

GENERAL SPECIFICATIONS AND REQUIREMENTS

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DIVISION 2 - SITE WORK**2.A. APPLICABLE DEMOLITION REQUIREMENTS**

1. Safety conditions shall be maintained at all times, and the contractor shall use all precautions necessary, such as suitable guard rails, barriers, and warning lights necessary, especially at excavations, to provide necessary protection for the owner, the public, and inspectors visiting the site.
2. Debris control shall be maintained at all times, and the Contractor shall provide all necessary drop cloths, dust screens, chutes and water sprays necessary to maintain and limit dust to the lowest possible levels practical. Roofing membranes, shingles and other roofing debris shall be prevented from falling or being blown onto adjacent and neighboring properties. All debris shall be removed each day from the streets, adjoining walks and properties.
3. Disposal of debris shall be removed from the site in approved carrier to legal disposal sites all in accordance with local ordinances and applicable environmental regulations.
4. Adjacent properties and Owner's property shall be protected from damage at all times. All shrubbery and trees in working areas shall be protected by the use of appropriate barriers and/or guard shields of adequate strength to protect same. Contractor is to restore and correct all damage caused in the performance of his work using materials and workmanship matching the quality and type of the damaged area or item.
5. If possible, demolition is to begin at top levels and work down through the building. All items of demolition materials are to be broken down into appropriate sizes convenient for handling and removal. Demolition is to be executed in such manner as to provide clean substrates for new work, free of any obstructions or damage to work that is to remain. All areas that are involved in demolition shall be secured by a barrier (plastic) to prevent the spread of debris/dust into other locations.
6. Shoring is to be provided where demolition of existing (partition removal, masonry wall removal, stairs removal, floor removal) or other elements are required. Shoring shall be provided of adequate framing and timbers with loads spread adequately at the base to protect the existing structure from damage. Shoring is to remain in place until defective removed structural items are replaced with new materials.
7. Gut interior of structure: Remove all interior floor, wall and ceiling coverings down to framing. Remove all plumbing, electrical and HVAC components. Remove all cabinets, doors, windows and all items necessary to prepare entire interior for installation of new surface components. Dispose of all items in code legal dump.

2.B. EXCAVATION

1. Areas of new concrete (walk, ramp, stairs, basement floor, and grade slabs) are too excavated to a minimum depth of 4" and uniformly graded to receive gravel for base of new work. Install construction forms as needed and provide a compacted sub-base of gravel or crushed stones to a minimum depth of 25cm, if necessary, before pouring concrete. For concrete, see Division 3.

2.C. BACKFILL

1. Only materials free of roots, stumps, wood, cinders, trash, and stones larger than four 10cm in diameter shall be used.
2. Fills shall be placed in successive layers not exceeding 20cm loose measure. Each layer shall be adequately and uniformly compacted.
3. All fill shall be thoroughly compacted to avoid damaging settlement to walks, driveways, lawns, and other site improvements.
4. Backfill shall not be placed upon muddy or frozen surfaces which contain frost or ice.
5. Settlement or washing that occurs in backfilled areas within one year of the acceptance of the work shall be repaired and grade re-established to the required elevation.
6. Rough grades shall be established at 10cm below the finish grade.

2.D. TOPSOIL

1. Topsoil shall be used to establish the finish grade except where a dust-free surface is required.
2. The topsoil shall be uniformly distributed on the designated areas and evenly spread to a minimum of 10cm for lawn areas to be seeded. Any irregularities in the surface resulting from topsoil or other operations shall be corrected in order to prevent the formation of depressions where water will stand.
3. Topsoil shall be fertile, easily crumbled, natural surface soil obtained from well-drained areas. Topsoil shall be free of subsoil, brush, organic litter, objectionable weeds, clods, shale, large stones, stumps, roots or other materials harmful to plant growth or hindrance to planting or maintenance.

2.E. LIME WASTE

1. Acceptable local materials, compacted to a depth as specified shall be used. Lime waste shall be free of clay, rock or gravel larger than 5cm in any dimension. It shall also be free of debris, waste, frozen materials, vegetable and other deleterious material.

2.F. REMOVAL OF TRASH

1. All trash shall be disposed of in a proper manner. Area shall be left raked or swept clean and level with surrounding grade. Disposal shall be in accordance with the local ordinances.

DIVISION 3 - CONCRETE**3.A. MATERIALS AND METHODS**

1. Concrete shall not be placed when stormy or inclement weather prevents good workmanship. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. All concrete materials and all reinforcement, forms, fillers and ground with which concrete is to come in contact shall be free from frost. Frozen materials or materials containing ice shall not be used. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing protection and curing to prevent excessive concrete temperatures or water evaporation that may impair required strength or serviceability of the member or structure.
2. Curing and protection shall be accomplished by preventing loss of moisture, rapid temperature change, and mechanical injury or injury from rain or flowing water for a period of seven (7) days. Curing shall be started soon after placing and finishing, and when free water has disappeared from the surface of the concrete. Expansion joints (e.j.) shall be placed at all locations where new paving abuts curbs or other structures, and in spans greater than 40 feet in length. All exterior concrete flat surfaces shall be cured within 12 hours with Kure & Seal or an written approved equal.

3.B. INTERIOR SLABS

1. When required by the Bid Document or Code, 15cm of lime waste or road stone, as needed, shall be placed on undisturbed or compacted fill. Rake sand level to a uniform thickness. Fill as needed base course of clean graded gravel, no larger than 5cm and not smaller than 0.5cm. Excavation shall not be below exterior wall base or footing.
2. A continuous 6 mil membrane shall be installed on top of gravel. Precaution shall be taken so as not to tear the membrane during concrete placement.
3. Concrete slab to be constructed with a 10cm minimum thickness.

3.C. EXTERIOR SLABS

1. When required by the Bid Document or Code, area shall be filled with 20cm compacted Granular Base-course aggregates.
2. A four 10cm with T10 rebar 5pm . shall be placed over fill. Control joints and expansion joints shall be used to divide slabs into approximate “squares” not exceeding 4m by 4m.

3.D. SLAB TOPPING

1. Existing slab shall be cleaned of all surface dirt and grease, and scrubbed thoroughly to provide a dust-free base for topping. Use a quality product manufactured specifically for this type of cleaning.
2. A minimum of 5cm concrete topping material with 6x6 10/10 welded wire shall be placed over slab. Trowel, slope and otherwise finish similar to regular slab work.

3.E. STEPS

1. **Concrete Steps** shall be formed to accurate profile with riser height not to exceed 16cm and tread to be a minimum of 33cm. Round all nosing and provide fillet on internal corners. Broom across direction of traffic. If applicable, see drawings or Bid Document for details of reinforcing.

3.F. CONCRETE REINFORCEMENT

1. Reinforced concrete work shall comply with building code requirements for reinforced concrete (ACI-318) of American Concrete Institute. Reinforcing material shall be new material conforming to the following:

- A. Deformed Steel Bars - ASTM A-305.
- B. Billet Steel Bars - ASTM A-15.

3.G. SUMP PUMP DRAIN

1. Furnish and install liner in cellar floor with gravel bottom for new sump pump. (See electrical and plumbing for sump pump.)
2. Location to be in utility area near sewer outlet. All concrete floors must slope to sump drain.

3.H. SLAB ON GRADE

1. New

All concrete slabs shall be poured monolithically and be a minimum of 10cm thick. Reinforcing shall be T10/5pm rebar 40cm o.c. both ways. Top of slab poured on existing grade shall be a minimum of 20cm above surrounding soil level. All beams shall conform to the requirements of city code.

Before concrete is poured, a slab inspection must be requested from the local building official and then pass inspection. All work shall meet the requirements of city code.

2. Repair

Foundation shall be properly supported at the designated locations through the use of piers or spread footings or other approved structural systems. The system shall be approved by a certified Professional Engineer skilled in foundation analysis. Plans shall be provided to the rehab office prior to commencement of repairs. All work shall comply with city codes and engineering specifications. Final result shall be a structurally sound system which shall be of sufficient design to support safely the loads imposed as determined from the character of the soil and prevent further structural damage and excessive differential movement for a period of 1 year.

DIVISION 4 - MASONRY**GENERAL**

This section covers all work, labor, materials, accessories, scaffolding and appliances necessary for the completion of all brick, block, anchoring, reinforcing and miscellaneous masonry work.

Repair: includes replacement of loose, missing or deteriorated elements, as identified by area in the Bid Document.

Install: includes all work necessary to provide complete masonry wall or veneer as identified by area or detail in the Work Write-Up.

4.A. PRODUCT DELIVERY, STORAGE AND HANDLING

Store materials under cover in a dry place and in a manner to prevent damage or intrusion of foreign matter. During freezing weather, protect all masonry units with tarpaulins or other suitable materials. Store concrete masonry units under covers that will permit circulation of air and prevent excessive moisture absorption. Concrete masonry units shall be protected against wetting prior to use.

4.B. JOB CONDITIONS

Masonry shall be kept to temperatures above freezing until mortar has attained sufficient strength and set so that it will not be damaged by freezing. Warm all materials in freezing weather to a minimum of 40° F and protect work by appropriate covering to prevent damage from freezing. The ambient temperature in the sheltered area shall not be less than 40° F for a minimum of 48 hours.

Protect walls against staining and keep top soils of walls covered when work is not in progress. Use non-staining, waterproofed covers, overhanging walls at least two feet.

4.C. MATERIALS

Masonry Mortar - ASTM C-270 Types S and N components

a) Portland Cement - Type I ASTM C-150, b) Masonry Cement ASTM C-91, c) Quicklime ASTM C-5, d) Hydrated Lime ASTM C-207, e) Water shall be clean and potable, and f) Sand shall conform to ASTM C-144.

Concrete Masonry Units, ASTM C-90-64 T (Load bearing). ASTM C-129 (Non-Load bearing) - Grade A, to be modular in size as set forth in the Work Write-Up.

All stored materials at the job site will be under cover and in a dry place. All concrete masonry units shall be covered at all times. During erection, all walls shall be kept dry by covering at the end of each day or shut down period with a strong water-proof membrane, and the membrane will be securely anchored so that it will remain in place during high winds or inclement weather.

