

Appendix 4. Design-Build Quality Management

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List of Attachments

- Attachment 4A. Construction Quality Control and Assurance Responsibility Matrix
- Attachment 4B. Inspection and Testing Plan and Log
- Attachment 4C. Construction Inspection Staffing Plan

APPENDIX 4

Design-Build Quality Management



4.1 PURPOSE

The purpose of this Appendix is to specify the minimum requirements for the Company's quality assurance and quality control (QA/QC) procedures that shall be implemented during design and construction. Quality assurance is defined in this Appendix as the documentation of inspections, certifications, test results, batch tickets, mill reports, certified factory inspections, and other reports to confirm that quality control procedures are being followed and implemented throughout the course of design and construction. Quality control is defined as inspections, sampling and testing, and other activities discussed in this Appendix to monitor and evaluate quality.

4.2 SRWA QUALITY OBJECTIVES

The Company shall perform the Design-Build Work in a manner that is consistent with and supportive of the following overall quality objectives established by the Stanislaus Regional Water Authority (SRWA):

- Ensure that the permitting, design, and construction of the SRWA Regional Surface Water Supply Project (Project) are consistent with the Design-Build Contract (Contract) and the Contract Standards.
- Ensure that quality is the primary focus of design and construction, such that the life-cycle costs of the SRWA infrastructure and facilities are minimized.
- Develop systems and procedures to ensure that problems are discovered early, resolved in a timely manner, and do not recur.
- Allow for independent oversight by the SRWA.
- Ensure implementation of the QA/QC procedures using specified monitoring and audit functions.

4.3 RESPONSIBILITY FOR QUALITY CONTROL

The Company shall be responsible for all design and construction quality control. The SRWA may provide oversight as necessary to verify compliance with the Contract Standards. The description of QA/QC activities provided in this Appendix may not include all activities necessary, and the absence of any specified QA/QC activities from this Appendix does not relieve the Company from responsibility for performing all tasks necessary to provide sufficient QA/QC. For the Construction Work, a Construction Quality Control and Assurance Responsibility Matrix is provided in Attachment 4A of this Appendix to show some of the anticipated construction-related QA/QC tasks and responsibilities.

The Company shall provide an experienced and professional full-time QA/QC Manager in preparation for and during the construction phase to be responsible for implementing and managing the Company's approved Design-Build Quality Management Plan described in Section 4.4 (Design-Build Quality Management Plan Development) of this Appendix. The Company shall also designate an Alternate QA/QC Manager to serve at the Sites in the absence of the designated QA/QC Manager.

4.4 DESIGN-BUILD QUALITY MANAGEMENT PLAN DEVELOPMENT

The Company shall develop and implement a Design-Build Quality Management Plan. The Design-Build Quality Management Plan shall be in the form of a report, submitted by the Company to the SRWA as described below, and adhered to throughout the design and construction of the Project. The quality and condition of the Design-Build Quality Management Plan shall be substantially similar to or commensurate with the example plan provided by the Company as part of its Proposal.

4.4.1 General Requirements for the Design-Build Quality Management Plan

The Design-Build Quality Management Plan shall address the permitting, design, and Construction Work and shall include detailed QA/QC programs as attachments. Minimum requirements of the Design-Build Quality Management Plan are specified in Section 4.5 (Minimum Requirements for Design-Build Quality Management Plan) of this Appendix.

In general, the Design-Build Quality Management Plan shall:

- Provide a clear definition and understanding of the roles, responsibilities and QA/QC standards applicable to all parties performing the Design-Build Work, including Subcontractors.
- Include provisions to ensure that adequate resources are dedicated exclusively to the Design-Build Quality Management Plan implementation. QA/QC staff must function independently of production staff and be empowered to enforce the Design-Build Quality Management Plan objectives. Minimum QA/QC staffing requirements are specified in Section 4.8 (Minimum Quality Management Staffing Requirements) of this Appendix.
- Be sufficiently clear, thorough, and complete to allow the SRWA to verify that all QA/QC objectives will be adequately met, and to ensure that quality can be verified during each phase of the Design-Build Work such that all Design-Build Work is properly reviewed and inspected and that all deficiencies are identified and resolved.

4.4.2 Schedule for Preparation and Approval of Design-Build Quality Management Plan

The Company's initial Design-Build Quality Management Plan shall be submitted to the SRWA within 30 days of the Contract Date. Elements of the Design-Build Quality Management Plan related to design shall be complete in the initial submittal and elements related to construction shall be included at least in outline form in the initial submittal. A complete draft, including all construction elements, shall be submitted to the SRWA at least sixty (60) days prior to the scheduled Construction Date.

The SRWA will not commence review of the first design submittal until acceptable design-related elements of the Design-Build Quality Management Plan have been provided. SRWA approval of a complete Design-Build Quality Management Plan must be obtained by the Company prior to the Construction Date in accordance with Section 4.2 (Construction Date Conditions) of the Contract.

The SRWA shall not be responsible for delays associated with Company's failure to provide a Design-Build Quality Management Plan acceptable to the SRWA.

4.4.3 SRWA Review of Design-Build Quality Management Plan

The SRWA shall review and comment on the Company's initial Design-Build Quality Management Plan submittal and on any necessary re-submittals within thirty (30) days of receipt thereof. The SRWA shall only review a Design-Build Quality Management Plan that is in compliance with the requirements of this Appendix and any other applicable Contract Standards.

Revisions and updates to the Company's Design-Build Quality Management Plan may be proposed by the Company as the Design-Build Work progresses. Changes to the approved Design-Build Quality Management Plan shall be subject to the approval of the SRWA. The SRWA will review and comment on the Company's proposed revisions within fifteen (15) days of receipt thereof. These revisions and updates may occur in one or more iterations. The Company shall not initiate any of the Design-Build Work that is impacted by proposed changes to the Design-Build Quality Management Plan unless and until the SRWA has reviewed and approved the proposed changes.

