



Title:

Design and Consultant of Transit Centre in Nimroz Province, Afghanistan

Contractor Quality Control Plan

20 October 2018

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Design and Consultant of Transit Centre in Nimroz Province, Afghanistan

Donor Project code number: AFG_NRC_HER_2018_45

Donor of Project: PATRIP Foundation

Client: Norwegian Refugee Council (NRC)

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1.0 Purpose and Scope of the Contractor Quality Control (CQC) Plan

1.1 Definition

Contractor Quality Control (CQC) Plan is a systematic management approach for planning, implementing, controlling, and assessing work to ensure that the results produce an end product that satisfies technical, administrative, and quality objectives for the site adaptation and construction project. The CQP encompasses the policies and procedures, authorities, requirements, and guidance necessary for implementation and assessment of work in compliance with governing codes, standards, regulations, and contractual requirements.

The CQC Plan establishes requirements for managing and implementing the CQC system both on site and off site and also applies to work by subcontractors, fabricators, and suppliers. Effective implementation of detailed CQC requirements, procedures, instructions, and reports developed from this plan.

In general, the CQC Plan establishes the requirements for:

- CQC organization, responsibilities, and authority
- Personnel qualifications and training
- Procedures, guidelines, checklists, and forms for conducting and controlling work
- Definable features of work
- Records and documentation
- Inspections and tests
- Deficiencies, non-compliances, and corrective actions
- Audits and surveillance

1.2 Purpose

The purpose of the Quality Control Program is to manage control and describe the necessary activities to be done in order to ensure compliance with the project requirements of the contract and the design documents; approved Drawings, SOW, TOR, specifications, submittals, etc. The Quality Control program is designed to be preventive in nature.

1.3 Scope

This CQC Plan is specific to the site adaptation and construction project for Zarng Transit Center Nimroz, Afghanistan, and complies with Term of Reference, Specification and approved design package. The CQC Plan applies to work, inspections, and testing activities performed including work performed by subcontractors. It includes control measures for verifying the quality of equipment and materials, processing submittals, monitoring construction activities, and testing. Contractors and subcontractor's personnel must meet the CQC Plan specific to them. After acceptance of the CQC Plan, Client shall notify the Contracting Officer in writing of any proposed change.

2. Quality Control Organization

2.1 General

The requirements for the CQC organization are a CQC System Manager, and sufficient number of additional qualified personnel to ensure safety and contract compliance. Project personnel are essential in achieving project success and will be responsible for reporting issues that could adversely affect the safety, scope definition, cost control, schedule performance, and/or the expected level of quality. Project CQC staff are trained and responsible for identifying, reporting, documenting, and verifying that the appropriate remedial and/or corrective actions have been implemented to ensure items and services conform to the specified contract requirements. The CQC staff will maintain a close working relationship with project management and will keep management advised of situations, which if not corrected or controlled, could adversely affect delivery of the expected level of quality of the project.

The CQC staff will maintain a presence at the site at all times during progress of the work and has complete authority and responsibility to take any action necessary to ensure contract compliance.

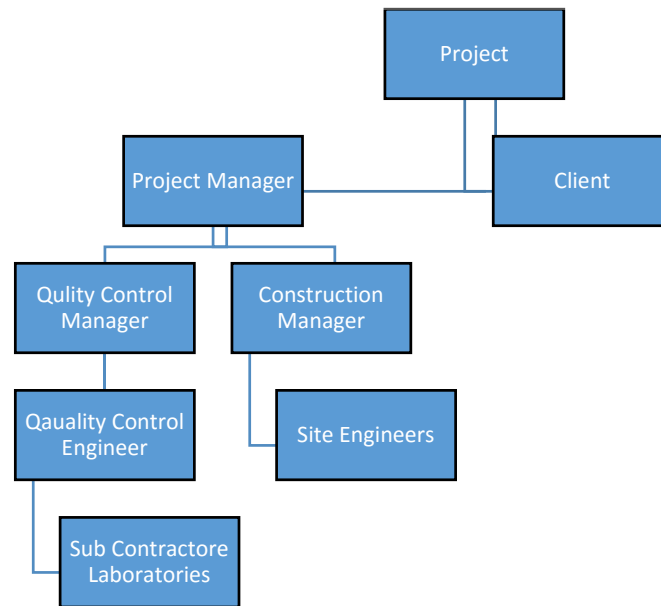
The CQC organization will maintain adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

This section describes and documents the organization and authority for the development, approval, and implementation of the CQC Plan including verification of work activities using the three phases of control. It documents the organizational structure, functional responsibilities, personnel qualifications, levels of authority, and lines of communication.

