



Rmeil 358 Sursock Palace Technical Specifications For lateral elevations

September 2024

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GENERAL REQUIREMENTS

1- Description of Work and Site

1-1 The Works

1-1-1 General Description

The project involves the implementation of the “Assistance to the Rehabilitation of the Sursock Palace (Rmeil 358),” specifically focusing on the restoration of the east and west lateral elevations.

The scope of work includes restoration and conservation efforts for the significantly impacted lateral elevation of the building, which suffered damages from the Beirut blast on August 4th, 2020.

1-1-2 The Works

The scope of the works encompasses, but is not limited to, several key elements. These include demolition activities, structural consolidation, and the restoration and cleaning of metal and wood components. Additionally, the project involves plaster works as well as structural plaster repairs.

1-1-3 Concurrent Work

Other work not forming part of the Contract will be carried out by the Employer or other contractors or public bodies during the execution of the works. Allow for the coordination of this work to enable the installation to progress without disruption to the completion of the works. Allow for the provision of all necessary temporary facilities as required and afford all reasonable access and assistance to enable the completion of these works in a timely manner.

1-1-4 Restraints

The maintenance of the existing utilities and access during the whole period of construction (i.e. electrical supplies water supply sewage disposal and telecommunications) imposes serious restraints upon the programming of the works. The Contractor is to consider carefully and incorporate all the restraints into his program of works and allow for same in his contract price.

1-1-5 Phasing of Work

The phasing of the work will be developed by the Employer and Contractor upon consideration of the contractor’s proposals for the program of works and construction activities. The contractor has to prepare his program in accordance with section 3-1 of these documents. The Contractor shall prepare his program to ensure that proper outlets will be provided to adjacent networks as soon as practicable and especially before wet seasons.

1-1-6 Sectional Completion

The Works are to be completed and will be taken over by the Employer, in accordance with Clause 48 of the Conditions of Contract, after agreement of the construction program.

1-1-7 Restrictions on Methods of Working

The contractor is to ascertain from the appropriate authorities any restrictions on the methods of working, incorporate into works and include in the Contract price.

1-1-8 Sequence of Construction

The limited workspace and numerous utilities in the Project Area call for a thorough and well-studied construction sequence. The Contractor shall prepare a construction sequence in conformity with his construction program. Such a sequence / program has to include procedures regarding maintenance of service during construction as well as utility diversion to ensure such service.

1-1-9 Restrictions on Times of Working

The contractor is to ascertain from the various authorities the local restrictions during the completion of the works. The contractor is to assume for the purposes of the tender that normal working hours shall be from dawn to dusk.

1-2 The Site**1-2-1 General**

The Site is described on drawings; the contractor shall make all necessary arrangements, including payment if need be, regarding any land outside the Site that may be needed as work areas. The Employer will not acknowledge any liability in respect of such land. The Contractor shall also be responsible for insuring that all roads and temporary facilities needed are sufficient to divert traffic adequately.

1-2-2 Contractors Site Compound

The Contractor shall locate and select sites outside the right-of-way for use of his plant, equipment, site offices, residences, Temporary Works or any other uses which are essential during the execution of the Contract. The Contractor shall take the necessary measures for using these sites and shall be responsible for all expenses that may become due in return for such use. Prior to using any land owned by public or private owner outside the Site, the Contractor shall obtain the approval of the concerned Authorities and the Project Manager/Engineer.

1-2-3 Existing Utilities and Obstacles

Utilities shall include, but not be limited to, existing water lines, gas lines, sewer lines, wire lines, service connections, water and gas meters and valve boxes, light poles and masts, pylons, cableways, signals, and all utility appurtenances within the limits of the proposed construction.

The Contractor shall:

- Take into account that the diversion works will be carried out to the requirements and approval of the Utility Owners and/or under their supervision, and that where required by the Utility Owners specialist diversion works be carried out by accredited specialist Contractors
- Verify and identify by excavating trial pits and other measures including, detection means existing utilities. Map these utilities and prepare detailed and accurate existing utilities drawings identifying after coordinating with the respective authorities the utilities that are in service and those that are dead or abandoned. Submit to the Project Manager/Engineer and to the Utility Owners existing utilities Drawings that are accurate and detailed giving location of utilities in plan and section with all pertinent data of the respective utility
- Work out and develop in coordination with the Utility Owners and the Project Manager/Engineer approved utilities diversion schemes as will be required, and also to enable execution of the Contract Works and maintain continued utilities services in the Area, and to the users
- Execute and provide superintendence for the execution of the utility diversions whether they are carried out by the Contractor directly or by other parties employed by him
- Provide accurate as Built Drawings of all permanent utility diversions that are executed under the Contract
- Include activities for such works in the Program of Work
- Be responsible for safeguarding and protecting from damage, all utilities and appurtenances encountered during the Works and be responsible for the costs of making good any damage thereto, arising out of his own negligence. Existing Obstacles shall include, but not be limited to existing, buildings, bridges and the like, walls, fences, gates, wells, septic tanks, manholes, pits, pipes, culverts, roadways, sidewalks, signs and rubbish dumps, whether or not shown on the Drawings. The contractor shall, at the commencement of the Contract, examine the Site and identify/verify all obstacles within the right-of-way above or below ground, and shall record all such information on suitable Site Drawings which shall be submitted to the Engineer within the agreed\ program but prior to commencement of that part of the work.

1-2-4 Utility Diversions

The necessary utility diversions, either temporary or permanent, shall be carried out by the Contractor. Alternatively, the Employer may make arrangements for such works to be executed by other parties, normally the Utility Owners. The Contractor shall take into account that the diversion works will be carried out to the requirements and approval of the Utility Owners and/or under their supervision.

2- DOCUMENTS AND DRAWINGS

2-1 Documents Generally

The Documents are: Bid Conditions and Procedures, Conditions of Contract, Technical Specifications, Bill of Quantities, Drawings

2-2 Drawings

2-2-1 Contract Drawings

2-2-2 Dimensions and Details

Drawings are not to be scaled. Take all sizes from the dimensions shown on the Drawings or, where appropriate, as measured on site. Use detailed drawings in preference to layout drawings.

2-3 Drawings Etc. Provided by the Contractor

2-3-1 General

The Engineer will supplement the Contract Drawings. The Contractor shall prepare all other drawings required for Temporary Works and for fabrication and coordination of trades and prepare all shop drawings and other drawings and documents required under the Contract, in addition to drawings for work to be designed by the Contractor.

2-3-2 Design

The Contractor shall provide and maintain a design office and design personnel to provide the coordination, control and development of the detailed construction design of the works. The Contractor is required to develop, where necessary, the Engineer design intent by providing the detailed drawings to enable the construction of the works.

2-3-3 Design and Shop Drawings

The Contractor shall prepare and submit for approval, design and shop drawings, method statements of each task shown in the BOQ, specifications, calculations, manufacturers' data etc. as required by the Specification or instructed by the Engineer in good time to meet the program (including an allowance of 5 days for Engineer's approval and extra time for resubmission in the case of rejection) and, in any case, a minimum of 15 days before the work is to be commenced or order placed, as appropriate. Drawings shall be carefully checked before submission to ensure that no conflict exists with other parts of the work.

2-3-4 Supporting Data

Supporting Data such as manufacturers' standard details, performance standards etc. are to be in English, or accompanied by a translation, and are to be properly referenced to the Drawings and Specifications and to be presented in accordance with Procedures Note 2: Submittals for Product Data (included at the end of this Section).

2-3-5 Procedure for Submission and Approval

1. Submit two copies of drawings and other documents for approval to the Engineer.
2. Within 5 days of receipt at the Engineer's design office, the Engineer will return one copy of the drawings stamped as:
 - a) approved, or
 - b) approved subject to amendments shown on the returned copy or in an accompanying letter, or
 - c) rejected, with recommendations for resubmission.
3. In the case of approval, work may be commenced or orders placed.
4. In the case of approval with clarifications, work may be commenced or orders placed, at the Contractor's risk, providing the qualifications are implemented. Submit revised drawings for approval.
5. In case of rejection, resubmit until approval is obtained.
6. Provide four copies, and reproducible copy if required, of all approved material in accordance with the Conditions of Contract.

2-3-6 "As-Built" Drawings

The Contractor shall neatly and professionally prepare as-built drawings for all work completed, on reproducible copies of the drawings and on electronic copy in a program stipulated by the Engineer for all the trades Architectural, Structural, Mechanical, Electrical, Environmental, Landscape and other utilities and such other "As Built" drawings as are called for by the Specification and submit to the Engineer for approval, and shall provide additional drawings of those parts of the permanent work designed by the Contractor to clearly show details, and other applicable drawings and sketches prepared for the work as required (being drawings which the Contractor or any subcontractor has to prepare for the purpose of the Works) and shall transmit the As- Built drawings to the Engineer on a continuous basis before completion of construction but in all cases prior to issuance of the certificate of completion of the Works. The Contractor shall maintain on site one complete set of the Contract which shall be available to the Engineer at all times and upon which the Contractor shall record on a continuous basis all changes and field adjustments. On a continuous basis shall mean as the work is progressively accomplished in relation to each Drawing. As Built drawing progress prints shall be submitted to the Engineer for review and approval as each Contract drawing reached the 50 percent, 75 percent, and 100 percent completions stage. As Built Drawings shall be considered as part of Contractor's work effort. Failure to submit as- built drawings will be the cause for delay of the Engineer's issuance of the Certificate of Completion.

2-3-7 Instruction and Maintenance Manuals

Where required under the Conditions of Contract and where required by the Specification, the Contractor shall provide four copies of instructions and maintenance manuals for equipment and installations. Manuals are to be in English and are to be properly bound in good quality hard covers and shall be submitted in accordance with Procedure Note 3: Instruction and Maintenance Manuals (included at the end of this section).

2-3-8 Completion

The works shall not be considered as complete for the purposes of the taking over under Clause 48 of the Contract until the “as built” drawings and instruction and maintenance manuals have been provided.

2-4 Bill of Quantities

2-4-1 Measurement Procedures Generally

All Works shall be measured net and in accordance with of the General Conditions of Contract. All units of measurement shall be in the Metric System, unless specified otherwise.

2-4-2 Field Measurements

Field Measurements of quantities for monthly certificates and for final payment shall be made by the Contractor in the presence of the Engineer. Original copies of the field measurement note, signed by the Contractor, will be retained by the Engineer. If the Contractor fails to measure any Pay Items, the Engineer may, at his discretion, estimate quantities of such items for the monthly Payment Certificate or recommend that no payment be made for the Items not measured and quantities not computed until it is measured.

2-4-3 Manufactured Items

Whenever standard manufactured items are specified, such as fence wire, plates, rolled shapes, pipe conduit, etc. and these items are identified by gauge, unit weight, section dimensions, etc., such identifications shall be deemed to be Nominal weights or dimensions. Unless controlled by tolerances in cited specifications, manufacturing established by the industries involved may be accepted by the Engineer at the recommendation of the Concerned Authorities

2-4-4 Gage Designations

The term “gage” when referring to the size steel plate shall mean U.S. Standard Gage, except when referring to galvanized sheets used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches and metal cribbing, when “gage” shall be as specified in AASHTO M36 or AASHTO M167, and when referring to wire when “gage” shall be as specified in AASHTO M32.

2-4-5 Fittings and Accessories

When items are shown on the Drawings or specified as requiring miscellaneous fittings and accessories for which no separate measurement is provided, the Pay Item will be deemed to include for all such fittings and accessories.

2-4-6 Weight Measurements

All materials which are to be measured or proportioned by weight shall be on accurate and approved scales by competent and qualified personnel, at locations designated or approved by the Engineer. Trucks used to haul material being paid for by weight shall be weighed empty each day at such times as the Engineer directs and each truck shall bear a plainly visible and legible identification mark.

2-4-7 Linear and Area Measurements

All items which are to be measured by linear meter, such as pipe culverts, guardrail, underdrains, etc., shall be measured parallel to the base or foundation upon which such structures are placed, unless otherwise shown on the Drawings.

