

## **General Requirements**

- 1- Description of Works and Site**
- 2- Documents and Drawings**
- 3- Management Procedures**
- 4- Quality Standards and Control**
- 5- Temporary Works and Services**

**January 2003**

**Rev 1.3**

## Table of Clauses

Clause No.	Page No.
<b>1- DESCRIPTION OF WORK AND SITE.....</b>	<b>1</b>
1-1 THE WORKS.....	1
1-1-1 General Description.....	1
1-1-2 The Works.....	2
1-1-3 Concurrent Work .....	3
1-1-4 Restraints.....	3
1-1-5 Phasing Of Work .....	3
1-1-6 Sectional Completion .....	3
1-1-7 Restrictions on Methods of Working.....	3
1-1-8 Sequence of Construction .....	3
1-1-9 Restrictions on Times of Working .....	4
1-2 THE SITE.....	4
1-2-1 General.....	4
1-2-2 Contractors Site Compound.....	4
1-2-3 Existing Utilities and Obstacles.....	4
1-2-4 Utility Diversions.....	5
<b>2- DOCUMENTS AND DRAWINGS .....</b>	<b>5</b>
2-1 DOCUMENTS GENERALLY .....	5
2-2 DRAWINGS .....	5
2-2-1 Contract Drawings.....	5
2-2-2 Dimensions and Details.....	6
2-3 DRAWINGS ETC. PROVIDED BY THE CONTRACTOR .....	6
2-3-1 General.....	6
2-3-2 Design .....	6
2-3-3 Design and Shop Drawings.....	6
2-3-4 Supporting Data .....	6
2-3-5 Procedure for Submission and Approval .....	6
2-3-6 "As-Built" Drawings.....	7
2-3-7 Instruction and Maintenance Manuals.....	7
2-3-8 Completion.....	7
2-4 BILL OF QUANTITIES .....	8
2-4-1 Measurement Procedures Generally.....	8
2-4-2 Field Measurements .....	8
2-4-3 Manufactured Items.....	8
2-4-4 Gage Designations.....	8
2-4-5 Fittings and Accessories.....	8
2-4-6 Weight Measurements .....	8
2-4-7 Linear and Area Measurements .....	9
2-4-8 Volume Measurements in Vehicles .....	9
2-4-9 Earthwork Volume Measurements.....	9
2-4-10 Ordering Materials .....	10
2-4-11 Shop Drawings.....	10
2-5 PROCEDURE NOTE 1 .....	11
2-5-1 Submittals For Shop Drawings.....	11
2-5-1-1 Shop Drawings.....	11
2-6 PROCEDURE NOTE 2 .....	11
2-6-1 Submittals For Product Data .....	11
2-6-1-1 Product Data.....	11
2-7 PROCEDURE NOTE 3 .....	12