4.5 MINIMUM REQUIREMENTS FOR DESIGN-BUILD QUALITY MANAGEMENT PLAN

4.5.1 Requirements for All Phases of the Design-Build Work

In addition to the requirements in Section 4.4.1 (General Requirements for the Design-Build Quality Management Plan) of this Appendix, the Design-Build Quality Management Plan shall include, at a minimum, the following information for each phase of the Design-Build Work:

- The Company's overall quality approach, including its QA/QC philosophy, approach for each phase, and a discussion of methods that will be used to assure that contracting and subcontracting relationships will support the Company and SRWA quality objectives.
- Minimum staffing and resource commitments for QA/QC activities for each phase, including fully explained responsibilities and authorities.
- Organization charts for each Project phase showing the relationship and reporting structure for the QA/QC Manager, special inspectors, field engineers, design engineers, Subcontractors, the SRWA, and all other Project personnel. The organizational charts shall include descriptions of the relationships of QA/QC staff to the monitored organizations performing the Design-Build Work. The reporting structure shall demonstrate that the QA/QC staff have authority independent from the construction staff.
- Definition of the design change process occurring during construction, including a description of the sequence of events to implement a design change and the documentation of any design changes, all consistent with SRWA rights, as described in Appendix 2 (Design-Build Work Submittal Requirements and Review Procedures) and with the Contract.
- A description of the Company's procedures to proactively identify any potential causes of unacceptable quality of Design-Build Work and to provide safeguards to avoid any unacceptable quality of Design-Build Work, and if not fully successful, to investigate any causes of unacceptable quality of Design-Build Work and to implement immediate corrective action to prevent future failures to meet the quality objectives.

- Procedures for ensuring environmental mitigation and monitoring requirements are successfully implemented.
- Procedures for ensuring that all Project-required permits are properly obtained, and that condition of approval or other constraints and reporting requirements by the permitting agency are properly complied with.
- Detailed description of the Company's audit procedures to confirm that all aspects of the Design-Build Quality Management Plan are being followed and implemented correctly.
- Formats for various elements of Design-Build Work including meeting minutes, progress payment applications, shop Drawing logs, clarification logs, and field observation/inspection reports.
- A description of procedures for such items as: monthly cost estimates; Design-Build Work budget tracking and work breakdown structure; tracking resolution of property owner issues and public complaints; archaeological considerations; environmental impact mitigation monitoring; Design-Build Work schedule development, approval process, revisions, and updating; correspondence and document control formats; reporting standards; management information system; safety program; and testing procedures.
- Inspection, sampling, and testing procedures to demonstrate that the quality defined and specified by the design staff is being provided by the construction contractor(s).
- A description of the Company's process to identify, document, and reach concurrence on corrective actions.
- Identification of all inspection points required by the design staff, as well as any construction contractor-imposed hold/inspection points.
- The procedures for verification and control of all testing required by the design staff, including the following:
 - Specific instructions for recording and documenting all observations necessary to demonstrate that the Design-Build Work is in compliance, or that any deficiencies are properly noted and appropriate action is taken.
 - Verifying that all required testing was performed, recording such verification on daily field reports, and documenting results, if available. A sample of the construction daily field report shall be included in the Design-Build Quality Management Plan.
 - Procedures for halting the covering of deficient or rejected Construction Work, including halting Construction Work, if necessary.
- Procedures to ensure that procured products and services conform to the requirements of the Design Documents. These procedures shall also be applied, as appropriate, to lower-tier suppliers and/or Subcontractors.
- Procedures for informing the SRWA of all unsatisfactory and nonconforming conditions for which the Company intends to request SRWA acceptance in accordance with Section 4.17 (Correction of Non-Conforming Work) of the Contract.

- Procedures, timing and frequency of documented audits to verify that quality control procedures are being fully implemented by the Company, including its subconsultants and subcontractors. Audits shall be performed by the Company's QA/QC Manager.
- Detailed quality assurance documentation and reporting requirements.
- All other applicable requirements of the Contract.

4.5.2 Requirements for Governmental Approvals

The Design-Build Quality Management Plan shall, at a minimum, address the following:

- Roles and responsibilities for obtaining Government Approvals.
- Standards and methods to be used in obtaining Government Approvals.
- Procedures for communicating permitting-related information and design constraints to the Company's design team.
- Procedures for ensuring that requirements associated with Governmental Approvals are incorporated into design and construction documents, and procedures for verifying compliance with those requirements during construction.

4.5.3 Requirements for Design Phase

The Design-Build Quality Management Plan shall identify the roles, responsibilities, and procedures necessary to ensure that design quality is maintained during the development, review and approval processes. The Design-Build Quality Management Plan shall include procedures for ensuring that the Design and Construction Requirements are incorporated into design and construction documents, including the Company's Design Documents, and verifying compliance during design and construction. Controls shall be established to coordinate design development activities, and proposed controls shall be submitted to the SRWA for review and approval. Coordination shall include all internal and external parties involved in the design development and review process, including inter-discipline reviews, and the verification process used to ensure that changes are clearly and consistently shown on all affected Design Documents. The Company's in-house startup, testing and operation and maintenance specialists shall be included in the review of the design for operability and life-cycle cost efficiency. Methods shall be incorporated to ensure that all design issues and reviewer comments are identified and tracked, until they have been addressed and incorporated into the design.

Measures shall be taken to ensure that designs are not released for construction until authorized and approved by the Company and, as applicable, by the SRWA.

4.5.4 Requirements for Construction Phase

The Company shall be responsible for controlling the quality of all Construction Work, including work of its Subcontractors and suppliers, and for ensuring that the required quality is achieved. The Design-Build Quality Management Plan shall describe the approach to on-site quality, off-site quality, the organization of construction phase QA/QC, and the methods and procedures used to ensure that quality is achieved during all stages of construction and testing. The Design-Build Quality Management Plan shall detail the QA/QC submittals for construction to ensure quality of

all materials and equipment. The Design-Build Quality Management Plan shall clearly define construction-period QA/QC activities including those referenced in various sections of this Appendix. The Design-Build Quality Management Plan shall identify responsible parties, each party's roles and responsibilities, and work products such as documentation and certifications, to ensure that the Construction Work is constructed as specified and required by the approved designs, codes, and industry standards. Section 1.2(M) (Applicability of Contract Standards) of the Contract shall govern any conflicts in the specified stringency of testing or other QA/QC requirements.

There shall be full oversight of the construction under the direction of the Company. The Company shall be required to certify that the construction of the Project was consistent with the Technical Standards and the Company's Design Documents. The Design-Build Quality Management Plan shall include procedures for ensuring the Company properly performs the required oversight, for documenting its performance, and for obtaining the required Company certifications. Throughout construction, the Company will make available to SRWA all construction documentation, including QA/QC documentation.

4.5.4.1 Role of Design Staff During Construction

The Design-Build Quality Management Plan shall describe the role of the Company's design staff during construction activities. Relevant design staff shall visit the Sites at sufficient frequency to verify the construction is proceeding in accordance with the design. At a minimum, the Design Manager shall be present at the Sites at least five (5) full days monthly during construction and shall be joined periodically by additional design staff responsible for Project elements actively under construction. Office design support during construction shall be staffed with the same individuals that developed the final design documents. During construction and commissioning, the Company's onsite design team presence shall range from one (1) to three (3) design staff, with the minimum level of onsite representation of one (1) full-time resident engineer for the entire duration of construction.