Unless otherwise specified longitudinal measurements for area computations shall be made horizontally and no deductions shall be made for fixtures with an area less than one sqm. Transverse measurements for area computations shall be the neat dimensions shown on the Drawings or as ordered by the Engineer.

2-4-8 Volume Measurements in Vehicles

Materials to be measured by volume in the hauling vehicle shall be hauled in approved type vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type approved by the Engineer provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to their level capacity and the Engineer may require loads to be releveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and if approved by the Engineer material specified to be measured by the cu.m. may be weighed and such weights will be converted to cu.m. for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by mutual agreement between the Engineer and the Contractor if no agreement is obtained the factors will be determined by the Engineer and shall be accepted by the Contractor.

2-4-9 Ordering Materials

The quantities stated in the Bills of Quantities are not to be used for ordering materials.

2-4-10 Shop Drawings

- A. Submit newly prepared information, drawn to accurate scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.
 - 1. Include the following information on Shop Drawings:
 - i. Dimensions
 - ii. Identifications of products and materials included
 - iii. Compliance with specified standards
 - iv. Notation of coordination requirements
 - v. Notation of dimensions established by the field measurement.
 - 2. Submit Co - ordination drawings where required for integration of different construction elements. Show construction sequences and relationship of separate components where necessary to avoid conflicts in utilization of the space available.
 - 3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the Shop Drawings.
 - 4. Do not permit Shop Drawings copies without an appropriate final stamp or other marking indicating the action taken by the Engineer to be used in connection with construction.
 - 5. Initial Submittal: Submit copy and one reproducible Engineers review, the reproducible print will be returned.
 - 6. Final Submittal: submit 4 copies and one reproducible copy.

2-5 Procedure Note 1**2-5-1 Submittals for Shop Drawings****2-5-1-1 Shop Drawings**

- A. Submit newly prepared information, drawn to accurate scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.
 - 1. Include the following information on Shop Drawings:
 - i. Dimensions
 - ii. Identifications of products and materials included
 - iii. Compliance with specified standards
 - iv. Notation of co - ordination requirements
 - v. Notation of dimensions established by the field measurement.
 - 2. Submit Co - ordination drawings where required for integration of different construction elements. Show construction sequences and relationship of separate components where necessary to avoid conflicts in utilization of the space available.
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3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the Shop Drawings.
4. Do not permit Shop Drawings copies without an appropriate final stamp or other marking indicating the action taken by the Engineer to be used in connection with construction.
5. Initial Submittal: Submit copy and one reproducible Engineers review, the reproducible print will be returned.
6. Final Submittal: submit 4 copies and one reproducible copy.

2-6 Procedure Note 2

2-6-1 Submittals for Product Data

2-6-1-1 Product Data

- A. Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.
 1. Where Product Data have been printed to include information on several similar products, some of which are not required for use on the Project, or are not included in this submittal, mark copies to clearly indicate which information is applicable.
 2. Where Product Data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.
 3. Include the following information in Product Data:
 - i. Manufacturer's printed recommendations
 - ii. Compliance with recognized trade association standards
 - iii. Compliance with recognized testing agency standards
 - iv. Application of testing agency labels and seals
 - v. Notation of dimensions verified by field measurement
 - vi. Notation of co - ordination requirements.
 4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 5. Submittals: Submit 2 copies of each required Product Data submittal; submit 2 additional copies where copies are required for maintenance manuals. The Engineer will retain one copy, and will return the other marked with the action taken and corrections or modifications required. Unless the Engineer observes non-compliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
 6. Distribution: Furnish copies of final Product Data submittal to manufacturers, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms
- i. Do not proceed with installation of materials, products and systems until a copy of Product Data applicable to the installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.

- ii. Do not permit use of unmarked copies of Product Data in Connection with construction.

2-7 Procedure Note 3

2-7-1 Instruction and Maintenance Manuals

2-7-1-1 Summary

- A. This Procedure Note specifies administrative and procedural requirements for instruction and maintenance manuals including the following:
 - 1. Preparation and submittal of instruction of operating and maintenance manuals for building operation systems or equipment.
 - 2. Preparation and submittal of instruction manuals covering the care, preservation and maintenance of architectural products and finishes.
 - 3. Instruction of the Employer's operating personnel in operation and maintenance of building systems and equipment.

2-7-1-2 Quality Assurance

- A. Maintenance Manual Preparation: In Preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.
 - 1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.
 - 2. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.
- B. Instruction for the Owner's Personnel: For instruction of the Employer's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the building equipment or system involved.

2-7-1-3 Submittals

- A. Submittals Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.
 - 1. Before Substantial Completion, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two draft copies of each manual to the Engineer for review. Include a complete index or table contents of each manual. The Engineer will return one copy of the draft with comments within thirty days of receipt.
 - 2. Submit one copy of data in final form at least thirty days before final of receipt of the Engineer's comments. inspection. This copy will be returned within thirty days after final inspection, with comments.

3. After final inspection make corrections or modifications to comply with the Engineer's comments. Submit the specified number of copies of each approved manual to the Engineer within fifteen days of receipt of the Engineer's comments.
- B. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the Employer's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment's into a single binder.
 1. Binder's: for each manual, provide heavy - duty, commercial quality, durable 3 - ring vinyl covered loose-leaf binder, in thickness necessary to accommodate contents, sized to receive 8- 1/2" by 11" paper. Provide a clear plastic sleeve on the spine, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.
 - i. Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the Project Manual table of contents. Cross- reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
 - ii. Identify each binder on the front and spine, with the typed or printed title "OPERATION AND MAINTENANCE MANUAL" Project title or name, and subject matter covered. Indicate the volume number for multiple volume sets of manuals.
 2. Dividers: Provide heavy paper dividers with celluloid covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.
 3. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
 4. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially, prepared data, neatly typewritten, on 8-1/2 " by 11", 20-pound white bond paper.
 5. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.
 - i. Where oversize drawings are necessary, fold the drawings to the same size as the text pages and as a foldout.
 - ii. If drawings are too large to be used practically as a fold out, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a typewritten page indicating the drawing title, description of contents and drawing location at the appropriate location in the manual.

2-7-1-4 Manual Content

- A. In each manual include information specified in the individual Specification Section, and the following information for each major component of building equipment and its controls.
 1. General system or equipment description
 2. Design factors and assumptions

3. Copies of applicable Shop Drawings and Product data
 4. System or equipment identification, including:
 - i. Name of manufacturer
 - ii. Model number
 - iii. Serial number of each component
 5. Operating instructions
 6. Emergency instructions
 7. Wiring diagrams
 8. Inspection and test procedures
 9. Maintenance procedures and schedules
 10. Precautions against improper use and maintenance
 11. Copies of warranties
 12. Repair instructions including spare parts listing
 13. Sources of required maintenance materials and related services
 14. Manual Index.
- B. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of product Data, supplemented by drawings and written text, and copies of each warranty, bond and service Contract issued.
1. Title Page: Provide a title page in a transparent plastic envelope as the first sheet of each manual. Provide the following information.
 - i. Subject matter covered by the manual
 - ii. Name and address of the Project
 - iii. Date of submittal
 - iv. Name, address, and telephone number of the Employer
 - v. Name and address of the Employer
 - vi. Cross reference to related systems in other operating and maintenance manuals.
 2. Table of Contents: After the Title Page, include a type written table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by the product name or other appropriate identifying symbol and indexed to the content of the volume.
 - i. Where more than one volume is required to accommodate data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.
 3. General Information: Provide a general information Section immediately following the Table of Contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.
 4. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet

to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information that is not applicable.

5. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.
 6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to
 7. Provide Control or flow diagrams. Co - ordinate these drawings with information contained in Project record Drawings to assure correct illustration of the completed installation.
- i. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.
8. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event product failure. List circumstances and conditions that would affect validity of the warranty or bond.

2-7-1-5 Material and Finishes Maintenance Manual

- A. Submit four copies of each manual, in final form on material and finishes to the Engineer for distribution. Provide one section for architectural products, including applied materials and finishes, and a second for products designed for moisture protection and products exposed to the weather.
1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.
- B. Architectural Products: Provide manufacturer's data and instructions on care maintenance of architectural products
1. Manufacturer's Data: Provide complete information on architectural products, including the following as applicable
 - i. Manufacturer's catalogue number
 - ii. Size
 - iii. Material composition
 - iv. Color
 - v. Texture

- vi. Reordering information for specially manufactured products.
- 2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendation for types of cleaning agents to be used and methods of cleaning. Provide information regarding cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.
- C. Moisture - Protection and Weather - Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture - protection purposes.
- 1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
 - i. Applicable standards
 - ii. Chemical composition
 - iii. Installation details
 - iv. Inspection procedures
 - v. Maintenance information
 - vi. Repair procedures
- D. Schedule: Provide complete information in the materials and finished manual on products as directed by the Engineer.

2-7-1-6 Instructions of The Employer's Personnel

- A. Prior to final inspection, instruct the Employer's personnel in operation, adjustment and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.
- 1. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

3- MANAGEMENT PROCEDURES

3-1 Commencement, Program and Progress

3-1-1 Commencement

After receipt of the Order to Commence the Contractor shall inform the Engineer's Representative at least 3 days in advance, of the proposed date for commencing work on Site.

3-1-2 Co-Ordination

The Contractor shall co-ordinate the construction activities included therein to assure efficient and orderly installation of each Part of the works. Coordinate construction operations included under differing sections of the Specifications that are depended upon each other for proper installation connection and operation.

1. Where installation of one part of the work is dependent on the installation of the components either before or after its own installation schedule construction activities in the sequence required to obtain the best results.
2. Where availability of space is limited restricted by access or security co-ordinate installation of the different components to assure maximum accessibility at desired times for required maintenance service and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

3-1-3 Program

The Contractor shall provide for the Engineer's review in accordance with Conditions of Contract a computer-based program in critical path network (CPN) form, showing at least the following information:

- a) Contract milestones (Engineer's Notice to commence, Commencement Date, date for completion of Sections of the Works, date for completion of the whole of the Works etc.)
- b) Duration Of each construction activity in working days
- c) Earliest/latest start and completion dates for each construction activity
- d) Free float time for each activity
- e) Total float time for each activity
- f) Cost of each activity as per contract rates
- g) Duration and earliest/latest dates for procurement of materials and plant
- h) Duration and earliest/latest dates for activities to be performed by subcontractors
- i) Number of working days per week and list of holidays
- j) Number of working shifts per day for each construction activity
- k) Activities for temporary works to be supplied and constructed and the dates for supply construction and removal
- l) Dates for supply by the engineer of drawings and other information
- m) Dates for submission by the Contractor of shop drawings samples and the like and dates for approval by the Project Manager/Engineer

- n) Dates and times for work to be performed by other Contractors or for materials and Plant to be supplied by the Employer
- o) Duration and earliest/latest dates for testing and commissioning plant and engineering installations
- p) Bar chart showing earliest dates and total float of activities

3-1-4 Guidance

The Contractor shall abide by the following:

- a) The Engineer will guide the contractor in the determination of the level of detail to be included in the CPN
- b) Construction activities will not be scheduled to exceed twenty-five (25) working days without the approval of the Engineer
- c) One day will be the smallest time unit used

3-1-5 Hardware

The computer hardware shall be IBM compatible

3-1-6 Computer Software

Project management software shall be of the professional high-end type (e.g. "Open Plan " "Primavera" or of similar capabilities) and it shall be to the approval of the Engineer. Contractor is to identify and submit details in his tender of his proposed software program.

3-1-7 Resource Schedules

The computer program used for preparing the program shall also be used for preparation of resource schedules to be submitted to the Engineer with the program. The resource schedules shall show at least the following information:

- a) quantity of materials to be used for each activity
- b) numbers and classes of workmen to be employed on the Site for each activity
- c) numbers and classes of equipment to be used for each activity
- d) histogram for workmen by class and overall classes
- e) histogram for equipment by class and overall classes.

3-1-8 Cash Flow Estimate

The computer program used for preparing the program shall also be used to prepare the cash flow estimate to be submitted by the Contractor

3-1-9 Monitoring

The Contractor shall monitor progress of the works and the supply of resources and cash flow compared with the program schedules and estimate, update the program with actual progress data monthly and shall revise the program schedules and estimate. Copies of revised programs

etc. and notices of actual and forecast delays and shortfalls shall be regularly given to the Engineer.