2.2 Organization, Duties, Responsibilities, and Authorities of CQC Personnel

Figure 3-1 presents an organizational structure, showing the reporting lines for each individual by category. It is the responsibility of personnel involved in project activities that may affect the quality of data collection, design, construction, operation, or other quality-related functions to be aware of and to implement the quality policies and practices set forth by the CQC Plan.

The duties, responsibilities, and authorities of project personnel are described in the following paragraphs.



2.3

Project Manager

As the chief contract representative, the Project Manager technically and administratively manages the contract and has authority and is responsible for the following activities:

- Issue and authorize, in conjunction with Client, Appointment Letters describing duties/responsibilities and delegating authority to the CQC System Manager to act on the Project Manager’s behalf for project-related quality activities.
- Issue stop-work order when necessary.
- Monitor and control work activities, through surveillance of project activities, to ensure that relevant portions of the plan are implemented.
- Interface directly with KCD to maintain awareness in planning and scheduling of CQC
- Establish an overall records management system for the project that ensures clarity, completeness, retrievability, and conformance to contract requirements and ensures document security.
- Implement the approved site-specific plans.
- Evaluate site-specific procedures and plans.
- Evaluate the project schedule and budget.
- Oversee design and construction to ensure compliance with technical requirements, specifications, and drawings
- Ensure team subcontractors perform quality work efficiently, safely, and cost-effectively.
- Track and monitor work and implement contract management procedures to ensure disciplined integration and effective integration of the work.

2.4 Quality Control Manager

The Project CQC System Manager is responsible for the overall management of on-site QC and has the authority to act on QC matters. The CQC System Manager shall be assigned no other duties. An alternate for the CQC Manager will be identified in the plan to serve in the event of the CQC Manager’s absence. The requirements for the alternate will be the same as for the designated CQC Manager. Either the CQC Manager or alternate will physically be at the project site whenever construction activities are being

performed and will oversee QC functions. The CQC Manager acts as the single point of contact for ensuring compliance with the quality requirements identified in the contract. Additionally the CQC Manager and alternate shall have successfully completed the **“Construction Quality Management for Contractors” course within the past 5 years.**

Duties, responsibilities, and authorities of the CQC Manager include:

- Provide and maintain an effective CQC system in accordance with the approved CQC Plan.
- Ensure Implementation of the approved CQC Plan through on-site supervision and surveillance.
- Supervise site Quality Control Engineer and Quality Control Inspectors
- Review and manage submittals in compliance with contract requirements and the CQC Plan.
- Prepare Daily CQC Reports for each day work is performed and submit to the KCD through the Quality Control System (QCS).
- Prepare weekly and monthly activity and project reports and submit to KCD through the QCS.
- Participate in weekly meetings with the KCD to ensure client directions have been received, understood, and are properly incorporated into the project.
- Prepare minutes to document meetings.
- Maintain schedule and actual dates and times of preparatory and initial control meetings in QCS.
- Prepare and submit documentation and reports required by the QCS.
- Perform Preparatory, Initial, and Follow-up phase meetings and inspections.
- Conduct completion inspections of completed work and develop a “punch list” of items not conforming to approved plans and specifications.
- Monitor QC activities to ensure conformance with authorized policies, procedures, and sound practices, and recommend improvements, as necessary.
- Monitor project and subcontractor personnel to assess need for on-site quality-related training.
- Ensure that records, logs, standard procedures, and project plans are maintained in a retrievable fashion and that controlled copies of standard procedures and project plans are distributed to appropriate personnel.
- Ensure that a Document Control system is established and maintained current for records of QC operations, activities, and tests performed on the project.
- Direct stop work or re-performance, with concurrence of the Project Manager, of any nonconforming activity resulting from improper application of prescribed procedures.
- Monitor corrective action documentation for conditions adverse to quality, verify implementation of corrective action, track and analyse corrective action, and close-out corrective action documentation upon completion of corrective action.
- Review drawings and specifications for compliance within the contract, review of drawings for coordination between different trades and disciplines, and review selection of materials and equipment to ensure utility, connectivity, and function.
- Maintain the RMS/QCS in accordance with responsibilities detailed RMS Implementation Plan.

