enamels, water paint and accessories shall be obtained from approved manufactures, and shall be subject to such tests and analysis as may be thought proper by Engineer. Each of the paints shall be ready made in shades to be chosen by Engineer.

### 2.2 Types of Paints

#### 2.2.1 Oil Paints

Shall be of ready mixed paints, consisting of pigments ground in refined linseed oil and adjusted to the necessary working qualities with driers and thinners.

All oil paints shall be washable, water repellent, decorative, flat and glassy finish for the application on interior and exterior services, such as matured cement and plaster, wood, metal or brick; the preparations must be described as resistant to alkali, fumes, heat, cold and moisture, and are stated to be unaffected by condensation as well as non-flaking. Two coats work at least in either flat or glass finish to be applied.

#### 2.2.2 Emulsion

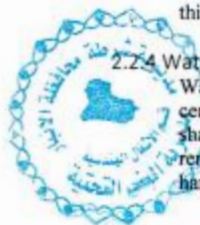
Shall be of ready mix plastic and coating shall be made with a base pigments of high capacity in medium of plastic emulsion, the coating should be immune to attack by alkalis which are present in new concrete, rendering and plaster. It must adhere strongly to most services which are free of oil and grease. The coating should provide a tough, durable satin finish which can be safely scrubbed when cleaning down. All surfaces must be smooth treated with suitable and approved coat filling material. Three coats of paint must be applied on the surfaces and each coat must be left to dry before the other coat is applied.

#### 2.2.3 Rustproof Paints

Shall be of ready mixed paints, water repellent, anti-acids and corrosive agents such as lactic, sulphuric and phosphoric acid, and shall be impervious to petrol, lubricating oils chlorine etc., and of bitumen render properties, especially suitable for the painting of exterior iron and steel surfaces, dissolved in drying oil with the addition of driers and thinners.

#### 2.2.4 Water (Plastic) Paints

Waterproof decorative (Plastic) Paint must be made with a base of white Portland cement, and in a power form for mixing with water, tenacious and elastic properties shall enable it to adhere to surfaces particularly suitable for application to cement rendering, brick asbestos cement, etc. It shall be waterproof protective and giving a hard, durable, and washable surfaces which resist absorption.



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### 2.2.5 Epoxy Paint

Epoxy Paint is mainly used for surfaces in contact with chemicals, wastewater and similar. Painted surfaces shall absolutely be nonporous.

### 2.3 Applications and Workmanship

Application during wet, foggy or frosty weather should be avoided, and dry surface is essential on exterior work.

Painting on damp surface must be avoided in all cases as the surface should be allowed to dry out thoroughly before painting is applied.

The surfaces should be clean of dirt, grease etc., and if necessary washed down, then examined for defects before painting is started.

Unpainted woodwork surfaces should be brushed down and rubbed down with waterproof sand paper, defects in the woodwork revealed by the cleaning process shall be made good with hard stopping and brought forward to a level surface.

Iron and steel work surfaces should be washed; all rust must be removed by scraping, wire brushing etc.

Cement and Plaster surfaces should be left out to dry thoroughly and mature before painting is attempted.

Efflorescence due to salt crystallising on the surface should be removed by repeating brushing until it on longer forms. No washing should be attempted.

Joinery should be primed assembly, all members to be inserted in cement or brick should be primed before fixing. Proper application of the priming should be brushed in to secure maximum penetration and provide a good key of subsequent coats.

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### 3. SANITARY WORK

#### 3.1 MAIN, DISTRIBUTION AND SERVICE PIPES

##### 3.1.1 General

- (1) The main and distribution pipes for water supply and fire protection of ductile iron and shall be laying in carefully preferred excavated trenches so that the barrels of the pipes when laid are well bedded down for their whole length on a firm surface and are true to line and gradient, generally at a depth of 1 m or as specified.
- (2) The width of the excavation shall be sufficient to allow the pipes to be properly laid and jointed, joint holes being made where necessary.
- (3) Before laying each pipe and fitting should be thoroughly cleansed internally and the ends temporarily plugged.
- (4) Precaution shall be taking to prevent floatation of the pipes, should the trench become flooded.
- (5) The coating, sheathing or wrapping of the pipes shall be examining for damage and repaired where necessary.
- (6) The laying of pipes shall preferably proceed in an "uphill" direction to facilitate joint making.
- (7) Thrust blocks of concrete shall be forming at all bends, branches and dead ends to transmit the hydraulic thrust on to undisturbed ground and spread it over a sufficient area, as per the following table (when specified).
- (8) End thrust and radial thrust on bonds in Mains (calculated for a pressure of 100 lb/in<sup>2</sup>).

