

**CONSTRUCTION OF**  
**BOUNDARY WALL**  
**AND**  
**WATCH TOWERS**

**VOLUME- III**

**SPECIFICATIONS**

**Civil Works**

## **TABLE OF CONTENTS**

| <b>Description</b>               | <b>Page No.</b> |
|----------------------------------|-----------------|
| 1- DEMOLITION AND SITE CLEARANCE | 3               |
| 2- EARTHWORK                     | 7               |
| 3- FORMWORK                      | 11              |
| 4- STEEL REINFORCEMENT<br>12     |                 |
| 5- CONCRETE                      | 13              |
| 6- BLOCK MASONRY<br>21           |                 |
| 7- PLASTER.<br>30                |                 |

## 8- PAINTING

35

### 1- DEMOLITION AND SITE CLEARANCE

#### 1. GENERAL REQUIREMENTS

**A- SURVEY:** Before starting work, examine all available information, carry out a survey of the structure(s), site and surrounding area, and submit a survey report and method statements to the Engineer covering all relevant matters.

#### 2. DEFINITIONS

- a) **Hand Demolition:** Systematic demolition of structures by workers using hand-held tools.
- b) **Mechanical Demolition:** Systematic demolition of structures using powered equipment.
- c) **Systematic Demolition:** Methodical dismantling of

structure piece by piece, usually carried out in reverse order of construction.

### **3. DEMOLITION WORK**

#### **A- WORKMANSHIP**

- a) Demolish structure(s) in accordance with BS 6187.
- b) Operatives must be appropriately skilled and experienced for the type of work.
- c) Site staff responsible for supervision and control of the work is to be experienced in the assessment of the risks involved and in the methods of demolition to be used.

#### **B- PROTECTION**

- a) Do not interfere with use and activities of occupants where applicable and adjacent buildings. Maintain free and safe passage to and from buildings. Maintain integrity of existing fire exits.
- b) Protect existing adjacent work against damages which might occur from falling debris or other causes due to work of this Section.
- c) Provide, erect and maintain required hoarding, sidewalk sheds if applicable, catch platforms, lights and other protection around site before commencing work. Maintain such areas free of snow, ice, mud, water and debris. Lighting levels shall be equal to that prior to erection.
- d) Provide flagmen where necessary or appropriate to provide effective and safe access to site to vehicular traffic and protection to pedestrian traffic.
- e) Ensure scaffolds, ladders, equipment and other such equipments are not accessible to public. Protect with adequate fencing or remove and dismantle at end of each Day or when no longer required.
- f) Do not interfere with use and activities of adjacent buildings. Maintain free and safe passage to and from

buildings.

- g) Where necessary to seal fire exits of adjoining or adjacent buildings, provide other exits in compliance with applicable fire safety and building regulations.
- h) Where demolition operations prevent normal access to adjacent properties, provide and maintain suitable alternative access.
- i) If at any time safety of adjacent buildings appear to be endangered, cease operations and notify Consultant; take precautions to support buildings; do not resume operations until permission is granted by Engineer.
- j) If Engineer considers additional bracing and shoring necessary to safeguard and prevent such movement or settlement, install bracing or shoring upon Engineer's orders. Should Contractor fail to comply promptly with such request, such bracing or shoring may be placed by Consultant at Contractor's expense.
- k) Take precautions to guard against movement, settlement or collapse of adjacent services, sidewalks, driveways, or trees. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.
- l) Erect and maintain partitions as required to prevent spread of dust, fumes and smoke to other parts of building. Maintain fire exits from site. On completion, remove partitions and Make Good surfaces to match adjacent surfaces of building.

### **C- EXISTING SERVICES**

- a) Notify Engineer to cut-off, remove and cap. Verify services are cut off and properly capped before commencing associated or effected demolition. Cap and cover catch basins outside the building during the work of this Section. Do not allow demolition debris into the drains.

- b) Provide and maintain temporary services required during demolition to satisfaction of authorities having jurisdiction, fire departments and utility companies.
- c) Verify prior to commencement work that disconnection and capping of mechanical services has been carried out in accordance with requirements. Make sure Natural gas supply lines are being removed by Gas Company or by qualified tradesman in accordance with Gas Company instructions.
- d) Before commencing demolition, disconnect and seal electrical power lines and communications cables entering buildings/structure to be demolished. Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
- e) In event of unexpected discovery of buried articles of value or antiquity and structures on the Site shall, be deemed to be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall, immediately upon discovery thereof and before removal, acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same
- f) Remove electrical equipment scheduled for removal to the extent as directed by the Engineer and as required by Work.
- g) Remove sewer and water lines to the extent as directed by the Engineer and cap to prevent leakage.

#### **D- DISPOSAL OF WASTE MATERIALS**

- a. Clear away dirt, rubbish and loose litter resulting from work minimum daily. Keep dust to a minimum. When necessary and practical demolition works shall be sprayed periodically with water to reduce dust. Wet down debris from time to time to control dust. Maintain roadways, lanes and street sidewalks in the vicinity of the

premises safe and clear.

- b. Selling or burning of materials on site is not permitted.
- c. Materials prohibited from municipality waste management facilities shall be removed from site and dispose of at recycling companies specializing in recyclable materials.
- d. Demolished, excavated material including contaminated excavated material shall be removed from site and dispose of out site the Karachi University premises without any additional cost to Employer.

#### **E- RESTRICTIONS**

Restrict demolition activities between hours of 8:00 a.m. and 6:00 p.m., Monday through Friday. Special permission for after hour may be obtained from Engineer / Employer

#### **F- MATERIALS ARISING**

Components and materials arising from the demolition are to become the property of the employer except where otherwise provided, shall not be removed from site

## **2- EARTHWORK**

### **A- PRE-CONSTRUCTION RECORDS**

Before an excavation is started:

- a. Ground levels shall be agreed at suitable intervals with the Engineer.
- b. Surface materials and conditions shall be recorded in presence of the Engineer and where appropriate, the Employer or occupiers of the land.

- c. The Contractor shall take photographs to illustrate existing damage or conditions, which may prove contentious at the time of reinstatement.
- d. This information shall be neatly presented and submitted to the Engineer.
- e. Any significant details of any existing natural or piped subsoil drainage or other underground features shall be identified to the Engineer as work proceeds.