3-1-10 Computer Program

The Contractor shall provide the Engineer with a copy on the computer copy of the Target updated and new Target programs, schedules and estimates.

3-1-11 Materials Procurement Schedules

The Contractor shall submit within 10 days after the date of the Letter of Acceptance a comprehensive Materials Procurement Schedule, tied with the Program of Works to include submission approval order and delivery stages status. The Contractor shall update this schedule monthly. Copy of revised schedule shall be regularly gives to the Engineer.

3-2 Records and Measurements

3-2-1 Labor Record

The Contractor shall provide each week a record showing the number and description of workmen employed each day on the Works including those employed by subcontractors.

3-2-2 Materials and Plant Record

The Contractor shall provide each week a record showing the quantity and description of all materials and plant delivered to the Site complete with copies of delivery notes.

3-2-3 Equipment Record

The Contractor shall provide each week a record showing the number, type and capacity of all Contractors Equipment, excluding hand tools daily employed on the Works.

3-2-4 Daily Work Record

The Contractor shall provide each day a record showing activities performed and locations in which work has been carried out and any other matter requested by the Engineer's Representative.

3-2-5 Monthly Report

The Contractor shall provide monthly reports which summarize the daily and weekly reports and deliver to the Engineer's Representative not later than one week following the end of each month.

3-2-6 Wages Books and Time Sheets

The Contractor shall keep accurate and proper wage books and time sheets showing wages paid to and time worked by workmen and, when required, produce such wage books and time sheets for inspection by the Engineer's Representative.

3-2-7 Climatic Conditions

The Contractor shall measure and keep an accurate daily record of and submit to the Engineer's Representative at the end of each week. Air temperatures: maximum and minimum Humidity Rainfall: total in mm and hours

3-2-8 Special Records

In the event of delays for which an extension of time for completion is sought under Clause 44 or in the event of any claim for costs, the Contractor shall keep such special records of the circumstances as the Engineer's Representative may require, and submit copies regularly for his inspection.

3-2-9 Photographs

The Contractor shall provide progress photographs taken from approved stations not less than 50 (fifty) at monthly intervals and submit the digital copies monthly to the Engineer in charge.

3-3 Site Administration**3-3-1 Engineer's Site Meetings**

The Engineer's Representative will hold site meetings once a week or more frequently if he deems necessary for the efficient management of the Works and he will distribute minutes. Attend all such meetings and secure the attendance of subcontractors and others if requested by the Engineer's Representative.

3-3-2 Contractor's Site Meetings

The Contractor shall hold such meetings as are necessary for co-ordination of subcontractors and review of progress.

3-3-3 Co-Ordination of Subcontractors Etc.

The Contractor shall co-ordinate the work of all trades and subcontractors so as to avoid delay and disruption or abortive work. The Contractor shall provide all drawings, dimensions and other information required for the proper execution of subcontract works and of associated builder's work and accept responsibility for the accuracy and fitness of subcontract works.

3-3-4 Quality Control

The contractor shall prepare and submit for approval by the Engineer a proposal for the Quality Control Management of the project. This proposal shall incorporate the requirements set out in B S 5750 or its equivalent and shall be incorporated into the Procedure Manual and will form an integral part of the contractor's management of the project. The proposal shall include, but not be restricted to:

- The provision and maintenance of a quality control program throughout the project,
- Inspection and testing of products, both on and off site, by independent professional inspection and testing companies,
- Provision of inspection and testing equipment,
- Verification of affidavits and certificates that selected materials meet the specified standards,
- The maintenance of quality control documentation in accordance with the various procedures identified in these documents.

3-3-5 Procedures Manual

The Contractor shall prepare and agree with the Engineer a Procedure Manual for the administration of the Project.

3-4 Completion

3-4-1 Notice of Completion

The Contractor shall give the Engineer's Representative at least four weeks' notice of the anticipated date of substantial completion of the whole or any part of the Works.

3-4-2 Making Good Defects

The Contractor shall make arrangements with the Employer and give reasonable notice of the dates for access to the various parts of the Works for the purpose of making good defects and shall inform the Engineer's Representative of the dates and when remedial works to the various parts of the Works are completed.

4- QUALITY STANDARDS AND CONTROL

4-1 Generally

4-1-1 Good Practice

Where and to the extent that materials products and workmanship are not fully specified they are to be of a standard appropriate to the Works and suitable for the purposes stated in or reasonably to be inferred from the Contract Documents, and in accordance with good building practice including the relevant provisions of current standards regulations etc.

4-2 Setting Out and Accuracy

4-2-1 Site Survey

Before commencing Works on Site, the Contractor shall carry out a topographical survey of the elevations in conjunction with or as instructed by the Engineer's Representative or of such parts or the Site as the Engineer's Representative may direct to record the Site limits, dimensions, ground levels obstructions and other features and to establish base lines and points for future setting out and to record the basis for remeasurement, where applicable.

4-2-2 General Setting Out

Shall be performed using methods and measuring instruments described in BS 5606, Section 5 and within the permissible deviations described in Table 4 in relation to the instruments being used. Details of methods and equipment to be used in setting out the Works shall be submitted to the Engineer's Representative. The Contractor shall inform the Engineer's Representative when setting out is complete and before Commencing construction and shall provide instruments and assistance for checking the setting out if required by the Engineer's Representative.

4-2-3 Setting Out Utility Works

Shall be as shown on the Drawings or as instructed on Site. Stake-out shall be revised if, in the opinion of the Engineer's Representative, modification of line or grade is advisable.

4-2-4 Setting Out Civil Work

Shall be as shown on Drawings or as instructed on site.

4-2-5 Record Drawings

The Contractor shall record details of all grid lines, existing ground levels, setting-out stations, bench marks and profiles on the site setting-out drawing; retain on the Site throughout the duration of the Contract and hand to the Engineer's Representative on completion.

4-2-6 All Dimensions and Levels

Both on the Drawings and the Site, shall be checked particularly the correlation between components and the work in place. Materials and components shall not be ordered or work carried out until any discrepancies have been resolved with the Engineer.

4-2-7 Appearance and Fit

The Works shall be constructed to higher levels of accuracy than those specified where necessary to achieve a satisfactory appearance and to ensure that materials, elements and components of the building fit together as designed. Wherever the accuracy, fit or appearance of the work is likely to be critical or difficult to achieve, the Contractor shall obtain the Engineer's approval of proposals or of the partially finished work as early as possible

4-2-8 Non-Compliance

Work which fails to meet the specified levels of accuracy must not be rectified without approval. Submit proposals for such rectification or removal and replacement and meet all costs arising, including effects on other work.

4-3 Materials

4-3-1 Products

Are to be new unless otherwise specified and are to be handled stored and fixed with care to ensure they are not damaged when incorporated in the work. Selection of products shall be in accordance with Procedure Note 4: Product Selection (included at the End of this Section).

4-3-2 Product List Schedule

The Contractor shall, before placing any purchase order for any materials intended for incorporation in the Works, submit for approval a product list schedule giving a complete description of all such materials, names of the firms from whom he proposes to purchase them and copies of all test reports verifying conformity with the provisions of the Specifications. Materials shall not be ordered without the approval of the Engineer. When directed by the Engineer or otherwise specified, the Contractor shall submit suitable samples for approval.

4-3-3 Standards

For products and materials specified to a national standard, such as BS or ASTM, certificates of compliance are to be obtained from manufacturers when requested by the Engineer or the Engineer's Representative.

4-3-4 Single Sources

Where a choice of manufacturer or source or supply is allowed for any particular product or material, the whole quantity required to complete the work must be of the same type, manufacture and source. Written evidence of sources of supply are to be provided when

requested by the Engineer or the Engineer's Representative and sources are not to be changed without approval.

4-3-5 Checking Compliance of Products and Materials

The Contractor shall check all delivery tickets, labels, identification marks and where appropriate, the goods themselves to ensure that all products comply with the Specification. Where different types of any product are specified, he shall ensure that the correct type is being used in each location. In particular, the following shall be checked:

- Sources types, qualities, finishes and colors are correct, and match any approved samples
- Accessories and fixings which should be supplied with the goods have been supplied
- Sizes and dimensions are correct
- Goods are clean, undamaged and in good condition, with intact protective coverings and unbroken seals
- Materials which have a limited shelf life are not out of date.

4-3-6 Storage of Materials

Materials shall be stored as to assure the preservation of their quality and suitability for the Works. Stored materials, approved before storage, may again be inspected prior to their use in the Works. Stored materials shall be located so as to facilitate their prompt inspection. Materials shall not be stored in the ROW except where permitted by the Engineer. Stockpiling of aggregate material within the ROW shall also be confined to such authorized areas. Where materials are stockpiled on Government or private property, such sites shall be abandoned immediately upon utilization of all stockpiled materials and the natural surface shall be restored as far as practicable to the original condition by the Contractor and to the satisfaction of the Engineer.

4-3-7 Protection of Products and Materials

The Contractor shall:

- Prevent over-stressing and any other type of physical damage.
- Keep clean and free from contamination and staining.
- Keep dry and in a suitably low humidity atmosphere to prevent premature setting moisture movement and similar defects. Where appropriate allow free air movement around and between stored components.
- Prevent excessively high or low temperatures and rapid changes of temperature in the material.
- Protect adequately from rain, frost, sun and other elements as appropriate.
- Keep different types and grades of materials separately and adequately identified.
- So far as possible, keep materials in their original wrappings, packings or containers, with unbroken seals, until immediately before they are used.

4-3-8 Materials Supplied by Employer

The Contractor shall be responsible for all materials furnished by the Employer and shall make good any shortages or deficiencies, from any cause whatsoever, or any damage which may occur, after delivery of such materials.

4-3-9 Local Material Sources

When material sources are not designated on the Drawings or in other documents, the Contractor shall be responsible for locating and providing suitable materials from approved sources. Any information provided in the tender documents about sources of local materials is considered as a guideline only and does not relieve the Contractor of his responsibility in respect of investigation and supply of suitable materials as specified. Materials, regardless of their source, shall not be incorporated in the Works until approved by the Engineer.

4-4 Workmanship

4-4-1 Work

Work is to be carried out by or under the close supervision of experienced tradesmen skilled in the particular type of work.

4-4-2 Manufacturer's Recommendations

Products shall be handled, stored, prepared and used in accordance with manufacturer recommendations. The Contractor shall inform the Engineer's Representative if these conflict with any other specified requirement and submit copies of manufacturer's recommendations to the Engineer's Representative when requested.

4-4-3 Suitability of Previous Work and Conditions

Before starting each new type or section of work the Contractor shall ensure that:

- Previous related work is appropriately complete, in accordance with the project documents, to a suitable standard and in a suitable condition to receive the new work.

4-4-4 Defects in Existing Work

The Contractor shall report to the Engineer Representative if any existing work is defective and obtain his instructions before proceeding with new work which may cover up the defective work or which may be adversely affected by the defective work.

4-4-5 Rectification of Defective Work

If any part of the work is known or is suspected to be not in accordance with the Contract, the Contractor shall submit proposals to the Engineer for opening up, inspecting, testing and rectification and carry out the Engineer's instructions in relation thereto, including, where so instructed, removal and reconstruction.

4-4-6 Warranties

The Contractor shall:

- Comply with specific requirements for warranties for work, products and installations that are required to be warranted in the specifications,
- Ensure that all warranties shall commence on the date of completion and are transferable to the employer upon completion of the defect's liability period, if the specific period of warranty exceeds this date.
- Ensure that the following additional requirements are accommodated in the warranties:
 - a) Related damage and losses when correcting warranted work that has failed, replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
 - b) Re-instatement of warranty: when work covered a warranty has failed and been corrected by replacement or rebuilding reinstate warranty by written endorsement the reinstalled warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
 - c) Replacement cost: upon determination that the work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with the requirements of the Contract Documents. The Contractor shall be responsible for the cost of replacing a rebuilding defective work regardless of whether the Employer has benefited from use of the Work through a portion of its anticipated useful service life.
- Submit written warranties for approval to the Engineer prior to date certified for completion or completion of parts as may be designated.
- At final completion, compile four copies of each required warranty and bind in loose leaf binders in a clear and logical manner.

