



BUILDING IDEA

TRADING AND CONTRACTING COMPANY

شركة فكرة البناء للتجارة و المقاولات

Quality Assurance Manual

BITC

P.O. Box-32239, Al Khobar-31952, Kingdom of Saudi Arabia. Phone # 013 8815858

E-mail: info@bitc.sa

QUALITY CONTROL PROCEDURES

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TALA CONSTRUCTION COMPANY (*BITC*) QUALITY ASSURANCE & CONTROL PROCEDURES

Introduction:

This quality Control Plan is developed to provide an effective system for controlling the quality of work, products and services in conformance with the contract requirements on time and free of defects. This Quality Control plan outlines the organization and policies which have been established to ensure that Procurement and Construction are carried out under controlled conditions, and as per project specifications. It requires that all personnel work in accordance with the project Quality Plan and contract requirements. All contractual activities are planned, controlled and documented in accordance with the standard procedure and requirements of the Quality Plan and contract documents. Records are maintained to provide evidence of quality level achieved which enable to certify the quality of the work supplied. The contents of the Project Quality Plan are binding on all projects staff in carrying out their duties, responsibilities, as to ensure effective flow of inspection, documentation, implementation of work in the project.

I. FOREWORD:

BITC Construction Company (BITC), engaged in Civil, Architectural and Building Construction business entity in the Eastern Province, Al Khobar. BITC objective is to provide experience, expertise, capability and quality services in a manner, which fully conform to the Client's contractual and regulatory requirements. In order to achieve this objective, it is a company to establish and maintain an effective and efficient Quality Assurance System planned and developed in conjunction with other management functions. Determination of conformance of work to contract and regulatory requirements is made based on objective evidence of quality.

BITC brings its rich experience and resources at its disposal into Special building sector. BITC is committed to meeting its client's requirements, has taken upon itself, the implementation of a quality system complying with international standards. The system outlined in this manual meets with the requirements of the international standards.

II. QUALITY CONTROL PROGRAM FOR PROJECT:

This project seeks well-planned and systematic quality control program to achieve the required quality work and good workmanship. The quality of work and quality control will be fully in accordance with Client / Consultant engineering specifications, the codes and the quality plan.

BITC will ensure that the project manager and the Q.C. Engineer will highlight team spirit and quality awareness in various coordination meetings with work force. The Q.C Engineer will ensure coordination between activities of various disciplines.

III. PROJECT EXECUTION

To carry out effective QC program we have divided the Civil / Structural / Architectural / Mechanical / Electrical part in to the following main activities.

The Activities subject to quality control, but not limited to be:

- 1.0 Earthwork
- 2.0 Reinforced steel, Formwork & Concrete
- 3.0 Pre-cast concrete elements
- 4.0 Concrete Masonry Units
- 5.0 Plaster Work
- 6.0 Hollow metal doors, wooden doors and Overhead doors.
- 7.0 Aluminum Doors and Windows
- 8.0 Flooring and Cladding Works
- 9.0 Installation of flooring ceramics
- 10.0 Installation of ceramics wall tiles
- 11.0 Thermal and Moisture Protection Painting
- 12.0 Painting
- 13.0 Installation of Underground Potable water lines — Exterior
- 14.0 Installation Underground Gravity Sewer Lines — Exterior
- 15.0 Plumbing— installation of Drainage Pipes - Interior
- 16.0 Installation of Hot & Cold water piping System
- 17.0 Installation of Plumbing Fittings and fixtures
- 18.0 Installation of Fire Fighting System
- 19.0 Duct Banks & Underground conduits
- 20.0 Conduits Embedded in Concrete Slabs and Under Floor Service Channel
- 21.0 Surface Mounted Conduits
- 22.0 Conduits in CMU Wall
- 23.0 Cabling & Wiring
- 24.0 Panel Boards
- 25.0 Lighting

REOUEST FOR INSPECTION

- Proper coordination of inspections of the works.
- 24 hours advance notification.
- Used of approved forms.

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An elaborate and methodical approach of execution of above work is given in the following pages to ensure quality control.

1.0 EARTHWORKS

1.1 DESCRIPTION / SCOPE

1- BITC shall perform all operations in connection with the stripping of topsoil excavation of soilh and rock material from the work site, placing and compacting of fill materials from work site excavations and / or imported from a borrow pit, and grading the site to the required elevations from building external works.

BITC will examine the site, records of exiting utilities arid construction records of test borings and the subsurface exploration reports and soil samples to determine all conditions under which work will be performed. We will formulate our own conclusions as to the extent of such construction where there is no record of existing utilities and constructions.