#### **B- MATERIAL TEST REPORT:**

From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

- a. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for backfill, fill, embankment and sub grade layer.
- b. Laboratory compaction curve according to ASTM D 1557 (Modified Proctor) for each on-site or borrow soil material proposed for backfill, fill, embankment and sub grade layer.

#### **C- EXISTING UTILITIES**

Survey to determine locations, sizes, and types of such utilities within construction areas in advance of disturbing them. Provide proper safeguard, support and protection from construction activities. Do not interrupt existing utilities serving facilities occupied by the Employer or others except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

- a. Provide a minimum 48-hours' notice to the Engineer and receive written notice to proceed before interrupting any utility.

#### **D- EXCAVATION**

Excavate to indicated elevations and dimensions within a tolerance of plus or minus 25 mm. Extend excavations a sufficient distance from permanent structures for working space requirements. Place blinding concrete, where indicated, immediately after excavating to final grades.

- a. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement or concrete. Trim bottoms to required lines and grades to leave solid base to receive other work.
- b. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 25 mm. Do not disturb bottom of excavations intended for bearing surface.
- c. Excavation includes removal and disposal of unsatisfactory soils and any surplus satisfactory soils.

#### **E- BACKFILL**

Place and compact backfill in excavations promptly, but not before completing the following:

- a. Removing concrete formwork.
- b. Removing trash and debris.
- c. Removing temporary shoring and bracing, and sheeting.

## **F- MATERIAL**

Fill material shall be obtained from required excavations and/or designated borrow areas. The selection, blending, routing, and disposition of material in the various fills shall be subject to approval by the engineer.

Fill material shall be free of sod, brush, roots, trash, or other objectionable material. Rock particles larger than 3 inches shall be removed prior to compaction of the fill.

## **G- COMPACTION OF BACKFILLS**

- a. Place soil materials in layers not more than 200 mm in loose depth for material compacted by heavy compaction equipment, and not more than 150 mm in loose depth for material compacted by hand-operated tampers.
- b. Place soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- c. Compact backfills and fills to not less than the following percentages of maximum dry density according to ASTM D 1557.
- d. Compact backfills and fills to not less than the following percentages of maximum dry density according to ASTM D 698:
  - Under structures, building slabs, ramps and steps, scarify and re-compact top 300 mm of existing sub grade and each layer of backfill or fill material at 100 per cent.
  - Under walks and pedestrian pavements, scarify and re-compact top 150 mm below sub grade and

compact each layer of backfill or fill material at 100 per cent.

- Under lawns or unpaved areas, scarify and re-compact top 150 mm below sub grade and compact each layer of backfill or fill material at 85 per cent.

## **H- FIELD QUALITY CONTROL**

- a. Engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- b. Allow testing agency to inspect and test sub grades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- c. Foundation and Footing Sub grades: At foundation and footing sub grades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing sub grades may be based on a visual comparison of sub grade with tested sub grade when approved by the Engineer.
- d. Testing agency will test compaction of soils in place according to ASTM D 698, ASTM D 1556, ASTM D 1557, ASTM D 2167, ASTM D 2922, ASTM D 2937, ASTM D 4429, and AASHTO T 180, as applicable. Tests will be performed at the following locations and frequencies.
- e. Foundation, Wall Backfill: At each compacted backfill layer, at least one test for each 30 m or less of wall length, but no fewer than two tests.

- f. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 50 m or less of trench length, but no fewer than two tests.

#### **J- DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- a. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and dispose of at designated spoil areas on the Employer's property (disposal area will be within a 6-km proximity to the construction area).
- b. Transport surplus satisfactory soil to designated storage areas on Employer's property. Stockpile or spread soil as directed by the Engineer.
- c. Remove waste material, including unsatisfactory soil, trash, and debris, and dispose of out of Karachi University premises.

### 3- FORMWORK

- A. **Forms for Exposed Finish Concrete:** Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.

**Forms for Unexposed Finish Concrete:** Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

- B. **Forms for Textured Finish Concrete:** Units of face design, size, arrangement, and configuration to match the Engineer's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- C. **Forms for Cylindrical Columns and Supports:** Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- D. **Form Release Agent:** Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form release agent with rust inhibitors for steel facing materials.

- E. **Form Ties:** Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that shall leave no metal closer than 38 mm to the plane of the exposed concrete surface. No permanent metallic part shall have less concrete cover than the reinforcement. Provide ties that, when removed, will not leave holes larger than 25 mm in diameter in the concrete surface. Furnish ties with integral water-barrier plates to walls indicated to receive damp-proofing or waterproofing.
- F. **Chamfer Strips:** Wood, metal, PVC, or rubber strips 20 mm x 20 mm, size OR as indicated on drawing.

#### 4- STEEL REINFORCEMENT

**Reinforcing Bars:** ASTM A 615M, Grade 60 (420 MPa) specified yield strength, or BS 4449 grade 460 Type 2 deformed, uncoated. One test per 5000 m length delivered to site.

1. **Plain-Steel Wire:** ASTM A 82, as drawn.
2. **Welded Wire Fabric:** ASTM A 185, welded steel wire fabric.
3. Only new material shall be furnished. On receipt and at time of installation, material shall be free of loose rust and loose mill scale, deleterious amounts of salts and coatings that reduce or destroy bond. Tight rust and mill scale or surface irregularities are acceptable if the weight and dimensions, including height of deformations and tensile properties, of a test specimen that has been wire-brushed by hand, are not less than those required by the applicable Standards.

4. Reinforcement shall be accurately bent, cut or formed to the dimensions and configuration shown on Drawings and within the tolerances specified in ACI 315. Reinforcement shall be bent cold using pin sizes in accordance with ACI 318. Bars may be preheated only if prior approval has been requested and received. Reinforcement shall not be rebent or straightened without prior approval.

Reinforcement having a reduced section, kinks, visible transverse cracks at bends, or otherwise damaged in any way shall not be used. Galvanized steel shall not be used for reinforcement.

Reinforcement shall not be welded unless specifically shown on Drawings or permitted as an exception and then only after approval of the welding method appropriate to the grade of steel and the type of welding rod to be used.

## **5- CONCRETE**

### **A. Portland Cement:**

Cement shall be low alkali with chemical composition in accordance with Table 1 of ASTM C 150. The magnesia content shall be limited to 4 percent by weight of cement, as tested in accordance with ASTM C 114. Use one brand of cement throughout Project unless otherwise approved by the Engineer. Manufacturer's test certification shall be supplied for each

delivery of cement and shall confirm that the cement complies with the above requirements and shall be submitted by the Contractor not later than the day of delivery of the cement. The Engineer shall have the right to call for tests, the cost of which is to be borne by the Contractor, on each delivery of cement to confirm that the cement meets the following requirements.