4-5-7 Warranties Employer Recourse

Written warranties made to the Employer are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which the Employer can enforce other duties, obligations rights, or remedies.

- Rejection of warranties: The Employer reserves the right to reject warranties to limit selections of products with warranties not in conflict with requirements of the contract documents.

4-6 Samples and Approvals

4-6-1 Samples

Where approval of products or materials is specified, the Contractor shall submit samples or other evidence of suitability. Orders shall not be confirmed or materials used until approval has been obtained. Approved samples are to be retained on the Site for comparison with products and materials used in the Works and removed when no longer required. All materials being used will be subject to inspection, testing, or rejection at any time prior to such incorporation.

Where samples of finished work are specified the Contractor shall obtain approval of stated characteristics before proceeding with the Works and shall retain approved samples on the Site for comparison with the Works Samples which are not part of the finished works shall be removed when no longer required. Shall be submitted in accordance with Procedure Note 5: Submittal of Samples (included at the end of this section).

4-6-2 Source Tests

All sources samples shall be taken by the Contractor in the presence of the Engineer, using approved sampling procedures. All source approval tests shall be performed under the supervision of the Engineer or, when so specified, by an independent laboratory approved by the Engineer and engaged by the Contractor. After approval of any source of materials, the Contractor shall produce from such source only to the extent that materials produced are of substantially the same quality as the approved samples.

The Engineer will periodically order retesting of previously approved sources to verify that they continue to conform to the Specifications and may order retesting at the same or at different laboratory from the one performing the original approval tests. If retesting indicates that a previously approved source no longer conforms with the Specifications, the Contractor shall forthwith cease production from such source.

4-6-3 Approvals

Where and to the extent that products materials or work are specified to be approved, or the Engineer instructs or requires that they are to be approved, the same must be supplied and executed to comply with all other requirements and, in respect of the stated or implied characteristics, either to the express approval of the Engineer, or to match a sample expressly approved by the Engineer as a standard for the purpose. Inspection or any other action by the Engineer must not be taken as approval of materials, products or work unless the Engineer so confirms in writing in express terms referring to:

- Date of inspection
- Part of the work inspected
- Respects or characteristics which are approved
- Extent and purpose of the approval
- Any associated conditions.

Approval, inspection or any other action by the Engineer shall not in any way relieve the Contractor from his responsibility for the suitability and fitness for purpose of materials, products or work. Where untested and unaccepted materials have been used, without approval of the Engineer, such use shall be at the Contractor's risk.

4-7 Work at Completion

4-7-1 Clearing Etc.

The Contractor shall clear the Works of all rubbish and surplus materials consequent upon the execution of the work. Clearing is to be carried out using methods approved by the Engineer's Representative and is to be completed in accordance with Procedure Note 6: Final Cleaning (included at the end of this section).

4-7-2 Temporary Markings

Coverings and protective wrappings shall be removed unless otherwise instructed by the Engineer's Representative.

4-7-3 Partial Possession by Employer

Where the Works are to be completed in sections, and any such section depends for its adequate functioning on work located elsewhere on the Site, such other work shall be completed in time to permit sectional completion as required.

4-7-4 Project Completion Procedures

The project completion shall be conducted in the manner prescribed in the Procedure Note 7: Project Completion (included at the end of this section).

4-8 Procedure Note 4

4-8-1 Product Selection

4-8-1-1 Product Selection

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation
 - 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 - 2. Standard Products: where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 2. Semi proprietary Specification Requirements: where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
 - a) Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Non - Proprietary Specifications: when the Specifications list products or manufacturers that are available and may be incorporated in the Work. but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 4. Descriptive Specification Requirements: where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 5. Performance Specification Requirements: where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - a) Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
 6. Compliance with Standards, Codes and Regulations: where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
 7. Visual Matching: where Specifications require matching an established Sample, the Engineers decision will be final on whether a proposed product match satisfactorily.
 - a) Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for non – compliance with specified requirements.
 8. Visual Selection: where specified product requirements include the phrase".... As selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color pattern and texture from the product line selected.

4-9 Procedure Note 5

4-9-1 Submittal of Samples

4-9-1-1 Samples

Submit samples physically identical with the material or product proposed for use; submit full-size, fully fabricated samples, cured and finished in the manner specified.

1. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match the Engineer's sample where so indicated. Include the following information.
 - a) Generic description of the sample
 - b) Size limitations
 - c) Sample source
 - d) Product name or name of manufacturer
 - e) Compliance with recognized standards
 - f) Compliance with governing regulations
 - g) Availability
 - h) Delivery time.
2. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a) Where variations in color, pattern, texture or other characteristics are inherent in the material or product represented by a sample, submit sets of multiple units of the sample (not less than 3 units), which show approximate limits of the variations.
 - b) Refer to other Specification sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c) Refer to other Specification sections for samples to be returned to the Contractor for incorporation in the work, such samples must be in an undamaged condition at time of use. On the transmittal form, indicate such special requests regarding disposition of sample submittals.
3. Preliminary Submittals: where samples are specified for selection of color, pattern, texture or similar characteristics from a manufacturer's range of standard choices, submit a single, full set of available choices for the material or product.
 - a) Preliminary submittals will be reviewed and returned with the Engineers marking indicating selection and other action taken
4. Submittals: except for samples intended to illustrate assembly details, workmanship, fabrication techniques, connections, operation and other characteristics, submit sets of samples; one set will be returned marked with the action taken.

- a) Maintain sets of samples, as returned by the Engineer, at the Project site, available for quality control comparisons throughout the course of construction activity.
 - b) Unless the Engineer observes non-compliance with provisions of the Contract Documents, the submittal may serve as the final submittal
 - c) Sample sets may be used to obtain final acceptance of the construction associated with each set.
5. Distribution of Samples: prepare and distribute additional set of samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and other as required for performance of the work. Show distribution on transmittal forms.
 6. Field Samples specified in individual Specification sections are special types of samples. Comply with sample submittal requirements to the fullest possible. Process transmittal forms to provide a record of activity.

4-10 Procedure Note 6

4-10-1 Part 1 - Final Cleaning

4-10-1-1 Final Cleaning

- A. This procedure note specifies administrative and procedural requirements for final cleaning at completion.
 1. Special cleaning requirements for specific elements of the work are included in appropriate sections of Parts 2 to 10.
- B. General Project close-out requirements are included in Procedure Note 7: Project Completion.
- C. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with government and local environmental and anti-pollution regulations.

4-10-2 Part 2-Products

4-10-2-1 Materials

A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property on that might damage finish surfaces.

4-10-3 Part 3 - Execution

4-10-3-1 Final Cleaning (where applicable)

- A. General. Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning, at the discretion of the Engineer.

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- B. Complete the following cleaning operations before requesting inspection for Final Certificate of Completion for the entire Project or a portion of the Project.
1. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petrochemical spills, stains and other foreign deposit. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
 2. Remove tools, construction equipment, machinery and surplus material from the site.
 3. Clean exposed exterior and interior hard-surfaced finishes to a free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes and similar spaces.
 5. Broom clean concrete floors in unoccupied spaces.
 6. Remove labels that are not permanent labels.
 7. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plate.
 8. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
 9. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 10. Replace air disposable filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. 1 Clean ducts, blowers, and coils if units were operated without filters during construction.
 11. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.
 12. Leave the Project clean and ready for use.
- C. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- D. Compliance: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.
- E. Where extra materials of value remain after completion of associated construction have become the Employer's property, dispose of these materials as described.
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4-11 Procedure Note 7**4-11-1 Part 1 - Project Completion****4-11-1-1 Summary**

- A. This Section specifies administrative and procedural requirements for project completion including but not limited to:
 - 1. Inspection procedures
 - 2. Project record document submittal
 - 3. Operating and maintenance manual submittal
 - 4. Submittal of warranties
 - 5. Final cleaning.
- B. Close-out requirements for specific construction activities are included in the appropriate sections in Part-2 to Part-10.

4-11-1-2 Partial Completion

- A. Preliminary Procedures: before requesting inspection for taking over certificate of Final or Partial Completion, complete the following:
 - 1. Submit specified warranties, maintenance agreements, final certifications and similar documents.
 - 2. Obtain and submit releases enabling the Employer unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
 - 3. Deliver tools, spare parts, extra stock, and similar items.
 - 4. Make final change-over of permanent locks and transmit keys to the Employer. Advise the Employer's personnel of change-over in security provisions.
 - 5. Complete start-up testing of system, and instruction of the Employer's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

4-11-1-3 Final Completion

- A. Preliminary Procedures-. before requesting final inspection for certification of final acceptance complete the following. List exceptions in the request.
 - 1. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.
 - 2. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of substantial completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

- B. Reinspection Procedure: The Engineer will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.
 - 1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance, or advise the Contractor or Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 - 2. If necessary, reinspection will be repeated.

4-11-1-4 Record Document Submittals

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 1. Mark record sets with red erasable pencil., use other colors to distinguish between variations in separate categories of the Work.
 - 2. Mark new information that is important to the Employer, but was not shown on Contract Drawings or Shop Drawings.
 - 3. Note related change order numbers where applicable.
 - 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Variations and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.
 - 1. Upon completion of the Work, submit record Specifications to the Engineer for the Employer's records.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily

discerned later by direct observation. Note related Variations and mark-up of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data to the Engineer for the Employer's records.
- E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Engineer and the Employer's personnel to determine which of the submitted samples that have been maintained during progress of the Work are to be transmitted to the Employer for record purposes. Comply with delivery to the Employer's Sample storage area.
- F. Miscellaneous Record Submittals. Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the Employer's records.

4-11-2 Part 2 - Execution

4-11-2-1 Close-Out Procedures (where applicable)

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Employer's personnel to provide instruction in proper operation and maintenance. If Installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items, as directed by the Engineer:
 - a) Maintenance manuals
 - b) Record documents
 - c) Spare parts and materials
 - d) Tools
 - e) Lubricants
 - f) Fuels
 - g) Identification systems
 - h) Control sequences
 - i) Hazards
 - j) Cleaning
 - k) Warranties and bonds
 - l) Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
 - a) Start-up
 - b) Shutdown
 - c) Emergency operations
 - d) Noise and vibration adjustments
 - e) Safety procedures

- f) Economy and efficiency adjustments
- g) Effective energy utilization.

5- TEMPORARY WORKS AND SERVICES

5-1 Generally

5-1-1 Locations

The Engineer's Representative's approval is to be obtained for the intended Temporary Works and services.

5-1-2 Standards and Details

Temporary Works are to be constructed to recognized standards and codes of practice so that they are fit for their purpose. Drawings and details of proposed Temporary Works are to be provided by the Contractor if requested by the Engineer.

5-1-3 Temporary Works

Temporary Works and services are to be maintained, altered and adapted and as necessary and cleared away on completion or when no longer required. Work disturbed is to be made good.

5-1-4 General

The Contractor shall provide all Temporary Works and services and Contractor's Equipment and tools required for the efficient and safe execution of the Works, including but not limited to:

- Temporary roads, hard standings, sleeper tracks and the like
- Temporary fences, gates and barriers
- Temporary offices, stores, mess-rooms, toilets and compounds
- Scaffold, ladders, hoists, cranes and the like
- Temporary screens, chutes, coverings, roofs and rainwater pipes for protection of the Works and personnel.
- Transport and vehicles on and off Site
- Fixed and movable mechanical plant and equipment
- Small tools
- Temporary water and power supplies and site lighting
- Temporary drainage.

5-2 Temporary Site Facilities

5-2-1 Roads

Permanent roads, hard standings and footpaths on the Site may be used provided they are adequately maintained and thoroughly cleaned and made good after use and left in unimpaired condition.