4.5.4.2 Construction Quality Control Programs

The Design-Build Quality Management Plan shall include a separate Construction Quality Control Program (CQCP) for each definable feature or portion of on-site or off-site construction. These definable features or portions of the work (DFOW) are separate and distinct tasks broken down by area, specification section, and/or trade/crew.

Each CQCP shall include an Inspection and Testing Plan and Log, which identifies who performs the inspections/tests, the inspection/test locations, frequency of each inspection/test, and all inspection/test hold points. An example Inspection and Testing Plan and Log form is included as Attachment 4B of this Appendix to illustrate the type of deliverable expected for each DFOW.

Instructions for performing inspections must be clearly presented, including the work attributes to be inspected, the acceptance criteria, frequency of inspections, and the requirements for documenting the inspection results. The CQCP shall require inspection during construction by inspectors who are not responsible, in whole or in part, for the scheduling or construction of the work being inspected.

Inspection records must be kept current, must have sufficient detail to enable the SRWA to clearly identify which inspections have been performed, and must fully document the results of the inspections. Inspections must be made throughout the construction period, including initial construction inspections, in-progress inspections, final inspections, and testing during construction.

The CQCP shall describe methods to be implemented to identify and track all unsatisfactory, deviating, and nonconforming work until the required repair, rework, or replacement is performed, and the has been re-inspected by the Company. The CQCP shall detail the means and methods for identifying and correcting all construction deficiencies such that construction quality meets the Technical Standards and the Company's Design Documents.

Procedures shall be used to verify that the material and equipment procurement documents conform to all Contract Standards and the Company's Design Documents, and that quality has been controlled during the manufacture and testing of all equipment that is being fabricated for the Project. The CQCP shall require written documentation of inspection of all material and equipment certifying that it conforms to all Technical Standards and the Company's Design Documents. Documentation such as material test reports, certifications, and equipment tests results must be received and promptly filed and maintained to demonstrate compliance with the Technical Standards and the Company's Design Documents.

The CQCP shall include monitoring and recording procedures to ensure that material and equipment is being stored and maintained according to requirements of the designer and the manufacturer. The record files related to material/equipment storage and maintenance may be periodically audited by the SRWA.

Procedures and controls shall be specified to ensure that inspections are being performed using the latest Design Documents and approved shop Drawings.

Procedures and controls shall be specified and implemented by the QA/QC Manager to ensure that an adequate number of inspection personnel are available at all times, who are qualified, trained, and proficient in performing inspections for the work to which they are assigned. At a minimum, the name and hours of work for each QA/QC staff present at the Sites shall be recorded in a daily log or equivalent document (e.g., a calendar or work schedule) and initialed at least weekly by the QA/QC Manager or Alternate.

4.5.4.3 QA/QC Steps during Construction

Each CQCP shall include at least four distinct QA/QC steps, which shall be implemented and managed by the Company's QA/QC Manager. The Company's QA/QC Manager shall conduct additional preparatory and work steps if the quality of the ongoing DFOW is unacceptable, if there is a change in the Company's QA/QC organization, if there are changes in on-site supervision of workers, or if work on a DFOW is resumed after a substantial period of inactivity.

The QA/CC steps to be described in each CQCP include the following minimum requirements:

Step 1 – Preparatory

- The preparatory phase consists of the actions required before beginning any DFOW.
- The Company’s QA/QC Manager must call a preparatory phase meeting at least thirty (30) days before beginning construction on any DFOW. The meeting shall be attended by the Company’s QA/QC personnel assigned to the DFOW, any governmental permitting agency’s personnel with active inspection or governance related to the DFOW, the Company’s supervisor responsible for the DFOW, the Subcontractor’s superintendent/foreman responsible for the DFOW, and any major suppliers related to this DFOW. For all meetings, the Company shall inform the SRWA at least five (5) working days in advance of preparatory phase meetings, shall prepare agendas, and shall record meeting minutes. Meeting minutes shall become part of the CQCP records.
- The following activities shall be performed before beginning construction on each DFOW, using this list as a preparatory phase checklist for each DFOW:
 - Review applicable Contract and Appendices section(s)
 - Review the applicable Design Documents
 - Verify that appropriate shop Drawing submittals for materials and equipment have been certified by the Company’s QA/QC Manager, submitted, and accepted by the SRWA Engineer
 - Verify receipt of factory test results, when required
 - Confirm all survey and layout requirements
 - Review the Inspection and Testing Plan and Log, and ensure that provisions have been made to perform the required QA/QC inspection and testing specific to the DFOW and all regulatory agency requirements
 - Review all inspection and test methods and respective hold points
 - Review all inspection and testing forms applicable to the DFOW
 - Develop plans for safe access for all inspection and testing
 - Examine the construction area to ensure that required preliminary work has been completed
 - Verify that all required craftsperson certifications are received and approved
 - Examine the required materials, equipment and sample work to ensure that they are available and conform to shop Drawing submittals accepted by the SRWA and Company Engineer of Record
 - Discuss proposed construction workmanship standards and tolerances, and identify the approach to be used to provide quality construction by planning ahead and identifying potential problems for each DFOW
 - Document the results of the preparatory phase actions in the Company’s CQCP records

Step 2 – Pre-Work Final QA/QC Planning

- Before starting construction on a DFW, the Company’s QA/QC Manager shall meet with the Company’s supervisor responsible for the DFW, the Subcontractor’s superintendent/foreman responsible for the DFW and the Company’s QA/QC staff assigned to the DFW, and perform the following:
 - Review and fill in the work phase checklist for the DFW
 - Review all relevant workmanship standards, tolerance limits, and steps to assure the quality of work required for the DFW
 - Identify and resolve potential conflicts with other portions of the work
 - Review the Inspection and Testing Plan and Log for the DFW and confirm that all required inspection and testing will be performed timely, that all inspection hold points are clearly understood, and that any required outside regulatory/governmental agency participates in the inspection and testing
 - Verify safe access for all inspection and testing
 - Discuss potential adverse weather or seasonal concerns
 - Approve survey and layout plans for the DFW
- The Company’s QA/QC Manager must be satisfied with all pre-work QA/QC planning and readiness before work is allowed to begin on a DFW. Any or all of the above steps must be repeated until the Company’s QA/QC Manager is satisfied that all key personnel are prepared, qualified and ready to construct quality work within the DFW.
- For all meetings, the Company shall inform the SRWA five (5) working days in advance of the meeting, shall prepare an agenda, and shall record meeting minutes. Meeting minutes shall become part of the Company’s CQCP records.