- a. Use Ordinary Portland Cement (OPC) conforming to ASTM C 150, Type I.
- b. Moderate sulphate: According to ASTM C150 type II.
- c. Test cement for fineness by air permeability apparatus in accordance with ASTM C 204 to meet the requirements of ASTM C 150.
- d. Test cement for soundness, Autoclave expansion in accordance with ASTM C151.

#### **B. Normal-Weight Aggregates:**

Aggregates shall be from approved sources and shall conform to the requirements of ASTM C 33 and BS 882. Petrographic analyses shall be made in accordance with ASTM C 295. Aggregates for exposed concrete shall be from a single source and shall not contain substances that cause spalling. Only aggregates not susceptible to alkali aggregate reaction shall be used. The Contractor shall supply samples of the materials for approval by the Engineer and each aggregate source shall be subject to monitoring by the Engineer. Grading of aggregate shall be to the completion of BS 882.

**Coarse Aggregate:** Coarse aggregate size shall be 20 mm nominal and those retained on a 5mm sieve and shall consist of crushed or uncrushed gravel or crushed stone and shall be selected, recrushed, finish screened and washed with water meeting the requirements of Paragraph 2.4 as necessary to comply with the following:

| Frequency of Tests | Test Description  | Standard          | Limit          |
|--------------------|---|-------------------|----------------|
| Initial            | Los Angeles Abrasion Loss (Grading A or B)  | ASTM C 131        | 25% maximum    |
| Initial            | Ratio of Los Angeles Abrasion Loss at 100 & 500 Revolutions (100/500 Revolutions Value) | ASTM C 131 Note 6 | 0.25% maximum  |
| 1 per day          | Clay Lumps and Friable Particles  | ASTM C 142        | 1.0% maximum   |
| 1 per day          | Material Finer than 75 Microns  | ASTM C 117        | 1.0% maximum   |
| 1 per 7 days       | Water Absorption  | ASTM C 127        | 2.0% maximum   |
| 1 per 3 days       | Chlorides as Cl   | BS 812            | 0.03% maximum* |
| 1 per 3 days       | Sulfates as SO <sub>3</sub>   | BS 812            | 0.3% maximum*  |
| 1 per 30 days      | Magnesium Sulfate Soundness Loss (5 cycles)   | ASTM C 88         | 5.0% maximum   |
| 1 per 3 days       | Flakiness Index   | BS 812            | 25% maximum    |
| 1 per 3 days       | Elongation Index  | BS 812            | 25% maximum    |

|              |                  |           |                                  |
|--------------|------------------|-----------|----------------------------------|
|              | Reactive Silica  | ASTM C 27 | Per Appendix X1.3.7 of ASTM C 33 |
| 1 per 7 days | Specific gravity |           | Minimum 2.6                      |
| 1 per 2 days | Moisture Content |           |                                  |

**C. Fine Aggregate:** Fine aggregate, those passing a 5mm sieve, shall consist of crushed gravel, crushed stone or natural sand with rounded or surrounded particles and shall be washed as necessary to comply with the following:

| Test Description                 | Standard   | Limit   |
|----------------------------------|------------|---|
| Clay Lumps and Friable Particles | ASTM C 142 | 1.0% maximum  |
| Material Finer than 75 Microns   | ASTM C 117 | maximum 3% for natural sand and 51 for crushed sand with no plastic fines |
| Water Absorption                 | ASTM C 128 | 1.0% maximum  |
| Chlorides as Cl                  | BS 812     | 0.06% maximum*  |
| Sulfates as SO <sub>3</sub>      | BS 812     | 0.30% maximum*  |
| Organic Impurities               | ASTM C 40  | Lighter than Standard   |

#### **D. Water:**

Water used for mixing concrete, ice production, washing and cooling aggregates, and curing concrete shall be free from impurities, oil, acid, salts, alkali, organic matter, and other potentially deleterious substances in accordance with AASHTO T26 and when tested in accordance with ASTM D 512 and ASTM D 516.

#### **E. ADMIXTURES**

- a. Admixtures containing Chlorides shall not be used.
- b. **General:** No admixture shall be used in the concrete without the Engineer's written approval and under no circumstances shall admixtures containing chlorides or other corrosive agents be allowed. Admixture

compatibility with the type of cement used shall be proven.

- c. The Contractor shall perform a trial batch and casting to substantiate the manufacturer's claims of workability, retardation and air entrainment (0 to 1.0 percent maximum), as specified in Article 2.14. Admixtures shall comply with the following standards: ASTM C494/C494 M, EN 934 and EN 480. Also, admixture shall comply with EN 12878 for pigments of cement.
- d. **Air-Entraining Admixture:** No air entraining agent shall be used.
- e. Admixtures shall be incorporated into the mix design strictly in accordance with the manufacturer's written instructions.

#### **F. CONCRETE MIXES**

- a. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
  - Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
  - Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
- b. Use a qualified independent testing agency acceptable to the Engineer for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- c. Do not use the same testing agency for field quality control.
- d. Submit written reports to the Engineer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed and approved by the Engineer.

## **G. CONCRETE MIXING**

**Job-Site Mixing:** All concrete mixed on Project site shall be in a batch mixer of approved size and design complying with ACI 304 and producing a uniform distribution of the materials throughout the mixed concrete in accordance with ASTM C 94 uniformity test. The contents of the drum shall be completely discharged before re-charging. After all the materials are in the mixer, mixing shall continue until the whole of the materials are uniformly distributed and the mass is of uniform color and consistency. In the case of concrete that contains silica fume with a density between 400-650 kg/cu. m, the mixing time shall be 50 percent greater than the requirement for concrete without silica fume.

- a. Whenever mixing is to be suspended for half an hour or longer, the drum of the mixer shall be thoroughly washed out with clean water. Provide a competent operator who shall be in continuous control of the mixer. No retempering of concrete, which has partially hardened, by the addition of cement, aggregate, or water shall be allowed.
- b. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

## **H. CONCRETE COVER**

- a. Concrete cover to reinforcement shall be as indicated on Drawings but shall not be less than the following:
  - Cover for all concrete below grade and waterproofed shall be 50 mm.
  - Cover for all other exterior exposed concrete faces shall be 50 mm.
  - Cover for all other interior protected faces shall be 40 mm, except slabs which shall be 25 mm.