2-7-1	<i>Instruction And Maintenance Manuals</i> .....	12
2-7-1-1	<i>Summary</i> .....	12
2-7-1-2	<i>Quality Assurance</i> .....	12
2-7-1-3	<i>Submittals</i> .....	13
2-7-1-4	<i>Manual Content</i> .....	14
2-7-1-5	<i>Material And Finishes Maintenance Manual</i> .....	15
2-7-1-6	<i>Equipment And Systems Maintenance Manual</i> .....	16
2-7-1-7	<i>Instructions Of The Employer’s Personnel</i> .....	17
<b>3-</b>	<b>MANAGEMENT PROCEDURES</b> .....	<b>18</b>
3-1	COMMENCEMENT, PROGRAM AND PROGRESS.....	18
3-1-1	<i>Commencement</i> .....	18
3-1-2	<i>Co-Ordination</i> .....	18
3-1-3	<i>Program</i> .....	18
3-1-4	<i>Guidance</i> .....	19
3-1-5	<i>Hardware</i> .....	19
3-1-6	<i>Computer Software</i> .....	19
3-1-7	<i>Resource Schedules</i> .....	19
3-1-8	<i>Cash Flow Estimate</i> .....	19
3-1-9	<i>Monitoring</i> .....	19
3-1-10	<i>Computer Program</i> .....	20
3-1-11	<i>Materials Procurement Schedules</i> .....	20
3-2	RECORDS AND MEASUREMENTS.....	20
3-2-1	<i>Labor Record</i> .....	20
3-2-2	<i>Materials And Plant Record</i> .....	20
3-2-3	<i>Equipment Record</i> .....	20
3-2-4	<i>Daily Work Record</i> .....	20
3-2-5	<i>Monthly Report</i> .....	20
3-2-6	<i>Wages Books And Time Sheets</i> .....	21
3-2-7	<i>Climatic Conditions</i> .....	21
3-2-8	<i>Special Records</i> .....	21
3-2-9	<i>Photographs</i> .....	21
3-3	SITE ADMINISTRATION.....	21
3-3-1	<i>Engineer's Site Meetings</i> .....	21
3-3-2	<i>Contractor's Site Meetings</i> .....	21
3-3-3	<i>Co-Ordination Of Subcontractors Etc.</i> .....	21
3-3-4	<i>Quality Control</i> .....	22
3-3-5	<i>Procedures Manual</i> .....	22
3-4	COMPLETION.....	22
3-4-1	<i>Notice Of Completion</i> .....	22
3-4-2	<i>Making Good Defects</i> .....	22
<b>4-</b>	<b>QUALITY STANDARDS AND CONTROL</b> .....	<b>23</b>
4-1	GENERALLY.....	23
4-1-1	<i>Good Practice</i> .....	23
4-2	SETTING OUT AND ACCURACY.....	23
4-2-1	<i>Site Survey</i> .....	23
4-2-2	<i>General Setting Out</i> .....	23
4-2-3	<i>Setting Out Utility Works</i> .....	23
4-2-4	<i>Setting Out Civil Work</i> .....	23
4-2-5	<i>Record Drawings</i> .....	23
4-2-6	<i>All Dimensions And Levels</i> .....	24
4-2-7	<i>Appearance And Fit</i> .....	24
4-2-8	<i>Non-Compliance</i> .....	24
4-3	MATERIALS.....	24
4-3-1	<i>Products</i> .....	24
4-3-2	<i>Product List Schedule</i> .....	24

4-3-3	Standards.....	24
4-3-4	Single Sources.....	24
4-3-5	Checking Compliance Of Products And Materials.....	25
4-3-6	Storage Of Materials.....	25
4-3-7	Protection Of Products And Materials.....	25
4-3-8	Materials Supplied By Employer.....	26
4-3-9	Local Material Sources.....	26
4-4	CONTRACTOR'S PLANT AND EQUIPMENT.....	26
4-4-1	Plant And Equipment.....	26
4-4-2	Plant And Equipment Of A Particular Size or Type.....	26
4-4-3	Contractor's Schedule Of Plant And Equipment.....	26
4-4-4	Provision And Use Of Plant And Equipment.....	26
4-4-5	Removal From Site.....	27
4-5	WORKMANSHIP.....	27
4-5-1	Work.....	27
4-5-2	Manufacturer's Recommendations.....	27
4-5-3	Suitability Of Previous Work And Conditions.....	27
4-5-4	Defects In Existing Work.....	27
4-5-5	Rectification Of Defective Work.....	27
4-5-6	Warranties.....	27
4-5-7	Warranties Employer Recourse.....	28
4-6	SAMPLES AND APPROVALS.....	28
4-6-1	Samples.....	28
4-6-2	Source Tests.....	29
4-6-3	Approvals.....	29
4-7	WORK AT COMPLETION.....	29
4-7-1	Clearing Etc.....	29
4-7-2	Temporary Markings.....	30
4-7-3	Partial Possession By Employer.....	30
4-7-4	Project Completion Procedures.....	30
4-8	PROCEDURE NOTE 4.....	30
4-8-1	Product Selection.....	30
4-8-1-1	Product Selection.....	30
4-9	PROCEDURE NOTE 5.....	31
4-9-1	Submittal Of Samples.....	31
4-9-1-1	Samples.....	31
4-10	PROCEDURE NOTE 6.....	32
4-10-1	Part 1 - Final Cleaning.....	32
4-10-1-1	Final Cleaning.....	32
4-10-2	Part 2-Products.....	33
4-10-2-1	Materials.....	33
4-10-3	Part 3 - Execution.....	33
4-10-3-1	Final Cleaning (where applicable).....	33
4-11	PROCEDURE NOTE 7.....	34
4-11-1	Part 1 - Project Completion.....	34
4-11-1-1	Summary.....	34
4-11-1-2	Partial Completion.....	34
4-11-1-3	Final Completion.....	34
4-11-1-4	Record Document Submittals.....	35
4-11-2	Part 2 - Execution.....	36
4-11-2-1	Close-Out Procedures (where applicable).....	36
5-1	GENERALLY.....	37
5-1-1	Locations.....	37
5-1-2	Standards And Details.....	37
5-1-3	Temporary Works.....	37
5-1-4	General.....	37
5-2	TEMPORARY SITE FACILITIES.....	37
5-2-1	Roads.....	37