4.D. CONCRETE BLOCK

1. Use standard weight 20cm x 40cm face size, with wall thickness as required by Code. Use concave ends for all block within the length of the wall, and either square ends or corner block for all corners. Lay running bond in full joints of mortar. Strike all joints and rod slightly concave on exterior to form a tight seal of mortar to block.
2. Reinforcing shall be as required in the Building Code.
3. Provide for proper ventilation.

4.E. MORTAR

1. Mortar to be type S mortar of an approximate mixture of one part Portland Cement, one-half part lime, and five parts sand, maximum. Vary as required by the Building Code.
2. Tint mortar to match existing if required.

4.F. ANCHOR BOLTS

1. Set sill plate anchor bolts 2cm x 20cm; space not more than 2m on center. Fit anchor bolt with washer or hook and anchor into grout.

4.F. LINTELS

1. All concrete lintels shall be reinforced with a minimum of two rods, sized as loading and Code requires.

4.G. TEMPERATURE

1. When the air temperature is expected to be below 0 Celcius during the placing of concrete, or within 24 hours thereafter, the temperature of the concrete as placed shall be not lower than 5 Celcius, and protected after placement during freezing or near freezing weather.
2. Do not work below 0 celcius unless special precautions are provided.
3. Use of anti-freeze agents or calcium chloride in mortar and concrete is allowed as per manufacturer's instructions.

4.H. CONCRETE BLOCK WALL

1. Remove existing deteriorated wall.
2. Replace with 10 cm concrete blocks. Set rebars in concrete footings.
3. Set new wall on 20cm x 40cm concrete footings. Fill void between new wall and existing foundation wall or firm soil with rubbish free dirt or sand. Tamp firm and level.
4. Place a minimum 5cm concrete cap, reinforced with 10cm/20 gauge wire mesh on top of wall.

DIVISION 7 - MOISTURE PROTECTION**SBS-MODIFIED BITUMINOUS WATER PROOFING****A SYSTEM PERFORMANCE REQUIREMENTS**

- 1- General: Install modified bituminous sheet roofing to withstand wind loads, structural movement, thermally induced movement, and exposure to weather, without failure.
- 2- UL Listing: Provide modified bituminous sheet roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
 - a- Provide roof-covering materials bearing UL Classification Marking on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.
 - b- Provide modified bitumen sheet roofing system that can be installed to comply with UL requirements for Fire Classified and Class 60 wind-uplift requirements.
- 3- FM Listing: Provide modified bitumen sheet roofing system and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage and that are listed in "Factory Mutual Approval Guide" for Class I construction
 - a- Roofing system shall comply with FM Class I-60 for wind-uplift resistance.
 - b- Provide roof-covering materials bearing FM approval marking on bundle, package, or container, indicating that material has been subjected to FM's examination and follow-up inspection service.
- 4- Insulation Fire-Performance Characteristics: Provide insulation materials that are identical to materials whose fire-performance characteristics have been determined for the assemblies of which the insulation materials are a part, per test method listed below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a- Surface Burning Characteristics: ASTM E 84.
 - b- Fire Resistance Ratings: ASTM E 119.

B SUBMITTALS

- 1- General: Submit the following according to Conditions of Contract and relevant Specification Sections.
- 2- Product data for each type of product specified. Include data substantiating that materials comply with requirements.

For asphalt bitumen, provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP), and equiviscous temperature (EVT).

C WARRANTY

- 1- Special Project Warranty: Submit two executed copies of a 5-year Roofing Warranty on an approved form, covering work of this section including roofing membrane, membrane flashing, roof insulation, any vapor retarders, and roofing accessories, signed and countersigned by Installer (Roofer) and Contractor.
- 2- Manufacturer's Warranty: Submit executed copy of roofing manufacturer's standard Limited Service Warranty agreement including flashing endorsement, signed by an authorized representative of modified bitumen sheet roofing system manufacturer, on form that was published with product literature as of date of Contract Documents, for the following period of time:

5 years after date of Substantial Completion.

D EXAMINATION

- 1- Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
 - a- Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1.5 mm out of plane.
 - b- Test concrete substrate for excessive moisture by pouring 0.5 L of hot bitumen at 400 deg F (204 deg C) or EVT on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling-then substrate is too wet.

E GENERAL INSTALLATION REQUIREMENTS

- 1- Cooperate with inspection and test agencies engaged or required to perform services in connection with installing modified bitumen sheet roofing system.
- 2- Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of modified bituminous sheet roofing system work.
- 3- Insurance/Code Compliance: Where required, install and test modified bitumen sheet roofing system to comply with governing regulations and specified insurance requirements.
- 4- Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work.
- 5- Asphalt Bitumen Heating: Heat and apply bitumen. Do not raise temperature above minimum normal fluid-holding temperature. Determine flash point, finished blowing temperature, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable tests. Do not exceed recommended temperature limits during bitumen heating. Do not heat bitumen to a temperature higher than 25 deg F (14 deg C) below flash point. Discard bitumen that has been held at temperature exceeding finished blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.

- 6- Aggregate Surfacing: Limit temperature of adhesive coat to minimum required for proper embedment of aggregate and maximum that will permit retention of required coating weight based on slope of surface. Bitumen Mopping Weights: For interply mopping, apply bitumen at the rate of **1.22 kg of asphalt per sq.m** (plus or minus 25 percent on a total-job average basis).
- 7- Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. Where mopping is applied directly to substrate, tape substrate joints or, where steep asphalt is used, hold asphalt back **50 mm** from both sides of the joint.
- 8- Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and any insulation. Provide temporary covering of two plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work.

F PREPARATION OF SUBSTRATE:

All areas to receive waterproofing membrane shall be clean, dry and free from all contamination. The areas shall be sound and free of surface laitence. Any contamination or laitence shall be removed by suitable mechanical means prior to the application of the surface treatment.

All dust or surface debris from the preparation processes shall be thoroughly cleaned off the substrate prior to continuing.

H MASTIC POINTING:

The turn-in of the membrane into the groove in the concrete shall be pointed with rubberized bitumen mastic.

I ALUMINUM FLASHING:

1,5 mm thick with non-corrosive fasteners to be fixed mechanically on top of the membrane where this latter is exposed to weather conditions without any hard protection.

J WATERPROOFING SYSTEM:

The membrane and primer shall be laid fixed as directed by the manufacturer of materials used.

Lap joints shall be minimum 100mm wide.

The roofing membrane shall be laid in the direction flow of the water.

along the joint by spot bonding this membrane at over lappings every 50cm with special bituminous glue.

K WARRANTY:

A ten years warranty shall be handed to the owner upon completion of the work.

The contractor shall execute and deliver to the employer before the certificate of completion, a written warranty in an approved form, stating should any defects develop during the warranty period, the contractor shall replace or satisfactorily repair such defects, including adjustments to adjacent work as required at the convenience of and without expense to the employer. The warranty period shall extend 10 years from the date of certificate of completion

L PROTECTING ROOFING

Protect roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report, with copies to Engineer and Owner, describing nature and extent of deterioration or damage found.

Repair or replace (as required) deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

DIVISION 8 - DOORS, WINDOWS, GLASS**8.A. REPAIR EXISTING DOOR**

Remove deteriorated stops, casing, trim, and jambs, and replace with new (as required in the bid document). Repair and/or replace damaged door and missing hardware (as required in the bid document) with materials of matching design and finish, or existing hardware. Install new locksets at existing exterior doors, over old cutouts with new cover escutcheon plates (as required in the bid document). Rehang door (as required by the bid document) with new hardware and new bronze tension type weather-stripping to provide a tight fit and smoothly operating doors.

Where casing trim is to be retained, remove existing deteriorated finishes, sand surfaces, and fill holes and dents to provide a smooth surface ready for new paint. Provide new weather-stripping at exterior door.

1. Adjust door:

Adjust door to open, close and lock properly. Trim any edges necessary for even reveal or fit. Adjust latch keeper (plug and re-drill old holes as needed). Sand and touchup affected surfaces to match existing.

2. Door stops:

Install new rubber tipped bumpers to all doors. Use appropriate bumpers (solid or hinged brass) for door location. All bumpers to be screwed in and not driven. **WORK SHALL INCLUDE PLACEMENT OF BRASS PLATES AT DOOR LOCATIONS PREVIOUSLY DAMAGED BY HINGE STOPS.**

8.B. REHANG DOOR

Rehang existing door(s), location as set forth in Bid Document. Restore to sound, free operating condition. Cut and plane as necessary. Adjust jambs, head, and threshold as required.

8.C. WINDOWS

3. REPAIR EXISTING WINDOWS

A. Aluminum windows

Free lower sash so that it opens properly; replace broken glass; reset loose glass; remove bad glazing; apply silicone sealant between frame and glazing; apply new glazing (vinyl) to unit(s) to make airtight seal; replace all rotted sills, casings, framing members, and trim both inside and out; install new lock and sash stop if existing is not present or cannot be repaired to operate; prep and paint all finish surfaces; all materials shall match existing. All windows shall be cleaned prior to final. All units shall at final be weathertight, operable and lockable.

8.D. GLASS & GLAZING

Glass shall be of a strength required for the size of light as recommended by glass manufacturer, and shall be free from flaws and distortion. In no case shall the glass be less than “B” strength.

Glass shall be sized to set free in the wood opening and shall be secured with metal glazing points before glazing compound is applied. Glazing compound shall be applied neatly and have a smooth appearance. It shall be painted when properly cured. Aluminum windows shall have the glass set free in metal opening, secured and sealed with silicone before installation of vinyl glazing materials (to manufacturer’s directions).

9.A. GENERAL

The work covered by these specifications include furnishing all labor, materials, tools, and equipment required for installation of finishes as enumerated in the attached Bid Document.