1.2 EXCAVATION:

While excavation activity starts based on approved excavation plan the following sequence shall be carried out.

1.2.1 Preserving and rerouting of underground utilities.

1.2.2 Noise and dust control, protection of property and safety.

1.2.3 Reuse of excavated material if suitable & recommended by independent laboratory.

1.2.4 Disposal of surplus excavated suitable materials: All excavated materials suitable for backfill shall be used and the surplus shall be removed from the site as directed by Client representative.

1.2.5 Bracing and shoring: For excavations over 1.20 m deep, the sides of pits and trenches shall be sloped back to the natural repose of the soil to avoid caving. Sides which cannot be sloped to natural repose because of adjacent

structures or ground condition shall be shored adequately to resist earth movement and protect workers.

1.2.6 Protection of adjacent building or existing structures: when the excavation is close to an existing structure, BITC shall avoid any possibility of undermining or disturbing the foundations by placing sheeting bracing and supports. If, during excavation BITC encounters existing footing or other obstruction not indicated on the drawings, he shall immediately inform the Client Representative. All construction operation shall then continue in accordance with subsequent instructions from the Client representative.

1.2.7 Drainage and Dewatering: To ensure proper drainage conditions throughout construction BITC shall provide and maintain devices (including spares) to intercept remove promptly, and properly dispose of all water entering the excavation or trenches. All excavation and trenches shall be kept dry until structures pipes and appurtenances to be built are completed.

1.3 STRUCTURAL FILL AND BACKFILL

1.3.1 Backfill around and beneath concrete foundation shall be in accordance with contract compaction shall have a minimum of 95 % standard proctor density.

1.3.2 Fill and backfill under structures shall be select fill or coarse aggregate and fine aggregate when indicated or specified for use under structures, and conforming to requirements for coarse and fine aggregate.

1.3.3 Fill and backfill materials shall be spaced in layers not exceeding 25 cm in thickness after compaction of cohesive soils material shall be moistened to within $\pm 1\frac{1}{2}\%$. Unless otherwise specified or indicated each layer shall be compacted to 95% of the maximum dry density or 95% relative density for cohesion less material or whichever ever gives a higher density.

1.3.4 Materials for backfill shall not be against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected without distortion cracking or other damage. Provide special leak tests if required as soon as practicable after structures are structurally adequate and other necessary work has been done. Start backfilling promptly after completion of tests. Avoid unequal soil pressure by depositing material evenly around structure.

13.5 All buried concrete structures shall be coated with two coats of coal tar epoxy prior to backfilling before coating concrete surfaces must be to well cured and dry.

1.3.6 BITC shall perform the required. Testing in accordance with the specification section.

1.4. FILL

1.4.1 The areas to receive the fill shall be proof rolled with pneumatic tire or vibrating drum rollers and any areas that fail to density or that rut excessively shall be cut to the depth of the loose material and that loose material removed. Ground surface on which fill is to be placed shall be plowed or otherwise broken up pulverized moistened or aerated as necessary thoroughly mixed and compacted to not less than 95%.

1.4.2 Fill materials shall be placed in successive horizontal lifts or layers not to exceed 250 mm in depth after compaction. Each layer before starting the next shall be leveled and smoothed by means of power driven graders bulldozers or other suitable equipment. Hauling and spreading equipment shall be operated over the fill width of each layer. Stones greater than 100 mm maximum size shall be removed from the top surface prior to compaction.

1.4.3 Each layer or fill materials shall be moistened to within +/- 1.5% of the optimum moisture content prior to compaction. It is BITC responsibility to determine the most efficient equipment to achieve required compaction. All fills shall be compacted to 70% relative dusty for cohesion less materials or 95% of the maximum dry density or cohesive materials or whichever is applicable and gives greater density.

1.4.4 BITC shall drain the surface at all times and pounding of water on the fill shall be prevented.

1.4.5 Backfill materials shall be placed and compacted uniformly in such manner as to prevent wedging action or eccentric loading upon or adjacent to the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations, equipment that will overload the structure in passing over and compacting this fill shall not be used.

1.4.6 Borrow materials shall not be brought to work site areas requiring fill without prior approval of Client representative and conformity with the specifications. Fill material which does not meet the requirements of specifications shall not be used.

1.4.7 Compaction test.

A. BITC shall verify, that the specified degree of compaction has been achieved and shall perform in — place density tests shall be made after compaction of each lift of fill and performed at least one lift thickness below the compacted surface.