- b. Cover to reinforcement shall be checked before any concrete is cast. The bending of reinforcement at a cold joint is not permitted. Concrete cover shall be checked with a cover meter as soon as formwork is removed.
- c. All lap splices shall be in accordance with ACI 318 class B tension lap splice unless otherwise shown on Drawings. All reinforcement bars shall be developed in accordance with ACI 318 unless otherwise shown on Drawings. Welded wire fabric shall be lapped 1.5 mesh plus the extension on the wires unless otherwise shown on Drawings.

## **J. CONCRETE PLACEMENT**

- a. **General:** Comply with ACI 301, ACI 304, and ACI 318.
- b. **Inspection:** Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Concrete shall not be placed until the condition of the reinforcement, other embedded items, and the formwork has been inspected and approved by the Engineer.
- c. **Transportation:** Concrete, after being discharged from the mixer, shall be transported as rapidly as possible to its final position in the Work by agitator trucks, which shall prevent adulteration, segregation, loss of workability or contamination of the ingredients. The containers that convey the concrete shall be kept
- d. **Placing Concrete in Forms:** Deposit concrete in forms continuously or in horizontal layers no deeper than 450 mm and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while the preceding layer is still plastic to avoid cold joints. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
  - a. Concrete shall not be dropped into place from a height exceeding 1.5 m nor through dense

reinforcing steel, which could cause segregation of the coarse aggregate. Structural concreting against open excavation will not be permitted as the concrete cannot be coated afterwards.

- b. When vertical lifts of concrete are interrupted or delayed for more than one hour, the surface of the unfinished concrete shall be thoroughly cleaned and washed with cement grout immediately before fresh concrete is added and the first layer of new concrete placed shall not exceed 150mm depth and particular care shall be taken with compaction of this new layer to ensure good bond.

## **K. CONCRETE PROTECTION AND CURING**

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

## **L. QUALITY CONTROL AND TESTING**

### **General:**

#### **a. Testing Laboratory:**

- Employ an independent testing agency to perform tests and to submit test reports.
- Be responsible for taking, identifying and delivering to the test laboratory all test samples called for in this Specification. The testing laboratory shall be responsible for the testing. Collect all test results and deliver them to the Engineer in the format and detail as specified.

#### **b. Testing on Fresh Concrete:**

1. Sampling, curing and testing shall be performed using the relevant procedures in ASTM C 31, ASTM C 39, and ASTM C 172.
2. Samples for production of concrete cylinders/cubes shall be taken at the point of placement at the average rate of one per 25 cu. m of concrete placed, with a minimum of one sample taken every day that the mix is used. A sample shall consist of six 150 mm molded and stored for laboratory-cured test specimens except when field-cured test specimens are required. Three cylinders/cubes are for testing at 7 days after casting, three for testing at 28 days after casting.
3. When strength of field-cured cylinders/cubes is less than 85 percent of companion laboratory-cured cylinders / cubes, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4. Records shall be kept of the mix details and position in the works of all batches of concrete and of all samples taken for cylinders and other specimens and of their test results. A copy shall be supplied to the Engineer within 24 hours after recording/testing. Records shall contain, but not be limited to, the following information:
  - I. Date, time, location, and volume of pour.
  - II. Ambient temperature and humidity.
  - III. Concrete temperature (at time of placement).
  - IV. Cement type and manufacture.
  - V. Concrete type and class.
  - VI. Aggregate type and source.
  - VII. Admixture details.
  - VIII. Water/cement ratio.
  - IX. Identification of test cylinder/cubes.
  - X. Name of concrete testing service.

- XI. Date and time of sampling.
- XII. Method of compaction.
- XIII. Date of testing and results of test.
- XIV. Age of sample in days, weight in grams, density in kg/cu. m.
- XV. Crushing load in newtons and crushing strength in N/sq. mm.
- XVI. Signatures of person preparing cylinder and of person crushing cylinder.
- XVII. Results of testing.

**c. Testing on Hardened Concrete:**

- a. General: The Engineer may request samples to be taken and tests carried out on any hardened structural grade concrete as specified below if he suspects that the concrete does not meet the specified requirements. If the tests confirm that the concrete does not meet the requirements of this Specification, then the Engineer may require the concrete to be removed at the Contractor's expense. If the tests confirm that the concrete meets the requirements of this Specification, then the cost of taking the samples shall not be at the Contractor's expense.
- b. Compressive Strength Tests: The Engineer may request cores to be drilled from a particular pour. 100 mm diameter cores shall be drilled as requested, in accordance with ASTM C 42, and sent for crushing. If the cores from that pour have an average compressive strength less than 85 percent of the characteristic strength or any individual core has a compressive strength less than 75 percent of the characteristic strength, it shall be evidence that the concrete from

which it was taken is not in accordance with the specified requirements.

- c. Concrete Cover: The Engineer may check the concrete cover over the reinforcement with a cover meter. Any indication that the cover is generally less than the requirements specified in Paragraph 3.6 shall be checked by limited surface concrete removal. If it is confirmed that the actual cover is generally less than specified, then the concrete shall be removed at the Contractor's expense. In the case of localized lack of cover and where appearance is not important, a repair shall be effected by removal of the inadequate cover and the cutting back of concrete for 50 mm behind the reinforcement. Resurfacing of the concrete with the specified cover shall be carried out as a repair by a specialist subcontractor as specified in Article 3.16.
- d. Absorption: A sample of three 75 mm diameter cores, 75 mm long, shall be taken from hardened concrete if directed by the Engineer and tested. Should the absorption of any core exceed by more than 1 percent the highest approved test result, then the concrete from which it was cut shall be removed. No absorption test shall be required for blinding concrete.
- e. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be used but shall not be used as the sole basis for acceptance or rejection.

## **6- BLOCK MASONRY**

### **1. GENERAL**

- 1.1** Unit masonry required for this Work is indicated on the Drawings and includes the provision and installation

of concrete blocks, Clay bricks, brick work, coping units and related material both inside and outside the building.

## **1.2 Quality Assurance**

- a.** For the actual cutting and placing of masonry units, use only skilled masons who are thoroughly experienced with the materials and methods specified and thoroughly familiar with the design requirements.
- b.** In acceptance or rejection of installed masonry units, no allowance will be made for lack of skill on the part of workmen.
- c.** Provide one skilled mason who shall be present at all times during execution of the work of this Section and who shall personally direct the execution of this portion of the Work.