Step 3 – QA/QC during Construction (Performed Daily)

- The Company’s QA/QC Manager shall perform QA/QC daily for each DFW and shall document the following in the Company’s CQCP records:
 - That all work is in compliance with the requirements of the CQCP for the applicable DFW, the Design Documents and all applicable regulatory permits
 - That all inspection and testing is performed safely and timely, and is properly logged
 - That rework items are being corrected promptly

Step 4 – Following completion of a Definable Feature or Portion of the Work

- Shortly after completion of a DFW, the Company’s QA/QC Manager shall verify the following:
 - That all tests, both passing and failing, are documented properly and filed in accordance with the Company’s document control system
 - That all inspections, both passing and failing, are documented properly and filed in accordance with the Company’s document control system

- That all laboratory tasks, both passing and failing, are documented properly and filed in accordance with the Company’s document control system
- That all survey records are obtained and filed in accordance with the Company’s document control system
- That all rework is completed, accepted and documented
- That all as-built records are completed and documented
- That all construction photos are properly labeled, logged and filed in accordance with the Company’s document control system

In addition to all of the above requirements, the CQCP and the Company’s construction quality control activities shall comply with the requirements of Section 4.6 (Additional Construction Quality Control Requirements) of this Appendix.

4.5.5 SRWA Audits of Implementation of the Design-Build Quality Management Plan

The SRWA shall have the authority to perform audits of the Company’s implementation of the Design-Build Quality Management Plan throughout the construction phase. The SRWA shall have the authority to require the removal of the Company’s QA/QC Manager from the Project should the Company’s QA/QC Manager, in the reasonable opinion of the SRWA, fail to professionally and successfully carry out the above described duties properly or on a timely basis.

4.6 ADDITIONAL CONSTRUCTION QUALITY CONTROL REQUIREMENTS

4.6.1 Site Investigation and Control

The following requirements shall apply with regard to Site investigation and control activities:

- The Company shall continuously check and verify all dimensions and conditions in the field during construction. The Company shall be solely responsible for any inaccuracies in the Construction Work due to the Company’s (including the Subcontractor’s) failure to comply with this requirement.
- The Company shall inspect related and appurtenant Construction Work and report in writing to the SRWA any conditions that will prevent proper completion of the Construction Work.

4.6.2 Inspection of Work

The following requirements shall apply with regard to the inspection of the Construction Work:

- All Construction Work performed by the Company and its Subcontractors shall be inspected by the Company. All nonconforming Construction Work and any safety hazards in the work area shall be noted and promptly corrected. The Company is responsible for the Construction Work to be performed safely and in conformance to the Contract.

- The Company shall provide full-time construction management and full and comprehensive construction administration for the Construction Work. Construction inspectors, who shall be provided with the latest Design Documents released to construction, shall perform initial verification of procurement and construction activities so that any conflicts will be identified at an early stage.
- The Company shall ensure that adequate resources are dedicated exclusively to the implementation of the Design-Build Quality Management Plan. QA/QC staff must function independently of design team and construction management team staff, and be empowered to enforce the Design-Build Quality Management Plan objectives, define quality expectations, independently verify quality, proactively identify any potential causes of unacceptable quality of work, and provide safeguards to avoid any unacceptable quality of work, and if not fully successful, investigate any causes of unacceptable quality of work and implement immediate corrective action.
- The Company shall provide a welding inspector to inspect all field-welding of steel pipe. The welding inspector shall have prior pipe-welding experience and shall be a Certified Welding Inspector (CWI) in accordance with American Welding Society (AWS) QC1. All field welds of steel pipe shall be 100 percent visually inspected before, during and after welding.
- The Company shall be responsible for scheduling and coordinating all special inspections required by the local Fire Marshall.
- Life and safety inspections of the occupied buildings shall be completed in accordance with Section 5.4.3.3 of Appendix 5 (Project Technical Requirements).
- All materials and articles furnished by the Company shall be subject to strict, documented inspection by qualified personnel, and no materials or articles shall be used in the Construction Work until they have been inspected by the Company's QA/QC Manager, with required notification providing opportunity for SRWA inspection. No Construction Work shall be backfilled, buried, cast in concrete, covered, or otherwise hidden until it has been inspected, with required notification providing opportunity for SRWA inspection. Any Construction Work covered in the absence of inspection with SRWA notification shall be subject to uncovering in accordance with Section 4.16 (Construction Monitoring, Testing, and Uncovering Work) of the Contract.
- Where uninspected Construction Work cannot be easily uncovered, such as in concrete cast over reinforcing steel, all such Construction Work shall be subject to demolition, removal, and reconstruction under proper inspection in accordance with Section 4.16 (Construction Monitoring, Testing, and Uncovering Work) of the Contract.
- The Construction Work shall be conducted under the periodic general observation of the SRWA and is subject to inspection and audit by the SRWA to ensure strict compliance with the requirements of the Contract. Such inspection may include mill, plant, shop, or field inspection, as required. The SRWA shall be permitted access to all parts of the Construction Work, including plants where materials or equipment are manufactured or fabricated.

- The presence of the SRWA shall not relieve the Company of the responsibility for the proper execution of the Construction Work in accordance with all requirements of the Contract. Compliance is the responsibility of the Company. No act or omission on the part of the SRWA shall be construed as relieving the Company of this responsibility. Inspection of work later determined to be nonconforming shall not be cause or excuse for acceptance of the nonconforming work.

4.6.3 Right of Rejection

The following requirements shall apply with regard to rejected Construction Work:

- The SRWA shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder that, in any respect, fail to meet the requirements of the Technical Standards and Design Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Construction Work at the Sites. If the SRWA, through an oversight or otherwise, has accepted materials or Construction Work which are defective or in any way contrary to the Contract, such materials, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected.
- The Company shall promptly remove or replace rejected articles or materials from the Sites after notification of rejection.
- All costs of removal and replacement of rejected articles or materials, as specified therein, shall be borne by the Company.
- Failure to promptly remove and replace rejected Construction Work shall be considered a breach of the Contract by the Company and the SRWA may, after seven (7) days' written notice, suspend the Company's right to proceed with the affected Construction Work, and the SRWA may remove and replace the Construction Work and issue a back charge to cover the cost of the Construction Work that has been removed and replaced by the SRWA.