5-2-2	<i>Diversions</i> .....	38
5-2-3	<i>Trench Crossings</i> .....	38
5-2-4	<i>Temporary Site Fence</i> .....	38
5-2-5	<i>Nameboard</i> .....	38
5-3	CONTRACTOR'S TEMPORARY OFFICES.....	38
5-3-1	<i>Contractor's Temporary Offices</i> .....	38
5-3-2	<i>Temporary Laboratory</i> .....	39
5-4	TEMPORARY SERVICES.....	39
5-4-1	<i>Water</i> .....	39
5-4-2	<i>Electricity</i> .....	39
5-4-3	<i>Power</i> .....	39
5-4-4	<i>Lighting</i> .....	39
5-4-5	<i>Permanent Electric Supply And Lighting Installation</i> .....	39
5-5	TEMPORARY FACILITIES FOR THE ENGINEER AND/OR EMPLOYER.....	39
5-5-1	<i>General</i> .....	39
5-5-2	<i>Representative's Site Offices</i> .....	40
5-5-2-1	<i>Furniture And Equipment</i> .....	40
5-5-2-2	<i>Conference Room Furniture And Equipment</i> .....	40
5-5-2-3	<i>Kitchen Furniture And Equipment</i> .....	41
5-5-2-4	<i>Store Room Furniture And Equipment</i> .....	41
5-5-2-5	<i>Lavatory Furniture And Equipment</i> .....	41
5-5-2-6	<i>Services</i> .....	41
5-5-2-7	<i>Telephones</i> .....	42
5-5-2-8	<i>Car Ports</i> .....	42
5-5-3	<i>Representative's Vehicles</i> .....	42
5-5-4	<i>Vehicle Driver</i> .....	42
5-5-5	<i>Computer</i> .....	42
5-5-6	<i>Surveying Equipment And Assistance</i> .....	42
5-5-7	<i>Thermometers</i> .....	43
5-5-8	<i>Test Equipment</i> .....	43
5-5-9	<i>Inspection Facilities</i> .....	43
5-5-10	<i>Digital Camera</i> .....	43
5-6	DIVERSION OF PUBLIC UTILITY SERVICES.....	43
5-6-1	<i>Temporary Diversion Of Existing Public Utility Services</i> .....	43
5-6-2	<i>Permanent Diversion Of Existing Public Utility Services</i> .....	43

## **1- DESCRIPTION OF WORK AND SITE**

### **1-1 The Works**

#### **1-1-1 General Description**

The project consists of *Insert description*

## **1-1-2 The Works**

The extent of the works includes but without limitation, the following main elements:

* Insert works description*

### **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 contractors 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 calls 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 arranged in four volumes namely :

Volume One	Bid Conditions and Procedures
	Conditions of Contract
Volume Two	Technical Specifications
Volume Three	Bill of Quantities
Volume Four	Drawings

### **2-2 Drawings**

#### **2-2-1 Contract Drawings**

Contract Drawings are detailed on the list of Drawings, Volume 4 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 with further drawings issued in accordance with sub-clause 7.1 of the Conditions of Contract as he deems necessary. 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, 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 30 days for Engineer's approval and extra time for resubmission in the case of rejection) and, in any case, a minimum of 45 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 30 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 qualifications, 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 diskette 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 in accordance with sub - clause 7.2 of the Conditions of the Contract to clearly show details for such as electrical signal line and wiring connections, piping and instrumentation diagram, 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 notes, 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 sq.m. 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 leveled 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 Earthwork Volume Measurements**

The average end area method shall be used in computing quantities of earthworks except where the error exceeds plus or minus 5% when compared with the results obtained using the prismatic formula, in which case the Engineer direct the use of the prismatic formula. The Contractor shall request such direction before he submits his quantities for approval.