2.5 Quality Control Engineer (CQC Manager Alternate)

The Quality Control Engineer reports to the CQC Manager and shall be responsible for the daily performance of quality-related field engineering activities in support of the project. The Quality Control Engineer will serve as the alternate CQC Systems Manager. The Quality Control Engineer may be supported by a staff of field and office engineers and subcontractor personnel depending on the phase of work. The Quality Control Engineer will:

- Ensure that all records, logs, manifests, permits, regulatory-required documentation, inspections, sample results, lab reports, manufacturers' instructions, warranties, standard procedures, and project plans are maintained and stored in a retrievable fashion.
- Ensure that training records of site personnel, including craft labour, are maintained in accordance with Project procedures and government regulations.
- Accurately interpret and apply design documents along with the codes and standards governing the implementation of the design.
- Update work plans when changes are warranted.
- Conduct acceptance and performance testing of installed equipment and systems.
- Provide quality program oversight of the subcontractors.
- Prepare Field Change Requests (FCRs) when required to obtain design engineering approval of requested field changes.

- Maintain record drawings or construction red line drawings.
- Take progress photographs of testing activities.
- Provide surveying and layout.
- Prepare or provide input to daily reports

2.6 Construction Manager

The Construction Manager is responsible for directing all site preparation and construction work and reports to the Project Manager. Quality-related duties, responsibilities, and authorities of the Construction Manager include:

- Provide site supervision of contractor and subcontractor personnel performing construction tasks to ensure compliance with the approved CQC Plan.
- Ensure construction adheres to approved drawings and specifications.
- Monitor in-process testing (slump, cube, compaction).

- Review and manage material submittals in compliance with contract requirements and the CQC Plan.

2.7 Construction Quality Control Inspectors

Construction QC Inspectors perform the construction and operation QC functions specified for the project and report to the CQC System Manager.

The type and number of CQC personnel present varies depending upon the complexity and nature of the definable features of work, shift work, or other operations that may require QC coverage. All QC personnel are fully qualified in the area of their responsibility according to Education, training, and experience. The duties, responsibilities, and authorities of the QC staff

include:

- Implement project QC procedures, inspections, and testing requirements to ensure appropriate documentation and photographic records are generated during quality checks.
- Assist/represent the CQC System Manager in the performance of his duties when so directed.
- Address and resolve quality issues during construction prior to inspections to minimize work stoppages and rework of tasks, the extent of final punch lists, and warranty issues.
- Authorize the issuance of a Deficiency/Non-conformance Report (NCR) and recommend stop-work orders to the CQC System Manager when necessary.
- Maintain a log of inspections, and provide necessary information to complete the Daily CQC Report and other inspection records including non-conformance reports.
- Inspect and document the implementation of corrective action.
- Monitor sampling activities and laboratory testing activities.
- Perform and document field inspections of construction and operating activities, including oversight of subcontractor's activities.
- Remain on the project site whenever work is being performed in the area of their responsibility or as directed by the CQC Manager

3. Procedures for Scheduling Inspections

3.1 General

Implementation of the three phases of control (Preparatory, Initial, and Follow-up) allows for the Program Manager, Construction Manager, and CQC Manager to plan and schedule work to ensure that preparatory actions have been completed, work is understood by project personnel, and required materials and equipment are available. The Three Phases of Control Inspections will be performed for definable features of work activities, as required by the contract.

The types of inspections performed will include Preparatory, Initial, Follow-up, and Completion as described in the following paragraphs.

3.2 Preparatory Inspection Control Phase

The Preparatory phase will be completed for each and every definable features of work; after all required plans/documents/materials are approved/accepted, or approved as noted, and after copies are at the work site. This phase will include a meeting, prior to the start of work, conducted by the CQC Manager and attended by the Construction Manager, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the Preparatory phase actions will be documented by separate minutes prepared by the CQC Manager and attached to the Daily CQC Report.

The Preparatory Inspection meeting includes:

- A review of the contract drawings.
- A check to assure that all materials and/or equipment have been tested, submitted, and approved.

- Review of provisions that have been made to provide required control inspection and testing.
- Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- A review of the appropriate activity hazard analysis to assure safety requirements are met.
- Discussion of procedures for controlling quality of the work including repetitive deficiencies.
- Document construction tolerances and workmanship standards for that feature of work
- A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- Discussion of the initial control phase.
- The Client will be notified at least 24 hours in advance of beginning each Preparatory control phase inspection with submission of an activity hazard analysis (AHA) and checklist. This phase will include a meeting conducted by the CQC Manager and attended by the Construction Manager, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the Preparatory phase actions will be documented by separate minutes prepared by the CQC System Manager and attached to the Daily CQC Report.

