

APPENDIX J – QUALITY MANAGEMENT

(see attached)

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1 BACKGROUND

1.1 DBSS 101

The following Quality Management requirements are based on the BC Ministry of Transportation and Infrastructure's Design-Build Standard Specification DBSS 101 Quality Management.

1.2 Exceptions

Any requirements for quality control or quality assurance related to design for which the Contractor is not responsible, do not apply to this Contract.

1.3 Additional Information

Specific quality control tests and inspection requirements, including frequencies, standards and acceptance criteria are specified in Appendix G – Specifications.

2 GENERAL

All work on BC Hydro projects will be undertaken through a total quality management process, utilizing BC Hydro, Contractor, and third-party resources, as necessary.

BC Hydro accepts the following definitions associated with Quality Management:

- (a) Quality Control ("QC"): The process of checking specific product or service results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory product or service performance.
- (b) Quality Assurance ("QA"): The process of evaluating overall product or service, by persons or companies independent of those doing the Work, on a regular basis to provide confidence that the product or service satisfies the relevant quality standards.
- (c) Quality Audit ("QAudit"): Review by a party independent of QC and QA, to provide confidence that QC and QA processes and resulting products satisfy the contractual requirements.
- (d) Quality Management ("QM"): The compendium of quality control, assurance, and audit provided by a party.

The quality management program has three key components as follows:

- (e) Quality Control: The Contractor's responsibility.
- (f) Quality Assurance: The Contractor's responsibility.
- (g) Quality Audit: BC Hydro's responsibility.

Each component of the program must address design, materials, processes, products, and documentation.

The Contractor will provide unrestricted access to all its Quality Management operations and documentation produced by or on behalf of the Contractor and will allow BC Hydro full access at any time during working hours.

Hydro's Representative will review the Contractor's performance of the Work and determine the acceptability of the Work based on BC Hydro's Quality Audit results and, where deemed appropriate by Hydro's Representative, supplemented by the Contractor's Quality Management results.

Work failing to meet the conditions of the Contract will be considered unacceptable Work.

Hydro's Representative may consider all Work from the last acceptable Quality Audit testing as unacceptable Work. The Contractor will not be entitled to payment for Work that lacks the appropriate Quality Management documentation, verified by the Quality Manager, as required by the Contract.

The Contractor will implement a well-coordinated approach to all operations related to the Work and will organize its team and operations in keeping with the goal of doing things right the first time.

3 QUALITY CONTROL PLAN

3.1 QC Plan General Requirements

The Contractor will be responsible for all Quality Control during the performance of the Work. QC work includes monitoring, inspecting and testing the means, methods, materials, workmanship, processes, and products of all aspects of the Work, including design, construction, and management, whether provided by the Contractor or a Subcontractor as necessary to ensure conformance with the Contract.

The Contractor will prepare a Quality Control Plan ("**QC Plan**") in accordance with the Contract provisions and will submit the complete QC Plan to Hydro's Representative a minimum of two weeks in advance of commencement of any element of Work covered by the plan.

The QC Plan will be structured around the ISO 9001:2008 program (although ISO registration is not required), and clearly demonstrate the Contractor's understanding and commitment to ISO's eight principles of quality management:

- (a) Customer focused organization;
- (b) Leadership;
- (c) Involvement of people;
- (d) Process approach;
- (e) System approach to management;
- (f) Continual improvement;
- (g) Factual approach to decision-making; and
- (h) Mutually beneficial supplier relationships.

The QC Plan must also include sections detailing the Contractor's quality management processes associated with each of the relevant sections of ISO 9001:2008 as listed in Table 3.1, work method statements describing the Contractor's methodology of doing the Work, and check lists to aid in verifying that the Work is compliant.

No work will be undertaken on any element of Work (including payment items and incidental Work, or submittals for review) for which there are QC Plan submission requirements until the Quality Manager and BC Hydro have accepted the base portion of the QC Plan and the specific details for that element of Work.

Subject to the submission requirements outlined in DBSS 101.02.03, the QC Plan is required to cover the Work in its entirety, including without limitation all materials and services the Contractor, designers and Subcontractors are supplying, and all items and phases of the design and construction on the Project.