2.0 REINFORCED STEEL, CONCRETE AND FORMWORK

2.1 Reinforcing Steel

a. The reinforcing steel & formwork will be strictly as per standards and codes and as per Client / Consultant Engineering specifications.

b. Detailed drawings/shop drawings bar bending schedules will be submitted from time to time for Client I Consultant Engineer representatives review and approval.

BITC will recommend its supplier to deliver the reinforcement in the bundled form, tagged and marked to the project site, to facilitate sorting transportation or storage.

c. All the reinforcement will be stored above ground and protected against dirt, rust, salts and chlorides. Sand blasting will be otherwise it will be cleaned to the satisfaction of Client representative.

Q.C. will take care of the following defects.

a) Bar lengths. depths and bends exceeding specified fabrication tolerance.

b) Bends or kinks not indicate the drawings.

c) Bars with reduced cross section.

d. Reinforcing will be secured with accessories and tie wires to prevent displacement before and during concreting. Surface clearance dimensions will be maintained as per the specifications. Reinforcement will be checked after fixing and no concrete will not be placed if the bars are not properly and securely placed with adequate supports.

e. Concrete cover blocks required for ensuring the position of reinforcement will be as small as possible consistent with their purpose, of a shape acceptable to Client Consultant. Tying wire will comply with the specification.

f. All the reinforcement will be clean and free from loose scale, rust, oil, crease or any other matter, prior to concreting BITC will ensure that the reinforcement is cleaned of all concrete adhering from previous pours.

g. Welded wire fabric will be installed in as long lengths as practical. Fabric will be placed on top of reinforcement or on chairs or spacers as indicated.

h. BITC will provide adequate scaffolding boards or similar to ensure that the reinforcement is not displaced by being walked upon during the placing of the concrete or other operations.

i. No concrete will be placed until QC representative is satisfied himself and a pre-pouring inspection is conducted by Client / Consultant-Engineer representative.

2.2 Formwork

A detailed drawing/shop drawings will be submitted showing the sequence of superstructure concrete placement, location of construction joints and the false work release.

a. All formworks will be so constructed that there will be no loss of material from the concrete and sufficiently mortar tight to prevent loss of liquid from the surface.

b. Concrete is placed in successive lifts. Care will be taken to ensure that the formwork is set tightly against the concrete of the proceeding lift to prevent the formation of lips and loss of grout and cement slurry between the formwork and previously placed concrete.

c. If during concrete placement, undue settlement bulging or other defects become apparent in the formwork, BITC will cease the placement and take all necessary steps to the satisfaction of Client / Consultant to remedy such defects.

d. The inside surface of the formwork will, except for permanent formwork or unless otherwise agreed with Client/Consultant be coated with an approved material to prevent adhesion of the concrete release agent will be applied in accordance with the manufacture's instructions or recommendation and will not come into contact with the reinforcement. Formwork will also be wetted with clean water before placing of concrete.

e. Forms or shoring will not be removed until the concrete members have acquired a minimum compressed strength of 100% of designed compressive strength. Form will be stripped as per the stipulated time and as per the type of members or 28 days compressive strength.

2.3 Concrete

2.3.1 Blinding Concrete

- a) BITC will submit ready mix concrete suppliers design mix for 1IN/mm² for lean concrete.
- b) The following test results which are obtained from ready mix concrete supplier, will also be submitted to ensure quality
- C) Specific gravity & water absorption combined coarse and fine aggregate.
- d) Soundness test of aggregates.
- e) Materials finer than No: 20 Los angles abrasion on combined aggregate
- f) Los angles abrasion on 3/4 & 3/8 “ aggregate.
- g) Acid soluble sulfate and chloride on combined aggregate
- h) Sieve analysis on combined aggregate 3/4” , 1/2” , 3/8”
- i) Chemical analysis of water

2.3.2 Reinforced Cement Concrete

- a) Ready mix concrete from approved batching plant will be used for this work. Contractor will submit design analysis and calculations for the type of concrete and type of mix which is going to be used to this project to Client / Consultant’s Engineer representative for his approval review. American Society for Testing and Materials, Corps of Engineers Codes and Standards are applicable.
- b) BITC will submit shop drawings and samples of all embedded items, coverings or other accessories, certificates of compliance, independent laboratory test results to Client I Consultant as and when required.
- c) BITC will coordinate with Client I Consultant’s independent testing laboratory to conduct on field tests. The following tests will be conducted.