3.3 Initial Inspection Control Phase

This phase will be accomplished at the beginning of a definable feature of work. The following will be accomplished:

- A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- Resolve all differences.
- Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- The Client will be notified at least 24 hours in advance of beginning the Initial phase. Separate minutes of this phase will be prepared by the CQC System Manager and attached to the Daily CQC Report. Exact location of the Initial control phase will be indicated for future reference and comparison with follow-up phases.
- The Initial phase should be repeated for each new crew to work on site, or any time acceptable specified quality standards are not being met.

Additional Preparatory and Initial phases will be conducted on the same definable features of work if; the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, on-site production supervision, or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.4 Follow-up Phase

Daily checks will be performed by Client to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks will be made a matter of record in the CQC documentation. Final follow-up checks will be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work.

3.5 Completion Inspection

3.5.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Contract Requirements clause, "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC Manager will conduct an inspection of the work. A punch list of items that do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, contractor shall notify Client that the work product is ready for Pre-Final Inspection.

3.5.2 Pre-Final Inspection

The Client will perform the Pre-Final Inspection to verify that the work product is complete and ready to be used as intended and "Pre-Final Punch List" will be developed as a result of this inspection. Contractor's CQC Manager will ensure that all items on this list have been corrected and notify the Client so that a System "Final" inspection with Client can be scheduled. Any items noted on the "Final" inspection will be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates. The CQC Manager shall make a second inspection to ensure all deficiencies have been corrected prior to proceeding with the Final Acceptance Inspection.

3.5.3 Final Acceptance Inspection

Contractor's QC Inspection personnel, plus the Construction Manager or other primary management person Consultant and Client Representatives, will be in attendance at the Final Acceptance Inspection.

The Final Acceptance Inspection will be formally scheduled by the Contractor based upon results of the Pre-Final Inspection.

4. SUBMITTALS

4.1 Submittal definition

All documents formally transmitted between Client and contractor which are contractual in nature and requiring action or response will be treated as submittals and documented in the Submittals Register. The CQC organization will be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements and to ensure adequate time is allowed for each type of submittal required. A submittal clerk will be assigned to assist in the submittal process.

Submittals will be taken to include but are not limited to:

- Requests for Information (RFI)
- Test/Inspection results
- Requests for Inspection
- As built and shop drawings
- Method Statements
- Manuals
- Materials Approvals
- Other documents

4.2 Submittal procedure

Copies of submittals shall be submitted in English clearly shows the specification and product data of each item as listed in contract, a Submittal Transmittal Form shall be used for submittals. Once the submittal has been prepared, one copy of the submittal will be transmitted to CLIENT and one copy retained on file.

4.3 Filing of submittals

Submittals (Material, Design, Data, Samples, Shop Drawings, mock –ups, material samples etc.) shall be filed in a secure place for reference and coordination.

Color and mock-up samples shall be maintained in a secure place, at the job site, for comparison with the finished product. When submittals are not approved or incomplete, they will be returned to the supplier and/or sub-contractor with comments. They shall be corrected and resubmitted for approval.

4.4 Submittal register

The Submittals Register shall be maintained by the QA/QC Site Engineer.

Revised copies of the Submittal Register shall be provided to the Client once a month or as requested.

The document controller is responsible for logging submittals inward / outward

The project manager is responsible for inward submittal distribution and approval for release of outward submittal

4.5 Responsibility

The CQC Manager will ensure that submittals are made on or before the dates shown in the submittal register.

4.6 Scheduling of Submittals

The Project Manager, in conjunction with the CQC Manager, reviews the contract for required submittals and directs the preparation of the submittal register to assure that submittals are made. This will ensure timely arrival of approved personnel, equipment, and materials on site.

4.7 Review of Submittals

The CQC Manager will review submittals for completeness and accuracy. The designated alternate CQC Manager may perform in that capacity has all the responsibilities and authority of the CQC Manager. Any submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review and approval by the CQC Manager and Project Manager prior to submittal to the Client for getting approval.

5. Control Testing Procedures

5.1 Testing Procedures

Client has hired a certified laboratory for conducting the tests required at job site under supervisor of the Consultant and its representative QA. So the all the tests procedure should perform the following activities, and record and provide the following data:

- Verify that testing procedures comply with contract requirements
- Verify that facilities and testing equipment are available and comply with testing standards
- Check test instrument calibration data against certified standards
- Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared
- Results of all tests taken, both passing and failing tests, will be recorded on the Daily CQC Report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given.