## **1.3 SUBMITTALS**

- a.** Samples:

Submit three samples of each type of block required, and the full range of exposed texture to be used in the completed works. The review will be for texture only

- b.** Test Reports:

Reports for compressive strengths of masonry units, grout and mortar.

## **1.4 PRODUCT HANDLING**

- a.** Protection and Storage:

- Protect masonry materials before, during, and after installation and protect installed work and materials of other trades.
- Masonry units and packaged material shall be placed on planks raised from the ground, covered with a waterproof

tarpaulin and kept well ventilated until time of use. No material shall be allowed to become wet. Use only quantities of blocks/bricks required for immediate use. Do not stock pile units on the structure. Sand or loose material shall be stored so that it will not be contaminated from dirt or other extraneous material from the ground.

**b. Replacement:**

- In the event of damage, immediately make repairs and replacements to approval of Engineer, at no additional cost to the Employer.

**2. PRODUCTS: CONCRETE BLOCK**

**2.1. Materials for Blocks**

Cement, aggregate and water for concrete blocks shall conform to the requirements as specified in the section for Plain and Reinforced Concrete.

**2.2. Concrete Block Making**

- a. The blocks shall be machine moulded. The block making machines shall be of the standard approved by the Engineer/Consultant. They shall be operated according to the instructions laid down by the manufacturers.
- b. Solid concrete blocks have a minimum crushing strength of 1,200 psi. Per average of 3 units tested, or 1,000 psi. Per individual unit tested, based on gross section area.
- c. Cured concrete blocks shall be stored off the ground, stacked on level platforms which allow air circulation under stacked units. Units shall be covered and protected against wetting.
- d. Care shall be exercised in the handling of all concrete blocks. No damaged blocks shall be used in the work.

- e. The blocks cast on different dates shall be stacked separately and must be labeled showing the date on which they are cast.

### **2.3 Properties of Blocks**

- a. Block sizes, unless otherwise indicated on drawings, shall be 16" by 8" by 4", 6", & 8" thickness (Approximately 400 by 200 by 100, 150 & 200 mm). Physical requirements shall comply with relevant ASTM or equivalent approved standards.
- b. For non-load bearing wall the cement, sand and coarse aggregate shall be volume batched in the minimum ratio of one part cement, three parts sand and six parts coarse aggregate and shall be mixed in a concrete mixer.
- c. For load bearing Hollow/Solid block wall the mix unless otherwise stated shall be proportioned to meet the following strength requirements:
  - i) Solid Load Bearing Concrete Masonry Units shall have a 28 day compressive strength of not less than 1500 psi (106 kg/cm. sq.) average of 3 units tested or 1200 psi (85 kg/cm. sq.) per individual unit tested.
  - ii) Hollow Load Bearing Concrete Masonry Units shall comply with ASTM C90, grade N-1 (moisture controlled), and shall have a 28 day compressive strength of 1350 psi (96 kg/cm. sq.) average of 3 units tested and 800 psi (57 kg/cm. sq.) on individual unit tested.

The compressive strengths shall be verified by tests in accordance with UBC section 2404, Para 2

- d. The Contractor shall provide test results proving the average minimum crushing strength of the blocks prior to the commencement of the construction. Further test results shall be provided as required by the Engineer/Consultant, to ensure that all batches of blocks have the minimum specified crushing strength.

- e. The test shall be carried out by an authority approved by the Engineer/Consultant. Evidence shall be produced that the block manufacturer has an efficient method of quality control. The Engineer will require to periodically testing samples of blocks, and the Contractor shall make any necessary arrangements.
- f. Hollow concrete block units wherever specified shall have cores with cross sectional area at least equal to the percent of gross area of block given below:

|                 |                |
|-----------------|----------------|
| 8 in. (200 mm)  | 38 percent     |
| 6 in. (150 mm.) | 30 percent     |
| 4 in. (100 mm)  | No requirement |

- g. Minimum shell wall thickness be 1-1/4 in. (32 mm).
- h. Permissible tolerance in size of block shall be 1/8 in(3 mm) each way.
- i. Special shapes for lintels, corners, jambs, sash, cleanouts, control joints and headers, bonding and other particular needs shall be provided where required.

#### **2.4 Mortar**

Mortar for unit masonry shall achieve a compressive strength of 1500 psi 28 days, and consist of:

- Cement: shall conform to BS-12-78 type.
- Aggregate: damp loose" sand to BS 1200, Table 10 graded 3/16 in. down.
- Water: clean and clear water which does not have sweet, saline or brackish taste to be used for mixing and curing of concrete. Conform to B.S. 3148 is essential.

- Mortar colorings: finely ground, first quality, sun-proof, lime-proof, high purity mineral pigment with a specific gravity similar to cement, conforming to B.S. 1014.
- Additives where used, shall be proprietary products used in the proportions and manner recommended by the manufacturer. The additives shall in no way adversely affect the mortar strength or contain chemicals which may be harmful to other buildings materials. To add gypsum to cement is strictly forbidden.

## **2.5 Grout**

Grout shall consist of approved cement, sand, pea gravel and adequate water to produce a concrete of approximately 10 inches (250 mm) slump, and shall have an ultimate compressive strength of 1500 psi in 28 days.

## **2.6 Concrete**

Concrete for infill between top of masonry walls and underside of structure shall be 1:3:6 mix by volume of 2000 psi compressive strength in accordance with standard.

## **2.7 Admixtures**

Admixtures may be used only with the written approval of the Engineer/Consultant.

# **3. EXECUTION**

## **3.1 Surface Condition**

- a. Inspection:

- Prior to work of this Section, carefully inspect installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
  - Verify that unit masonry can be completed in accordance with pertinent codes and regulations and the original design. Discrepancies:
    - 
    - in the event of discrepancy, immediately notify the Engineer/Consultant.
  - Do not proceed with installation in areas of discrepancy until they have been completely resolved.
- b. Environmental Condition:
- During hot weather protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature above 32 C (90 F) in the shade with a relative humidity less than 50%.

### **3.2 Coordination**

Carefully coordinate with other trades to ensure proper and adequate interface with them and the work of this Section.

### **3.3 Mixing Mortar**

#### **a. General:**

- Use a mechanical mixer of one sack minimum capacity. Hand mixing will be permitted provided quantities of materials and water is accurately controlled, and that method of mixing is approved by Engineer/Consultant.
- Mix mortar at least three minutes after materials have been added.