4.6.4 Sampling and Testing

The following requirements shall apply with regard to sampling and testing:

- Except as otherwise required, all sampling and testing shall be performed in accordance with the methods prescribed in the current standards of the American Society for Testing and Materials (ASTM), as applicable to the class and nature of the article or materials considered.
- All construction testing shall be performed by individuals who are qualified and experienced in providing these testing services.
- Equipment used to perform tests shall be calibrated according to requirements in the testing procedure.

- The SRWA shall reserve the right to make independent investigations and tests as specified in the following paragraph, and failure of any portion of the Construction Work to meet any of the Contract Standards shall be reasonable cause for the SRWA to require the removal or correction and reconstruction of any such work in accordance with Section 4.17 (Correction of Non-Conforming Work) of the Contract.
- In addition to any other inspection or quality assurance provisions that may be specified in the Contract, the SRWA shall have the right to independently select, test, and analyze, at the expense of the SRWA, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the results of tests or analyses performed by the Company to determine compliance with the applicable specifications for the materials so tested or analyzed. Wherever any portion of the Construction Work, as determined by such independent testing or investigation by the SRWA, fails to meet the requirements of the Contract, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such work shall be borne by the Company in accordance with Section 4.16 (Construction Monitoring, Testing, and Uncovering Work) of the Contract.
- All tests performed by a testing laboratory must be documented and transmitted to the design staff for review and approval. Documentation shall be prepared by the design staff certifying that the test records have been reviewed and approved. These records shall be maintained on-site and be subject to periodic audit reviews performed by the SRWA.

4.6.5 Test Reports

The following requirements shall apply with regard to test reports:

- Written reports of tests and engineering data regarding materials and equipment proposed to be used in the Construction Work shall be continuously maintained by the Company in the construction field offices and be subject to periodic review and audit by the SRWA to ensure compliance with the requirements contained within this Appendix.
- The Company's testing laboratory and field testing personnel shall furnish at least three (3) copies of the written reports for each test. One (1) copy of each test report shall be transmitted directly to the SRWA in a sealed envelope within three (3) working days after each test is completed. Two (2) copies of each test report shall be transmitted to the Company, of which one (1) copy shall be transmitted to the design staff for their review and approval. Consecutive numbering shall be assigned to each report for each type of test.
- The SRWA shall furnish to the Company one (1) copy of each field and laboratory quality assurance test conducted by the SRWA.

4.6.6 Laboratory Testing Services

The following requirements shall apply with regard to laboratory testing services:

- The Company shall perform all tests requiring the services of a laboratory to determine compliance with the Contract, using a certified testing laboratory acceptable to the SRWA. The Company's testing laboratory shall be staffed with experienced technicians who are properly equipped and fully qualified to perform the tests in accordance with the specified standards.
 - The Company's construction quality testing laboratory shall be accredited by the American Association of State Highway and Transportation Officials (AASHTO) for the tests they will perform and as appropriate to the construction work being performed. The Company's laboratory shall also be AASHTO accredited in current versions of the following standards as applicable to materials being tested: ASTM C1077 (Concrete and Concrete Aggregates), ASTM C1093 (Masonry), ASTM D3740 (Soil and Rock) and ASTM D3666 (Road and Paving Materials).
 - The SRWA shall have the right to inspect work performed by the testing laboratory, both at the Sites and at the laboratory, including inspection of the independent testing laboratory's internal quality assurance records (quality assurance manual, equipment calibrations, proficiency sample performance, etc.).
 - The Company shall obtain SRWA approval of the testing laboratory before having services performed and shall pay all costs for testing services.
 - Testing services provided by the SRWA, if any, are for the sole benefit of the SRWA; however, test results shall be made available to the Company, upon the Company's request. Testing necessary to satisfy the Company's internal quality control procedures shall be the sole responsibility of the Company.
 - Testing, including sampling, shall be performed by the Company testing laboratory personnel in the general manner and frequency indicated in the Contract Standards.
 - The testing laboratory shall perform all laboratory tests within a reasonable time, consistent with the specified standards, and will furnish a written report of the results of each test.
 - The Company shall furnish all sample materials and testing activities, including sampling. The Company shall interrupt the Construction Work when necessary to allow testing, including sampling, to be performed. When testing activities, including sampling, are performed in the field by the testing laboratory personnel, the Company shall furnish personnel and facilities to assist in the activities.

- Unless otherwise specified, the Company shall provide all testing services in connection with the materials and areas of Construction Work including, but not limited to, the following:
 - Concrete materials and mix designs testing
 - Masonry units, masonry grout, mortar materials and design mixtures testing
 - Asphaltic concrete materials and design mixtures testing
 - Embankment, fill and backfill materials testing
 - All import soil and aggregate materials offsite QA/QC testing
 - Joint sealant and caulking samples and tests
 - Comprehensive quality control testing of all precast concrete
 - Holiday testing of pipeline coatings
 - All other tests and engineering data required for SRWA review of materials and equipment proposed to be used in the Construction Work
 - Concrete strength tests
 - Test of masonry prisms
 - Field control test of masonry
 - Asphaltic concrete relative compaction testing
 - Moisture-density and relative-density tests on embankment, fill, and backfill materials
 - Controlled density fill material compressive strength tests

4.6.7 Other Testing

The following requirements shall apply with regard to other testing activities:

- In addition to the laboratory testing, the Company shall be responsible for all other testing services including, but not limited to, the following:
 - Pipeline pressure and leak testing
 - Disinfection testing
 - Hydraulic structure leak testing
 - Manhole and pre-cast testing
 - Cathodic protection testing
 - Holiday testing and thickness testing of field coatings
 - In-place field density test on embankments, fills and backfill
 - Load testing for epoxy adhesive anchors and rebar reinforcement steel embeds
 - Structural bolting torque testing
 - Heating, ventilation, and air conditioning (HVAC) balance testing
 - Vibration testing
 - Equipment performance, including factory, functional and reliability testing
 - Electrical tests and acceptance testing

