

1 QUALITY CONTROL

- 1.1 Provide a quality control system, in the form of a Quality Management System Plan (QMSP) which will ensure that the specified quality of the Work is achieved.
- 1.2 Provide all required testing and include all associated costs for testing required to satisfy the standards listed in the appropriate sections of the specifications.
- 1.3 Submit the QMSP minimum 4 weeks after contract award and 2 weeks prior to commencement of work on site. Submit to Project Manager for review and approval.

2 QUALITY MANAGEMENT SYSTEM PLAN

2.1 Purpose:

- 2.1.1 The Design Builder is responsible for the design and delivery of a facility that meets the standards of quality indicated in the specifications, as it applies to both materials and workmanship. The QMSP is intended to assist the Design Builder in fulfilling this obligation, and to provide to the Project Manager, a means of confirming that the specified level of quality is being achieved.

2.2 Definition:

- 2.2.1 The "Builder" element of the Design Builder produces the work of the contract to the standards of quality called for in the performance specifications.
- 2.2.2 The "Designer" element of the Design Builder can attest that the work, as it progresses, is in conformity with the quality standards specified, that the completed facility has been constructed in accordance with the plans and specifications, and meets the design intent.

- 2.3 The Project Manager can be assured that work meets the specified quality standards by confirming that the Builders and Designers quality control and quality assurance processes are being implemented according to plan.

2.4 The QMSP activities and processes consist of:

- 2.4.1 Builders Quality Control Process.
- 2.4.2 Designers Quality Assurance Process.
- 2.4.3 Project Managers Quality Management Process.

3 BUILDERS QUALITY CONTROL PROCESS

- 3.1 Is a series of activities which will permit the Builder to meet the quality standards set out in the Contract by maintaining strict control over the quality of the work prior to and while it is being put into place. These activities include:

- 3.1.1 Instilling in management staff, supervisory personnel, sub-contractors and the Designer an awareness of the requirement for quality work and obtaining the commitment to produce it.
- 3.1.2 Maintaining an experienced staff capable of performing good quality work.
- 3.1.3 Setting up regular drawing and specification reviews with the Designer to ensure that the design requirements are understood.
- 3.1.4 Engaging sub-contractors capable of producing good quality work.
- 3.1.5 Maintaining materials ordering procedures which will verify and confirm that the materials purchased will meet the specified standards.
- 3.1.6 Ensuring adequate materials testing procedures are in place.
- 3.1.7 Maintaining an effective shop drawing verification and approval system.
- 3.1.8 Verifying that the equipment which is to be used to perform the work is appropriate and in good working order.
- 3.1.9 Consulting with supervisory personnel, workmen and sub-contractors to confirm that the requirements of the drawings and specification are thoroughly understood.
- 3.1.10 Insisting upon close supervision during each stage of each construction operation to ensure that the work is being done in accordance with the drawings and specifications.
- 3.1.11 Providing continuous inspection, in some cases by engaging specialist firms, of certain high risk installations such as roofing.
- 3.1.12 Double checking of vital measurements prior to proceeding with the next phase of the work (e.g. verification of anchor bolt locations and projections before placing concrete).
- 3.1.13 Confirming that the work of one stage meets the requirements before the next stage is performed (e.g. verifying that granular base material is compacted to the specified standards before placing reinforcing steel, and verifying reinforcing steel installation for conformity to specifications, before placing concrete and hydrostatic, pneumatic pressure testing prior to backfilling).
- 3.1.14 Ensuring that the material and items of equipment delivered conform to specifications before they are incorporated into the work.
- 3.1.15 Ensuring that quality assurance tests have been carried out successfully on all relevant items before backfilling or enclosing them.
- 3.1.16 Insisting upon constant attention to the co-ordination of the drawings and the work of the various sub-trades.

- 3.1.17 Providing mock-ups or sample sections of repetitive work to establish acceptable standard of workmanship (e.g. concrete pavement sections, concrete block masonry and/or brickwork).

4 BUILDERS QUALITY CONTROL PLAN

- 4.1 Provide a Builders Quality Control Plan (BQCP). Prepare the BQCP in consultation with sub-contractors and submit the BQCP to the Project Manager for approval. Describe in detail, the Builders proposed quality control practices. Identify the items of work which will be subjected to the controls, and list the particular checks and tests which are to be performed for each such item. Indicate the frequency of the checks or tests, and the milestones at which they are to be carried out. Provide for reports on the results of these activities. Submit the reports weekly to the Designer and to the Project Manager.
- 4.2 Include all of the activities necessary to ensure that the quality of the work will be as specified. Co-ordinate and consult with the Designer to ensure that the intended standard of quality is understood. Prepare the BQCP in conjunction with the Designers Quality Assurance Process.

5 DESIGNERS QUALITY ASSURANCE PLAN

- 5.1 Provide a Designers Quality Assurance Plan (DQAP), of sufficient detail to assure the Designer that the work is being performed in accordance with the drawings and specifications, and that the completed work meets the standards set out in the specifications. Ensure these activities are extensive enough to permit the Designer to attest, in writing, that the completed facility, as constructed, meets the design intent.
- 5.2 Describe in detail, the proposed quality assurance practices. Co-ordinate with the BQCP to ensure that it compliments and confirms the BQCP. Identify the items of work which will be subjected to quality assurance measures. List the inspections, checks and tests which are to be performed for each corresponding item. Indicate the frequency of inspections, checks and tests, and the milestones at which they are to be carried out. Provide for written reports describing the outcome of the quality assurance activities.