5-2-2 Diversions

The Contractor shall:

- i. Provide temporary detour roads, and other facilities to divert traffic through or around any part of the Works or for maintenance of traffic in locations affected by his works that warrant such temporary works. Location, standard, width, construction and maintenance of detour routes shall be approved by the Engineer's Representative, ensuring at all times that the routes are signed, striped, maintained and furnished with all traffic control devices as shown, directed and/or needed.
- ii. Submit designs and detailed working drawings of the proposed temporary works for approval by the Engineer prior to commencement of the works. The design live load for temporary bridges related to roads exposed to heavy vehicles shall not be less than the design live load for permanent bridges, or as directed by the Engineer,
- iii. Where measure are taken for continuously regulating and supervising traffic, provide temporary roads and bridges for one-way traffic.
- iv. Phase the execution of temporary and permanent works to minimize the disruption to traffic
- v. Submit a phased program of temporary works one month before commencement of any part of the works.

5-2-3 Trench Crossings

Trench Crossings are to be provided for free and safe passage of vehicles and pedestrians over pipe trenches.

5-2-4 Temporary Site Fence

The Contractor shall provide a suitably secure temporary site fence where necessary or as directed by the Engineer. The design of the fence is to be submitted to the Engineer for approval.

5-2-5 Nameboard

The Contractor shall provide nameboards in both languages English and Arabic at suitable locations bearing the Employer's and Engineer's names, the name of the project, the Contractor's name and such other names and information as the Engineer may direct. Design of the name board shall be submitted for the Engineer approval prior to fabrication and erection.

5-3 Contractor's Temporary Offices

5-3-1 Contractor's Temporary Offices

The Contractor shall provide all necessary temporary sheds, offices, mess-rooms, sanitary accommodation and other temporary facilities required for his and subcontractors use.

5-3-2 Temporary Laboratory

The Contractor shall provide, furnish and equip a laboratory as necessary to carry out all testing of materials on Site required by the Specification, manned by suitably qualified staff.

5-4 Temporary Services

5-4-1 Water

The Contractor shall provide clean fresh water for the Works and make temporary arrangements for storing and distributing about the Site.

5-4-2 Electricity

The Contractor shall provide electric supply and all equipment for lighting and power for the Works and make temporary arrangements for distributing about the Site.

5-4-3 Power

The Contractor shall provide electric power for the Works including supplies for commissioning engineering services and plant, at the required voltages.

5-4-4 Lighting

The Contractor shall provide lighting for the Site and the Works for safety and security to the Works and to facilitate proper execution of work and to illuminate internal surfaces during finishing work and inspection. Spaces designed to be artificially lit during daylight hours are to have temporary illumination similar to that provided by the permanent installation.

5-4-5 Permanent Electric Supply and Lighting Installation

Permanent electric supply and lighting installation may be used for commissioning and to illuminate the Works subject to the following conditions:

- The employer does not guarantee that it will be available
- The Contractor must take responsibility for the operation maintenance and supervision of the system, indemnify the Employer against all damage and pay all costs and renew all used tubes and lamps
- The Contractor must indemnify the Employer against reduction in manufacturer's guarantee periods for equipment etc., due to its use before completion of the Works.

5-5 Temporary Facilities for The Engineer And/or Employer

5-5-1 General

All facilities provided for the Engineer's and/or Employer's staff shall remain available until the end of the defect's liability period or until such earlier time as the Engineer may instruct.

5-5-2 Representative's Site Offices

The Contractor shall provide prefabricated portable or demountable offices or other as may be approved by the Engineer for the sole use of the Engineer's Representative and his staff, comprising:

- at least 1 office size approximately 4m x 5m
- 1 toilet

Offices are to be of proprietary manufacture, with hard-wearing, mosquito proof, weather proof, easy-clean surfaces and robust and secure fittings. The offices shall have full partitions and all rooms shall have individual entrance doors. Corridor and entrance areas shall be additional to the office size. All rooms shall have glazed windows complete with fly screens. The offices shall be provided with call bell system. The contractor shall submit full details to the Engineer's Representative for approval before delivery to the Site and erection.

5-5-3- Services

The Contractor shall provide and maintain the following minimum services:

- Heating and air-conditioning for each room office
- Electric lighting and power
- Water supply
- Drainage system

All bills and charges related to the services shall be paid by the Contractor.

5-5-4 Surveying Equipment and Assistance

The Contractor shall supply and maintain in full working order or shall replace whenever directed by the Engineer during the progress of the Work the surveying and other equipment scheduled below for the safe use of the Engineer's Representative and his staff and shall provide a topographer and other assistants if required.

5-5-5 Inspection Facilities

The Contractor shall provide all ladders, access lighting facilities and assistance etc. required by the Project Manager Representative/Engineer's Representative to inspect any part of the Works.

5-6 Diversion of Public Utility Services**5-6-1 Temporary Diversion of Existing Public Utility Services**

Where execution of the Works involves the temporary diversion of existing public utility services, the Contractor shall perform such temporary diversion and shall maintain the flow or service as directed by the Engineer. Unless otherwise stated the cost will be deemed to be included in the Contract Price.

5-6-2 Permanent Diversion of Existing Public Utility Services

Where the works require the permanent diversion of existing public utility services, either where shown on the drawings or where directed by the Engineer, the diversion shall be carried out by the Contractor and shall be paid for at the prices stated for such work in the Bill of Quantities.

SITE CLEARING

Part 1 General

1.1 Summary

- A. Section Includes:
 - 1. Removing surface debris.
 - 2. Removing designated paving, curbs and the like.
 - 3. Removing abandoned utilities.

1.2 Submittals

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.3 Quality Assurance

- A. Perform Work in accordance with the drawings and to the satisfaction of the Engineer.
- B. Conform to applicable code for environmental requirements, disposal of debris, use of herbicides, etc.
- C. Maintain one copy of each document on site.

Part 2 Products

2.1 Materials

- A. Herbicide: When necessary, Type approved by authority having jurisdiction.

Part 3 Execution

3.1 Examination

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify salvage areas for placing removed materials designated to remain.

3.2 Preparation

- A. Notify all local authorities having jurisdiction not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 Protection

- A. Locate, identify and protect utilities indicated to remain from damage.
- B. Protect trees, plant growth and features designated to remain as final landscaping.
- C. Protect bench marks, survey control points and existing structures designated to remain from damage or displacement.

3.4 Clearing

- A. Clear areas required for access to site and execution of Work.
- B. Clear undergrowth and deadwood, without disturbing subsoil.
- C. Apply herbicide to remaining stumps to inhibit growth.

3.5 Removal

- A. Remove debris, rock and extracted plant life from site.
- B. Remove paving, curbs and the like as indicated on Drawings. Neatly saw cut edges at right angle to surface.
- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

3.6 Topsoil Excavation

- A. Excavate topsoil from entire site without mixing with foreign materials for use in finish grading down to natural ground level.
- B. Do not excavate wet topsoil.
- C. Compact surfaces to required density in areas that do not need further excavation
- D. Remove topsoil from site and cart away to approved dumping areas.

3.7 Schedules

- A. As indicated on the drawings and where directed by the Engineer.

SCAFFOLDINGS

Part 1 General

1.1 summary

- A. Section Includes:
 - 1. Scaffolding types for the various foreseen works

1.2 Submittals

- A. Volume 1 - Conditions of Contract: Submittal procedures.
- B. Shop Drawings: Propose design of scaffolding according to Heritage building context, survey and foreseen structural consolidation works to be executed.
- C. Calculation notes according to loads on the scaffolding structure. The analysis shall consider and include also all expectable live loads (working loads, local storage of masses, equipment, etc.), local wind loads and a minimum seismic force equal to one tenth (1/10) of the total weight of the system.
- D. Report: giving the schedule of the use of scaffolding according to foreseen works.
- E. Crane manufacturer' s data including capacity, maximum operable height, maximum effective cantilever, capacity schemes, assembling, installing, dismantling and removing instructions and procedures.
- F. Calculation notes according to loads on the crane structure. The analysis shall consider and include also all expectable live loads (working loads, hung masses, equipment, etc.), local wind loads and a minimum seismic force equal to one tenth (1/10) of the total weight of the system.
- G. Report: giving the schedule of the use of crane (or cranes) according to foreseen works.

1.3 Project Conditions

- A. Investigate the soil which will house the crane (or the cranes) in order to ensure the feasibility of the installation proposed. Conservative assumptions shall be made and conservative calculations shall be carried out in order to demonstrate that the soil is suitable for the installation of the foreseen equipment.

Part 2 Products

2.1 Materials

- A. Modern modular heavy and light scaffolding with security systems (handrails and integrated staircases) including: tube-joint frames, adequate bracing elements, safety and security systems (handrails, integrated staircases, toe boards, etc.), work platform and decking. The complete system shall be certified and verified versus security, safety and stability according to all applicable standards and in accordance with requested submittals.
- B. Various types of cranes and mobile cranes according to site needs.

Part 3 Execution

3.1 Examination

- A. Volume 1 - Conditions of Contract: Coordination and project conditions.
- B. Accurate survey of heritage structures in order to prepare scaffolding design.

3.2 Preparation

- A. Stone manipulation projects: Design of heavy scaffolding with the calculation notes.
- B. Surface cleaning and consolidation: Design of light scaffoldings.
- C. Stone transportation and lifting: Calculation notes.
- D. Crane support: calculations to be carried out in order to demonstrate that the chosen soil is suitable for the installation of the foreseen crane (or mobile crane).
- E. Crane stability: calculation notes.

3.3 Heavy Scaffolding Set Up

- A. Protection of historic context before scaffolding installation.
- B. All scaffolding structure should be free standing (without connections with close historic structures). Contractor shall notify the Contracting Officer of any foreseen necessity to use the original structures as temporary support or restraint. Contractor shall proceed only after written approval by the Contracting Officer and as instructed.
- C. All lifting and cranes accessories should be fixed to main structure frame.
- D. Security and staircases could be independent of scaffolding structure.

3.4 Light Scaffolding Set Up

- A. Protection of archaeological/historical context before scaffolding installation.
- B. All scaffolding structure should be free standing (possible, only when permitted and approved, connections with close archaeological structures should be protected with wooden panels).
- C. All lifting and cranes accessories are forbidden on this scaffolding type.
- D. Security and staircases should be integrated in the scaffolding structure.

METAL WORKS

Part 1 General

- The restoration of ironwork in the building involves the repair or re-instatement of corroded or damaged components. This work is to be carried out by skilled blacksmiths.
- The policy on restoration can be summarized in four main objectives:
 - o To retain as much as possible of the original work and only replace details that are beyond practical repair
 - o To study and slavishly reproduce the personal style and working techniques of the original smith
 - o To take all possible steps to protect the ironwork from future corrosion
 - o To take 'before' and 'after' photographs to show what we have done.
- For the restoration and repair of the historic wrought iron work it may be possible to use old wrought iron salvaged from scrap metal or modern alternatives, which include mild steel, stainless steel or pure iron.
- Architectural and industrial salvage can provide a useful source of re-usable wrought iron if the source is known and the provenance good.
- For the new parts, mild steel can be used
- Stainless steel can be used where corrosion-resistance is most important for example the armature which support the handrail can be replaced in stainless steel.
- Galvanic compatibility is an important consideration when using stainless steel in contact with other metals such as wrought iron and mild steel. Without proper protection of the surface's electrochemical reactions between the two metals can cause accelerated corrosion.
- The ceaseless corrosion of iron unless protected from oxygen and water must also be considered to ensure works carried out will perform for the required design period.

1.1 Summary

Section includes painted steel balusters

1.2 Design Requirements

Fabricate and restore railing assembly

1.3 Submittals

- General Requirements: Requirements for submittal procedures.
- Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- Samples: Submit two samples of handrail, length as directed by the Engineer.

Part 2 Products

2.1 Handrails and Railings

- Manufacturer: Any recognized manufacturer having a similar experience official technical agreement to conformity with standards for the product.