##### 3.1.2 Building Drainage

- (1) Soil, waste and vent stacks shall be providing installed with extensions and branches to all plumbing fixtures as shown on the drawings.
- (2) Soil and waste piping and other drainage piping underground shall be u.p.v.c. Ventilation systems inside the building shall be u.p.v.c, exposed pipes shall be galvanized steel pipes. Pipes shall have bitumen coating inside and outside in both cases.
- (3) The rainwater pipes shall be cast iron to B.S 460.
- (4) Buried piping shall be supported throughout its entire, length, to the grades as shown.

If installed on fill, the pipes shall be supporting by concrete cradles to firm earth or a continuous bed of concrete as specified.

- (5) All excavations required to be made for the installation of the building drainage system or any part thereof within the walls of a building shall be open trench work and shall be kept open until the piping has been inspected, tested and accepted.
- (6) Adequate precaution shall be taking to ensure proper compactness of backfill around piping without damage to such piping. Trenches shall be back filled in



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thin layers to (300 mm) above the top of the piping with clean earth which shall not contain stones, boulders, cinder fill or other materials which would damage or break the piping or cause corrosive action. The fill shall be properly compacted.

- (7) When excavating a trench, sufficient compacted soil should remain at the bottom so that the pipe, both joints and barrel, rest on and is fully supported by undisturbed earth.
- (8) A soil or waste pipe or building drain passing under foundation wall shall be provided with a relieving arch, or there shall be built into the brick wall an iron pipe sleeve two pipes greater than the pipe passing through, or equivalent protection shall be provided as may be approved by the Engineer. Annular space between sleeves and pipes shall be filling or tightly caulked with coal tar, or asphalted compound, lead or other materials found equally effective.
- (9) No piping shall be laying parallel to footings or outside bearing walls closer than (1 M) except as may be approved by the Engineer upon finding that a leisure distance is safe.
- (10) Piping installed deeper than footing or bearing walls shall be 45° except as may be approved by the Engineer upon finding that a greater angle is safe.
- (11) Drainage and Vent Pipes:

- (a) Drainage and vent pipes shall be installing in as direct and straight as possible without drops or sags. The pipes shall be graded and joined to drain to the outlet by gravity at the following minimum slopes.
- (b) Horizontal piping 100 mm □ with a slope of 2 %.
- (c) Horizontal piping greater than 100 mm □ within a slope of 1 %.
- (d) Connections to soil and waste stacks shall be made by the appropriate use of 45° long quarter bends, sixth, eight or sixteenth bends, or by combination of these fittings. Standard tees, quarter bends crosses shall not be using on drainage pipes. Such fittings may however be used on vent pipes and on other piping conveying fluids that not carry clogging, substances. No fitting having a hub in the direction opposite to flow or the branch shall be using as drainage fitting No drainage or vent piping shall be drilling or tapped. W.C. branch to the stack shall preferably be made below the branch to lavatory basins, sinks baths etc. waste branches must not enter the stack opposite a W.C. branch as there is then the risk of W.C. discharge entering waste branch. In this case, the connection should be at right angles.

- (12) Connection between a vent pipe and a vent stack or stack vent shall be at least 150 mm above the rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents or loop vents shall be at least 150 mm above the floor level rim of the highest fixture served. All vent and branch vent pipes shall be so graded and connected as to drip back to the soil or waste pipe by gravity.

- (13) All vent pipes extending through the roof shall pass through flashing sleeves properly water proofed, in an approved and neat manner. The vent pipes must be extending at least 0.6 m above the roof and shall be at least 1.5 m above the roof, when the roof is accessible to the residents. Its top shall be covering



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with a durable and strong metal screen or of wire balloon to exclude dropping of objects down the pipes.

- (14) The drainage, soil and waste pipes shall be u.p.v.c.
- (15) All pipes work shall be so arranging as to be accessible for repair and replacement without disturbing adjacent work. Suitable access doors and frames shall be providing wherever valves, controls and other apparatus requiring periodic inspection or maintenance to located in enclosed spaces, behind partitions or in the spaces above suspended ceiling or in the pipe shafts.