6 PROJECT MANAGERS QUALITY MANAGEMENT PROCESS

- 6.1 A series of activities to permit the Project Manager to verify that the work is being performed in accordance with the drawings and specifications, and to the standards of quality set out in the specifications. Enables the Project Manager to monitor the Design Builder Quality Control (QC) and Quality Assurance (QA) mechanisms, and to request any adjustments to the QC or QA processes. Allows the Project Manager to verify on a continuing basis, that an appropriate QMSP is in place and is being implemented effectively.

7 QUALITY ASSURANCE REQUIREMENTS

7.1 Include the following minimum testing and certifications in the DQAP:

7.1.1 **Civil:**

7.1.1.1 Provide independent concrete, soils, and asphalt testing.

7.1.1.2 Provide independent testing and certification of fill materials and compacting relating to filling and backfilling.

7.1.2 **Site Services.** Provide the following:

7.1.2.1 Construct Mock-Ups. Installation to be approved by Designer.

7.1.2.2 Weekly inspection by Designer. Report to comment on joints, bedding, thrust blocks, slope, general workmanship.

7.1.2.3 Hydrostatic testing certified by Designer.

7.1.2.4 Flushing and disinfecting certified by Designer.

7.1.2.5 Final certification of all structural fills, subgrade, proof rolling and granular fills by soils consultant.

7.1.2.6 Concrete and asphalt paving tests. Indicate the involvement, relationship and authorities of the site superintendent, the testing consultant and the Designer.

7.1.3 **Structural.** Provide the following:

7.1.3.1 QA inspection sign-off sheets for formwork, re-bar and soils testing for each concrete pour.

7.1.3.2 Inspection of soils during foundation installation by soils consultant.

7.1.3.3 Designers weekly inspection of foundation and other concrete work. Report to comment on re-bar, and/or bolts, inserts, formwork, concreting materials and methods and conformance to specification and drawing, as well as code requirements.

7.1.3.4 Inspection and approval of cold weather concreting practices by Designer during weekly inspections. Include form removal practices.

7.1.3.5 Structural steel mill test reports.

7.1.3.6 Weekly inspection of structural steel installation by Designer to certify conformance to specifications and drawings. Submit reports to Project Manager.

7.1.3.7 Inspection of bolt torque and weld by Designer. Percentage of inspection to be determined by Designer.

- 7.1.3.8 Structural weld radiography. Number of tests to be determined by Designer.
- 7.1.3.9 Certification by Designer that all erectors, fabricators and welders are certified in accordance with the appropriate CSA standard.
- 7.1.4 **Architectural.** Provide the following:
 - 7.1.4.1 Independent Waterproofing installation inspection report.
 - 7.1.4.2 Masonry and mortar test reports.
 - 7.1.4.3 Pre-cast concrete test reports.
 - 7.1.4.4 Daily independent roofing inspection. Provide weekly reports.
 - 7.1.4.5 Daily independent air barrier installation inspection. Provide reports.
 - 7.1.4.6 Construct window mock-ups. Approval by Project Manager.
 - 7.1.4.7 Inspection of insulation and vapour barrier. Approval by Project Manager before cover-up.
 - 7.1.4.8 Inspection and approval of fireproofing and fire barriers by Designer.
 - 7.1.4.9 Weekly site inspections by Designer. Include report on overall conformance to specifications and drawings, quality, accuracy, alignments, levelness and plumbness.
- 7.1.5 **Mechanical.** Provide the following:
 - 7.1.5.1 Pressure tests of all underground and concealed piping. Designer to certify.
 - 7.1.5.2 Weekly inspection and report on piping installations by Designer.
 - 7.1.5.3 Certification that all piping and strainers have been cleaned prior to system filling.
 - 7.1.5.4 Water treatment and cleaning report by Designer or independent water treatment specialist.
 - 7.1.5.5 Inspection and report by Designer that all plumbing clean-outs are installed such that the entire drainage system can be rodded.
 - 7.1.5.6 Inspection and report by Designer on pipe hangers, hanger spacing and rod diameter.
 - 7.1.5.7 Inspection and report by Designer on position of service valves. Certify that valves are oriented correctly.
 - 7.1.5.8 Inspection and report by Designer on adequate service clearance being provided for mechanical equipment.

- 7.1.5.9 Inspection and report by Designer on isolation valves and unions being properly located for specific equipment.
- 7.1.5.10 Inspection and report by Designer on adequate headroom being provided.
- 7.1.5.11 Inspection and report by Designer on installation of expansion joints and flex connectors in piping system.
- 7.1.5.12 Designer to inspect and report weekly on general installation conformance to specifications and drawings.
- 7.1.6 **Electrical.** Provide the following either as part of the QA or the Commissioning.
 - 7.1.6.1 Load balance check. Provide at Project completion.
 - 7.1.6.2 Phase checks. Provide throughout and after power is available.
 - 7.1.6.3 Insulation resistance. Provide throughout as installation progresses.
 - 7.1.6.4 HIPOT of High Voltage Feeders. Provide when installed, prior to energizing.
 - 7.1.6.5 Main electrical service insulation. Provide when installed, prior to energization.
 - 7.1.6.6 Main electrical service grounding and neutral continuity. Provide when installed, prior to energizing.
 - 7.1.6.7 Resistance testing of Grounding and Lightning Protection. Provide throughout as installation progresses.
 - 7.1.6.8 Operational testing of all lighting systems. Provide at project completion.
 - 7.1.6.9 Fire Alarm System Testing. Provide at project completion.
 - 7.1.6.10 Voice/Data System. Provide at project completion as per standards.
 - 7.1.6.11 Operational Testing for all other systems. Provide at project completion.
 - 7.1.6.12 Provide weekly inspection reports by Designer on general installation and conformance to specifications and drawings.