2.2 Painted Steel Railing System Components

- Sections, motifs, Fasteners, Bolts, Nuts similar to existing
 - Rails and Posts: Type, size and shape similar to existing
 - Mounting, Exposed Fasteners, Splice Connectors: Steel, concealed spigots, welding collars and/or threaded collars.
 - Painting type and color as per existing and as specified by architect
-

2.3 Fabrication of New Similar to Existing

- Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.
- Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

Part 3 Execution

3.1 Examination

- Verify field conditions are acceptable and are ready to receive work.
- Indicate where handrails need to be replaced or restored

3.2 Restoration

3.2.1 Cleaning

- Grit blasting: If not properly done this method can be highly damaging as it is liable to remove not only the paint but also the original 'mill scale', the outer surface of the iron formed in the forge.
- Paint removal is therefore best carried out using chemical agents chosen according to the type of paint and the need to avoid damage to the metal itself.
- After the paint is removed, care should be taken to ensure that any chemical residues are also removed or neutralized.
- Rust is most easily removed following the application of heat as rust scale does not expand to the same extent as iron, causing its grip to be sufficiently loosened for it to be brushed off.
- cleaning exterior metalwork, including that trapped between components, to remove all rust prior to application of a new high-quality paint system If part of an item has corroded to such an extent as to be structurally inadequate, it must be replaced to allow the item to be useable.

3.2.2 Repairs and Missing Components

- All repairs are best carried out using the same material and techniques used originally.
- Both mild and stainless steel can be welded to wrought iron, and the use of stainless-steel tips may be appropriate where fixings bedded in damp masonry have rusted away.

3.2.3 Protection

- Thorough protection from the weather is vital for all exterior ironwork. When reassembled, interior faces of joined elements may be bedded in a modern silicone mastic as an alternative to the red lead putty used traditionally. All surfaces should be carefully painted, taking care to include the underside of repoussé ornament. A wide variety of paints are available to reduce the risk of rusting, including epoxy resin-based paints and red lead or zinc-rich undercoats. Care should also be taken to avoid collection points for moisture and, once painted, recesses may be filled with a suitable filler such as pitch (the traditional solution) or an epoxy resin.
- Galvanizing is not allowed.
- Interior fittings can sometimes be protected with oils or waxes such as linseed oil. Then the iron is heated and wiped over with emery cloth. Finally, a combination of beeswax and boiled linseed oil was rubbed into the surface.

3.3 Installation

- Install components plumb and level, accurately fitted, free from distortion or defects.
- Anchor railings to structure with anchors, plates and/or angles.
- Field weld anchors as indicated on shop drawings.
- Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- Assemble with spigots and sleeves to accommodate tight joints and secure installation.
- Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 Erection Tolerances

- General Requirements: Quality requirements for tolerances.
- Maximum Variation from Plumb: 6 mm per story, non-cumulative.
- Maximum Offset from Alignment: 6 mm.
- Maximum Out-of-Position: 6 mm.

WOOD OPENINGS

1.Dismantling, Assessing, Treating and Storing

This section deals with the dismantling, assessing, treating and storing of the wooden dismantled doors and windows.

1.1 General Description

Departure from the usual climatological surroundings may cause swelling or shrinkage of a door or a window, resulting in cracks, splits, and cleavage of the item or between the door itself and the various paintings layers (stolow 1967).

The cross-grain instability of wood is the major problem as it is in the nature of wood and wooden objects to seek equilibrium between internal moisture content and that of the surrounding atmosphere.

Knowing that green as well as old wood respond to changes in humidity.

1.2 Steps to follow

1. Dismantling the doors and windows
 - The contractor shall document and carefully dismantle the doors and windows from the façade. The frames and jambs shall remain in situ
 - Historic windows were typically designed to be taken out of the frames for repair. Each shutter swings on hinges that are fixed on the window. Gently swinging the leaves will gradually take out the item Dirt, grime and debris should be removed from surfaces following gentle cleaning methods
 - Marking the door or window tag as per the given inventory with an indelible pen on the upper or lower side of the door. An R or L indices shall be added to distinguish the leaves.
 - If Some windows and doors leaves were found already dismantled on site. They should be inventoried and shall be assessed and stored like the other items.

Tools to be used	Tools not to be used
16" pry bars, flat on both ends	screwdrivers
Claw hammer	Hacksaw blade
Leather work gloves	seesaw
Utility knife with retractable blade	
Nail puller	
Metal file	
Stepladder	
Twine for bundling trim	
Indelible pen (only to use on the hidden side of the doors and windows)	

2. Assessing and treating (when needed) the doors and windows
 - The contractor shall re-assess and update the sheets of the openings;
 - Controlling of any existing residual active infection by larvae and minimizing the risk of infection and decay in future.
 - Examination and soundings shall be done in situ to inspect any presence of insects, specially the active ones.

* An active insect damage can be caused by Deathwatch Beetle (*Xestobium rufuvillosum*). A non-active insect damage can be caused by the House Longhorn Beetle (*Hylotrupes bajulus*) and the Common Furniture Beetle (*Anobium punctatum*).

- The infected items shall be treated with gas prior to the storage;
- Submitting the digital updated assessment sheets to the consultant

3. Treating the infected items

- Enclosing the items to be treated in a gas-proof container or enclosure, and pumping in the inert gas (carbon dioxide or nitrogen) until the oxygen content of air has been reduced to below 0.2 per cent. These conditions have to be maintained for at least two weeks to ensure the suffocation of the insect larvae. However, it should be noted that damp conditions within the materials may protect the larvae from oxygen deprivation.

4. Protecting the doors and windows frames and jambs

Aim: Protecting the windows and doors frames against unwanted splashes of paint, plaster splashes and scratches and sustain impact damages during works

- Gently cleaning the doors and windows frames
- Install hardwearing foam guard protection around the frames of windows and doors. preferably use the pre-slit to clip foam protection that snaps around the door frames for a better grip and a faster application.

Thick paperboard material can be used as well.

- Install hardwearing foam to protect the windows sills

5. Protecting the gates frames (stone and marble)

full plywood enclosure constructed

A system shall be designed for fitting the marble or stone frames of the gates with temporary protective coverings to avoid damage while still allowing for their use in the course of the extensive renovation work.

The basic system shall consist of using plywood padding to cover the item without using any anchoring devices that would damage historic material. Screws are used rather than nails in fastening the wooden temporary pieces together to lessen the chances of accidental damage to historic fabric and to facilitate disassembly.

The frames shall be encased in plywood.

1.5cm or 2cm plywood boards shall be used, cut wider than the frame to permit attachment of 2 by 4 blocking on the underside for securing the plywood side walls away from the frame.

For padding, neoprene or similar foam pads shall be glued to the face of the blocking closest to the edge of the frame as a cushion in case the covering was jarred.

- The entire assemblage is secured tightly with judicious use of braces and blocking or where necessary screwed to the temporary wood floor.

6. Storage area conditions

It is crucial to control continuously the moisture content of the storage area.

Although there may not be an ideal relative humidity RH for storages areas, it is evident that some objects require, or would benefit from, separate microenvironments, regardless of the chosen RH set point (Erhard and Mecklenburg 1994).

Some aspects that are used as criteria for the boxes meant to receive the wooden items has to be followed; The higher the temperature, the more rapid the rate of the moisture transfer and the greater the change in RH, the faster the rate of moisture transfer.

7. Monitoring the storage area
 - The storage area shall be monitored every 30 days
 - The RH, temperature and humidity shall be recorded
 - The boxes shall be checked and inspected every 60days
 - Results shall be recorded and submitted to the consultant
-

2. Wood Openings Conservation

Part 1 General

1.1 General Notes

the openings are nearly always an important part of the historic character of a building. In most buildings, windows and doors also comprise a considerable amount of the historic fabric of the wall plane and thus deserve special consideration during the restoration of the house.

Further to a close visual diagnostic of the openings the intervention works were divided into 3 major interventions taking into consideration the possibility to repair, upgrade and possible replacement of total or parts of the damaged element in an opening:

- Low intervention: maintenance works
- Medium intervention: repair works that could include the replacement of some parts of the opening.
- High intervention: replacement of total or major element of the opening.

Maintenance work; maintain the historically significant features

- Protection and maintenance of the wooden and steel elements which comprise the opening frame, leaves, knobs, hinges and surrounds through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and re-application of protective coating systems. The maintenance works will also include the adjustment of the wooden frames to have a normal operating system.
- The maintenance could include the improvement of thermal efficiency through the introduction of weather stripping.
- Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound. Proposal and sample to be submitted by contractor for approval.
- Water Leakage: make sure that the existing system is waterproofed, otherwise contractor is to propose how to improve this aspect.

Repair damaged openings

- Repair opening frames, damaged parts, damaged ironmongery by replacing, patching, splicing and consolidating or otherwise reinforcing.
- The repair may also include replacement in kind or with compatible substitute material of the decayed parts that are either extensively deteriorated (ex: wooden oculi and entrance door). The added parts should be similar to the existing parts; physically and chemically compatible with the window material.

Replace what cannot be repaired

- Replacing in kind an entire opening that is too deteriorated to repair using the same design details. Also, if using the same kind of material is not technically or economically feasible when replacing the opening deteriorated beyond repair, then a compatible substitute material may be considered.
- System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with applicable code.
- The replacement of an opening or its decayed ironmongery should be an accurate restoration using existing historical, pictorial, and physical documentation.
- Adequate measures should be undertaken to assure the protection of the openings.

- Protection against humidity; treatment of potential threat like cracks in facades joints, sealing holes between blocks, re-pointing the stone elevation, treatment of rusted steel element, assure well drained holes where existing.
- Protection against rain water; periodic maintenance and protection with appropriate paint layers.
- The restoration and conservation of the openings is carried out in detail in the attached tables (Schedule of openings)

Maintenance

- Regular maintenance through an annual oiling for metal pivoting and locking systems to smoothen the opening and closing of the different openings features; wooden blinds, locks, strap-hinges etc.
- Assure a protective paint every 3 to 5 years to the different wooden and metal elements and parts of the openings, mainly to the exterior and exposed parts.
- Assure a periodic checking and maintenance to the drain holes of window sills for windows with inner wooden blinds.
- Assure protection from any water percolation or infiltration to the openings framing and elements anchored the masonry.

1.2 Submittals

Samples:

- Submit two samples, size as directed by the Engineer, cut from top and/or bottom corner of opening.

1.3 Qualifications

Manufacturer and restorer: Company with a relevant experience in manufacturing and restoring products specified in this section with minimum ten years documented experience.

Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.4 Warranty

- General Requirements: Execution requirements for product warranties and bonds.
- Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
- Provide five-year warranty for exterior openings.

1.5 Environmental Requirements

- General Requirements: Product requirements.
- Do not install sealants when ambient temperature is less than 5 °C.
- Maintain this minimum temperature during and after installation of sealants.

Part 2 Products

2.1 Components

- Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- Product Description: To match existing - Solid or hollow core flush wood opening; fire rated or non-rated types; flush glazed design; with or without louvers; factory pre-fit;
- Wood: Approved solid wood species similar to existing, finish and color as specified by architect
- Unit Frame and Intermediate Mullions Construction: Wood with mortise and tenon, doweled or slot mortise joint construction.
- Fixed and Sliding Frame Construction: Wood with mortise and tenon or glued and steel pinned joint construction similar to existing
- Sills: Solid wood to match existing; sloped for positive wash; one-piece full width of opening.
- Window Hardware:
 - Sash lock, Operator, Horizontal Sliding Sash, Double Hung Sash, Projecting Sash Arms, Pulls, handles, door stop, locks, hinges, and all general hardware, all similar to existing

- Louvers (Grill and Frame): Solid wood to match existing windows, thickness and spacing as per existing.

2.2 Finishing

- Factory finish openings in accordance with approved sample.
- Seal opening with color and/or clear sealer to match opening facing.

Part 3 Execution

3.1 Installation

- Install fire rated and non-rated openings as indicated
- Coordinate installation of glass and glazing as specified and approved by architect
- Site finish opening as specified and approved by architect
- Coordinate attachment and seal of perimeter air barrier and vapor retarder materials

3.2 Installation Tolerances

- General Requirements: Quality requirements for tolerances.
- Align opening plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- Maximum Vertical Distortion (Bow): 3 mm measured with straight edge or taut string, top to bottom, over imaginary 915 x 2,130 mm surface area.
- Maximum Width Distortion (Cup): 3 mm measured with straight edge or taut string, edge to edge, over imaginary 915 x 2,130 mm surface area.