- Mix only as much mortar as can be used in one hour after water has been first mixed into the batch.

### **3.4 Installation**

#### **a. General:**

- All masonry lay plumb, true to line, with level and accurately spaced courses and reveals, with corner plumb and true, and with each course breaking joints with the course below. Bond shall be kept plumb throughout. Units with greater than 12 percent absorption shall be wetted before laying.
- Concrete blocks for wall construction at jambs to openings and at piers to be grouted.
- The methods and equipment used for transporting the masonry units and mortar shall be such as will not damage the units nor delay the use of mixed mortar. Units shall not be placed during rains sufficiently heavy or prolonged to wash the mortar from the brick. Mortar already spread which becomes diluted by rain shall be removed and replaced before continuing with the work. All brick to be used in brick masonry shall be moistened with water from three to four hours before they are used by a method which will ensure that each brick is thoroughly and uniformly wetted. All bricks shall be free from water adhering to their surface when they are placed in the brick masonry.

#### **b. Laying up:**

- Place units in mortar with full trowelled bed and head joints.

- Align all vertical cells to maintain a clear, unobstructed system of flues, or shafts. Clean out as work proceeds.
- Mortar work to be in accordance with B.S.CP 121.
- When laying fresh units to set or partially set masonry, clean surfaces of those previously installed and remove loose mortar prior to laying fresh units.
- The masonry work shall be carried up in uniform manner and no portion shall be carried out. More than one meter above the adjoining one at any time. All masonry shall be kept strictly true and square and the whole properly bonded together and leveled around each floor.

**c. Dowels and wall ties:**

- Install projecting reinforcing bar dowel anchors into beams, columns and slabs and grout into masonry. Bars to be drilled and grouted into structural members, as specified in the structural specification/drawings.
- Embed wall ties 3 ins. (75mm) into each bearing of double skin walls, at 18 ins. (450 mm) centers vertically and 24 ins. (600 mm) horizontally, staggered pattern.

**d. Tolerances:**

- Unit masonry shall be erected plumb and true to line and level with a maximum variation of 1/8 in. (3mm) in 10 ft.(3m).

### **3.5 Grouting**

**a. Timing:**

- Do not grout until masonry has cured at least 24 hours.
- Consolidate grout at time of pouring by puddling and filling cells of masonry, and then reconsolidating later by puddling before the plasticity is lost.

**3.6 Curing & Repairs**

- All unit masonry shall be watered cured and shall be kept wet for at least seven days, by an approved method which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements of these Specifications for water used in the manufacturer of masonry units.
- If, after the completion of any masonry work, the units are not in alignment or level, or does not, conform to the lines and grades shown on the drawings or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the Engineer grants permission, in writing, to patch or replace the defective area.

**3.7 Cleaning & Protection**

**a. Inspection:**

- Upon completion of the Work of this Section, make a thorough inspection of installed unit masonry and verify that units and joints have been installed in accordance with the provisions of this section; make necessary adjustments.

**b. Protection:**

- Protect sills, ledges and surrounding work from mortar drippings or other damage during masonry construction. Remove misplaced mortar or grout immediately.
- Wrap wood mullions and other built-in wood items with 4 mm. Polythene sheeting and remove at completion of work.
- Cover tops of uncompleted walls with non-staining waterproof coverings when work is not in progress.

**c. Cleaning:**

- Clean surfaces of unit masonry as required for proper application of the specified finishes.
- Cut out and re-point defective joints.
- Upon completion of Work to this Section, promptly remove from the Job Site mortar droppings, broken units debris arising from the work of this Section, and tools and equipment, leaving all areas in a neat and orderly condition to the approval of the Engineer/Consultant.

**4. SCAFFOLDING**

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expense. Scaffolding which is unsafe in the opinion of the Engineer/Consultant shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc. shall be included by the Contractor in the unit rate for masonry items.

Damage to masonry from scaffolding or from any other object shall be repaired by the Contractor at his own cost

**7- PLASTER.**

## **1. GENERAL**

### **1.1 Description**

#### **a. Work Included:**

- Work of this Section includes the supply and application of plaster materials and accessories for interior and exterior finishes indicated on the Drawings and Schedules and these Specifications,

### **1.2. Qualification of Installers**

- For application of coatings, use only thoroughly trained and experienced plasterers who are completely familiar with the requirements of this Work and the recommendations contained in the referenced Standards.
- In acceptance or rejection of installed materials, no allowance will be made for lack of skill on the part of workmen.

## **2. MATERIALS**

- Portland Cement: Ordinary and white conforming to P.S.232 or B.S.12
- Sand: Clean, sharp, angular, free from alkali, silt or organic matter, to conform to B.S. 1198 - 1200 or the draft Pakistan Standard "Sand for Plaster".
- Water: Potable, clean, free from deleterious amount of oils, salts, alkali, organic matter and other harmful materials conforming to B.S. 3148.
- Color Pigment: Salt-free, inorganic. Type and amount to be approved by Engineer/Consultant.
- Marble Powder: White and same consistency as dry cement.
- All plaster materials shall be uniform in quality and free of Alkalis

### **3. ACCESSORIES**

- Expanded metal lath to be flat rib diamond mesh of 1/4" short way type, galvanized to B.S. 729, conforming to B.S. 1369. Use BB,263, 2.25 lbs per sq. yds (1,22 Kg/m<sup>2</sup>) for external use. And reinforcement of joints and BB 264, 3 lbs per sq. yds (1.63 Kg/m<sup>2</sup>) for suspended plaster ceilings. Paint lath with zinc rich primer for internal conditions.
- Plaster stops: 26 gauge. steel with 3 - 1/8 in. expanded metal flanges, size to surf plaster depth, galvanized to B.S. 729.
- Tie wire to be 18 gauges. Annealed steel wire galvanised to B.S. 443.
- Fastening such as expansion bolts, galvanized nails, metal trim and other accessories to Consultant's approval.

### **4. ADDITIVES**

- Additives for controlling the setting and working characteristics of plaster, or for imparting anti-corrosion, fungicidal or water proofing properties, shall be added to the plaster strictly in accordance with the particular manufacturer's written instructions.

### **5. OTHER MATERIALS**

- Materials and methods not specifically described but required for proper fabrication and installation of plaster, shall be provided by Contractor subject to prior approval of Engineer, at no additional cost to Employer.