The Contractor may require a Subcontractor or supplier to perform QC on the portion of the Work performed by that Subcontractor, but the responsibility for the adequacy of the QC remains with the Contractor, and the Contractor will perform QA on the Work performed by the Subcontractor.

The plan may be operated wholly or in part by a qualified Subcontractor or an independent agency/organization. However, the plan's administration (including conformance with the plan and its modifications) and the quality of the Work remain the responsibility of the Contractor.

Table 3.1: ISO Section Headings

§	ISO 9001:2008 Section Heading
4	Quality Management System
4.1	General Requirements
4.2	Documentation Requirements
5	Management Responsibility
5.1	Management commitment
5.2	Customer focus
5.3	Quality policy
5.4	Planning
5.5	Responsibility, authority and communication
5.6	Management review
6	Resource Management
6.1	Provision of resources
6.2	Human resources
6.3	Infrastructure
6.4	Work environment
7	Product Realization
7.1	Planning of product realization
7.2	Customer-related processes
7.3	Design and development
7.4	Purchasing
7.5	Production and service provision
7.6	Control of monitoring and measuring equipment
8	Measurement, Analysis and Improvement
8.1	General
8.2	Monitoring and Measurement
8.3	Control of nonconforming product

§	ISO 9001:2008 Section Heading
8.4	Analysis of data
8.5	Improvement

The Contractor's QC program and the Work will be undertaken in accordance with the QC Plan. Testing results must represent actual operations. Results will be reported accurately and in a timely manner.

The Contractor will also ensure that all workers are familiar with the Quality Management Plans, its goals, and their role under it, as well as with the Contract specifications associated with the Work they are to undertake.

3.2 QC Plan Quality Control Staff and Equipment Submission Requirements

The Contractor will provide all resources and take all actions necessary to ensure:

- (a) Provision of sufficient review, inspection, and testing staff, with adequate equipment and technical support to perform all Quality Control functions in an accurate and timely manner.
- (b) That QC staff perform only reviews, inspections and tests for which they are qualified.
- (c) All testing equipment is calibrated, properly maintained, and in good operating condition.
- (d) All testing and inspection is performed in accordance with applicable industry standards and the appropriate standards of the Contract.
- (e) Submission to Hydro's Representative, within twenty-four (24) hours, of daily reports for all tests and inspections that indicate non-conformance of the material being tested.
- (f) Production, within forty-eight (48) hours, of daily reports for all tests and inspections that indicate conformance of the material being tested and the availability of back-up documentation to substantiate test results when required.
- (g) Organization, compilation, and submission of all project QC documentation within 14 days of the last day on Site and as a condition precedent to the issuance of the Completion Certificate.

The Contractor will designate one person as the Quality Manager (the **Quality Manager**) who will be responsible for the implementation of the QC Plan. The Quality Manager will be a qualified Professional Engineer, Certified Engineering Technician, or Applied Science Technologist, or other person subject to professional liability for their certifications and with knowledge, skills and abilities acceptable to Hydro's Representative. The Quality Manager will be at arm's length from the productivity part of the Contractor's organization and specifically will not be the Project Manager or the Project Superintendent. On small, low-risk, design build minor works contracts, this requirement will, upon request by the Contractor and where the candidate is deemed acceptable under the foregoing paragraph, generally be waived by Hydro's Representative.

BC Hydro recognizes the Contractor's Project Manager, Superintendent and Designer as the personnel responsible for making the product meet the contractual requirements, but the Quality Manager's duties include being responsible to measure and enforce conformance and to ensure that quality is not compromised by production pressures.

The Quality Manager is not entitled to waive or vary any requirement of the Contract, but may seek authorization of any proposed variance from Hydro's Representative.

The Quality Manager, or a designated replacement acceptable to Hydro's Representative empowered and able to perform all of the Quality Manager's relevant duties, will remain on Site at all times the Contractor is performing Work which must be tested or inspected in-process, and must be readily accessible and able to return when off-Site.