9.B. MATERIALS

1. Stucco – NOT APPLICABLE.
2. Plaster - to be factory prepared plaster as manufactured by U.S.G. or written approved equal. (A and B above to be of type satisfactory for intended use.)
3. Water - clean and potable free of substances harmful to stucco.
4. Admixture - “Thorougard” by Standard Dry Wall Products or written approved equal.
5. Metal Lath - 3.4 lb. diamond mesh galvanized.
6. Casing bead - 24 ga. galv. expanded flange.
7. Expansion Joint - 24 ga. galv. expanded flange.
8. Outside Corners - #1. A. exp. corner bead.
9. M.R. Gypboard - shall be ½” moisture resistant gypboard
10. Standard Gypboard - shall be ½” Gypboard
11. Rock Lath - to be as manufactured by USG, Gold Bond, or written approved equal.
12. Ceramic Tiles - to be manufactured by LECICO, or written approved equal.
13. Ceiling Tiles - to be 12” x 12”, 24” x 24” or 24” x 48” (see Bid Document) mineral fiber type III, class 25, LR grade 1. White finish fissured texture, square edge .
14. Suspension System - to be exposed Tee Grid, semi-recessed Tee Grid, or concealed accessible grid system (see Bid Document) as manufactured by Conwed, Alcan, Armstrong or written approved equal. Where suspension system is exposed type, members are to have low-sheen satin white enamel finish.
15. Vinyl Sheet Flooring - to be .070” thick as manufactured by Armstrong, Congoleum, or written approved equal. Color to be selected by Rehab Office from samples submitted. Minimum 5 year warranty.
16. Vinyl Tile Flooring - to be .080 thick in gauge and 12” x 12”, 9” x 9” in size and shall be as manufactured by Armstrong, Congoleum or written approved equal. Minimum 5 year warranty.
17. Composition Flooring - – NOT APPLICABLE
18. Rubber Sheet and/or Rubber Tile Flooring - – NOT APPLICABLE
19. Molded Rubber or Vinyl Base – NOT APPLICABLE
20. Rubber or Vinyl Stair Treads – NOT APPLICABLE
21. Paints – TINOL, SIPES, or written approved equal. To be of type and grade as recommended by the manufacturer for the kind of surface on which it is to be installed.
No lead-base paints are to be used.
22. Flashing must be high grade and rust resistant.

9.C. CERAMIC TILE REPAIR

1. Ceramic tile repairs are to be made to all walls and floors where tiles are loose, cracked, or missing. Repairs shall be made with near matching materials, or where not available by removal of all portions of the defective tile and replacing with a type readily available.
2. Remove all deteriorated joints and regrout with special grout patching mix.
3. Replace broken or cracked tile accessories such as grab bars, soap dishes, towel bars, tumbler holders, with suitable accessories of close matching design. Anchor with mortar set, organic adhesive, or anchoring device that will firmly attach accessory to wall.
4. Caulk all edges in contact with adjacent surfaces (remove old caulk). Color to match adjacent surfaces as close as possible.

9.C. PLASTER REPAIR

Remove all loose, spalling, or damaged plaster and lathing materials. At areas of loose plaster and exposed wood lath, carefully cut out damaged or loose pieces of wood lath without damage to existing sound areas of lath and plaster. In damaged areas install new 2.5 lb. wire lath anchoring firmly to existing sound lath and framing to provide backing for plaster repair. Apply plaster in three (3) coats, scratch and brown with white coat finish, allowing at least 24 hours curing between brown and finish coat.

Provide backing at holes and large cracks prior to filling and finishing. Cracks are to be repaired by widening existing cracks to form a “V” groove. Use patching plaster at crack repairs when appropriate. Spackle minor cracks and fissures as required to provide surface ready for painting. recommendations.

9.D. NEW PORTLAND CEMENT PLASTER**Materials****1. Cement**

Cement shall be Portland Cement to BS 12 or ASTM C 150 Type I.

2. Sand

Sand shall be clean, washed sharp sand to BS 1199, Table 1.

3. Lime

Lime shall be hydrated conforming to ASTM C-207, latest edition and shall be at least 92% hydrated lime putty shall be stiff mixture of lime and water, kept moist until used.

4. Angle Beads, Stop Beads, etc.

All such plastering accessories shall be standard galvanized mild steel products.

5. Mix

The mix shall be 1 part cement to three parts sand by volume, or as otherwise agreed with the Consultant. Plasticiser shall only be used with the approval of the Consultant.

6. Accessories

Angle beads shall be as manufactured by "Cantic", "Expamet" or approved equal to the approval of the Consultant.

Stop beads shall be to the approval of the Consultant.

The above accessories are from 0.56 tight coat galvanized sheet, synthetic coated, with white PVC protective nosing.

Exposed plaster stops shall be aluminium.

7. Metal Lath

Expanded metal lath diamond type shall be used at joints of dissimilar materials in order to reinforce against cracks especially at concrete/blockwork intersection and shall extend 100mm at each side.

Expanded metal lath shall be manufactured to BS 1369: Part 1:1987. The galvanized steel used in the manufacture of metal lath shall be in accordance with BS EN10142: 1991 of Fe P02G quality coating type Z275.

Sheet lath mesh shall be minimum 9mm diamond pattern, weight 1.63kg/m², galvanized.

Workmanship

1. Preparation of Substrate

Ensure that all chases or other apertures have been cut. Ensure that the substrate surface is free from dust, oil, etc. Ensure adequate key for plaster, if necessary by hacking the surface or applying a coat of approved bonding agent. Rake out joints in blockwork.

2. Trims and Joints

Fix beads, stops, angle beads, etc., plumb, square and true to line and level, as indicated on drawings.

3. Plaster

Unless single coat plastering is required or agreed by the Consultant apply plaster in two coats to a total thickness of 20mm.

Thickness and finish of plaster shall be as stated in the Bills of Quantities.

Apply spatter dash coat to all concrete and blockwork surfaces and allow to dry thoroughly. Apply first coat with rough finish to provide key for second coat.

Allow the first coat to dry thoroughly before applying second coat.

Dub out as necessary to correct inaccuracies; dubbing out shall not exceed 10mm.

Apply second coat and finish with a wood float to give smooth finish.

Each coat shall be applied firmly to achieve good adhesion, in one continuous operation. Finish the surface to a true plane to the correct line and level and plumb, with all angles and corners to a right angle unless otherwise shown on the drawings.

Wire mesh metal lathing shall be installed at all junctions of dissimilar materials and wall to wall connections, wall to ceiling connections.

Plaster to existing walls shall be in multi coats with wire mesh to achieve the verticality of the finished wall.

9.E. CERAMIC WALL AND FLOOR TILE

Ceramic tile shall be LECICO or equivalent , Dimensions and colours to be approved by UNDP Engineer. All tile shall be set true, level and plumb. Standard wall tile adhesive or concrete mortar shall be used unless otherwise specified. Wall surface shall be free of defects before applying tile, and surface preparation shall conform to manufacturer's specifications.

1. **FLOOR TILE REPAIR** - Furnish all labor and materials necessary to repair existing floor tile. All surfaces shall be clean, dry, and free from excessive adhesive. Surfaces shall be smooth and straight.
2. **FLOOR CLEANING** - Furnish and install all labor and materials necessary to clean floor, base, and/or vinyl base. Cleaning products shall not be abrasive as to damage surface, or hazardous to the applicator or residents. Surfaces shall be clean of grease, dirt, and residue.

9.F. NEW CERAMIC WALL TILES

Product Handling

1. Tiles

The tiles shall be transported and stored in the manufacturer's cartons with seals unbroken and labels intact until time of use.

Tiles shall at all times be handled and stored to prevent damage and soiling.

2. Pointing Mortar and Grout

Materials shall be transported and stored in the manufacturer's sealed containers until required for use and shall at all times be handled in accordance with the manufacturer's instructions.

3. Cement and Sand Mortar

Cement and sand mortar shall be as specified in 04220 Concrete Unit Masonry.

Materials1. Glazed Ceramic Wall Tilesa. Source

All tiles shall be obtained from "Uniceramic" or approved equal. Each type of tile shall be obtained from a single manufacturer together with all fittings and specials relating to that type.

b. Tiles

The tiles shall be to BS 1281 with cushion edges and spacer lugs. Fittings and specials shall be to BS 1281: round edge fittings shall be as Fig. 1 in the BS.

c. Sizes

Size shall be as indicated on the drawings or as otherwise agreed with the Consultant. Tolerances shall be in accordance with BS 6431.

d. Colours, Finish and Patterns

Colours, finish and patterns shall be selected by the Consultant and shall accurately match approved samples.

e. Defects

The tiles shall be entirely free from defects and blemishes.

f. Characteristics

Bond strength 50 PSI
Break strength 250 lbs or greater wall
Resistance to wear index of 50
Water absorption 0.3%

2. Mortar

Cement and sand mortar shall be 1:3.

The cement shall be portland cement to BS12. The water shall be clean, free of impurities and the least needed for proper workability.

The bedding mortar shall consist of a mixture not richer than 1 Part cement to 3 parts sand and not leaner than 1 part cement to 4 parts sand, and shall be not less than 12mm thick. The sand for the mortar shall be in all respects in accordance with the requirements of BS 1200. The cement shall be Portland Cement to BS 12. The water shall be clean and free of impurities.

3. Grout

The ceramic tiles grout shall be determined by the Consultant. The grout shall be used in accordance with the instructions of the manufacturer. The Consultant shall determine what grout will be used if there was a danger of damp penetration.

Workmanship

1. General

- a. Manufacturer's recommendations are to be strictly followed for all products and materials.

- b. Standards

Comply with the requirements of BS 5385, Part 1.

- c. Setting Out

The tiling shall be set out strictly in accordance with the Consultant's drawings or approved Contractor's drawings.

Cut tiles shall be kept to a minimum and shall not be less than half the width of a full tile. Joints shall be truly horizontal and vertical and horizontal joints in adjacent walls shall align. All joints shall be 1.5mm wide or as determined by spacers.

- d. . Tolerance

Maximum permissible gap under a 2m straight edge shall be 3mm.

Owing to variations which may occur in tile sizes within the limits of BS 6431, the Contractor shall be responsible for sorting all tiles into batches after delivery to site and before any fixing is commenced. Each batch shall contain tiles of the same size and the tiler shall apportion the batches to ensure that only tiles of one size are used in any one room.

2. Background

- a. Acceptance of Background

Before fixing tiling ensure that the background is:

- i. Adequately true and level to achieve specified tolerances.
- ii. Free from contamination and loose areas.
- iii. Adequately prepared to give a good bond.