## **6. EXECUTION**

### **6.1. SURFACE CONDITIONS**

Inspection and Preparation;

- Prior to Work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
- Concrete surfaces to be plastered shall be cleaned to remove grease, form oil and other impurities which will otherwise adversely affect the adhesion of plaster to the surface. Surfaces of concrete work if so required by Engineer/Consultant shall be hacked by approved means to give the required key for plastering.
- Surfaces shall be washed with clean water and kept damp for 2 hours before further treatment. Surfaces thus prepared shall be treated uniformly with a cement and sand slurry of one part cement, one part sand mix before application of plaster.
- Application should not be undertaken if work is exposed to dry hot winds, where temperature is above 32 C (90 F), in the shade, and relative humidity is below 50%. Extreme caution should be taken to avoid rapid setting of mixture and resultant shrinkage cracks. Refrain from excessive trowel ling.
- Do not apply coatings when temperature is below 4 C (39 F) or for at least 4 to 6 days following, to ensure that conditions will permit the curing treatment specified.

Discrepancies:

- In the event of discrepancy, immediately notify the Engineer/Consultant.
- Do not proceed with installation in areas of discrepancy until they have been completely resolved.

## **7. WORKMANSHIP**

- a.** Proportioning & mixing;
  - Measurement of materials by volume shall be of known capacity to maintain consistent proportions. No lumpy or cracked material shall be used. Mixing equipment, boxes and tools shall be clean. Materials shall be proportioned as specified or as directed by the Engineer/Consultant. Mixing shall be continuous until complete and ingredients are evenly distributed.
  - Only limited water shall be used for proper workability. Mortar shall be consumed within thirty minutes of mixing. Retempering will not be permitted. Mortar which has begun to stiffen shall be discarded.
  - Plaster ingredients shall be thoroughly mixed by hand on a clean platform or by mechanical mixer.
- b.** Expanded metal lath;
  - Before plastering, wherever reinforced concrete meets block masonry at a flush condition, install 8 ins wide continuous strip of expanded metal lath, attached with galvanized nails, to both surfaces, covering joint completely, to prevent cracking.
- c.** Control joints;
  - Strike V depressions, where required to create controlled crack lines in finish.
  - Install plaster stops in ceilings to end plaster material or to create control joints.

## **8. CURING OF PLASTER**

Curing shall commence as soon as plaster has set and shall continue for 8 days unless noted otherwise.

Curing of ceiling plaster shall be by direct application of water so as to keep plaster damp at all times for 8 days.

## **9. CLEANING AND PROTECTION**

- a.** Rubbish and debris shall be removed as necessary to Make way for work of other trades and as directed by the Engineer. As each room or space is completed, all rubbish, debris, scaffolding and tools should be removed to leave the room clean.
- b.** Prior to plastering all aluminum windows and finished metals should be covered by sheet of plastic or tarpaulin to protect it from damage.
- c.** Protect finished plaster from injury by any source. Contractor shall also protect walls, floors and work of other trades from plaster materials.

## **10. TOLERANCES**

Maximum deviation from a true plane shall be 1/16" (1.5 mm) as measured from the line of 16 feet (5 meters) straight edge placed at any location on the surface.

## **8- PAINTING**

### **8.1. SCOPE**

- a.** The work covered by this section of the Specifications, consists of furnishing all materials, plant, labor, equipment appliances and performing all operations in connection with surface

preparation, mixing, painting and varnishing of every surface requiring paint or varnish finish which includes concrete works, gates, frames, structural steel works, steel pipes, valves, steel and wooden doors, windows, louvers wall, ceilings and all such surfaces as shown in the Drawings and/or as directed by the Consultant/Engineer, in strict accordance with this section of the specifications, & subject to the terms and conditions of the Contract.

## **8.2. GENERAL**

- Except as otherwise specified, all painting & decoration shall be applied in conformity with best local practice as applicable to the work, and as directed.
- The Contractor shall repair at his own expense all damaged or defective areas of shop-painted metal work and structural steel work. Metal surfaces against which concrete is to be placed will be furnished shop-painted and shall be cleaned prior to being embedded in concrete.
- Except as otherwise specified, all concrete and smooth plastered surfaces are to be painted.
- All painting and decorating materials shall be supplied in accordance "with the manufacturer's printed instructions.
- Every possible precaution shall be taken to keep down dust before and during painting processes. No paint shall be applied to surface structurally or superficially damp and all surfaces must be ascertained to be free from condensation, efflorescence, etc., before the application of each coat.
- Primer or undercoated woodwork and metalwork should not be left in an exposed or unsuitable situation for an undue period before completing the painting process. No exterior or exposed painting shall be carried out under adverse weather conditions, such as rain, extreme humidity, dust storm, etc.

- Metal fittings such as ironmongery etc. not required to be painted shall first be fitted and then preparatory processes are commenced. When all painting is completed the fittings shall be cleaned and re-fixed in position.
- The contractor will be required to repaint, at his own expense, any work where the paint is incorrectly applied. The contractor shall be responsible for protecting from damage the paintwork and all other work during and after painting operations including the provision of all necessary dust sheets, covers, etc.
- Brushes, pails, bottles, etc., used in carrying out the work shall be clean and free from foreign matter. They shall be throughout cleaned before being used for different types or classes of material.
- The number of coats stated in this specification is the minimum, and the contractor must apply sufficient coats to achieve a proper even finish to the approval of the Consultant.

### **8.3. MATERIALS/PAINTING SCHEDULE**

#### **3.1**

- The decorating material shall be obtained from approved manufacturers and shall be supplied in the manufacturer's sealed and branded containers.
- All materials must be thoroughly stirred before use, unless not recommended by the manufacturer.
- Details of mixing and application shall be in accordance with the specifications of the manufacturers concerned and to the approval of the Consultant.
- The mixing of paints, etc., of different brands before or during application will not be permitted. No dilution of painting materials shall be allowed except strictly, as detailed by the manufacturers and as approved by the Consultant.
- Mordant solution shall be of approved manufacture.

- Rust inhibitors shall be of approved manufacture. Stopping for woodwork to receive clear finish shall be tinted to match surrounding woodwork, to approval.
- Stopping for internal woodwork, plywood, hardboard, and fiberboard, shall be linseed oil putty to BS 544, tinted to match the color of the undercoat.
- Stopping for external woodwork shall be white lead paste and gold size well mixed. Thinners shall be approved turpentine or white spirit to BS 245
- All materials shall be acceptable, proven, top-grade products and shall meet or exceed the minimum standards of reputable manufacturers as approved by the Consultant.