The QC Plan will include the following information:

- (h) the name of the Quality Manager and qualifications establishing a proven capability to provide the specific services required for the Project;
- (i) the name of QC testing agencies and their proven capability to provide the specific services required for the Project;
- (j) a listing of QC staff (including names, qualifications and relevant experience) and their assigned roles and work scheduling in performing QC duties;
- (k) a list of testing equipment to be used for the Work.

The QC Plan must include an organizational chart showing details of the flow of information, "hold" points designated by the Contract, the designer, QM staff, or BC Hydro, rectification of deficiencies and other relationships and responsibilities necessary to assure Project quality requirements are met.

The QC Plan should describe how the QC staff are allocated to Project requirements, the tasks assigned to each, and how their work will be coordinated.

Without limitation, the Contractor's Quality Manager will:

- (l) implement the Contractor's QC Plan;
- (m) be responsible for measuring conformance with all aspects of the contract quality;
- (n) stop work when materials, product, processes or submittals are deficient;
- (o) develop inspection and testing plans for each element of Work;
- (p) develop acceptance/non-acceptance reports and quality control checklists for each element of Work in sufficient detail to gauge conformance with all contractual requirements;
- (q) ensure the requirements for quality management (including an overview of how the QC Plan operates, the worker's role in it, contractual specifications for the Work, and work procedures) are known to, understood by, and adhered to by all workers on the Site;
- (r) ensure that all QC checklists are signed-off by competent and responsible parties;
- (s) review, sign, and be responsible for all reports (materials and testing results);
- (t) consult with field inspectors regarding materials and testing issues;
- (u) receive notification by inspectors for deficiencies and ensure re-testing or rejection;
- (v) provide weekly and monthly summary reports on testing and inspection results;
- (w) initiate the non-conformance process when materials or product do not meet the required specifications and, inform Hydro's Representative of such non-conformance;

- (x) consult with the Contractor's Representative and initiate corrective and/or preventative action on non-conformance;
- (y) respond to each Non-Conformance Report ("NCR") issued by the Contractor or Hydro's Representative within the time specified in the NCR;
- (z) schedule testing and inspection services in coordination with the Contractor's superintendent and foremen;
- (aa) include and monitor QC testing and inspection procedures including those of the Subcontractors;
- (bb) work directly with Hydro's Representative on matters related to QC;
- (cc) provide timely notice to Hydro's Representative of timing of construction activities that Hydro's Representative may wish to witness in-progress;
- (dd) ensure required approvals and permits from Hydro's Representative and others are obtained as and when required;
- (ee) verify that all testing equipment is properly maintained and kept in good working order;
- (ff) keep an organized filing system to ensure that quality records are easily accessible so that auditors can obtain necessary information;
- (gg) review issued for construction drawings, calculations, and shop drawings and ensure that all concerned Contractor staff have current versions of documents applicable to their part of the Work;
- (hh) ensure any proposed changes to the approved Design have been reviewed and approved by the Designer and Hydro's Representative prior to implementation;
- (ii) notify Hydro's Representative of any changes in survey layout, location, line, grade, etc., for approval; notify the company principles of any issues that compromise the integrity or function of the Quality Management System, and
- (jj) provide an auditable trail for survey computations to Hydro's Representative.

3.3 QC Plan Submission Requirements (Contract-Specific)

3.3.1 Full Submission

Unless otherwise specified in the Contract, the Contractor's QC plan will provide details of the means, methods, and frequencies of Quality Control measures for all elements of Work (whether payment Items or incidental or being performed by Subcontractors including design, construction and management) in the Contract.

3.3.2 Partial Submission

On projects considered by BC Hydro to be of low complexity and/or risk, and only where explicitly invoked by the Contract, BC Hydro will accept a partial QC Plan submission.

Notwithstanding any such reduced submission requirements, the Contractor remains responsible for QC for all aspects of the Work.

The Contractor's partial QC Plan submission to Hydro's Representative is only required to address the details of the following types of Work:

- (a) Traffic Management;
- (b) Survey/layout;
- (c) Design;
- (d) Materials incorporated into the Work (concrete barrier, culverts, filter cloth, lock-blocks, etc.);
- (e) Compaction (subgrade, embankments, granular aggregates, culvert backfill, etc.);
- (f) Aggregate gradation; and
- (g) Plus any other elements identified in the Contract as a submission requirement.