3. Fixing

a. Preparation of Tiles

Tiles which are dirty or have a coating of dust shall be cleaned with clean water, but must be entirely dry before application of adhesive.

b. Mortar Bedding

Mortar fixing shall be used for bedding ceramic wall tiles.

c. Cleaning Off

Remove surplus mortar as soon as bedding is complete. Do not disturb tiles.

4. Grouting

When bedding has set sufficiently to prevent disturbance of tiles, but not more than 7 days after fixing, all joints are to be grouted by working ceramic tile grout in so that the joint is completely filled. Finish flush and thoroughly clean off surplus grout as the work proceeds using a damp cloth. Tool joints smooth.

5. Finishing

The finished work shall be left clean and free from cement, plaster, paint, dust or any other marks or imperfections; cleaning down must not be carried out with materials which will scratch or in any way impair the finished work.

Final polishing shall be done with a soft dry cloth.

6. Protection

The Contractor shall adequately protect the tiling from all damage, howsoever likely to be caused, until the handing over. Any damage which does occur shall be made good by the Contractor at his own expense. The whole of the work shall be prepared for handover in a state satisfactory to the Consultant.

9.G. CERAMIC FLOOR TILES

Product Handling

1. Tiles

The tiles shall be transported and stored in the manufacturer's cartons with seals unbroken and labels intact until time of use.

Tiles shall be handled and stored at all times to prevent damage and soiling.

2. Bedding Materials

Cement, aggregates, etc., shall be handled and stored.

3. Pointing Mortar and Grout

Cement and Sand mortar shall be 1:3

The cement shall be Portland cement to BS12. The water shall be clean ,free of impurities and the least needed for proper workability.

The bedding mortar shall consist of a mixture not richer than 1 part cement to 3 parts sand and not leaner than 1 part cement to 4 parts sand , and shall be not less than 12 mm thick. The sand for the mortar shall be in all respects in accordance with the requirements of BS 1200 . The cement shall be Portland Cement to BS 12. The water shall be clean and free of impurities.

Materials

1. Tiles

- a. All tiles shall be as manufactured by "Uniceramic", "Lecico" or approved equal to the approval of the Consultant. Each type of tile shall be obtained from a single manufacturer together with all fittings and specials relating to that type.
- b. All tiles shall be in accordance with Standards as listed in Clause B3 above.
- c. Tiles shall have an approved anti-slip surface produced by the nature of the tile ingredients and not by ribbing, projecting studs or other form of surface profiling.

d. Sizes

Size shall be 300 x 300 x 6mm as indicated on drawings, schedules and Bills of Quantities or as directed by the Consultant. Thickness of tiles shall be approved by the Consultant.

- f. Skirting tiles shall be 80mm high x 6mm thick and shall match the floor tiles and be from the same manufacturer.

g. Colours, Finish and Defects

These shall be selected by the Consultant and shall accurately match approved samples. The tiles shall be entirely free from defects and blemishes.

All ceramic tiles shall be mat.

- h. Tiles shall be fully vitrified as defined in BS 6431

I. Characteristics

Bond strength 50 PSI
Break strength 250 LBS or greater wall
Resistance to wear index of 50
Water absorption 0.3 %

2. Bedding Materials: Mortar

Cement shall be Portland Cement to BS 12. Sand shall comply with the requirements of BS 1200 clean, sharp, not too fine and free from clay, organic or soluble matter. Sea sand shall not be used. The water shall be clean, free of impurities and the least needed for proper workability. The mixture shall be not richer than 1:3 and not leaner than 1:4, cement: sand, and the mortar shall not be less than 12mm thick.

3. Grout

The grouting mortar shall be flooring grade coloured grout to the Consultant's approval.

Workmanship

1. General

The floors shall be laid in accordance with BS CP 202.

2. Inspection and Protection of Base

The Contractor shall inspect the base on which the ceramic tiles are to be laid. The base surface shall be thoroughly clean, free from dust, oil, plaster, lime or other foreign materials immediately before tile laying is commenced.

3. Bay Division

The floor areas shall be sub-divided into bays not exceeding 10m² with the long side of each bay not exceeding the shorter side by more than one and a half times.

Movement joints around the perimeter of the floor and at bay sub-divisions shall be 6mm wide, through the depth of the tile and bed, filled with strip filler materials and finished with sealant.

4. Ceramic Tile Fixing

Ceramic tile fixing shall be carried out in accordance with BS CP 202 and manufacturer's instructions.

Maximum permissible gap under a 2m straight edge shall be 3mm

5. Grouting

The tiling shall be grouted on completion with non-shrink grout of a colour to match the tiles, ensuring, that all joints are completely filled.

Surplus grout is to be cleaned off the face of the tile and adjoining surfaces and the tiles are to be carefully cleaned.

6. Final Cleaning

The finished work shall be left clean and free from cement, plaster, paint, dust or any other marks or imperfections; cleaning down must not be carried out with materials which will scratch or in any way impair the finished work.

The final polished surface is to be washed with hot water and alkali-free detergent, and left clean and protected from damage to the satisfaction of the Consultant.

7. Protection

The Contractor shall adequately protect the tiling from all damage, howsoever likely to be caused, until the handing over. Any damage which does occur shall be made good by the Contractor at his own expense. The whole of the work shall be prepared for handover in a state satisfactory to the Consultant.

9.H. EPOXY FLOOR COATINGS

Product Handling

The material shall be supplied in the manufacturer's sealed containers, properly labeled, and shall be stored as recommended by the manufacturer.

Materials

The Coating shall be safety abrasive flooring 'Epoxy' type or other approved equal surface applied coating containing a fine grade carborundum or other approved abrasive component.

Workmanship

The coating shall be applied entirely in accordance with the manufacturer's instructions.

9.I. PAINTING

Scope

1. This section includes the Site Painting of all interior and exterior items and surfaces throughout the project except as otherwise indicated or work having a natural specified finished surface. The term 'Painting' in this context covers all coating and finishing systems and their component or accessory materials whether used as prime, intermediate or finish coats, and this Specification includes the Site preparation of surfaces by cleaning, roughening, rubbing down, stopping and filling, or other preparatory process all as specified hereunder.

All exposed items and surfaces shall be painted and all materials that require a protective coating shall be painted except where indicated on drawings or schedules as being unpainted, work having a natural specified finished surface, and work covered in the following paragraph.

The work covers the painting and protection of all plant, apparatus, pipework and equipment installed under the Mechanical and Electrical Work.

Performance and Standards

1. All painting systems shall be entirely satisfactory in terms of compatibility of constituent to substrate, adhesion, coverage, colour-fastness and durability in the climatic and other conditions pertaining to the site within the limits of accepted good practice.
2. Work in this section shall comply with:

BS CP 231 Painting of Buildings.
BS CP 3012 Cleaning and Preparation of Metal Surfaces.
BS 3900 Methods of Tests for Paints.
BS 5493 Code and Steel Structures against corrosion.
3. All materials shall conform to applicable British Standards whether referred to in this Section or not.

Related Items

05030 Metal Finishes
08110 Steel Doors
08210 Wood Doors
08215 Wood Shop Fronts
09220 Portland Cement Plaster
09225 External Render

Submittals**1. Manufacturer**

The names, official addresses and technical brochures of the paint manufacturers, giving properties of materials, shall be submitted to the Consultant for clearance, prior to ordering.

2. Manufacturer's Instructions

Provide the Consultant with copies of the manufacturer's application instructions and call his attention to any discrepancy between these instructions and the Specification. Obtain the written concurrence of the Consultant and manufacturer as appropriate to any proposed change in either Specification or manufacturer's instruction.

3. Coordination

Ensure that the paint manufacturer is aware of and accepts the substrate to which his product is applied, in particular, to ensure compatibility, where the surface to be painted has already received a coating such as shop-applied primer. Provide barrier coats over incompatible primers or remove and reprime as required.

4. Colour Samples

After selection but prior to application provide samples of each colour on cards 500 x 500mm and obtain the Consultant's approval thereof.

5. Control Samples

Complete representative sample areas of each type of coating as directed by the Consultant, including preparation of surfaces. Obtain approval of appearance before proceeding. Provide, for the Consultant's inspection, lighting conditions such as those under which the work will normally be seen.

6. Testing

Arrange for any tests called for by the Consultant to be carried out to determine compliance with the Specification, and submit the results of the tests to the Consultant.

Permit coating manufacturers to inspect work in progress and to take samples of their products from Site if required. The results of any tests carried out by or on behalf of manufacturers shall be submitted to the Consultant.

7. Certificates

The Contractor shall submit test certificates in respect of any fire-retardant coatings he proposes to use.

Product Handling**1. Delivery and Labeling**

Coating materials and all materials used in painting shall be delivered to Site in sealed undamaged containers, clearly labeled with the following information:

- a. Type of material.
- b. Manufacturer's name, brand name, if any, and identification related to colour schedules.
- c. Manufacturer's batch number and date of manufacture.
- d. Contents by volume for major pigment and vehicle constituents.
- e. Manufacturer's intended use.
- f. Thinning and application instructions.

2. Order of Use

Batch deliveries of coating materials shall be dated for use in order of delivery which shall reflect the order of manufacturing dates.

3. Container Size

Paints other than water-based and bituminous paints shall be delivered in containers not exceeding 5 litres capacity.

4. Storage

Store materials in a clean, dry area protected from extreme temperatures. Keep storage space neat and accessible at all times. Protect floors from paint spillage. Discard and remove from Site any paints in containers which have received any but superficial damage.

5. Pre-Installation Protection of Mechanical and Electrical Equipment

All ferrous apparatus and equipment shall be provided at the manufacturer's Works with a protective coat of primer paint to minimize corrosion prior to installation.

All bright, polished machined parts, chrome-plated or similarly finished components shall be wrapped with self-adhesive plastic which shall be retained on Site by the Contractor, until the equipment is commissioned. The Contractor shall then remove the wrapping, clean up and re-instate the original finish.

Material1. General

Coating materials shall be obtained from one approved manufacturer only for each type of material. All coats from primer to finishing coat in a system shall be from the one manufacturer.

Painting materials shall be as manufactured by "Sipes", "Tinol" or approved equal.