Test reports are maintained on site and refer to specific drawings or specification requirements and state the comparative test procedures with both expected and actual results. The CQC Manager performs the following activities and records the following data:

- Prepares a Test Log.
- Verifies that testing procedures comply with the intent of the contract requirements. (The specifications may establish the minimum testing requirements. Client may increase test frequency or provide additional tests as necessary to ensure compliance of work performed.)
- Verifies that recording forms, including all of the test documentation requirements, have been prepared.
- Verifies that test documents report the expected test results and actual test results for each test or phase.
- Attaches a copy of the updated Test Log to the last Daily CQC Report of each month.

5.2 Tests

The required tests will be performed at the site by a Client certified laboratory with a facility within the project boundaries. In addition, test reporting requirements are defined; facilities and testing equipment verified, calibrated, and accepted, and personnel are qualified.

Testing procedures will be implemented to perform the tests specified for each definable feature of work of the project as applicable or specified. The type, number, and frequency of the tests will be as specified in the contract documents and CQC Plan and will include the requirements of referenced standards or regulatory guidelines.

Tests performed will be documented on CQC test forms, which include the following:

- Test name/procedure/frequency
- Responsible laboratory/personnel
- Acceptance criteria

- Statement of acceptability of the feature of work being tested

Note that existing geotechnical information is available at the adjacent project site and may be used by Contractor to develop foundations, fill at elevated slabs, materials, earthwork, and other geotechnical- related design and construction activities for this project.

The CQC Manager, or designee, is responsible for monitoring all testing activities conducted to verify conformance to the contract requirements. The monitoring will include on-site project activities and both on-site and off-site laboratories activities. Monitoring includes:

- Sampling methods, locations, and frequencies
- Testing procedures
- Test equipment availability and compliance
- Calibration methods and frequency
- Test documentation and results

5.2.1 Excavation and Compaction of Fill

The contractor is responsible for excavation to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the location. Keep excavations free of water. Excavate soil disturbed or weakened by the Contractor's operations, soils softened, or made unsuitable for subsequent construction due to

Exposure to weather. Refill with satisfactory material and compact to at least 95% of the maximum dry density, as determined by the Modified Proctor laboratory procedures. ASTM D1557 shall be used for producing the Modified Proctor moisture-density curve. Confirmation will be performed using the on-site approved laboratory.

5.2.2 Concrete Mix Design

All of the testing procedures will be performed under the supervision of the CQC System Manager in the on-site laboratory. The CQC System Manager will prepare and submit pavement concrete mix design according to specification as follows:

5.2.3 Water – Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete is 0.45.

5.2.4 Aggregate

Fine and coarse aggregate will be tested in accordance with ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates, and gradations must satisfy the limits mentioned in ASTM C33, Standard Specification for Concrete Aggregates.

Fine and coarse aggregates shall "be tested and evaluated for alkali-aggregate reactivity in accordance with ASTM C 1260. The fine and coarse aggregates shall be evaluated separately and in combination, which matches the Contractor's proposed mix design proportioning. All results of the separate and combination testing shall have a measured expansion less than 0.10 percent at 16 days after casting. Should the test data indicate an expansion of 0.10 percent or greater, the

aggregate(s) shall be rejected or additional testing using ASTM C 1260 and ASTM C 1567 shall be performed. The additional testing using ASTM C 1260 and ASTM C 1567 shall be performed using the low alkali Portland cement in combination with ground granulated blast furnace (GGBF) slag, or Class F fly ash. GGBF slag shall be used in the range of 40 to 50 percent of the total cementitious material by mass. Class F fly ash shall be used in the range of 25 to 40 percent of the total cementitious material by mass."

5.2.5 Fine Aggregate

Fine aggregate shall conform to the quality and graduation requirements of ASTM C 33/C 33M.

5.2.6 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33/C 33M, Class 5S, size designation 467 (reinforced slabs on ground) or 67 (reinforced walls, columns, beams and other formed sections).

5.2.7 Cementitious Materials

Cementitious materials shall be Portland cement, Portland-pozzolan cement or Portland cement in combination with pozzolan conforming to appropriate specifications listed below. Restrict usage of cementitious materials in concrete that will have surfaces exposed in the completed structure so there is no change in color, source, or type of cementitious material.