The quantities of excavation paid for under the Contract unit prices shall be limited to the lines shown on the Drawings and on approved cross sections. Excavation beyond lines shown on approved cross sections shall not be paid for unless approved by the Engineer. Excavation in excess of approved cross sections will be measured for payment only in the case of unstable or unsuitable materials ordered by the Engineer to be removed.

The Engineer will adjust the angle of slopes for cuts and fills as the Works proceed and make determinations of the appropriate slope angles following his evaluation of soil conditions in case there is a change in the type of the soil. The actual slopes of the cuts as constructed shall be measured and recorded by the Contractor. The Engineer will check these records and, if satisfactory, will approve the measurements as a basis for payment.

Within 60 days of the date of field survey, the Contractor shall submit to the Engineer for his approval plots of due original and final earthwork cross sections together with the area and volumetric earthwork computations. The Contractor's cross sections shall be on transparent

cross section sheets for print reproductions. All sheets shall have a title block and be of the size designated by the Engineer. On final approval of the Contractor's cross sections, the Contractor shall submit the original transparencies and 3 prints of each such transparency.

In case of any variations from the approved Drawings, the Contractor shall submit the original and 2 copies of the plotted cross sections and profiles and the notes and computations of his survey. The Contractor shall take cross sections at maximum 25m intervals along the centerline and at other locations if directed by the Engineer. Upon mutual agreement between the Engineer and the Contractor, the Contractor may submit cross sections intermediate to these locations. The Engineer will indicate, on one copy, his approval of the proposed lines of the Works or his revisions thereto and return such copy to the Contractor. The Contractor shall resubmit for approval any cross sections the Engineer may have revised.

The Contractor may, as an alternate method of earthwork computation, request approval to use an electronic computer. Such request shall include details of the computer hardware, the earthwork software programs, the input and output, and a complete summary of the methods and procedures to be used. The Contractor may use an electronic computer for computations, only if approved, and continuance of such approval is contingent upon satisfactory results being achieved. If results are not as represented or are otherwise deemed unsatisfactory, the Contractor shall recompute the earthwork quantities by the cross section method.

#### **2-4-10 Ordering Materials**

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

#### **2-4-11 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 utilisation 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.
  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.
- B. Special operating and maintenance data requirements for specific pieces of equipment or building operating systems are included in the appropriate Sections of Divisions - 2 through 16.

#### **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. Organise into suitable sets of manageable size. Where possible, assemble instructions for similar equipment's into a single binder.
1. Binders : 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 ½" 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 typewritten 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 Equipment And Systems Maintenance Manual**

- A. Submit four copies of each completed manual on equipment and systems, in final form, to the Engineer for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic systems.
  - 1. Refer to Specification Sections for additional requirements on operating and maintenance of the various pieces of equipment and operating systems
- B. Equipment and Systems : Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.
  - 1. Description : Provide a complete description of each unit and related component parts, including the following :
    - i. Equipment or system function
    - ii. Operating characteristics
    - iii. Limiting conditions
    - iv. Performance curves
    - v. Engineering data and tests
    - vi. Complete nomenclature and number of replacement parts.
  - 2. Manufacturer's Information : For each manufacturer of a component part or piece of equipment provide the following:
    - i. Printed operating and maintenance instructions
    - ii. Assembly drawings and diagrams required for maintenance
    - iii. List of items recommended to be stocked as spare parts.
  - 3. Maintenance Procedures : Provide information detailing essential maintenance procedures, including the following :
    - i. Routine operations
    - ii. Trouble - shooting guide
    - iii. Disassembly, repair and reassembly
    - iv. Alignment, adjusting and checking