2. Filling, Stopping, Cleaning Materials

a. Paint strippers, abrasive papers and blocks, cleaning agents, etching solutions, mould inhibitors, rust inhibitors, size, stopping, knotting, fillers and other ancillary materials shall be the best of their respective kinds, used as recommended by their respective manufacturers and the decorative coating manufacturer for the surface being prepared, unless otherwise specified.

b. White spirit shall be to BS 245.

2. Filling, Stopping, Cleaning Materials (Cont'd)

c. Knotting shall be to BS 1336.

d. Stopping for woodwork to receive clear finish shall be tinted to match surrounding woodwork, to approval.

e. Stopping for other internal work shall be plastic base, non shrinking.

3. Gloss/Semi-Gloss Paint

a. Long - oil based alkyd paint, undercoats and finishing coats to BS 2524.

b. Polyurethane based paint, undercoat and finishing coat.

c. Titanium Dioxide paint, undercoat and finishing coat.

4. Emulsion Paint

Vinyl emulsion paint, matt and semi-gloss as directed by the Consultant. All emulsion paints shall be vinyl unless otherwise specified.

5. Emulsion Primer/Mist Coats

Material shall be thinned strictly in accordance with manufacturer's instructions.

6. Wood Primer

Acrylic.

7. Steel Primer
 - a. Calcium plumbate to BS 3698.
 - b. Zinc-rich primer.
8. Steel Primer for Mechanical Work

Zinc chromate.
9. Galvanized Steel Primer

2 pack etching primer.
10. Bituminous Paint

To BS 3416.
11. Anti-Alkaline Primer

As recommended and manufactured by the manufacturer of follow-up coats
12. Lead Content

Lead content in the pigment shall not be allowed.
13. Putty

Putty to wood and cement surfaces shall comply with the following standards:

ASTM	C.321-83 and D.2486-79
BS	2750, sound reduction.
BS	1191, 4551, 5270, 5492 and 6214 C and E.
NF	T 30-606 and 30-608
US Federal	TT C-555, textured coating

Putty material for wood surfaces, concrete and plaster surfaces shall be as manufactured by "alltek" or approved equal to the approval of the Consultant.

Workmanship

1. Preparation
 - A Generally
 - a. Prepare surfaces in accordance with decorative coating manufacturer's recommendations.

- b. Remove ironmongery, electrical plates and fittings, etc., from surfaces to be decorated and refix on completion of decoration.
- c. Use rust inhibitors, size, stopping, knotting and fillers in accordance with manufacturer's recommendations.
- d. Ensure that all holes, cracks, defective joints and other defects in surfaces to be prepared and decorated have been made good so that they are not visible when decoration is completed.
- e. Ensure that pre-primed surfaces have been properly prepared and that the primer is of a suitable type, firmly adhering and in good condition.
- f. Before decorating allow surfaces to dry thoroughly.
- g. Brush down all surfaces immediately before decorating to remove dust, dirt and loose material. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning.
- h. Apply three (3) coats of putty to concrete and plaster surfaces.

B New Concrete, Block, Plaster and Render Surfaces

- a. Remove release agents by washing with a weak detergent solution and rinse off with clean water.
- b. Ensure that surface deposits and loose or flaking material are removed.
- c. Efflorescence: Remove surface salts with a stiff brush or coarse dry cloth. Remove residue with a damp cloth frequently wrung out in clean water. Leave for 48 hours and repeat process if further efflorescence occurs. Sand or scrape glossy-surfaced hard bloom to provide a key for finish.

C New Iron and Steel Surfaces

- a. Manual cleaning: chip, scrape and wire-brush surfaces to remove loose scale, welding slab and spatter. Clean out crevices. Remove oil, grease and dirt using white spirit, naphtha or steam.
- b. Pre-primed surfaces: ensure that defective primer, rust and loose scale are removed back to bare metal, and patch primer to match existing. Remove dirt and grease from satisfactorily primed surfaces and rub down lightly.

D New Timber, Plywood, Chipboard, Fibre Board Surfaces

- a. Moisture content: ensure that at time of decorating timber has a moisture content appropriate to its use.

- b. Loose knots: ensure that large and dead knots are removed and made good with sound timber. Rub down flush before priming.
- c. Smoothness: ensure that surfaces have a smooth, even finish with arises rounded or eased.
- d. Nail and screw heads: ensure that heads are countersunk sufficiently to hold stopping. Ensure that pelleting is of full size, fills the whole of the recess and is securely fixed.
- e. Stopping for painting: after priming, stop nail and screw holes and similar depressions with stopping pressed well in. Finish off brush with surface.
- f. Stopping for clear coatings: stop nail and screw holes and similar depressions with stopping to match colour of timber, pressed well in. Finish off flush with surface.
- g. Knotting: remove resinous exudations and apply knotting to resinous timber and all knots and allow to dry.
- h. Degreasing: wash down with white spirit immediately before priming hardwoods containing an excess of natural oil. Clean off surface oils from building boards with white spirit and roughen surface with fine abrasive paper. Dust of surface before decorating.
- j. Filling: after priming or sealing and stopping, fill pore and grain irregularities with filler, brush or knife applied. Remove surplus and rub down to leave a smooth, even surface.
- k. Pre-primed surface: ensure that any areas of defective primer are removed and patch-primed to match existing. Remove dirt and grease from satisfactory primed surfaces and rub down lightly.

2. Coating Materials

A Generally

- a. Prepare surfaces for decoration as specified in G1 above.
- b. Where surfaces have been treated with preservatives, check with treatment manufacturer that coating materials are compatible with the treatment.
- c. Cleanliness:

Keep all brushes, tools and equipment in clean condition. Keep all surfaces clean and free from dust during coating and drying.
- d. Provide suitable receptacle for liquids, slop washings, etc.

B Precautions and Protection

- a. Place paint or solvent soaked rags, waste or other materials which might constitute a fire hazard in metal containers and remove from premises at close of day's work. Take every precaution to avoid damage by fire.

- b. Protect freshly applied coatings from damage.
- c. Exhibit 'Wet Paint' signs and provide protection barriers where necessary.
- d. Protect adjacent surfaces adequately.
- e. Protect cordage, seals and the like from contamination by paint. Remove any paint that does get on by appropriate solvent.
- f. Remove ironmongery and other fittings as in G 1.01 (b) above. Items which must remain in position during painting must be adequately and carefully taped.

C Preparation of Materials

- a. Generally. Prepare coating materials as recommended by their manufacturers.
- b. Strain through fine gauze any coating materials showing bittiness in application.
- c. Do not intermix different coating materials.
- d. Stir coating materials to attain an even consistency before use unless otherwise recommended by manufacturers.

D Application

- a. Carry out decoration in colour as selected by the Consultant and in accordance with approved samples.
- b. Generally: apply coatings in accordance with their manufacturer's recommendations to clean, dry surfaces in dry dust free atmospheric coats have hardened.
- c. Covering capacity: the Contractor is to allow for quantities of paint necessary to give proper cover in the number of coats specified and in accordance with the nature of the material to which it is to be applied.
- d. Unsuitable conditions: do not apply coatings:
 - i. To surfaces affected by moisture or frost.
 - ii. When ambient temperature is below 4 degrees C.
 - iii. When heat is likely to cause blistering or wrinkling.
- e. Priming Generally:
 - i. Apply priming coats by brush unless other methods are approved.
 - ii. Work primer into surface, joints, angles and end grain.

- iii. Ensure that priming coats are of adequate thickness and suit surface porosity.
- iv. Ensure that any primed surfaces which have deteriorated on Site or in transit are touched up or re-primed.
- f. Concealed joinery surfaces: apply priming coat to all concealed surfaces of built in joinery components before fixing.
- g. Priming metal: prime metal surfaces on same day as they have been cleaned.
- h. Undercoats: apply an even film over all exposed surfaces, avoiding uneven thickness at edges and angles.
- j. Finishing coats: apply an even film over all exposed surfaces, avoiding brush marks, sags, runs and other defects.
- k. Rub down all priming and undercoats to a smooth surface with abrasive paper and remove all dust before applying the next coat.
- l. Cut in neatly and cleanly. Do not splash or mark adjacent surfaces.
- m. Brush Painting:
 - i. Apply all paints by brush unless otherwise specified.
 - ii. Lay off all areas evenly and ensure that finished surfaces are free from brush marks.
- n. Roller painting will be permitted in the application of emulsion paint.
- p. Spray painting will be permitted in the application of emulsion paint.
- q. Spray Painting: mask all adjoining surfaces.
- r. Cleaning: clean off any paint spots or spillage from adjacent surfaces as the work proceeds without damage to that surface.

H. Schedule of Interior Painting

- 1. Paint interior surfaces exposed to view in accordance with this Schedule of Interior Painting, except as specifically shown or specified. For number of coats refer to Bills of Quantities.
- 2. Ferrous Metal
 - a. Shop-Primed
 - i. Undercoat: Spray Enamel Undercoater

- ii. Putty
 - iii. Finishing Coats: Spray Alkyd Eggshell Enamel
 - b. Galvanized
 - i. Prime Coat: Spray Zinc Dust Primer
 - ii. Putty
 - iii. Undercoat: Spray Enamel Undercoater
 - iv. Finishing Coats: Spray Alkyd Eggshell Enamel
3. Plaster
- a. Enamel Finish
 - i. Prime Coat: Latex Primer
 - ii. Putty
 - iii. Undercoat: Enamel Undercoater
 - iv. Finishing Coats: Alkyd Eggshell Enamel
 - b. Flat Finish
 - i. Prime Coat: Latex Primer
 - ii. Putty
 - iii. Undercoat: Latex Undercoater
 - iv. Finishing Coats: Latex Flat
4. Wood
- a. Shop-Primed
 - i. Undercoat: Enamel Undercoater
 - ii. Finishing Coats: Varnish
 - b. Plywood and Softwood
 - i. Prime Coat: Alkyd Primer Sealer
 - ii. Putty
 - iii. Undercoat: Enamel Undercoater
 - iv. Finishing Coats: Alkyd Eggshell Enamel

DIVISION 15 - PLUMBING**15.1 PIPE WORKS AND FITTINGS****A. General Requirements**

Supply and install, wherever shown on the drawings and as specified herein, all pipe works and fittings.