5.2.8 Portland cement

Hydraulic cement produced by pulverizing clinker consisting primarily of hydraulic calcium silicates, typically containing forms of calcium sulfate as underground addition, will conform to ASTM C150/C150M, Standard Specification for Portland Cement, Type I, 1A low alkali with a maximum 15 percent amount of tricalcium aluminate, or Type II, IIA low alkali. White Portland cement shall meet the above requirements except that it may be Type I, Type IA, Type II or Type IIA low alkali.

5.3 Concrete Pouring Inspections

5.3.1 before Placement

Mix Design Check

Ensure the quality and quantity of the concrete is requested as required.

Ensure aggregate sieve analysis is in accordance with ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

Ensure checks mentioned in the concrete pour card are completed by QC Civil, Mechanical Chief, and Electrical Chief. Ensure Concrete Pour Card is filled and signed by QC Civil, QC Mechanical, and QC Electrical staff 24 hours before the start of concrete placement, and complete any missing items detected (see following table and bullets for suggested check items

Formwork Checks

- Material
- Clean & Oiled
- Chamfer

- Straight, Level, Plumb
- Adequate Bracing
- Dowels, Tie Bars & Reinforcement
- Grade
- Size
- Splices
- Spacing
- Clearance
- Cleanliness
- Adequate Support

Embedment

- Anchor Bolts
- Grounding Rods
- Tie Bars
- Angle Iron
- Pipes
- Conduits

Miscellaneous

- Joints
- Slope
- Vapor Barrier

Others

- Define any job specific items

Sub-Foundation Checks

- Base Course
- Elevation
- As-build drawings including elevations
 - Ensure operational vibrators (one for spare) are brought to the site.
 - Ensure equipment and material for curing and for protecting concrete from weather or mechanical damage is available on site, in proper working condition, and in sufficient quantity for the entire placement.
 - Ensure roads are clean and have sufficient strength to resist deformation caused by heavy loads.
 - Ensure temperature gage is operational and available on site.
 - Ensure slump set is available on site.
 - Ensure safety checks are completed and proper personal protective equipment (PPE) is available on site in accordance with EM385-1-
 - Ensure precautions have been taken for abnormal weather conditions.
 - Ensure underlying material base course is cleaned, damped, and free from debris waste concrete or cement and standing or running water.

5.3.2 During Placement

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the limits specified in accordance with ASTM C 143/C 143M, Standard Test Method for Slump of Hydraulic Cement Concrete and the results meet the specifications and mix design Limits.

Ensure concrete temperature tests are being performed for each delivery with the ambient weather temperature.

The maximum allowable temperature to place concrete shall not exceed 32 degrees Celsius [$^{\circ}\text{C}$].

Cylinders for strength test shall be molded and laboratory-cured in accordance with ASTM C31/C31M-03a, Standard Practice for Making and Curing Concrete Test Specimens in the Field, and tested in accordance with ASTM C39/C 39M-03, Test Method for Compressive Strength of Cylindrical Concrete Specimens. Obtain samples in accordance with ASTM C172.

Evaluation of Concrete Compressive Strength. Fabricate compressive strength specimens (152 by 305 mm cylinders), laboratory cure them in accordance with ASTM C 31/C 31M and test them in accordance with ASTM C 39/C 39M. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f_c and no individual test result falls below the specified strength f_c by more than 3.5 MPa. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required

at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

Discharge mixed concrete within 1.5 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 30 degrees C, reduce the time to 45 minutes. Place concrete within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Provide adequate scaffolding, ramps and walkways so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities prevent proper consolidation, finishing and curing. Provide sufficient placing capacity so that concrete can be kept free of cold joints.

5.3.3 After Placement

- The sequence of operations shall be finishing, floating, and straightedge finishing; texturing; and then edging of joints.
- After placing and finishing, concrete shall be cured by an approved method for 7 days. Immediately after placement, protect concrete from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Maintain air and forms in contact with concrete at a temperature above 10 degrees C for the first 3 days and at a temperature above 0 degrees C for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds in PART 2, moist curing shall be provided for any areas to receive any paint or other applied coating, or to which other cementitious material and tile is to be bonded.
- Maintain concrete, to be moist-cured, continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the

concrete. Provide an approved work system to ensure that moist curing is continuous 24 hours per day.

- Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by removal operation. Prevent damage to concrete from formwork removal. Do not pry against face of concrete. Use only wooden wedges to separate forms from concrete.
- All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels and conform to the contract drawings details.
- Straightedge control of the slabs.
- Joint installation will begin after the necessary cleaning and repairing of the joints and approval of slabs.