Colors shall be pure, non-fading pigments, mildew-proof sun-proof, finely grounded in approved medium. Colors used on plaster and

- concrete surfaces shall be lime-proof. All materials shall be subjected to the Consultant's approval.

### **3.2 Priming paints shall be**

- for woodwork: leadless grey priming paint in accordance with the recommendations of the decorative coating manufacturer;
- for steel work: red oxide priming paint in accordance with BS 2524
- for galvanized, zinc or aluminum alloy surfaces: grey zinc chromate priming paint in accordance with BS 3698
- for plaster: concrete and block work, ceiling boards, etc., alkali resisting priming paint in accordance with the recommendations of decoration ceiling manufacturer.

Knotting shall be in accordance with BS 1336.

### **3.3 Undercoating shall be**

- zinc oxide based undercoating paint;
- White lead based undercoating paint in accordance with BS 2525-7. Colors shall approximate to the finishing paint;
- Synthetic alkyd based undercoating in accordance with the recommendations of the decorative coating manufacturer.

Finishing paint shall be as shown on the drawings with the minimum specifications:

- zinc oxide based oil paint;
- White lead based oil gloss finishing paint in accordance with BS 2525-7. Colors shall approximate to the finishing paint;
- Synthetic alkyd based finishing paint as approved by the Consultant.

Petrifying liquid shall be used undiluted as supplied by the manufacturer. A small quantity of water paint of the finishing color may be mixed with the petrifying liquid.

Water paint shall be an approved brand of washable oil bound water paint complying with BS 1053 type A. Thinning shall be done with petrifying liquid or fresh water only.

Emulsion paint shall be of the Polyvinyl Acetate (PVA) type obtained from an approved manufacturer. The precise specification shall comply with the manufacturer's normal practice. In all cases thinning shall be done with thinners supplied by the manufacturer or fresh water only.

Stain for woodwork shall be an approved brand of oil stain complying with BS 1215. Polyurethane lacquer for woodwork shall be of an approved manufacture.

## **PREPARATION PROCESS**

### **a. Internal Plaster, Fair Faced Concrete and Block Work.**

- Surfaces shall be allowed to dry out completely and cracks shall be cut out and made good with suitable hard plaster or cement and sand mix as appropriate, such repaired portions shall be allowed to dry out. No painting shall be carried out on plastering less than five weeks old.
- Efflorescent shall be completely removed by rubbing down with dry coarse cloths followed by wiping down with damp cloths and allowed to dry. All surfaces shall be nibbed down with fine glass paper and brushed free of dust before applying any form of decoration.
- Surfaces, which are to receive water paint, shall be treated with one coat of petrifying liquid applied by brush and allowed to dry for at least 24 hours before the application of water paint. A period of 24 hours or longer if necessary shall be allowed between subsequent coats.
- Fair-faced concrete and/or cement and sand plastered surfaces, which are to receive oil paint, shall be given one day. The surfaces shall then be rubbed down with fine glass paper and given a second thin coat of oil putty and when completely set shall be rubbed down again with fine glass paper before applying the "priming coat of oil paint.
- All surfaces, which are to receive oil paint, shall be treated with one coat of alkali resisting priming paint applied by brush and allowed to harden completely.

### **b. STEELWORK INCLUDING WINDOWS. LOUVERS, ETC., INTERNALLY AND EXTERNALLY.**

- If delivered galvanized, the surface shall be cleared to remove grease and dirt before priming. Where rusting has occurred through damage to the galvanizing such rust shall be removed by wire brushing back to clean metal and the surface shall then be treated with one coat of mordent solution and one coat of zinc chromate priming paint.
- If delivered primed, the surfaces shall be examined to ascertain that the priming paint is hard, firmly adhering and in good condition. If not satisfactory, the priming paint shall be removed and the surfaces cleaned to remove rusts and re-primed. If the condition of the priming paint is satisfactory, the surfaces shall be cleaned to remove grease and dirt, minor damage to the priming paint, being made good with red oxide priming paint after removal of rust.
- If delivered unprimed and not galvanized, the surfaces shall be clean remove grease and dirt, and wire brushed and scraped to remove all rust and scale before applying a red oxide priming paint.
- Priming paint shall be brushed well into the surface and shall be allowed to dry and harden thoroughly before the application of subsequent coats.
- Items of steel work such as frames to roller shutters, covers to expansion joints, etc., which are to be built into walls, shall first be primed.
- The Consultant reserve the right to have rusted items removed from the site and reloaded at the Contractor's expense if he considers the item has been too badly affected or incorporation in the works.

#### **4. FINISHING PROCESSES**

- Where emulsion paint is specified at least three coats shall be applied by roller in addition to any priming paint in order to produce a finish to the Consultant's satisfaction.
- Where water paint is specified two coats shall be applied by brush in addition to the petrifying

liquid. The water shall be thinned to the consistency of thick cream.

- Where oil paint is specified this shall be two or three coat work as detailed in the manufacturer's specifications, applied by roller or spray, to produce hard gloss, oil gloss, eggshell or flat finish as required.
- The finishing coat of paint to walls and ceiling shall be applied after the completion and testing of the electrical installation. Any paint splashes on electrical fittings shall be carefully cleaned off.

## **5. EXECUTIONS**

### **a. Submittals:**

Color samples shall be submitted on 6"x6" asbestos/ wood/metal boards showing each type of paint for Consultant's approval. Manufacturer's color charts shall be submitted for Consultant's color selections.

### **b. Job Conditions:**

- Observe manufacturer's recommended minimum and maximum temperature but do not apply paint or finish to any surface unless ambient temperature is 10°C (50°F) or above and less than 43°C (110°F). No painting shall be done above 90% relative humidity.
- Place drop clothes to adequately protect all finished work.
- Remove and replace all items of finish hardware, device plates, accessories, lighting fixtures or other removable items.
- In no case shall any finish hardware or other finished item that is already fitted into place be painted, unless otherwise specified by the Consultant.

**c. Quality Assurance:**

All paint for any one surface shall be top quality, of one manufacturer and approved by the Consultant. Deep tone accent colors shall be used and the unavailability of final coat colors may be the basis for rejecting materials for any one surface.