COMPRESSION TEST SPECIMEN:

- d) Five samples of cubes/cylinders will be taken for every 76 M1 or 500 m² of surface area of each class of concrete placed. Test results of each sample tested after 7, 14 and 28 days will be submitted to Client/Consultant.
 - e) Core boring test will be conducted by BITC if the strength test results are below the specifications requirement or where there is evidence that the quality of concrete is below the specifications requirement.
 - f) Slump test will be performed by the owner's representative.
 - g) Once the pre pouring inspection is conducted and satisfied by the inspector, pouring of concrete will done as per the standards and specifications. Concrete will be placed in the forms as close as possible in horizontal layers. Concrete will not be allowed dropping freely more than 1.5 m high. Concrete will be delivered in continuous manner without segregation or loss of ingredients.
 - h) Concrete from batching plant will be poured in forms within 30 minutes. Concrete temperature will not exceed 30°C. No water is allowed to add during concreting.
 - i) Immediately after placing of concrete each layer will be compacted with good mechanical vibrators.
 - j) Concrete will be protected from wind, rain and drying effect of wind, sun and high temperature as soon as the concrete has hardened sufficiently to avoid its surface being marred, it will be covered with burlap, damp sand cotton or other approved material. Such material will remain on the concrete for seven days and during this time it will be kept thoroughly saturated by spraying at such intervals as may be necessary.
- i. Concrete curing and protection.**
- A. General: Initial curing shall begin as soon as free moisture has disappeared from the concrete surface after placing and finishing. Curing shall be continuous for 14 days. Only sweet water shall be used for curing, as per contract specification.

B. Curing Method: Provide moisture curing for all concrete by any of the Following methods:

1. Keeping the surface of the concrete continuously wet by covering with water.
2. Continuous water-fog spray.
3. Covering the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet. Place cover so as to provide coverage of the concrete surfaces and edges with a 100 mm lap over adjacent absorptive covers.

C. Curing formed surfaces: Moisture loss from surfaces placed against wood form or metal forms exposed to heating by the sun shall be minimized by keeping the forms continually wet until they can be safely removed. After form removal the concrete curing period shall continue as specified above.

3.0 PRE-CAST CONCRETE ELEMENTS

N/A

4.0 INSTALLATION OF CONCRETE MASONRY UNITS

4.1 Concrete blocks are used for construction. The following submittals will be made before taking this work complying the specification & codes of project specifications.

- a. Detailed Drawings/Shop Drawing's
- b. Certificate of compliance

4.2 Concrete masonry units brought from the approved manufacture will be stored on raised pallet racks and will be protected from weather, soiling and damage.

4.3 QC will take care that all surfaces of the block will be flat and rectangular opposite faces will be parallel.

4.4 All units will be uniform in size and weight. The bedding surfaces will be right angle to the face of blocks

4.5 Mock-ups for the wall type on site will be prepared for approval from Client/Consultant.

- 4.6 Before the start of masonry work, one sample of mortar or grout will be taken to see that the results will have specified minimum compressive strength.
- 4.7 Concrete masonry units will be flushed-up in water before use and laid in stretcher bond jointer. Half units, bonds beam units, open end units, concerns, lintels, jamb, sash, header and other shapes necessary to property complete the work will be provided.
- 4.8 The average thickness of all horizontal and vertical mortar joint will be 10 mm thick and where wall face will be plastered will be racked out to from a key. Wall shall be carried out evenly course by course.
- 4.9 Horizontal & Vertical reinforcement will be placed as applicable in project specifications and standards.
- 4.10 Concrete masonry units will be placed maximum of up to six layers. Further work will proceed only with the inspection and satisfaction of Client/Consultants representative .
- 4.11 Joints will be treated concave for exposed masonry and flush for concealed/covered masonry.
- 4.12 Fixing of built in / special items to be carried out as the work progress and after close coordination with other trades.
- 4.13 Sufficient formwork, scaffolding will be provided to carry out the work for further heights.
- 4.15 Curing of concrete masonry units will be carried out as per contract specification.
- 4.16 BITC will ensure that the finish walling will not be damaged by subsequent operations. All newly or partly built walls will be protected with proper shades against drying out in the sun's heat.
- 4.17 Expansion joints and control will be provided as per the approved

5.0 PLASTER WORKS

- 5.1 The following submittals will be made before taking this work
Complying with the specification & codes as per project specifications.
- a. Detailed Shop drawings.
 - b. Samples of all plastering accessories.
 - c. Mock-up for approval.
- 5.2 After cleaning the surface properly, preparing works will be done prior to plaster.
- 5.3 Installation of plaster accessories to the location and indicated I approval types.
- 5.4 Attached accessories securely to plaster bases to hold accessories in place and align properly during plastering.
- 5.5 After Inspection and approval from Client/Consultants representative BITC proceed for plaster base coat.
- 5.6 Finish coat will be applied after 7 days of base coat. Surface of base coat shall be uniformly damp when finish coat is applied.
- 5.7 Plaster will be cured for minimum of 24 hours on interior and 48 hours on exterior to assure hydration. Shades will be provided if required to protect the moisture.