- Control system and Supervisory Control and Data Acquisition (SCADA) system testing
- All other tests and engineering data required by the design staff review of materials and equipment proposed to be used in the Construction Work
- All tests required of particular craftsmen skills and qualifications, such as welder operator certifications on particular weld types and procedures
- Leakage tests of concrete water retaining structures shall be performed following the requirements of the American Concrete Institute (ACI) 350.1R and as specified herein. Structure walls shall not be backfilled prior to leakage testing. The structure shall be filled to the normal operating depth of the structure. Water in the structure shall be maintained at the specified test elevation for a minimum of seven (7) days prior to the start of the leakage test. The maximum allowable leakage rate shall be 0.075 percent of the structure water volume per 24-hour period.
- Steel pipe manufacturers shall perform spot X-ray examination of pipe fabrication seams if directed by the SRWA. Manufacturers may elect to substitute full-length real-time radiography for spot X-rays.
- All steel pipe double lap weld joints and butt strap circumferential joints shall be tested using full circumference magnetic particle testing.
- Steel pipe single lap weld joints shall be tested using full circumferential magnetic particle testing at the following locations:
 - All welds within 200 feet to each side of fabricated fittings greater than or equal to 11.25 degrees
 - 20 percent of all other single lap welds
- All field coatings on steel pipe shall be inspected using an approved high-voltage flaw detector.
- Shop coatings on steel pipe that is suspected of having been damaged shall be visually inspected and tested for holidays.
- Just prior to lowering coated pipe into the trench, all steel pipe coatings shall be tested for holidays using a high-voltage flaw detector.
- A plan shall be prepared by the Company, subject to review and approval by the SRWA, to test every joint in the steel pipelines after each joint has been packed with grout and cured for a minimum of 24 to 72 hours. All joints will be tested by tapping with 16-ounce flat faced hammer to determine soundness of the grout.
- Pipelines and appurtenances shall meet pressure-testing requirements after the trench is backfilled, but before the surface is restored. Water conveyance pipelines and appurtenances shall be pressure-tested in accordance with the applicable American Water Works Association (AWWA) Standards except as herein modified. Testing of Buried Steel Water Pipe shall be per applicable sections of AWWA C604 standard for “Installation of Buried Steel Water Pipe”.
- Compaction testing of water transmission pipeline trench backfill shall be performed on each lift (not to exceed two-feet) at random intervals not to exceed 200 feet.

- Construction quality assurance testing within public road rights-of-way or easements shall conform to requirements of the applicable governmental authority and applicable encroachment permit, as specified in Appendix 9 (Government Approvals, Utilities, and Landowner Coordination).
- Project facilities shall be cleaned, disinfected, and tested in accordance with the requirements of Appendix 5 (Project Technical Requirements).

4.6.8 Receipt and Installation of Manufactured Materials and Equipment

The following requirements shall apply with regard to the receipt and installation of manufactured materials and equipment:

- **Inspection:** The Company shall inspect materials and equipment upon the arrival on the jobsite and immediately prior to installation. The Company shall remove damaged and defective items from the jobsite. The Company shall permit the SRWA to witness the Company's inspections or perform independent inspections. The Company shall assist the SRWA with performing any independent inspections.
- **Measurements:** The Company shall verify measurements and dimensions of the work as an integral step of starting each installation.
- **Manufacturer's Instructions:** Where installations include manufactured products, the Company shall comply with manufacturer's applicable instructions and recommendations for installation to whatever extent such instructions and recommendations are more explicit or more stringent than applicable requirements indicated in the Contract.

4.7 REQUIRED CERTIFICATIONS BY COMPANY QA/QC MANAGER

The following QA/QC certifications shall be furnished by the Company to the SRWA. Certifications shall include the QA/QC Manager's professional stamp and signature.

QA/QC Manager's Inspection Staff Certification

Prior to utilizing staff for inspection and testing at the Sites, the QA/QC Manager shall certify that each inspector is a Certified Public Infrastructure Inspector per American Public Works Association (APWA), or by an equivalent professional organization such as the Association of Construction Inspectors.

QA/QC Manager’s Weekly QA/QC Report and Certification

The QA/QC Manager’s QA/QC Weekly Report Certification must contain the following statement signed by the QA/QC Manager or Alternate QA/QC Manager:

"On behalf of Company, I certify that this report is complete and correct, that equipment and material received and/or used, and work performed during this reporting period are in compliance with the requirements of the Design Documents to the best of my knowledge, except as noted in this Report.

Certified by QA/QC Manager _____, Date _____”
(Signature)

QA/QC Manager’s Submittal Certification

The QA/QC Manager must stamp and sign the cover transmittal sheet of each construction period shop Drawing submittal with the following QA/QC certifying statement:

"The (equipment) (material) (article) (item) shown and marked in this shop Drawing submittal has been checked and complies in all respects, except as specifically noted in writing on the shop Drawing submittal and accompanying transmittal, with the requirements of the Design Documents, is a complete shop Drawing, has been coordinated with all other accepted shop Drawings and can be properly installed in the allocated spaces.

Certified by QA/QC Manager _____, Date _____”
(Signature)

QA/QC Manager’s Invoice Certification

The following certification must be furnished with each payment request, signed by the QA/QC Manager:

"The Design-Build Work for which payment is requested, including materials on hand, is in compliance with the requirements of the Design Documents, construction record documents (daily field reports, survey records, inspection/testing reports, record Drawings and other required project quality control documents) are current, accurate, and correctly show Design-Build Work installed as of the date of the payment request.

Certified by QA/QC Manager _____, Date _____”
(Signature)

QA/QC Manager's DFWO Inspection and Testing Plan and Log Completion Certification

The following certification must be provided on each Inspection and Testing Plan and Log for each DFWO:

"I certify that the above definable portion of the work has been constructed, inspected and tested in compliance with the approved plans, specifications and all applicable approved changes.

Certified by QA/QC Manager _____, Date _____"
(Signature)

QA/QC Manager's Substantial Completion Certification

Prior to requesting Substantial Completion inspection, the QA/QC Manager must furnish the following certification to the SRWA:

"The Design-Build Work has been completed, inspected, tested and is in full compliance with the requirements of the Design Documents except for the minor corrective items (punch list items) listed in the attached Corrective Items List.

Certified by QA/QC Manager _____, Date _____"
(Signature)

QA/QC Manager's Project Final Completion Certification

Prior to requesting Final Completion of the entire Design-Build Work of the Project, the QA/QC Manager must furnish the following Project Completion Certification to the SRWA:

"The entire Design-Build Work of the Project has been completed, inspected, tested and is in full compliance with the requirements of the Design Documents except for the minor deficiencies listed in the attached Deficiency List.

Certified by QA/QC Manager _____, Date _____"
(Signature)

QA/QC Manager's Record Document Certification

Accompanying submission of the final Record Documents, as defined in Appendix 3 (Construction Work Requirements), and prior to requesting final payment, the QA/QC Manager must furnish the following Certification to the SRWA:

"The attached Record Documents were prepared in accordance with the Contract Standards, are accurate and complete, and may be relied on by the SRWA to locate installed Design-Build Work.