4. Operating Procedures : Provide information on equipment and system operating procedures, including the following :
    - i. Start - up procedures
    - ii. Equipment or system break - in
    - iii. Routine and normal operating instructions
    - iv. regulation and control procedures
    - v. Instructions on stopping
    - vi. Shut - Down and emergency instructions
    - vii. Summer and winter operating instructions
    - viii. Required sequences for electric or electronics systems
    - ix. Special operating instructions.
  5. Servicing Schedule. Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
  6. Controls : Provide a description of the sequence of operation and as - installed control diagrams by the control manufacturer for systems requiring controls.
  7. Co-ordination Drawings : Provide each Contractor's co - ordination drawings.
    - i. Provide as - installed color - coded piping diagrams, where required for identification.
  8. Valve Tags : Provide charts of value tag numbers, with the location and function of each valve.
  9. Circuit Directories : For electric and electronic systems, provide complete circuit directories of panelboards, including the following :
    - i. Electric service
    - ii. Controls
    - iii. Communication.
- C. Schedule : Provide complete information in the equipment and systems manual on products specified as requested by the Engineer.

#### **2-7-1-7 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. For equipment that requires seasonal operation, provide similar instructions during other seasons.
  2. 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 7 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 in accordance with conditions of contract clauses 6 and 7
- (m) Dates for submission by the Contractor of shop drawings samples and the like and dates for approval by the Project Manager/Engineer in accordance with Conditions of Contract sub clauses 7.2 and 7.3

- (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 in accordance with Conditions of Contract sub-clause 14.3.

#### **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 as required by Conditions of



Contract Clause 14. 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 diskette of the Target updated and new Target programs, schedules and estimates.

### **3-1-11 Materials Procurement Schedules**

The Contractor shall submit within 98 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 but not less than 36 (thirty six) at monthly intervals and submit the negative and 3 prints not less than 16 cm x 20 cm of each negative.

## **3-3 Site Administration**

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

The Engineer's Representative will hold site meetings once a month 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 contractors 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 Site 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 of excavation and earthwork, 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 Contractor's Plant And Equipment**

##### **4-4-1 Plant And Equipment**

Used on the Works shall be of sufficient size and in such mechanical condition as to meet the requirements of the Specification and shall be available for use when required by the Engineer. The Engineer may order removal and replacement of unsatisfactory plant or equipment.

##### **4-4-2 Plant And Equipment Of A Particular Size or Type**

Wherever Plant And Equipment Of A Particular Size or type is specified, the Contractor may request permission to use an alternative type in place of that specified. In such cases, the Contractor shall furnish evidence to the Project Manager/Engineer, before approval is given, that the production of the plant or equipment proposed is at least equal to that of the specified type.

##### **4-4-3 Contractor's Schedule Of Plant And Equipment**

The Contractor shall submit together with his Tender, a detailed schedule of the numbers and types of plant and equipment which he proposes to utilize on Site to carry out the Works. The schedule shall contain full details for each item, including type, manufacturer, model, identification number, year of manufacture, number of years in use, and, for all new and previously used items, the manufacturer's brochures, catalogs and specifications.

##### **4-4-4 Provision And Use Of Plant And Equipment**

The Contractor shall furnish all plant and equipment listed in his Schedule and necessary for construction of each phase of the Works. Such plant and equipment shall be delivered to the Site, inspected, and approved by the Engineer prior to commencement of the particular phase of the Works for which it is intended. Any plant or equipment, or part thereof, which becomes

excessively worn or defective shall be promptly repaired or replaced, as required by the Engineer.

#### **4-4-5 Removal From Site**

The Contractor shall not remove from the Site any approved plant or equipment without the permission of the Engineer.

#### **4-5 Workmanship**

##### **4-5-1 Work**

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

##### **4-5-2 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.

##### **4-5-3 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.

##### **4-5-4 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.

##### **4-5-5 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.

##### **4-5-6 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 defects 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. Semiproprietary 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 matches 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 colour, 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..
- 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 can not 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.
  - 1. Where extra materials of value remain after completion of associated construction have become the Employer's property, dispose of these materials as described.

#### **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, messrooms, latrines 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, messrooms, 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 defects 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:

- 2 offices size of each approximately 4m x 5m
- Meeting room for 12 people
- Secretary's room of approximately size 4m x 5m
- 1 kitchenette
- 2 toilets
- Car shades for 4 cars.