The Contractor will initiate such other Quality Control procedures as are necessary for ensuring the production of a quality product and may include them in the Quality Control Plan submission.

3.3.3 For Both Full and Partial Submissions

The initial QC Plan will be submitted to Hydro's Representative a minimum of seven (7) days in advance of the Project pre-construction meeting and must provide details of all elements of Work anticipated to be undertaken within the Contractor's first thirty (30) days on Site.

The portion of the QC Plan dealing with the design will be submitted to Hydro's Representative on the earlier of:

- (a) thirty (30) days after Award; and
- (b) a minimum of seven (7) days in advance of the first design submission.

Detailed submissions for the balance of the Work must be received a minimum of seven (7) days prior to the anticipated first day of Work on each element covered by the submission.

The initial submission, as well as any subsequent submission or revision, must be accompanied by the Contractor's QC checklist for Quality Management, verifying that the submission meets all relevant contractual requirements.

Improved procedures may be introduced after the start of work as necessary as amendments to the Quality Control Plan. All amendments require the written acceptance of Hydro's Representative.

The type and frequency of QC tests will be established by the Contractor and will be in conformance with the requirements of the Contract, including the minimum frequencies specified in the Contract and/or DB Standard Specifications (for those listed items applicable to the Work), and the current acceptable practice of the industry.

When materials or equipment are specified by standard or performance specifications, the Contractor will obtain from suppliers or manufacturers independent test reports, or test certificates stating that the materials or equipment meet or exceed specified requirements. The Contractor will provide documentation of actual testing results upon request by Hydro's Representative.

4 QUALITY ASSURANCE PLAN (QA PLAN)

The Contractor will prepare and the Quality Manager will implement a Quality Assurance Plan, based in part on the effectiveness and reliability of the Contractor's Quality Control Plan, to assess the performance and effectiveness of that QC Plan and the quality of the product.

The Contractor will also undertake random and systematic reviews, inspections, and tests of the Work, procedures, materials, and QC documentation produced by the Contractor, designers and Subcontractors.

The purpose of the QA Plan and inspectional activities is to ensure that QC procedures are available, are being followed, and that the Contractor will have confidence that the resulting products (transitory or permanent) conform to Contract requirements.

The operation of the QA Plan will be fully independent of those performing the QC tasks, except for the Quality Manager.

Any instances of unacceptable Work discovered will result in a Non-Conformance Report being issued by the Contractor to the Contractor.

The QA program activities will not relieve the Contractor of Quality Control responsibilities under the terms of the Contract.

The frequency of QA inspection and testing will generally be approximately five to ten percent (5 – 10%) of the frequencies undertaken by the Contractor in its QC Plan and will initially be set at a level commensurate with the risk that an element will have on final product quality. Elements that have higher risks will be checked at higher frequencies; lower risk elements may be checked at lower frequencies.

The Contractor may, with the prior approval of Hydro's Representative, decrease the frequency of QA inspection and testing during the course of the Work, based upon the proven effectiveness of the Contractor's QC Plan.

5 QUALITY AUDIT

BC Hydro will have one or more auditors on the Project. The BC Hydro audit will provide a systematic and independent assessment of whether or not the design, construction, and management comply with the Contract and the Contractor's QC and QA Plans.

The objective of Quality Auditing is to have an independent opinion on both QC and QA activities and be proactive in avoiding or reducing quality related issues by requiring the process of conformance verification to be systematic.

The auditor(s) will be allowed unrestricted access to the Site and all activities therein, to all testing and documentation of the work done by BC Hydro, Contractor and their agents and suppliers.

Hydro's Representative will monitor the Contractor's operations and the Quality Control program to assure that standards and the terms of the Contract regarding quality of materials and processes are being met, and to assess what payments have been earned under the terms of the Contract.

6 NON-CONFORMANCE REPORTS (NCRS)

The Contractor will and BC Hydro may review the Work to determine conformance with the contractual requirements.