Certified by QA/QC Manager _____, Date _____"
(Signature)

4.8 MINIMUM QUALITY MANAGEMENT STAFFING REQUIREMENTS

The Company's QA/QC staff shall be empowered to enforce the Design-Build Quality Management Plan objectives, define quality expectations, independently verify quality, proactively identify any potential causes of unacceptable quality of work, provide safeguards to avoid any unacceptable quality of work, and if not fully successful, investigate any causes of unacceptable quality of work and implement immediate corrective action to prevent future failures to meet the quality objectives.

4.8.1 Company Design QA/QC Staffing

The Company shall provide a sufficient number of experienced senior engineering staff responsible for performing the design quality control procedures specified in the Design-Build Quality Management Plan. The design QA/QC staff persons shall not be involved in preparation of the work being reviewed but shall have applicable experience. The Company's QA/QC Manager shall manage and document all quality control checking of the design documents.

4.8.2 Company Construction QA/QC Manager

The Company shall provide an experienced and professional full-time QA/QC Manager in preparation for and during the construction phase to be responsible for implementing and managing the Company's approved Design-Build Quality Management Plan, and the approved CQCP for each DFOW, as described in Section 4.5 (Minimum Requirements for Design-Build Quality Management Plan) of this Appendix. The QA/QC Manager shall have a minimum of fifteen (15) years of experience as a superintendent, QA/QC Manager, construction project manager, construction project engineer, or construction manager on similar size and type construction projects that included all of the major trades involved with this Project (including large diameter water transmission mains). A minimum of five (5) years of this experience shall be from Design-Build projects.

The Company shall also designate an Alternate QA/QC Manager to serve at the Sites in the absence of the designated QA/QC Manager. The Alternate QA/QC Manager shall have the same minimum level of experience as the QA/QC Manager.

The designated QA/QC Manager shall not be absent from the Sites for more two (2) consecutive weeks at a time. The Alternate QA/QC Manager shall be present at any time the QA/QC Manager is absent.

Initially, and at any time a change in either position is proposed, the Company shall provide certification of the relevant experience of the proposed replacement, and shall provide the following information for approval by the SRWA: (1) Number of years of total experience of the proposed replacement as a superintendent, QA/QC Manager, construction project manager, construction project engineer, or construction manager on similar size and type project, (2) For three such projects on which the proposed replacement previously worked, the project name, Owner, construction duration, Owner's Representative name and contact information, and On-Site Construction Manager's name and contact information.

No on-site Construction Work, including testing, shall be performed unless the QA/QC Manager or Alternate QA/QC Manager is present at the Sites. Any exceptions to this requirement shall have written approval by the SRWA five days prior to commencement of the Construction Work or testing.

The Company's QA/QC Manager's duties include, but are not limited to, the following:

- Be on the Sites at all times during performance of Construction Work, with complete authority to take any action necessary to ensure conformance with the requirements of the approved Design Documents. In the event of the QA/QC Manager's absence, the Alternate QA/QC Manager shall be present and have the same authority as the QA/QC Manager.
- Implement and manage the CQCP for each DFO.
- Immediately stop any portion of the Construction Work that does not comply with requirements of the approved Design Documents, and direct the removal, correction or replacement of any defective Construction Work.
- Certify weekly that all Construction Work performed on and off the construction site conforms to requirements of the CQCP and the requirements of the approved Design Documents. Certify weekly that all materials and equipment delivered or installed in the Construction Work comply with the requirements of the approved Design Documents. Report any deficiencies and corrective action planned and taken.
- Ensure that Company's construction management team is adequately staffed with qualified personnel to perform all required inspections and tests.
- Supervise and coordinate inspections and tests made by the Company's construction management team, including the tests and inspections of the Construction Work of subcontractors and suppliers.
- Provide 48-hour notice to the SRWA of planned tests and inspections, particularly all tests and inspection hold points.
- Ensure that third party special inspectors are utilized as required by Applicable Law.
- Ensure that all specified tests required of the Company are performed and results are reported. Indicate to the SRWA whether test results do or do not conform to requirements of the Design Documents. Submit corrective action plan(s) in accordance with the CQCP for nonconforming items.
- Remove any person from the Project that consistently fails or refuses to meet the requirements of the Design-Build Quality Management Plan.
- Report to the Company's senior management and the SRWA the identity of any subcontractor or supplier with Construction Work that consistently fails or refuses to meet the requirements of the Design-Build Quality Management Plan.
- Initiate and conduct all QA/QC meetings required herein.

- Process shop Drawing submittals and requests for information (RFIs) to the Design Engineer and the SRWA for review, comment and approval in accordance with the Contract Requirements prior to construction.
- Certify all shop Drawing submittals for conformance with the requirements of the Design Documents.
- Certify each payment invoice as it pertains to construction.
- Certify each Inspection and Testing Plan and Log for each DFO.
- Certify completion of the Design-Build Work (or portions thereof) prior to requesting Substantial Completion.
- Certify completion of the entire Design-Build Work prior to requesting Final Completion.
- At the Sites, perform daily/weekly/monthly maintenance and updating of the following:
 - Shop Drawing submittal log
 - RFI response log
 - Testing plan and log
 - Rework items list
 - Record Documents, marked to show any deviations made from the requirements of the Design Documents and to indicate the actual materials and equipment incorporated in to the Design-Build Work
 - Records binder containing all QA/QC records and meeting minutes

The designated QA/QC Manager shall attend all key Project meetings including, but not limited to, the preconstruction conference, the schedule orientation meeting, progress meetings, commissioning meetings, demonstration and training meetings, start-up meetings, and the pre-Acceptance testing meeting.

4.8.3 Company Construction Inspectors

The Company shall provide sufficient qualified construction inspectors to properly implement each CQCP, including performance of all necessary observations and completion of all documentation. The number of inspectors may vary, depending on the magnitude and nature of construction activities, but shall never be less than generally accepted industry practices for similar types and magnitude of construction. The Construction Inspection Staffing Plan in the form of a resource schedule is provided in Attachment 4C, which specifies the number of inspectors that shall be provided at the Sites during each month of construction, broken down by category of inspector qualifications. Attachment 4C lists the minimum qualifications for each category of inspector included in the resource schedule. Any deviation from the number or qualifications of staff specified in Attachment 4C must be proposed to the SRWA in writing, including any proposed price adjustment, for SRWA consideration. Any such change is subject to the approval of the SRWA through a process consistent with the Contract.