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.

#### **5-5-2-1 Furniture And Equipment**

Each office shall contain:

- 2 desks with lockable drawers and swivel chairs
- 2 lockable steel filing cabinets
- 2 office chairs
- 1 drawing hanger for 10 sets
- 2 shelves
- 2 pin boards
- 2 waste paper baskets.
- 1 reference table

And, in addition, the following shall be provided:

- 1 secretary's desk and swivel chair
- 2 large lockable sheet filing cabinets
- 2 reference tables
- 6 office chairs
- 10 calculators
- 1 photocopying machine with duplex, sorter and document feeder + consumables + all photocopying papers
- Pinboards, shelves and waste paper baskets.
- 1 computer minimum (or as may be required by the Engineer) with all consumables and all stationary and offices supplies.

#### **5-5-2-2 Conference Room Furniture And Equipment**

Details to be decided by the Engineer as needed and based on the following:

- 1 conference table for 12 people
- 12 chairs

- 2 pinboards
- 2 shelves
- 2 waste baskets
- 1 reference table.

### **5-5-2-3 Kitchen Furniture And Equipment**

Shall comprise for each pantry:

- 1 refrigerator 14 cu. ft. capacity
- 1 water filter and 20 liters water cooler/hot/cold
- 2 electric boiling rings
- 1 stainless steel sink and drainer
- 1 heat resistant worktop
- 1 set of storage cupboards
- 1 set of crockery and cutlery for each member of the staff
- 1 large waste basket with cover.

And all necessary consumables for the making of beverages for the duration of the contract.

### **5-5-2-4 Store Room Furniture And Equipment**

Shall comprise:

- Shelves units
- Drawing hangers and racks.

### **5-5-2-5 Lavatory Furniture And Equipment**

Shall comprise for each lavatory:

- 1 european w.c. suite
- 1 toilet roll holder
- 1 wash hand basin with shelf
- 1 mirror
- 1 paper towel holder
- 1 soap dispenser
- 1 waste basket with cover.
- 1 extractor fan

And all necessary consumables.

### **5-5-2-6 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

- Fire fighting appliances
- Cleaning facilities and general attendance.

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

#### **5-5-2-7 Telephones**

The contractor shall provide a three separate telephone connections, one which is mobile and two fixed for office use and facsimile. The Contractor shall pay all installation, rental and call charges.

#### **5-5-2-8 Car Ports**

Car ports, complete with hardstandings and all necessary adjoining walkways, shall be provided for a minimum of four vehicles. Covered car parking areas shall be adjacent o the offices.

#### **5-5-3 Representative's Vehicles**

The Contractor shall provide and maintain a new four wheel Drive, air-conditioned vehicle, minimum 2400 CC for the sole use of the Engineer's Representative and his staff and shall supply all fuel and lubricants, repair and maintain the vehicle to keep it in good roadworthy condition at all times, comprehensively insure the vehicle for any driver at all times and replace with identical vehicle any vehicle removed for maintenance or repair or for any other reason.

At the end of the Project the above car shall remain the property of the Contractor.

#### **5-5-4 Vehicle Driver**

The vehicle shall have a competent driver during normal working hours. The vehicle is to remain in the possession of the Engineer's Representative and his staff after normal working hours

#### **5-5-5 Computer**

The Contractor shall provide on site for the use of the Engineer's Representative and his staff two latest model computers along with the necessary operating systems, softwares, A4 laser printer, A3 plotter and UPS.

#### **5-5-6 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 topograph and other assistants if required.

### **5-5-7 Thermometers**

The following shall be provided on Site:

- Maximum and minimum thermometer for measurement of atmospheric temperature
- Thermometer for measurement of concrete and ground temperature.

### **5-5-8 Test Equipment**

The Contractor shall make available to the Engineer's Representative all test equipment and testing laboratories required for carrying out tests on materials, Plant or finished work required by the Specification.

### **5-5-9 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.

### **5-5-10 Digital Camera**

The Contractor shall provide one digital camera latest model for the sole use of the Engineer's Representative and his staff.

## **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.