5.3.4 Hydrostatic Test for Piping Systems

All pipes and joints shall be capable of at least 1.03 MPa leakage test and 1.38 MPa hydrostatic pressure test unless otherwise specified. After the pipe is laid, the joints completed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 1.38 MPa. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially opened trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants, and valves discovered following this pressure test shall be removed and replaced and retested until the test results are satisfactory.

The Contracting Officer, or appointed designee, shall be notified not less than 48 hours prior to conducting any hydrostatic testing.

5.3.5 Leakage Test

Leakage tests shall be conducted after all pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test, water lines shall be subjected to not less than 1.01 MPa.

5.3.6 Documentation

Testing activities and results of the tests and monitoring activities will be included in the Daily CQC Report. Test reports, calibration records, and other recording forms used to document test activities will be maintained by the CQC System Manager.

5.3.7 Construction and Acceptance Testing (Inspection Guideline)

Procedures will be implemented to perform construction and operational inspections and acceptance testing of engineered systems and their components according to approved

design specifications or other planning documents. These procedures also provide for an appropriate level of independence for inspection and test personnel, according to the design specifications and CQC Plan requirements. If

Acceptance criteria are not met, the CQC Manager will resolve deficiencies and conduct additional inspections, as required. Procedures will be established and implemented to demonstrate that inspection and testing of items and processes will be performed as follows:

- Procedures will be used at appropriate levels of independence in the testing program, according to the design specifications and CQC Plan requirements.
- Procedures will be implemented and maintained to ensure that measuring and test equipment are of the proper type, range, and accuracy and are properly calibrated, maintained, and used according to design specifications and other planning documents. The procedures will also apply to measuring and test equipment used for operational process monitoring and acceptance.
- Equipment found unsatisfactory for acceptance testing will be recalibrated and certified as within tolerances before using for acceptance testing. The validity of measurements and tests will be repeated as required.
- Measuring and test equipment used in quality-affecting work will be calibrated against certified equipment with known valid relationships to nationally recognized performance standards. If no such standards exist, the basis for the calibration will be documented.

6.0 Reporting Procedures

6.1 CQC Reporting

Contractor is responsible for QC and will establish and maintain an effective CQC system in compliance with the CQC Plan. The implementation of the Three-Phase CQC Control System, preparation of Daily QCQ Reports, identify and track deficiencies, document progress of work, and support other contractor CQC requirements.

6.1.1 Daily CQC Reporting

Daily CQC Reports, including the following information, will be prepared and exported daily in RMS system.

Daily Weather Information

All information about the daily temperature, wind, and precipitation will be issued in daily reports. If there is any delay because of weather conditions it will also be issued in this section.

Daily Activities Progress

All daily activities on site and in the office will be issued in this section.

Activity Start and Finish Date

All daily activities started on site or finished will be issued in this section.

Preparatory/Initial Date

All daily Preparatory/Initial meetings will be issued in this section.

CQC Requirements

All personnel performing CQC test, description of test, requirement number, location, and result will be issued in the daily report. The test result will be added in RMS and a hard copy of the test will be submitted to the Client's Project Engineer or responsible project personnel.

CQC Punch List

CQC punch list will be prepared by the CQC Manager. The punch list items will be a list of work needed to be corrected or completed by the Contractor. Corrected or completed items of the punch list will be issued in the daily report.

6.1.2 QC Summary

Summary of weather, QC narratives, punch list items, QC requirements, Preparatory/Initial inspections, activities started/finished, contractors on site, labor/equipment hours, and accident reporting.

Client will perform specified and required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. We will perform the following activities and record and document the following data:

- Testing procedures are in compliance with contract requirements
- Facilities and testing equipment are available and in compliance with testing standards
- Test instrument calibration data are traceable to certified standards
- Recording forms and test identification control number system are prepared and meet all test documentation requirements
- Results of all tests taken, both passing and failing tests, are recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test are given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility will be provided directly to the Contracting Officer.
- Summaries and Status/Progress Reports will be prepared weekly and monthly.

6.1.3 Features of Work

Three phases of control will be conducted by the CQC System Manager for each definable feature of the construction work as follows: Preparatory phase, Initial phase, and Follow-up phase.

Plans will be reviewed for timeliness and adequacy at least monthly with a signature sheet signed and dated documenting that these reviews took place.

6.1.4 QC Requirements

The CQC System Manager will develop and maintain a complete list of QC testing and required structural and life safety special inspections, transferred and installed property, and user training requirements in QCS. The CQC Manager will update all data on these CQC requirements as work progresses, and promptly provide this information to the Client.