ATTACHMENT 4A

Construction Quality Control and Assurance Responsibility Matrix

Construction Quality Control and Assurance Responsibility Matrix

Task	Design-Build Contractor ^(a)	SRWA
Overall Construction Management/Administration	F	--
Pre-Construction Meeting	F, N	A
Inspection Procedures	F	R
Weekly Construction Meeting	F, N	A
Baseline Schedule Meeting	F, N	A
Monthly Schedule Update Meeting	F, N	A
Baseline Schedule of Values	F	R
Monthly Payment Application	F	R, V
Monthly Construction Report	F	R
Tracking Property Owner Coordination and Public Complaint	F	P1
Submittal Review and Response	F	R
RFI Response	F	R
Earthwork Inspection	F	P1
Differing Site Conditions Identification	F	R, V
Civil/Sitework Inspection	F	P2
Pipeline Inspection	F	P1
Concrete & Reinforcement Inspection	F	P1
Mechanical & Plumbing Inspection	F	P2
Electrical Inspection	F	P1
Instrumentation and Controls (I&C) Inspection	F	P2
Painting and Coating Inspection	F	P2
Building/Structural Inspection	F	P1
Materials & Laboratory Testing (i.e., concrete strength, etc.)	F	P2
Specialty Inspection	F	P2, R
Environmental Construction Monitoring	F	P1
Field Witness Testing (i.e., leakage testing, etc.)	F	P2
Construction Safety Observation	F	P2
Factory Witness Testing	F	O
Daily Inspection Reports	F	R
Non-Compliance Notices and Resolution	F	P1, R, V
Change Order/Claims Management	F	R, V
Start-Up Meetings	F, N	A
Start-Up Inspection	F	P2
Operations and Maintenance (O&M) Trainings	F	A
Acceptance Testing	F	P1
Record Documents	F	R, V
Communication & Notifications to the SRWA	F	--

(a) The Contract requires that the Design-Build Contractor be responsible for all construction quality control. The tasks listed herein is not comprehensive and omissions from this list do not relieve the Design-Build Contractor from its duty to perform all tasks necessary to provide sufficient quality control. The SRWA may monitor for compliance with this and other Contract requirements.

Legend:

- F = Full Responsibility
- Periodic:
 - P1 = Level I
 - P2 = Level II
- = None
- N = Admin
- R = Review
- A = Attend
- V = Approve
- O = Optional

ATTACHMENT 4B

Inspection and Testing Plan and Log

SRWA Regional Surface Water Supply Project
 Inspection and Testing Plan and Log for: **(NAME OF DEFINABLE FEATURE OR PORTION OF THE WORK - ALL CAPS, BOLD)**

Notes: 1. Confirm that all listed submittals including manufacturer material certifications received and approved per Specs prior to start of installation. List all required special quality inspections or testing required for each task.		Assigned Company QA Employees: John Doe (JD), Fred Smith (FS), Karen Long (KL)	Subcontractors:	Suppliers:	Special Consultants:					
				Regulatory Agency:		Laboratory:				
SPEC REFERENCE and APPLICABLE APPROVED SUBMITTAL	CONSTRUCTION ACTIVITY DESCRIPTION Include Activity ID from Project CPM Schedule	QA/QC ACTIVITY Include activity location and frequency	VERIFYING DOCUMENTS / COMMENTS	QA/QC ACTIONS BY PARTICIPANTS						
				Company	Sub	Supplier	Regulatory Agency	Special Consultant	Laboratory	Date Observed

Guide to 'QA/QC Actions': P = Prime Responsibility for Inspection/Testing W = Witness Inspection/Testing O = Observe H = Hold A = Approved I = In Review S = Samples T = Test
Company Construction QA/QC Manager Certification:
 I certify that the above definable portion of the Work has been constructed, inspected and tested in compliance with the approved plans, specifications and all applicable approved changes.

Signed: _____ Title: Construction QA/QC Manager
 Printed Name: _____ Date: _____

ATTACHMENT 4C

Construction Inspection Staffing Plan

PROPOSAL FORM T-34

DESIGN-BUILD QUALITY MANAGEMENT

Proposers shall provide the minimum number of worker hours and staff qualifications to adequately perform quality control reviews and inspections during design, construction, and start-up/testing phases of the project.

To aid SRWA in the selection process, Proposers shall provide the digital Microsoft® Word document version on CD-ROM. To facilitate transfer of the table to a spreadsheet format, Proposers shall not merge cells, use special symbols, or change the order of the requested parameters. Proposers shall limit the number of characters in each cell to 1024.

Phase of Work	Minimum Worker Hours	Staff Type	Role/Responsibility	Minimum Qualifications
Design	1,500	Design QC Manager and Discipline QC Reviewers	<ul style="list-style-type: none"> Primary responsibility for the development and implementation of the design phase QMP Performs Discipline specific Quality Assurance throughout design effort as well as formal Quality Control Reviews of discrete deliverables 	<ul style="list-style-type: none"> Professional Engineer 10 years discipline design experience
Construction/Startup	4,000	QA/QC Manager	<ul style="list-style-type: none"> Monitors overall project QA/QC including occasional check-ins with construction and design managers, lead QC Inspector Coordinates with auditing team to ensure audits are conducted on a regular basis Develops QA/QC Plan Be on the Site at all times when construction is occurring during performance of Design-Build Work, with complete authority to take any action necessary to ensure conformance with the requirements of the approved Design Documents 	<ul style="list-style-type: none"> 15 years' experience
Construction	3,000	Lead Inspector	<ul style="list-style-type: none"> Responsible for supporting the QA/QC Manager under their direction 	<ul style="list-style-type: none"> 10 years' experience as construction Inspector
Construction/Startup	4,000	Resident Engineer(s)	<ul style="list-style-type: none"> Manage submittal and RFI processes Coordinate with design team to prepare DCNs Lead, maintain and finalize as-builts and record drawings Prepare all required engineering close-out documents Support QC inspections of the work for compliance with the design documents Coordinate with field staff and design engineers 	<ul style="list-style-type: none"> Lead RE: PE with 5 years design experience Discipline RE: 2 years design experience

Phase of Work	Minimum Worker Hours	Staff Type	Role/Responsibility	Minimum Qualifications
Construction	4,000	Materials Testing & Special Inspectors	<ul style="list-style-type: none"> • The work requiring special inspection will be identified during design and included in the construction documents • The following is a listing of typical items requiring special inspection on similar projects: <ul style="list-style-type: none"> • Structural Steel Inspection • Concrete Inspection • Masonry Inspection • Post-Installed Anchor Installation • Non-Shrink Grouting Inspection • Concrete Repair Inspection 	<ul style="list-style-type: none"> • Certifications as appropriate