All pipes shall carry the Kite Mark of the standard to which they are manufactured, clearly indicated at intervals. Pipes without the above markings shall be rejected.

Pipe works shall be installed in a manner to allow for ease of air escape and system draining. It shall be endeavored to obtain this naturally by gravity; however, where conditions do not permit it, an automatic air vent shall be supplied and installed at all air pockets locations and a drain valve shall be supplied and installed at all low points and risers legs.

In addition to the stipulations of the above paragraph, cold and hot water pipes supplying bath rooms as well as all vertical risers shall be provided with automatic air vents and associated drain pipes.

Drainage pipes shall be installed with a slope of not less than 1% unless specifically indicated otherwise on the drawings.

Drainage pipes installed underground shall be minimum 2" diameter.

Before installing any pipe, it shall be internally cleaned from dirt, debris, etc, by passing through it a cleaning cloth.

Pipes shall be installed in a neat manner with runs parallel and branching or changes in direction at 90 or 45 degrees. Change in direction and size, branching and jointing of pipes shall be made with regular pipe fittings (elbows, tees, reducers etc...). Pipe bending shall not be accepted. All elbows shall be long radius. All drainage fittings shall be long radius sweep type.

Field fabricated fittings, bushings, close nipples and street elbows shall not be allowed.

Sleeves shall be supplied and installed wherever pipes cross slabs, walls, partitions, etc, Sleeves shall be cuts of galvanized steel pipes having an internal diameter of not less than 1 1/2" (4cms) larger than the outside diameter of the bare sleeved pipe or the insulated sleeved pipe.

Floor sleeves shall protrude about 3/4" (2cms) above finished floor level and shall be flush with finished walls. Gaps between sleeves and pipes shall be filled with non-flowing plastic or waterproof mastic filler or paste.

Escutcheons shall be provided at all sleeves, when exposed to view. Escutcheons shall be chrome-plated.

Cleanouts shall be supplied and installed at all changes in direction and every 15 meters of long runs of soil, waste and drain and rain water drain pipes,

Unions or flanges shall be provided at adequate intervals in the piping networks, as approved by the Engineer, to permit easy disassembly for alternations and repair.

Unions or flanges shall be provided at connections to equipment, near valves, controls, strainers and other accessories requiring removal.

All pipes shall be supplied and installed complete with the followings:

- a. All connections and fixings to equipment and accessories.
- b. Unions, flanges, couplings, elbows, crosses, reducers, caps, etc,
- c. Expansion joints wherever specified or indicated on the drawings as well as all passages of pipes at structural expansion joints.

On drain and soil pipes, expansion joints shall be packing type.

- d. Shock absorbers or water hammer arrestors at quick closing valves as well as automatic air vents at high points and drain valves at low points.
- e. Dielectric unions or flanges wherever copper pipes connect to ferrous pipes, or wherever dissimilar metals liable to galvanic corrosion are connected together.
- f. Metallic supports, saddles, anchors, etc,
- g. All cutting, patching and making good of walls, slabs, partitions, etc, in connection with fixing, supporting and anchoring of pipes within the building.
- h. All works of excavations, trenching, back filling and making good of roads, green spaces, walkways, etc, in connection with installing of pipes outside the building.

Buried metallic pipes shall be wrapped with corrosion protection tape or other approved type of protective cover (i.e. Denso tape or equal).

B. Pipes Material

Unless otherwise noted on drawings, pipe materials to be used shall be as follows:

- a. Galvanized steel pipe and fittings for exposed domestic cold water on the roof.
- b. Polypropylene Random (PPR) and fittings for domestic cold, hot and potable and heating water, to be provided with aluminum protection wherever noted.
- c. Polypropylene drainage pipes for laboratory drainage system.

- d. UPVC non-pressure pipe and fittings for soil waste and vent pipes and rainwater pipes
- e. Black seamless steel pipes and fittings for fire water system and fuel oil pipes and heating system when noted.

C. Black Steel Pipes

Supply and install all black steel pipes as specified herein

Each black steel pipe shall conform with the following requirements:

- a. Black steel pipes shall be seamless steel to ASTM A106 Grade B, schedule 40 or conforming to DIN 2440, BS 1387 medium class or equivalent international standard for steel pipes.
- b. Pipe fittings (tees, elbows, crosses, reducers, unions, flanges, etc.) shall be of the same weight and quality as the pipe.
- c. Pipes and fittings up to 2" shall be black malleable iron suitable for threaded connections.

Each black steel pipe shall conform with the following requirements: (Cont'd)

- d. Pipes and fittings larger than 2" shall be black seamless suitable for welded connections.
- e. Fittings up to 2" shall be banded with threaded connections.
- f. Pipe wall thickness and weight shall be as follows:

Pipe Size (inches)	Thickness (mm)	Weight of Plain End Pipe Kg/m
1/2	2.65	1.22
3/4	2.65	1.58
1	3.25	2.44
1 1/4	3.25	3.14
1 1/2	3.25	3.61
2	3.65	5.10
2 1/2	3.65	6.51

D. Galvanized Steel Pipes

Supply and install all galvanized steel pipes as specified herein.

Each galvanized steel pipe shall conform with the following requirements:

- a. Galvanized steel pipes shall be seamed steel medium weight conforming with DIN 2440, BS 1387 medium class or equivalent international standard for steel pipes.
- b. Pipe fittings (tees, elbows, crosses, reducers, unions, flanges, etc.) shall be galvanized steel of the same weight and quality as the pipe.
- c. Pipes and fittings shall be suitable for threaded connections.
- d. Fittings shall be banded with threaded connections.
- e. Pipe thickness and weight shall be same as those for corresponding black steel pipes.

E. UPVC Non-Pressure Pipes

Supply and install all UPVC pipes as specified herein.

Each UPVC pipe shall conform with the following requirements:

- a. Plastic pipes shall be extruded unplasticized PVC (UPVC) conforming to the following British Standards or approved equal, for non-pressure drainage pipes:
 - Pipes 32mm to 50mm diameter to BS 5255. for above and under ground pipes
 - Pipes 82mm to 160mm diameter installed above ground: to BS 4514.
 - Pipes 110mm and 160mm diameter installed underground: to BS 4660.
 - Pipes larger than 160mm diameter to BS 3506.
- b. Pipe fittings shall be UPVC of the same weight and quality as the pipe.
- c. All pipes and fittings shall be marked with the Kite Mark of the standard to which they are manufactured.
- d. Unless specifically stated otherwise, pipes and fittings for drainage works shall be suitable for rubber ring pressure joint. Sealing rings to be rubber to BS 2494 Part 2.

F. Pressure UPVC Pipes and Fittings

Supply and install all pressure UPVC pipes and fittings as specified herein.

- a. All pressure UPVC pipes shall be of extruded unplasticized Polyvinyl Chloride to BS 3505 class E or approved equal International Standards. Fittings shall be of same material and pressure as pipe.
- b. All joints shall be of the solvent weld joint.

G. Polypropylene Random (PPR)

Polypropylene pipe shall be of high grade polypropylene random (PPR), to comply with DIN 16962 appropriate to the service working pressure. The tube shall be provided in straight lengths form.

Joints and fittings shall be welded type, of the same material and type of the tube. Fittings shall consist of gunmetal bodies coated with polypropylene suitable to be welded to the tube at one end and to receive a threaded coupling at the other end.

Welding shall in all cases be carried out by skilled craftsmen who are in possession of a current certificate of competency issued by an approved authority. Specimen welds, representative of the thickness and diameter of the joints and the condition of site welding, shall be submitted as required by the Engineers in request of every craftsman employed in such work.

When the general hydraulic tests of the completed systems are carried out, each weld shall be lightly hammered whilst pressure is maintained. If any leaks occur, the portion of the weld near the leak shall be cut out and re-welded. Should a considerable portion of the welded joints made by a particular operative be found to be defective due to faulty workmanship, all such welds shall be cut out and re-welded by another operative whose work has proved satisfactory.

All expansion loops shall be proportioned such that the total stress set up in the material of the pipe wall; taking into account the components due to internal pressure, torsion and bending; is taken up in the geometry of the changes of direction.

All expansion loops shall be generally inserted in the pipe lines in such a manner that cold draw to extend of one-third of the anticipated expansive movement is taken up. Such conditions shall be agreed on the site with the Engineer at time that erection is taking place.

Expansion loops shall be factory fabricated of similar materials to the pipe work

15.2. PIPE HANGERS AND SUPPORTS

A. General Requirements

- a. Supply and install pipe hangers and supports to properly carry weight of pipes and accessories without sagging as specified and required.
- b. Hangers and supports shall be designed and tested to sustain a load 8 times the actual supported load, and shall be easily adjustable.
- c. Hangers and supports shall be steel with smooth flat bearing surfaces and shall allow free movement of pipes due to expansion and contraction without any deformation. Hangers and supports for UPVC Pipes shall be of material, type and spacing strictly in accordance with manufacturer's recommendations.
- d. Hangers and supports on insulated pipes shall have galvanized steel sheet protection saddles or shields, 3mm thick, 30cms long to fit outside diameter of insulation and cover 180° of arc.
- e. Pipe anchors and guides shall be 3/4" diameter U-bolt.
- f. Piping to be independently supported of equipment and located at adequate intervals to avoid air pockets and dirt traps. All branching shall be directly supported.
- g. Spring cushions shall be used where pipe is subject to considerable vertical movement or vibration.
- h. Insulated hot pipes shall be supported on a clevis hanger or pipe clamp lined with protection shields.
- j. The contractor shall submit shop drawings for all types of supports showing construction details.
- k. Hangers and supports locations shall be shown on shop drawings.

B. Steel Pipe work

Horizontal steel pipe supports shall be installed at intervals not exceeding the maximum support spacing and by hanger rod of minimum size as follows:

<u>Pipe Diameter</u>	<u>Maximum Support Spacing -M</u>	<u>Minimum Size of Hanger Rod (mm)</u>
1/2"	1.5	10
3/4"	1.8	10
1"	2.0	10
1 1/4"	2.5	10
1 1/2"	2.7	10
2"	3.0	10
2 1/2"	3.3	13
3"	3.6	13
4"	4.2	16
5"	4.8	16
6"	5.2	22
8" and larger	5.8	25

Vertical steel pipe supports shall be installed at a minimum of every storey height.