6.1.5 Equipment Checks

All equipment ID, make/model, serial number, description, and last safety inspection dates of the equipment will be included in the equipment check. The last inspection date will be updated.

7.0 Documentation

The CQC Manager will establish a document control system to provide measures for control of issuing, distributing, storing, and maintaining quality-related documents, including documents from subcontractors, off-site fabricators, laboratory suppliers, vendors, and other suppliers. Document controls include the identification of documents and their specified distribution; the identification of those responsible for preparing, reviewing, approving, and issuing documents; and the review of documents for adequacy, completeness, and correctness prior to approval and issuance. Preparation, review, approval, and issuance of documents (including revisions) affecting quality will be controlled to the extent necessary to determine that the documents include the specified requirements and provide adequate procedures or guidelines to perform the intended activities. Such documents may include the following:

- Drawings and Specifications
- Calculations
- Procedures
- Plans
- Reports

7.1 Daily CQC Report

The Daily CQC Report will be submitted to Client the report will be submitted electronically within 24 hours after the date covered by the report.

7.2 Storage of Records

CQC records will be prepared to furnish documentary evidence of the quality of items, services, and engineered systems provided. Records will be maintained and stored in secure storage facilities at the project site until turnover to the Client. The records will be readily retrievable for review and auditing purposes by Contractor or regulatory agencies. The records will be controlled in a manner that prevents loss, damage, or other detrimental conditions of the records. Duplicate records will be maintained in separate storage facilities.

7.3 Indexing and Filing of Records

Only authorized personnel will perform indexing and filing of records. The records will be maintained in a central filing system under the direction of the Project Manager. Various project file categories and letter designations will organize the project record files. File folders will be divided into appropriate categories based on content, and then the files will be numbered and filed sequentially within each category. Folder tabs will indicate the folder number and file title as it appears on the project index. A numbered index will be prepared and updated as designated personnel add records. The index will list the individual file folders and the records within them for easy identification. The index will be kept in a separate folder at

The front of the project file. The CQC Manager is responsible for monitoring the control of records and performing scheduled audits or surveillances of the document control system in accordance with the requirements of this CQC Plan.

8.0 Procedures for Identifying and Tracking Nonconformance's and Corrective Actions

8.1 Notification of Non-Compliance

The Contracting Officer will notify Contractor of any detected noncompliance with the foregoing requirements. The CQC Manager shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the contractor at the work site, shall be deemed sufficient for the purpose of notification. If Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the contractor.

8.2 Deficiency Tracking

Work or materials not conforming to the specifications, drawings, or contract requirements will be identified and documented. The QCS will be used to numerically track deficiencies/nonconformance's using CQC punch list items. Client will track the item until it is reported as complete and the action is completed satisfactorily. The CQC Manager will regularly update the correction status of QC and punch list items.

8.3 Nonconformance Report

Work or materials found to be not conforming to the specifications, drawings, or contract requirements will be identified and documented on a Nonconformance Report (NCR) for internal tracking. The NCR will detail the nonconforming condition, recommended corrective action(s), and disposition of the corrective action(s). The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified by CQC personnel.

8.4 Identification of Deficiencies/Nonconforming Items

Items not conforming to specifications, drawings, or contract will be identified as follows:

- Description of nonconforming item or activity in sequential order
- Detailed description of nonconformance
- Referenced criteria
- Recommended disposition and Corrective Action to prevent recurrence (as applicable)
- Affected organization

8.5 Control and Segregation

The nonconforming materials or items will be controlled to prevent inadvertent use or further processing. Items determined to be nonconforming will be identified and segregated from acceptable items.

8.6 Disposition

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include reworking, replacing, retesting, or re-inspecting. Implementation of the disposition may be done in accordance with the original procedural requirements, a specific procedure or instruction, or a FCR.

8.7 Corrective Actions

In addition to resolving identified nonconforming conditions, the corrective action record will also address the initial cause of adverse conditions and establish methods and controls to prevent recurrence of the same or similar types of nonconformance. The CQC Manager will track the nonconformance and corrective actions to identify any trends in the causes of the nonconforming conditions and then initiate necessary actions to prevent recurrence. The CQC Manager will also monitor the corrective actions to verify that they were properly implemented and accepted and that the NCR was closed out.



9.0 Turnover

Prior to initiation of Pre-Final inspections, a Turnover Procedures Plan will be developed with Client to outline project turnover from Pre-Final Inspection to final project closeout.