Non-conformances found will be dealt with as follows.

6.1 Contractor's Internal NCR

Should the Contractor's QC or QA reporting indicate that the Work is not in conformance, the Quality Manager will issue an internal Non-Conformance Report (NCR) to the Contractor, with a copy to BC Hydro, including a response time.

The Contractor will then respond to the Quality Manager, with a copy to Hydro's Representative, with respect to the NCR, within the specified time, with proposed resolutions and corrective and/or preventative actions. The Contractor and/or the Quality Manager may consult with Hydro's Representative on the proposed resolutions.

Payment (where specified in the Contract) for Quality Management will not be affected by internal NCRs, as long as the issue is diligently pursued and resolved.

Payment for the Work itself may be withheld until the NCR issue is resolved.

6.2 BC Hydro-Issued NCR

Should BC Hydro's QAudit reporting indicate that the Work is not in conformance, Hydro's Representative will issue to the Contractor a NCR, including a response time.

The Contractor will then respond to that NCR, within the specified time, with proposed resolutions and corrective and/or preventative actions.

Hydro's Representative will accept or reject the proposed resolution and action proposal.

Assurance testing and inspection will be performed to determine if the corrective action has provided an acceptable product. Acceptance and rejection will continue until Hydro's Representative determines that a quality product has been achieved.

A portion of the payment (where specified in the Contract) for Quality Management may be withheld until the NCR issue is resolved or, in accordance with DBSS 101.07, may be withheld permanently.

Payment for the Work itself may be withheld until the NCR issue is resolved.

6.3 Opportunity for Improvement

Should the QAudit review indicate that the Work is not in conformance, but the variance is deemed minor by Hydro's Representative, Hydro's Representative may issue an Opportunity for Improvement (OFI) report.

The Contractor is encouraged to review the findings and undertake such modifications to the QC and/or QA Plan and the work procedures as necessary to address the issue.

An OFI will not affect payment (where included in the Contract) for Quality Management or for the Work itself.

6.4 Appeal

If the Contractor disputes the validity of a finding in an NCR, the Contractor may file an appeal with Hydro's Representative. Hydro's Representative and the Contractor's Representative will use all reasonable efforts to refine the area of dispute and to resolve the dispute in conformance with the Contract.

If Hydro's Representative and the Contractor's Representative cannot come to a mutually agreeable resolution, the Work that is the subject of the Non-Conformance Report will be re-evaluated by an independent third-party, selected by Hydro's Representative in consultation with the Contractor, at a test frequency equivalent to twice that specified in the Contract or to such other frequencies as may be mutually agreed between Hydro's Representative and the Contractor.

If the appeal testing confirms the non-conformance determination, all appeal testing costs will be borne by the Contractor. If the appeal testing shows that the Work did in fact meet the requirements of the Contract, all appeal testing costs will be borne by BC Hydro.

6.5 Payment

The lump sum price indicated on Appendix E – Schedule of Quantities and Prices for Quality Management will be full compensation for all costs resulting from the Quality Management requirements set out in the Contract.

Payment will be made on a monthly basis prorated for the percentage of the total Work completed as determined by Hydro's Representative, subject to the Contractor being compliant with the requirements of this Appendix J – Quality Management and with its own QC Plan.

Hydro's Representative, following the issuance of an NCR pursuant to DBSS 101.05.02, may deduct an amount from any monthly payment so computed, for any quality management work required but not satisfactorily undertaken during that month. Hydro's Representative may also reduce the total lump sum payable by the value of any quality management work required but not satisfactorily undertaken during the Term of the Contract. The foregoing determinations will be made in the sole discretion of Hydro's Representative.

Inspection or testing by Hydro's Representative will be at BC Hydro's cost. However, re-inspection or re-testing by BC Hydro for repaired deficient details will be at the Contractor's cost.

Work that is deemed unacceptable in accordance with DBSS 101.01 will not be eligible for payment from the applicable Item for that Work.

The certificate of Total Completion will not be issued if there are any unresolved Non-Conformance Reports.