3.3 Adjusting and Cleaning

- General Requirements: Execution requirements for testing, adjusting and balancing.
- Adjust opening for smooth and balanced opening movement.
- Adjust closer for full closure.
- Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

LIME PLASTER

Part 1 General

1.1 Summary

Section includes lime plaster

1.2 References

A. ASTM International:

1. ASTM C977 - Standard Specification for Hydrated Lime.
2. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
3. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C932 - Standard Specification for Surface-Applied Bonding Agents for Exterior Plastering.
5. ASTM C1032 - Standard Specification for Woven Wire Plaster Base.
6. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. British Standards:

BS EN 459-1: 2001 type NHL Natural Hydraulic Lime strength classes 2, 3, and 5.

C. Underwriters Laboratories Inc.:

UL - Fire Resistance Directory.

1.3 Performance Requirements

A. Conform to ASTM E119 and applicable code for fire rated assemblies, and as follows:

1. Fire Rated Partitions: Listed assembly by UL or WH.
2. Fire Rated Ceilings Bulkheads and Interior Soffits: Listed assembly by UL or WH.
3. Fire Rated Structural Column Framing: Listed assembly by UL or WH.
4. Fire Rated Structural Beam Framing: Listed assembly by UL or WH.

B. Fabricate vertical elements to limit finish surface to 1:360 deflection under lateral point load of 445 N.

C. Fabricate horizontal elements to limit finish surface to 1:360 deflection under superimposed dead load and wind uplift loads.

1.4 Submittals

A. General Requirements: Requirements for submittal procedures.

B. Product Data: Submit data on plaster materials, characteristics and limitations of products specified.

C. Samples: Submit two samples, size as directed, illustrating finish color and texture.

1.5 Quality Assurance

A. Follow strictly manufacturer's instructions as per approved technical data sheet.

B. Maintain one copy of each document on site.

1.6 Qualifications

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.7 Mockup

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up, size as directed by the Engineer, including exterior and interior wall and ceiling system illustrating surface finish.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 Pre-Installation Meetings

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 Environmental Requirements

- A. General Requirements: Product requirements.
- B. Exterior Plaster Work: Do not apply lime plaster when ambient temperature is less than 4°C

Part 2 Products**2.1 Lime Plaster**

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 Components**A. Plaster materials:**

- 1. Hydrated Lime:
 - a) Type A - Hydrated Lime Powder:
 - I. It shall consist of a dry powder obtained by treating quicklime with enough water to satisfy its chemical affinity for water under the conditions of its hydration. This material is to consist essentially of calcium hydroxide or a mixture of calcium hydroxide and a small allowable percentage of calcium oxide, magnesium oxide and magnesium hydroxide. Hydrated lime shall meet the requirements of ASTM Designation C977.
 - II. When sampled and tested according to prescribed Texas Highway Department procedures, hydrated lime shall conform to the following requirements as to chemical composition:

Hydrate alkalinity, percent by weight $\text{Ca}(\text{OH})_2$	Min. 90.0%
Anhydrate lime content, percent by weight CaO	Max. 5.0%
"Free Water" content, percent by weight H_2O	Max. 4.0%

III. The percent by weight of residue retained shall conform to the following requirements:

Residue retained on a No. 6 sieve	Max. 0.0%
Residue retained on a No. 10 sieve	Max. 1.0%
Residue retained on a No. 30 sieve	Max. 2.5%

b) Type B - Commercial Lime Slurry:

- I. It shall be pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity and/or nature injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content", shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition, residue and delivered in trucks which shall be equipped with an agitator which will keep the lime and water in a uniform mixture.
- II. Chemical Composition: The "solids content" of the lime slurry shall have a hydrate alkalinity $\text{Ca}(\text{OH})_2$ of not less than 90% by weight.
- III. Residue: The percent by weight of residue retained in "solids content" of lime slurry shall conform to the following:

Residue retained on a No. 6 sieve	Max. 0.0%
Residue retained on a No. 10 sieve	Max. 1.0%
Residue retained on a No. 30 sieve	Max. 2.5%

2. Natural Hydraulic Lime NHL

- a) Natural Hydraulic Limes is produced from the natural argillaceous limestone deposits. It is classified in feebly (NHL 2), moderately (NHL 3,5) and eminently (NHL 5) hydraulic lime, (BS EN 459-1: 2001 type NHL Natural Hydraulic Lime strength classes 2, 3.5 & 5). Mixed with sand provide HLM used for laying stone and brick masonry, tiles, external rendering and internal plastering, consolidation injections. Suggested uses for Hydraulic Lime Mortar by building components:

Building Component	Hydraulic Lime Mortar designation
Internal walls	HLM 0.5
External walls	HLM 0.5 – 2.5
Facing to solid construction	HLM 1.0 – 2.5
Walls close to/below ground	HLM 2.5 – 3.5
Parapets, sills, lintels and cornices	HLM 2.5 – 3.5
Copings and capping	HLM 2.5 – 5.0
Chimneys	HLM 3.5 – 5.0
Earth retaining walls	HLM 3.5 – 5.0
Masonry below water level	HLM 5.0

b) General guide to selection by hydraulic lime mortar designation (HLM)

HLM designation	NHL 2 lime: sand by volume	NHL 3,5 lime: sand by volume	NHL 5 lime: sand by volume	Mean Compressive strength (MPa @ 91 days
HLM 5.0	-	-	1:2	5.0
HLM 3.5	-	-	1:2.5	3.5
HLM 2.5	-	1:2	1:3	2.5
HLM 1.0	1:2	1:3	-	1.0
HLM 0.5	1:3	-	-	0.5

3. Pre-mixed pozzolanic based lime (Similar to type Mapei-Antique Structural by MAPEI S.p.A.)

- a) It is a free cement lime made of lime and pozzolanic, natural sands special additives and inorganic fibers. It is classified according to the UNI EN 998-2 as Mortar Masonry type M 15 for its compressive strength $\geq 16 \text{ N/mm}^2$ (UNI EN 1015-11). It is used in execution of reinforced plasters of weak masonry less cohesive to be laid in 20-25 mm of thickness per each layer.

b) The product must comply with the following technical data:

- Compressive strength (UNI EN 1015-11) (N/mm^2): 16 (after 28 days)
- Flexural strength (UNI EN 1015-11) (N/mm^2): 3.5 (after 28 days)
- Adhesiveness to the underlying structure (N/mm^2). resistance to tensile stress (UNI EN 1015-12): 0,50
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4. Salt resistant cement free pre-packed mortar (Similar to type Mape-Antique Rinzafo by MAPEI S.p.A.)

- a) It is a cement free pre-packed powder mortar composed of special hydraulic binders with pozzolanic action, natural sand, special additives and synthetic fibers especially recommended as first coat (to be laid on the previously prepared substrate in a thickness of approx. 5mm) in restoration of old stones buildings for its capacity to improve the bonding over irregular surfaces.

5. Aggregate: Natural sand, within the following sieve sizes and percentage retained limits:

Sieve Size	Percent Retained
4.75 mm	0
2.36 mm	0 to 5
1.18 mm	5 to 30
0.60 mm	30 to 65
0.30 mm	65 to 95
0.15 mm	90 to 100

6. Water: Clean, fresh, potable and free of mineral or organic matter capable of affecting plaster.
7. Bonding Agent: type recommended for bonding plaster to stone wall surfaces.
8. Admixtures: Type as per manufacturer instructions.
9. Color Pigment: ASTM C979 mineral oxide or synthetic type, color as selected by the Engineer.
10. Sand for finish coats shall be clean, graded silica sand, 100% passing a 30-mesh screen

B. Furring and Lathing:

1. Casing and Corner Beads, and Base Screed: Formed sheet steel, depth governed by plaster thickness, maximum possible lengths, expanded metal or solid flanges, with square, bullnosed, or beveled edges; galvanized.
2. Corner Mesh: Formed sheet steel, minimum 0.5 mm thick, perforated or expanded flanges shaped to permit complete embedding in plaster, minimum 50 mm size; galvanized.
3. Strip Mesh: Expanded metal lath, minimum 0.5 mm thick, 50 mm wide x 600 mm long; galvanized.
4. Control and Expansion Joint Accessories: Formed sheet steel, according profile, 50 mm expanded metal or solid flanges each side, galvanized.
5. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.

C. Reinforcing Fiber Glass Mesh:

The product consists in a reinforcing mesh made of thermosetting composite FRP (Fiberglass Reinforced Polyester) similar to KIMIA, MAPENET EM30, St. GOBAIN VERTEX G120, etc. manufactured with AR (Alkaline-resistant) continuous glass fibers that are pre-tensioned and impregnated with a thermosetting resin and braided together to create a strong while flexible mesh structure suited for consolidation of walls and reinforcement of plastering. The product is used in execution of reinforced plastering.

3.2 Special Parts and Accessories:

- a) Corner Reinforcement: Element made with FRP composite net with angles of variable width, suited for connecting the reinforcement in adjacent walls (or made with 316L stainless steel).
- b) Connector: Suited for mass and point to point mesh/wall connections; made with a bracket of variable length and FRP composite net square.

3.3 The product must comply with the following technical data:

Code	Mesh A x B mm	Ultim. Tensile strenght on sheet	Actual breaking load on knot KN	Ultim. Elong %	Weight Gr/m2	Thick.mm	Dim. Rolls m.
N/A	40x40; Or 30x30; Or 66x66	Minimum (no less than): 50 KN	1 KN	3	Minimum (no less than): 150 Gr/m2	Minimum 1.5 mm	VAR.

2.3 Mixes

- A. Except where hand-mixing of small batches is approved by the Engineer, mechanical mixers of an approved type shall be used for the mixing of plaster. Frozen, caked or lumped materials shall not be used.
- B. Mechanical mixers, mixing boxes and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water uniform in color and consistency. Retimbering will not be permitted and all plaster which has begun to stiffen shall be discarded.
- C. All tools, implements, vessels and surfaces shall at all-time be kept scrupulously clean and strict precautions shall be taken to avoid the plasterer or other materials becoming contaminated by pieces of partially set material which would tend to retard or accelerate the setting time.
- D. It is essential that the lime is uniformly dispersed and that any fine agglomerations are broken down. The time of mixing will be controlled by the efficiency of the mixer. Roller-pan mixers and screed mixers have the most efficient action but simple tilting-drum cement mortar mixers can be used if a longer mixing time is allowed. If the job is sufficiently large use a mixer with a capacity for a full bag of lime.
- E. The following sequence will be suitable for a tilting-drum mixer. When mixing wear protective goggles and waterproof gloves. Introduce half of the sand and add all the lime, mix for 2 to 5 minutes until a uniform color is achieved. Stop the mixer and isolate the drive. Scrape down any material adhering to back. Add the remaining sand and mix for 2 to 5 minutes to get uniform dispersion. Continue mixing adding water slowly over at least 10 minutes and giving plenty of time for water to be fully incorporated. The mortar should be more like a dough than a slurry; the less water added to achieve this, the better the mortar performance will be; the longer the final mixing time the more workable (fatter) the mortar will be. Workability will be improved by allowing mixed mortar to stand for 15 minutes before re-mixing for a further 5 minutes. (In hot weather do not over-mix as water will be evaporated).
- F. Mix proportion, follow producer instruction, in principle 3 layers shall be provided:

1. Key Coat (2-3mm) Lime: sand volume proportion 1:1. Curing period 4 to 5 days with constant watering.
 2. Scratch Coat (10-12mm) Lime: sand volume proportion 1:2. This coat is applied by casting on to a still damp but not over saturated support and is left as cast to provide good keying and is scratched at the end to support the next layer. Curing period 14 days with constant watering.
 3. Brown Coat (12-15 mm) Lime: sand volume proportion 1:2. Can be applied in 2 passes of min. 1cm. Second pass only after first is reasonably dry. Curing period 14 days with constant watering.
 4. Finish Coat of 5mm Lime: sand volume proportion 1:2.5. The dosage/thickness may vary in accordance with the desired finish and the sand used. In smooth floated finishes if very fine sands containing clay are used the binder (NHL) quantity will be reduced, or also stone powder or marble powder. Curing period 5 to 6 days with constant watering.
- G. Mix only as much plaster as can be used prior to initial set.
- H. Add color pigments to finish coat.
- I. Mix materials dry, to uniform color and consistency, before adding water.
- J. Protect mixtures from freezing, frost, contamination, and excessive evaporation.
- K. Do not retemper mixes after initial set has occurred.