C. UPVC Pipe work

The following shall be used as a guide line. Manufacturer's recommendations shall be strictly followed:

<u>Pipe Diameter</u>	<u>Maximum Support Spacing</u>		<u>Minimum Size of Hanger Rod</u>
	<u>Horizontal Pipes (cm)</u>	<u>Vertical Pipes (cm)</u>	
1/2"	60	120	10 mm
3/4"	70	140	10 mm
1"	75	150	10 mm
1 1/4"	80	160	10 mm
1 1/2"	90	180	10 mm
2"	105	210	10 mm
3"	135	270	13 mm
4"	150	300	16 mm
6"	180	360	16 mm
8" and larger	215	360	16 mm

D. PPR Pipe Work

The following shall be used as a guide line. Manufacturer's recommendations shall be strictly followed:

External Pipe Diameter (mm)	Maximum Horizontal Pipe Support Spacing (cm)	Temperature C	0	20	30	40	50	60	70
16		70	50	50		50	50		50
20		85	60	60		60	55		50
25		105	75	75		70	65		60
32		125	90	90		80	75		70
40		140	100	100		90	85		80
50		165	120	120		110	100		95
63	105	190	140	140		130	115		
75	115	205	160	150		140	125		
90	125	220	160	160		150	140		

Maximum support spacing for vertical pipes is 1.3 times that of horizontal pipe support spacing.

Approved manufacturer: obtain pipe hangers and supports from one of the followings:

- Mupro (Germany)
- Sikla (Germany)
- Walraven (France)

or approved equal.

15.3. VALVES AND SPECIALTIES

A. General Requirements

Supply and install, wherever shown on the drawings and as specified herein, all valves and specialties.

In addition to valves proper, this section is applicable to the strainers, safety valves, automatic air vents, float valves, etc,

The drawings indicate locations of major valves only. This does not limit the Contractor's responsibility to supply and install all valves and specialties specified separately under equipment or systems and in full compliance with the requirements of this section and the following stipulations:

- a. Valves shall be designed for a working pressure of not less than 125 psi steam working pressure rating and 200 psi cold water non-shock pressure rating unless otherwise specified.
- b. Valves 2" diameter and less shall be bronze, threaded ends.
- c. Valves 2 1/2" diameter and larger shall be cast iron, flanged ends.
- d. Valves on fire service pipes are to be of the indicating type.
- e. Unless specifically stated otherwise, valves shall be of the same size as the pipes on which they are installed.

Whenever the pipe size on which valves are to be installed is larger or smaller than the equipment connection provided, an enlarger or reducer shall be first installed at the equipment connection to the required pipe size, after which the valves can be installed.

- f. A conical union shall be supplied and installed with each threaded valve.
- g. Install silent check valves on pump discharge pipes.
- h. Approved Manufacturers: obtain valves from one of the following:

Crane Co.	(U.S.A or U.K.)
Nibco	(U.S.A)
Newman-Hattersley	(U.K.)
Serseg	(France)

or approved equal.

- h. Approved Manufacturers: obtain silent check valves from one of the following:

The Williams Gauge Co.	(U.S.A)
Combination Pump Valve Co.	(U.S.A)

or approved equal.

B. Gate Valves

Supply and install, wherever shown on the drawings and as specified herein, all gate valves.

Each gate valve shall conform with the following requirements:

- a. Bronze gate valves shall have bronze body and trim and shall be non-rising stem, screwed bonnet and solid wedge disc.
- b. Cast iron gate valves shall have cast iron body and shall be inside screw, non-rising stem, bolted bonnet, wedge disc and bronze trimmed.

C. Globe Valves

Supply and install, wherever shown on the drawings and as specified herein, all globe valves.

Each globe valve shall conform with the following requirements:

- a. Bronze globe valves shall have bronze body and trim and shall be inside screw, rising stem, screwed bonnet and renewable composition disc.
- b. Cast iron globe valves shall have cast iron body and shall be outside screw and yoke, rising stem, bolted bonnet, renewable bronze disc and seat ring and bronze trimmed.

D. Check Valves

Supply and install, wherever shown on the drawings and as specified herein, all check valves.

Each check valve shall horizontal or vertical lift, non-slam type and shall conform with the following requirements:

- a. Bronze check valves shall have bronze body and bronze trim and shall be screwed bonnet and renewable composition disc.
- b. Cast iron check valves shall have cast iron body and shall be bolted bonnet, renewable bronze disc and seat ring and bronze trimmed.
- c. Silent check valves 2" diameter and under shall be non-slam, spring loaded, screwed, with bronze body, seat and disc, 18-8 stainless steel spring with body having 300 psi working pressure rating.
- d. Silent check valves 2 1/2" diameter and above shall be non-slam, spring loaded, flanged, with cast iron body, bronze seat and disc, 18-8 stainless steel spring, with body having 250 psi working pressure rating.

E. Strainers

Supply and install, wherever shown on the drawings and as specified herein, all strainers.

Each strainer shall conform with the following requirements:

- a. Strainers 2" diameter and under shall be bronze body, 150 psi steam working pressure, screwed, "Y" type with 20 mesh stainless steel screen and screwed end-cleaning cap with 1/2" tapped hole for blow down valve.
- b. Strainers 2 1/2" and larger shall be flanged, cast iron body, 125 psi steam working pressure "Y" or basket type with 20 mesh stainless steel screen and bolted end-cleaning cap with 3/4" diameter tapped hole at bottom for blow down valve.
- c. Approved Manufacturers:

Crane Co.	(U.S.A or U.K.)
Newman-Hattersley	(U.K.)
Barukmann	(Germany)
Serseg	(France)

or approved equal.

F. Float Valves

Supply and install, wherever shown on the drawings and as specified herein, all float valves.

Each float valve shall conform with the following requirements:

- a. All bronze construction including levers and arms suitable for 150 psi cold water working pressure.
- b. Balancing piston type flow control mechanism.
- c. Adjustable bronze rod.
- d. Copper float.
- e. Similar to Newman-Hattersley No. 329 for screwed inlet and No. 328E for flanged inlet, or approved equal.

G. Safety Valves

Supply and install, wherever shown on the drawings and as specified herein, all safety valves.

Each safety valve shall conform with the following requirements:

- a. Bronze body and trim, suitable for 150 psi steam working pressure.

- b. Adjustable, spring loaded relief mechanism testing arm.
- c. Spring pressure adjusted locknut.
- d. Relief outlet for piped connection.

Setting of safety valves shall be at 125% of the system operating pressure. After adjustment, the adjusting screw shall be locked by an adequate lead sealed wire.

H. Expansion Joints

Supply and install, wherever necessary and as specified herein, all expansion joints.

Expansion joints shall be installed on piping to relieve expansion stresses and shall be located at all structural expansion joints and on all straight runs of pipes at 30 meters intervals.

U-bends expansion joints may be accepted under certain conditions after written Engineer's approval.

Each expansion joint shall conform with the following requirements:

- a. Pack less bellows type, monel metal for pressure pipes services suitable for 150 psi steam working pressure.
- b. Packing type for gravity piped.
- c. Expansion joints shall have screwed flanged or welding ends as required for the pipe size and system served.
- d. Approved Manufacturers:
 - Vokes (U.K.)
 - IWK (Germany)
 - Anaconda (U.S.A)
 - Flexonics (U.S.A)or approved equal.

I. Automatic Air Vents (AAV)

Supply and install, wherever shown on the drawings and as specified herein, all automatic air vents.

Each automatic air vent shall be completed as specified herein:

- a. Cast iron body.

- b. Standard float.
- c. Single lever orifice vent.
- d. Vent test cock.
- e. Isolating valve.

J. Hose Bibs (HB)

Supply and install, wherever shown on the drawings and as specified herein, all hose bibs.

Each hose bib shall conform with the following requirements:

- a. All brass, chrome plated construction.
- b. 3/4" threaded end connection with serrated hose bib nipple for 3/4" hose connection.

K. Water Hammer Arrestors

Supply and install, at all pipe connections to flush valves and as specified herein, all water hammer arrestors.

Each water hammer arrestor shall be complete as specified herein:

- a. Stainless steel shell and adapter.
- b. Elastomer bellows.
- c. Hydraulic displacement fluid.
- d. Pressurized insert gas pneumatic displacement chamber.
- e. 1/2" NPT threaded connection.
- f. Approved Manufacturers:

Josam (U.S.A)

Zurn (U.S.A)

or approved equal.

L. Flexible Connections

Supply and install, wherever shown on the drawings and as specified herein, all flexible connections.

Flexible connections shall be installed on all pipe connections to rotating equipment.

Each flexible connection shall conform with the following requirements:

- a. Seamless bronze tubing with annular corrugations covered with high tensile bronze braid suitable for 200 psi cold working pressure.
- b. Screwed ends for pipes 2" diameter and smaller and flanged ends for pipes 2 1/2" diameter and larger.
- c. Approved Manufacturers:
 - Mason Industries (U.S.A)
 - Anaconda (U.S.A)
 - Flexonics (U.S.A)or approved equal.

15.4. POLYETHYLENE WATER TANKS

Supply and install polyethylene water tanks wherever shown on the drawings and as specified herein.

Each tank shall be of the open cylindrical type fabricated from polyethylene. Shall be provided with screwed cover of the same thickness. Polyethylene used in manufacturing shall be US FDA approved.

each tank shall be provided with welded 5 x 5cm x 5mm thick structural angle support platform with legs of the same angle size. The legs shall have 10 x 10cm x 10mm thick steel sole plates welded on them.

Each tank shall be complete with:

- a. Access cover.
- b. Balancing piston type float valve with shut-off valve.
- c. Low level float switches assemblies as required and as necessary for the control of the relevant systems.
- d. High water level alarm float switches connected to central alarm panel at the reception desk.
- e. Drain valve, and supply valve.
- f. Drain and overflow to nearest drain provision or as shown on the drawings and vent pipes with insect copper mesh screen.

15.5. DRAINAGE

A. Floor Drains - Type FDV, FD

Supply and install all floor drains wherever shown on drawings and as specified herein.

Floor drains are to be bottom outlet for FDV, and horizontal outlet for FD, of type suitable for connection to UPVC non-pressure pipes, similar to Redi, Nicoll or approved equal.