### 3.1.3 Piping

- (1) Drawings are generally diagrammatic and indicative of work to be installed. Run and arrangement of piping shall be approximately as indicated, subject to modifications as required to suit conditions in building to avoid interference with work of other trades, or for proper, convenient and accessible location of all parts of piping system. Due to small scale of drawings all required offsets, fittings, valves, traps, drains etc, may not be indicating. The architectural, structural, electrical and mechanical drawings and details may be referred to carefully and checked, noting location of pipe shafts and conflicts with work of other trades and the work shall be arranged accordingly furnishing all offsets, fittings, valves traps, drains etc. required to meet such conditions.
- (2) The piping shall be running in wall chases, recesses, pipe shafts and false ceilings where the same are providing. Exterior utilities are diagrammatic and exact location and invert elevations shall be as indicated or required to meet existing conditions. The piping shall not be closed or covered before examination and testing. The piping shall be run straight and direct as possible, in general forming right angles with or parallel with walls or other piping and neatly with risers erected plumb and true. The piping shall be hanging at or in ceiling from construction above, as close as possible to bottom of slabs, beams etc. maintaining max. head room at all time in a neat manner on approved type of hangers.
- (3) The architectural drawings may be checking with for approved ceiling heights and work shall be installing above this height. Control valves shall be providing as shown or required for complete regulating control of all system, plumbing fixtures and equipment. All valves shall be accessible and these shall not be installing with handles pointing down.
- (4) Adequate provision for proper expansion and contraction of piping shall be made. For piping passing through building expansion joints.
- (5) In concrete construction, approved inserts shall be carefully set to support the piping, close to the bottom of beams, slabs etc. The pipes passing through floors shall pass through a galvanized sheet iron tube not less than one size larger than the pipe or its covering. Escutcheons shall be of spun brass made of 12 gauge sheet and shall be chromium plated for installation in finished spaces. These may be of cast iron in other locations.
- (6) The spacing of hangers and supports for different type or pipes shall be as follows generally.

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Type of pipe	Vertical	Horizontally
Cast iron soil pipe	at every story height and at its base	at not more than 1.5 m intervals
Socket pipe	at not less than every other story height	at approximately 3.5 m interval depending on dia. of pipe (Table below)

Spacing of mixing for internal piping

Material of pipe	Size of pipe (mm)	Max-Spacing of vertical run	Supports in a horizontal run
Galvanized mild steel	15	2.4	1.8
	20	3.0	2.4
	25	3.0	2.4
	32	3.6	2.7
	40	3.6	3.0
	50	3.6	3.0
	65	4.5	3.6
	80	4.5	3.6
	100	4.5	3.9
	150	5.2	4.5
Cast Iron, and p.v.c.	50	1.8	1.8
	80	2.7	2.7
	100	2.7	2.7
	150	3.6	3.6

### 3.1.4 Jointing

- (1) Joints and connections in the plumbing system shall be gas tight and water tight for the test pressures as specified No varnish or other coatings are permitted on the joint until after the joint has been tested and approved.
- (2) Joints in cast iron with spigot and socket pipes shall be mechanical coupling type. Flexible joints in which preformed joint rings of rubber or other material are compressed between the spigot and socket may also be used with the approval of the Engineer.
- (3) Screwed steel piping shall be jointing with screwed socket joints using fittings of wrought iron, steel, or malleable cast iron. A jointing compound or tape may be using with a few stands of fine hemp where necessary. Compounds containing red lead shall not be used due to the danger of contamination of the ware. Care should be taking to remove any burr from the ends of pipes and to prevent the entry of the excess jointing material.



- (4) Small diameter pvc pipes shall be jointed by using special jointing solvents provided by the manufacturer or alternatively with separate sleeves or with flexible rings and spigot and socket joints

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- (5) Copper piping of small diameter shall be jointing to cast iron, spun iron or steel piping by the use of copper alloy unions.
- (6) For large diameters, the joints shall be made by flanged connecting pieces.
- (7) Small diameter plastic pipes may be jointing to metal piping by means of union adaptors for PVC pipes of 75 mm bore and upwards, flexible joints or flange joints may be used.
- (8) While jointing pipes to cisterns, care should be taking so that holes in the correct positions are made for the connection of pipes to cisterns. The end of the galvanized steel connecting pipe shall be threading, passed through hole in the cistern and secured back nuts and washers both inside and outside.

### 3.1.5 Test

- (1) All piping forming part of the domestic water system shall be tested before backfilled, covered up or built in to twice the hydrostatic working pressure.
- (2) The entire system of soil, waste and vent pipes and horizontal drains including all branches shall be testing either in their entirety or in sections. Each section shall be filling with water standing 3.3 m above the section (except the top most section) for at least 15 minutes at which condition, the pipes and joint shall show no leaks.