Part 3 Execution

3.1 Examination

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Masonry: Verify joints are cut flush and surface is ready to receive work of this section. Verify no bituminous or water repellent coatings exist on masonry surface.
- C. Mechanical and Electrical: Verify services within surfaces to be plastered (walls, ceiling, etc.) have been tested and approved.

3.2 Preparation

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.
- C. Roughen smooth concrete surfaces and apply bonding agent.
- D. Galvanized wire mesh reinforcement shall be provided wherever needed, beams or slabs, and plaster finish is required to continue walls and protruding columns. The galvanized wire mesh reinforcement shall consist of 20 cm wide strips and shall cover the whole length of the joint, horizontally as well as vertically and shall be securely nailed, plugged or stapled in place to both surfaces at intervals not exceeding 40 cm at both edges.

- E. Plastering shall not be commenced until all mechanical and electrical services, conduits, pipes and fixtures have been installed complete and tested.
- F. All walls shall be wetted immediately prior to applying the first spatter dash coat to provide key for subsequent coats.

3.3 Existing Work

- A. Extend existing Lime plaster installations using materials and methods as specified
- B. Repair existing damaged Lime plaster which remains or to be remodeled.

3.4 Installation

A. Installation of Lathing Materials:

- 1. Apply one or two layers of Grade D building paper over substrate; lap edges 50 mm minimum. Fasten in place
- 2. Install metal lath in accordance with ASTM C1063.

B. Installation of Accessories:

- 1. Install accessories in accordance with ASTM C1063.
- 2. Place corner bead at external wall corners; fasten at outer edges of lath only.
- 3. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.
- 4. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- 5. Install door and glazed frames plumb and level in opening. Secure rigidly in place.
- 6. Position to provide convenient access to concealed work requiring access.

C. Installation of FRP mesh FIBRE NET type requires no special procedures or specific expertise because it is laid exactly as electro welded meshes. The meshes can be cut to measure with any standard tools (brick cutter, cutting nippers, etc...) The locking connecting system of F.R.P. meshes and relevant composite brackets are the same as commonly used in construction (fixing is made with screw anchors, plastic elements, chemical substances etc.). Sheets are joined by overlaying one over another.

D. Control and Expansion Joints:

- 1. Install interior control and expansion joints as indicated on Drawings.
- 2. Install exterior contraction joints after initial set, scribed as indicated on Drawings by cutting through 2/3 of cement plaster depth, neatly, in straight lines.
- 3. For horizontal exterior surfaces, install control and expansion joints as indicated on Drawings.
- 4. For vertical exterior surfaces install control and expansion joints as indicated.
- 5. Establish control and expansion joints with specified joint device.

E. Plastering:

- 1. Plaster shall be thoroughly mixed with the proper amount of water until uniform in color and consistency. Retimbering will not be permitted and all plaster which has begun to stiffen shall be discarded.
- 2. All plastering shall be executed in a neat workmanlike manner and corners shall be true, straight and plumb.

3. All tools, implements, vessels and surfaces shall at all times be kept scrupulously clean and strict precautions shall be taken to avoid the plaster or other materials becoming contaminated by pieces of partially set materials which would tend to retard or accelerate the setting time.
 4. The temperature before, during and after application of plaster shall be uniformly maintained above 12° C. The heat shall be well distributed in all areas, and concentration or irregular heat on plaster surfaces shall be prevented.
 5. Ventilation shall be provided to properly dry the plaster during and subsequent to its application. Plaster shall be prevented from too-rapid drying.
 6. All ingredients entering the several mixes shall be proportioned and measured by means of calibrated boxes or containers of such nature that the quantities can be accurately checked at any time. Ingredients shall be thoroughly mixed and then cleaned from the mixer and tools after each mix.
 7. Plaster shall be rodded and straight-edged to uniform thickness in true planes flush to the required surface and flush with outlet boxes, and similar details and steel-troweled smooth and level with sharp, straight arises and true angles. Plaster shall be free from laps, cracks, trowels marks, or other structural defects or surface imperfections.
 8. Where plaster finish is flush with adjoining surface or where tooled joint is indicated on the drawings, the plaster shall be grooved back with smallest available edging tool, to control any cracking at these points.
 9. At doors and frames and other openings, all plaster shall be keyed in, except that across head of openings and 12 inches down each side plaster shall be cut free of frame, or grounds with edge of trowel, after stiffening but before setting, to allow for expansion.
 10. All pressed metal door frames in walls shall be grouted full with Portland cement fine concrete after being completely anchored in place and prior to application of plaster. Rake grout to allow plaster to enter jamb.
 11. Apply the spatter dash coat and allow to dry before rendering is commenced.
 12. Moist cure each coat. Apply successive coat immediately following initial set of scratch coat.
 13. After curing, dampen previous coat prior to applying finish coat.
 14. Apply finish coat to indicated color and texture.
 15. Plumb, square and level.
 16. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.
 17. Moist cure finish coat for minimum period of 48 hours.
- F. Waterproof Plaster to External Surfaces:
1. All surfaces to be plastered shall be clean and free from dust, grease, loose or projecting mortar and all traces of salts and are to be thoroughly sprayed with water but all free water shall be allowed to disappear from the surface before the plaster is applied.
 2. Efflorescence shall be brushed off and all dust and foreign matter removed. All waterproof plastering shall be in two coats and shall contain 475 kg of cement per one-meter cube of sand mixed with an approved waterproofing admixture compound and applied in accordance with manufacturer's instructions and shall be applied and allowed to dry before rendering is commenced. All walls shall be wetted immediately prior to applying the first coat of rendering and this shall be allowed to thoroughly dry out before the next coat is applied.
- G. Execution of Reinforced Plastering: Undertake the reinforced plastering after stone conservation intervention and removal of plaster. Apply primer coat; apply first plaster coat of about 0,5 cm of salt resistant cement-free lime mortar (type similar to Mape Antique Rinzafo) with property to prevent soluble salt from penetrating macro porous mortar; apply fiber glass reinforced polyester mesh 66x66 mm (type similar to Fiber Net 66x66T96) and cover with about 4cm thick hydraulic lime plaster (type similar to Mape Antique Structural). Drill 1 cm through the whole thickness of the masonry or 2/3 of the thickness in case of one side plaster application; install 5mm stainless steel ties or fiberglass bars, strips, tightening threaded device

at each end to connect the plastered faces with FGRP and the wall together. Devices: 4 №/m², for stone masonry and 6 №/m² for mud walls, embedded in appropriate mortar according to the masonry materials.

3.5 Adjusting

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Remove damaged or defective plaster by cutting and replace with specified materials to match adjacent plaster.
- C. Fog coat non-uniform or discolored plaster with finish coat materials spray applied to entire finish coat surface.

3.6 Schedules

- A. As indicated on drawings and where directed by the Engineer.

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PAINTS AND COATINGS

Part 1 General

This work will involve providing all necessary materials and the execution of all painting and decorating tasks as outlined in the Drawings, Specifications, and Bill of Quantities. Additionally, it will include cleaning the premises upon completion of the work and before final hand-over.

Part 2 Materials

All oil and emulsion paints and paint treatments, including wood and steel primers and fillers and all varnishes, shall be of good quality, obtained from approved manufacturers, brought to Site (after Engineer's approval) in the manufacturer's sealed container, and meeting the requirement of B.S. 4800: 1972.

Part 3 Execution

3.1 General Requirements

- A. All wood and steel surfaces and sections shall be thoroughly cleaned and rubbed smooth before painting.
- B. No painting on exterior surfaces shall be carried out during wet or dusty weather, or on surfaces that are not thoroughly dry.
- C. All coats of oil and emulsion paint shall be thoroughly dry before subsequent coats are applied.
- D. Each coat of paint shall be thoroughly rubbed down with fine sandpaper and filled with an approved putty or filler before the succeeding coat is applied.
- E. The tints of undercoats shall approximate that of the finishing coat, but there shall be sufficient contrast between the succeeding coats to clearly indicate missing (unpainted) areas.
- F. The priming of all wood and metal works shall be done before installation. Priming paints on copper and galvanized steel are to incorporate a suitable etching agent.
- G. All paints and primers shall be used in strict accordance with the specifications and instructions of manufacturers.

3.2 Painting on Woodwork

All cracks, crevices and holes in the woodworks shall be scrapped out, primed and made good with hard-stopping, and faced up and rubbed down to an even and smooth finish. The hard-stopping shall be of an approved make or made up on the Site in accordance with the best local custom and to the satisfaction of the Engineer. All knots shall be burnt and treated with an approved solution of methylated-spirit shellac. All woodwork shall receive one priming coat of leadless chromates/Alkyds before installation. After installation, it shall receive two coats of putty and two coats of undercoat paint (with each undercoat following each putty coat in succession) and rubbed smooth after each undercoat, and a final coat of semi-gloss or gloss finish oil paint as required of an approved color, conforming to B.S. 2525 and as manufactured by I.P.I. or I.P.C. or an approved equivalent. All hardwood shall be painted with three coats of translucent paint (varnish shellac) unless otherwise specified, which complies with the provisions of ASTM D360.

3.3 Painting of Metalwork

All rust, scale and loose paint (if any) shall be removed from metal surfaces prior to painting by means of metal brushes and chisel and hammer.

All steel work shall have one priming coat of metallic chromate/alkyd primer 2 dry mils, brush-or spray-applied to ASTM D-478 before installation; and three further coats after installation of rubber-based paint of an approved color and used in accordance with the manufacturer's instructions.

3.4 Oil Painting on Walls

Walls to receive oil paint shall be rubbed smooth with sandpaper or carborundum stone and shall receive one priming coat of oil-based primer, two undercoats and a coat of gloss finish oil paint. After each of the undercoats, the surfaces shall be treated with putty and rubbed smooth so that finished painted surfaces shall be straight, even and free from bulges or depressions.

3.5 Emulsion Paint

All plastered surfaces to be painted shall be dry-brushed and cleaned. Where surfaces show salt deposits or efflorescence, the Contractor shall carefully neutralize them with a solution of 2 kg. of zinc sulphate crystals dissolved in 5 liters of water. This solution shall be left to dry. Emulsion paint shall be based on Acrylic co-polymers providing a silk-smooth finish upon drying. A fungicide additive shall be used with the paint in accordance with the directions of the manufacturer, obtained from an approved manufacturer and applied in one primer coat and three finishing coats, with putty treatment after each undercoat.

3.6 Textured Paint

Where shown on the Drawings or required by the Engineer, external plastered surfaces shall be decorated with textured paint of acrylic tripolymer-elastomeric type or rubber based, to B.S. 3900, Parts Fl, 2, 4 and 7. Surfaces to be so treated shall be even, free from cracks, irregularities or any other defects, and cleaned and left to dry.

The paint shall be of an approved color and shall be brought to Site in the manufacturer's sealed containers and applied in two coats in strict accordance with the manufacturer's specifications and instructions. Application shall be by use of suitable texture-forming brush, roller or spray gun as may be required by the nature of the work and/or specified in the Bill of Quantities.

The first coat shall be allowed to dry for 24 hours before application of the second coat. Decorated surfaces shall be of an even color, free from brush marks or any other stains, and to the satisfaction of the Engineer.

3.7 Painting of Pipes

All steel pipes or cast-iron pipes, whether buried or exposed, shall be painted with alkyd base paint in two coats, applied by brush or spray to the satisfaction of the Engineer.

3.8 Cleaning

After finishing all painting, the Contractor shall clean all glass panes, hardware and the premises of all dirt and spots of oil and emulsion, and shall refax all handles and other hardware accessories which had been removed before starting the priming works.