B. Roof Drains (RD), Terrace Drains (TD),

Supply and install all roof drains, terrace drains and trench drains wherever shown on the drawings and as specified herein.

Drains shall be used on all horizontal surfaces exposed to rain water i.e. roofs, terraces, etc,

1. Roof Drain - Type RD

Each roof drain shall be constructed of heavy duty UPVC with bottom outlet and shall conform to the following requirements:

- a. Large grate area body with no trap and with gravel guard.
- b. Adjustable heavy duty elevated dome type strainer.
- c. Perforated extension sleeve for inverted roofing.
- d. Integral flashing flange.

2. Terrace Drain - Type TD

Each terrace drain shall be constructed of heavy duty UPVC and shall conform to the following requirements:

- a. Large sump with no trap, bottom outlet.
- b. Heavy duty UPVC grate 300mm x 300mm with frame.
- c. Integral flashing flange.

C. Clean-Outs

Supply and install all clean-outs wherever shown on the drawings and as specified herein.

Each clean-out shall be of the same material and dimension as the pipe shall conform with the following requirements:

- a. For pipes exposed or in false ceilings, clean-outs shall consist of a threaded cap screwed onto pipe end.
- b. Floor **FCO** and wall clean-outs **WCO** shall consist of capped wide elbows ending under a chrome plated bronze tile 20 x 20cms with screwed cover.

D. Roof Vents and Vent Caps

Supply and install all roof vents and vent caps wherever shown on the drawings and as specified herein.

- a. Vent cap shall be full size of stack connected to it and provided with cap. UPVC with hooded vent cap.
- b. Vent shall be provided with an extension nipple for fixing onto the vented stack.

E. Manholes Type MH

Supply and install manholes wherever shown on the drawings and as specified herein.

- a. Manholes shall be constructed of in situ reinforced concrete as detailed on drawings.
- b. Top shall have a circular opening with recess to accommodate cast iron cover and frame.
- c. floors shall be formed by hand with cement mortar to size and shape of sewer. Changes in sewer size shall be gradual and even.
- d. Wall to be plastered internally with two coats of cement and sand ratio 1:3 to a total thickness of 15mm.
- e. Provide complete with cast iron cover and frame. Cover is to be of the type suitable for tiling on top of it.

It shall be the Contractor's responsibility to coordinate and determine manholes invert levels, pipes inverts and locations of pipes connected to manholes.

Depth shall conform with pipe invert and site conditions but shall in any case allow a final cover of at least 40cm over pipes and a minimum slope between consecutive manholes of not less than one percent, unless otherwise indicated.

15.6. SANITARY FIXTURES**A. General**

- a. Plumbing fixtures, trim and accessories to be obtained from one approved manufacturer unless otherwise specified.
- b. Vitreous china: first quality, of specified color, with smooth glazed surfaces free from warps, cracks, checks, flaws, discoloration or other imperfections.
- c. Vitreous china accessories: to match fixtures and of same manufacture and color.
- d. Exposed piping and metal trim: chrome plated brass or same finish as other trim and accessories in the same area with polished finish guaranteed not to strip or peel off.
- e. List of all proposed plumbing fixtures, trim and accessories, indicating manufacturer, type and model number and catalogues shall be submitted for approval.
- f. Samples for fixtures, trim and accessories shall be submitted for approval.
- g. Plumbing fixtures shall be stored under cover and kept dry.
- h. Mortar: as per architectural specifications.
- j. Black bitumen coating solution for cold application to BS 3416 Type 1.
- k. Waterproof jointing compound for wastes: type recommended by waste manufacturer.

B. Lavatories**1. Lavatory**

White vitreous china, 450 x 355mm, wall hung type, with center hole for mixer, LECICO model "NOVA" or approved equal, complete with following trim and accessories or approved equal:

- a. 1/2" chrome plated single hole basin mixer handle operated, with blue and red marks, with 1 1/4" pop-up waste, GROHE model CLASSIC LINE. No. 21217
- b. 1 1/4" Chrome plated P-trap with wall tube and wall flange, adjustable type, with reducer joint 2" to 1 1/4"
- c. Two No. 1/2" chrome plated angle valves, blue and red index with 300mm long tubes and wall flanges.

2. Lavatory - (For Handicapped)

White vitreous china, 508 x 686mm, wall hung type, suitable for wheelchair users, with center hole for mixer, American Standard model No. 9140.047 or approved equal, complete with following trim and accessories or approved equal :

- a. 1/2" chrome plated single hole monobloc mixer lever operated with 1 1/4 " pop-up waste, American Standard model CERAMIX Jr. No. 2000.151X or approved equal.
- b. 1/4" Chrome plated P-trap with wall tube and wall flange, adjustable type, with reducer joint 2" 1 1/4".
- c. Two No. 1/2" chrome plated angle valves, blue and red index with 300mm long tubes and wall flanges.
- d. Towel rail, 60cms long, chrome plated.

C. Water Closets**1. Water Closet**

White vitreous china, European type, floor mounted, siphonic action with tank, S-trap bottom connection, LECICO model SIDON or approved equal, complete with the following trim and accessories or approved equal:

- a. White open front solid plastic seat with cover, with chrome plated metal hinge, washers, screws and nuts, Church No. 1580C.
- b. Complete with flush tank accessories.
- c. Chrome plated toilet paper holder, with hood and plastic roller, exposed surface mounted type, polished finish.

2. Water Closet –Disabled

White vitreous china, European type, wall mounted, with tank, siphonic action, P-trap back connection, LECICO model GARDENIA or approved equal, complete with the following trim and accessories or approved equal:

- a. White open front solid plastic seat with cover, with stainless steel metal hinge, washers, screws and nuts,
- b. Flush tank mechanism complete with all accessories and fittings.
- c. Stainless steel toilet paper holder, with hood and plastic roller, exposed surface mounted type, polished finish
- d. L-shaped supporting frame with floor fixing and support.

It suitable for people with disabilities, and in addition, complete with stainless steel grab bar sets as follows:

- Wall grab bar 60 cm,
- Swing away grab bar, wall mounted,

DIVISION 16 – ELECTRICAL WORKS**13.A. GENERAL**

1. All products supplied shall conform to the requirements of the local code.

13.B. EXISTING EQUIPMENT

Existing electrical equipment throughout the building which is not required and becomes superfluous shall be disconnected and removed.

Existing materials found to be in good condition and complying with the appropriate electrical code may be left in service.

13.C. MATERIALS

1. Wiring
 - a. Service and Feeders - shall be in a metal raceway.
 - b. Branch Circuits - shall be installed as per N.E.C. and local code requirements.
2. Junction boxes and outlet boxes shall be Underwriter labeled, and shall be installed according to local code requirements.
3. Panel boxes shall be U.L. or equivalent listed, and installed according to local code.
7. The contractor shall provide all lighting fixtures, complete with lamps, glassware, mounting hardware, frames, trim, stems, ballast's, and sockets, to provide a complete operating fixture as called for under work description, and shall be listed by U.L. or equivalent.

13.D. INSTALLATION

1. **PANEL BOX** - Disconnect and remove existing service panel boxes and replace with 12 circuit (minimum) breaker panel with main breaker and ground. Existing circuits are to be disconnected and rewired in such manner that owner will not be left without any power. New panel box shall be securely mounted at code approved location. Height of panel box shall be set to code approved height. Breakers shall be plug-in type with single pole breakers being of full module size. Two pole breakers shall not be installed in a single module. Multiple breakers shall be common trip type and shall have a single operating handle. All work to be in accordance with N.E.C., local utility company and local code requirements.
3. **WIRING** - All conductors are to be of copper and shall be U.L. or equivalent listed. In no case will aluminum conductors be acceptable in any part of the work. Wire color coding shall be in accordance with N.E.C. and shall be uniform throughout the building. Wiring shall be run concealed in all rooms of first and second floors, and/or living, bedroom, bathroom and kitchen areas. All wiring shall be installed in accordance with N.E.C. and local code requirements.
4. **OUTLET BOXES/JUNCTION BOXES** - Where called for and required by N.E.C. and local code requirements, shall be U.L. listed or equivalent.
5. **SWITCHES** - Shall be LEGRAND or equivalent listed. Where more than one switch occurs at a given point, the switches shall be installed under a common gang plate.

6. **CONVENIENCE OUTLETS** - Duplex receptacles shall be rated 15 amps

Exterior outlets shall have an exterior weather-proof face plate.

Outlet boxes in walls shall be located 18” above the finished floor line,

7. **LIGHT FIXTURES** - The contractor shall provide all lighting fixtures complete with lamps, glassware, mounting hardware, frames and trim, stems, ballast's, sockets, etc., to provide a complete operating fixture at each location, as called for in the Work Write-Up. See Bid Document for minimum fixture allowance.

- A. Globe - Furnish and install all labor and materials necessary to install new globe on existing light fixture base. Electrician to ensure fixture is wired correctly, and is in good physical condition.
- B. Fan/Light - Furnish and install all labor and materials necessary to install new three-speed/reversible fan with light. Light to be switched at room entrance and be UL-approved.
- C. All exterior light fixtures shall be weather-proof.

8. **REMOVE OLD EXPOSED WIRING** - and all old and unsafe receptacles, switches and fixtures where specified in the Bid Document. All work shall be meet N.E.C. and local code requirements.

9. **REPAIRS/REMOVAL** - Where repairs and/or removal are required to the existing electrical system, repairs and/or removal are to be made to conform to N.E.C. and local code requirements.

10. **VENT FANS** - Where vent fans are required because of lack of natural ventilation, they shall be installed in accordance with the Code (NEC), and provide a minimum of two air exchanges per hour. The exhaust from this fan shall not be discharged into an attic or crawlspace, but discharge directly to the exterior.

11. **CONDUIT** - Furnish and install conduit, wiring, and hardware necessary to place all exposed wiring at location specified in the Bid Document.

12. **CEILING FAN** - Furnish and install a new 52” ceiling fan complete with light kit, bracing, wiring and switch.

13. **HVAC SERVICE DISCONNECT** - Furnish and install a service disconnect to HVAC system. All work shall be performed by a licensed electrician to code.