### 3.2 STORM DRAINAGE

- (1) The storm water from roofs, paved yards, approaches the chambers and gullies to manholes.
- (2) The storm manholes shall be similar in construction in roads is drained through gully chambers and curb gullies to manholes.
- (3) The manholes shall be complete with manhole covers and frames of solid cover or with grating suitable for the particular duty as specified.

### 3.3 SANITARY APPLIANCES

- (1) All sanitary appliances shall be new of approved quality, colour and of standard design as specified. The fixtures shall be of twice fired, vitreous china ware of the specified color, having smooth, permanently non absorbent surface and free from pores generally conforming to BS: 3402.
- (2) Each fixture shall be complete with trap, waste, water connection and vent of sizes shown on the drawings or as specified. All exposed metal parts of the appliances shall be chromium plated, unless otherwise specified.
- (3) The appliances shall be adequately supporting independent of piping or other plumbing work.
- (4) All fixing screws should be of non-ferrous metal or stainless steel and any steel work in brackets or other supports should be galvanized, whether subsequently painted or not.



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- (5) Brackets shall be of adequate strength and securely fixed with built-in-legs or of surface type securely screwed thereto. The screws should be driving into proper plugs inserted into holes. When brackets are fixing to thin or lightweight partition walls, more secure fixing shall be provided by use of such devices as toggle bolts.
- (6) Appliances like W.C. pans fixed directly to the floor shall rest properly levelled and even surface. Appliances on pedestals or legs shall also be fastening to walls to give stability, except in those where the whole fitting is design to be self-supporting.
- (7) Water supplies and discharge pipes shall be installed before the appliances are fixed and the joints between appliances and traps and/ or pipes should be of union or detachable type.
- (8) Sinks and baths should be so fitting so that they drain to the outlet.

### 3.4 EXTERNAL SEWERAGE

- (1) The external drainage pipes shall be U.P.V.C. pipes with necessary fittings complying BS: 4660.
- (2) The excavation for trenches of sewer pipes shall be to the correct depths and gradients and true to line.
- (3) The excavated material shall not be depositing within 0.5m of the edge of the trench and the sides of the excavation shall be supporting by planking or strutting as directed by the Engineer. The bottom shall be keeping free from water by pumping, bailing or otherwise. Excavation below required level shall be back filling at contractor's expense with 1:4:8 concrete as directed by the Engineer. Sufficient protective measures as lighting, warning signs etc. shall be taking conforming to the local byelaws and as directed by the Engineer.
- (4) The sewer pipes shall be laying on a granular material bedding 20 cm thick under the pipe in the bottom of the trench No. point bearing shall be allowing. U.P.V.C. pipes shall be laid and jointed as per manufacturers site instructions. After laying and pointing the pipes granular material same as in the bedding shall be placed on the sides of the pipe and trench shall be filled to a depth of not less than 30 cm above top of the pipe. The remaining trench shall be back filling with selected excavated material.
- (5) The pipes shall be jointed together with rubber rings or equivalent joint as per manufacturer's instructions.
- (6) The manholes shall be constructing in brickwork as per the specified dimensions. The concrete base shall be at least 150 mm thick trench pipes shall discharge into the main stream as nearly as possible in the direction of flow in the main channel. In wet ground the outside faces shall be plastered in 1 : 2 cement mortar up to 300 mm above wet soil line with the addition of suitable water proofing compound as directed by the Engineer.
- (7) Where the depth of manholes exceeds 1.8 m brick on edge ring arches over the ends of the drainpipes exceeding 150 mm in diameter shall be built into the walls.



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- (8) The manhole covers and frames shall be of medium duty and shall be bedding cement mortar 1:3 cement concrete 1:2:1 finished smooth on top and with other edges slightly roundel.
- (9) Where the difference in level between the branch pipe entering a manhole and the manhole invert exceeds 700 mm, the connection shall be made by means of cast iron vertical drop pipe encased in concrete 1:3:6 outside the manhole complete with tend junction.
- (10) The manhole covers shall conform to BS:497 or equivalent of medium duty for manhole located in areas where light vertical traffic is expected of heavy duty where heavy traffic load is expected and of light duty in foot paths and in areas of pedestrian traffic only.
- (11) The step irons for manholes shall be of galvanized malleable cast iron complying with the requirements of BS: 1247. Step iron should be built into the wall at every fourth course at 300 mm intervals, staggered both horizontally and vertically. The top step iron should be 450 mm below the top of the manhole cover and the lowest not more than 300 mm above the benching

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