6.0 HOLLOW METAL DOORS, WOODEN DOORS & OVERHEAD DOORS

- 6.1.1 Shop drawings, all details, installations instructions. prepared by Client / Consultants approved manufacturer will be submitted to Client / Consultant's engineer representative for its review & approval.
- 6.1.2 Hollow metal units will be protected from damage during transit, storage and installation. Materials will be stored in a dry location of the ground and in such manner as to prevent deterioration.
- 6.1.3 Care will be taken to mark finish floor level, correct opening & door position, concealed items are considered.
- 6.1.4 Hollow metal door frames will be set at correct locations as shown on approved drawings in perfect alignment and elevations, plumb level, straight and true.

- 6.1.4 Anchorage will be extended below tills and finishes. Anchors will be welded to frames in fabrication shop. Eight or as per approved drawing self-tapping pan head framing screws per bucket will be fixed to steel studs and left open for inspection.
- 6.1.5 Hollow metal door leaves will be hanged using the specified and approved type and no of metal hinges as shown on the drawings and approved schedules.
- 6.1.6 Dimensional clearances and tolerance at jambs threshold under cuts, heads, meeting stiles etc are maintained.
- 6.1.7 Touch up with approved primer to metal doors and frame will be given where patched puttied or filled.
- 6.1.8 Specified hardware in accordance with item manufacturer's instruction and recommendations will be installed or fixed.
- 6.1.9 Item which are not to be painted will be protected with tape. Care to be taken that painting does not inhibit or cause binding of door & frame.

6.2 WOODEN DOORS

- 6.2.1 Shop drawing showing sizes, elevation of each kind of door, door schedule, detail of construction, fire ratings, requirements for factory finishing and other useful data shall be submitted and approved by client / consultant.
- 6.2.2 Samples of each type of wooden door to be used i.e. transparent finished doors plastic laminate faced doors, teak veneer faced doors and shop finished doors shall be submitted and subject for approval by the client.
- 6.2.3 Doors which are not conforming to the Specifications shall be rejected.
- 6.3.4 Proper handling, storage, shall be observed to prevent damages.
- 6.3.5 Timely installation of doors is required and it shall be coordinated with all related construction activities.
- 6.3.6 Install fire rated doors in corresponding fire rated frames in accordance with Specifications.

6.3 OVERHEAD DOORS

- 6.11 Manufacturers pre-qualification together with product data, roughing in diagrams, installation and operating instructions, and details shall be submitted and approved by client / consultant.

- 6.3.2 Door curtain overhead coiling of interlocking slats designed to withstand required wind loading cold rolled galvanized steel sheets and phosphate treated before fabrication end locks shall be riveted and installed alternately to avoid lateral movement
- 6.3.3 Provide weather seals at door heads 3mm thick continuous sheet secured to inside of curtain coil hood and 3mm thick continuous strip secured to exterior side of the jamb.
- 6.3.4 Counter balance barrel shall be hot formed structural quality carbon steel or seamless pipe with deflection of not more than 2.5mm/m brackets shall be cast iron or cold rolled steel plate with groove for curtain and steel hoods shall be 0.6mm hot-dip galvanized steel sheet of G90 Zinc coating Overhead doors shall be ferrous metal and galvanized surfaces, rust inhibitive primer shall be completed prior to delivery and finishes shall be done on site.
- 6.3.5 Electric door motor type shall be bracket mounted door operator with an electric motor having high starting torque, reversible, constant duty, class. A insulated over load protection, sized to more door in either direction, from any position at not less than 200 mm/sec nor more than 300mm/sec. motor shall be totally enclosed, non ventilated, fitted with plugged drain and control.

7.0 ALUMINIUM DOORS & WINDOWS

- 7.1.1 Shop drawing for the fabrication and installation of aluminum doors and windows showing associated component of the work, schedule, elevations at 1:20 scale shall be submitted and approved by client / consultant.
- 7.1.2 Manufacturer's pre-qualification, product sample, product data shall be submitted and approved by client / consultant.
- 7.1.3 Aluminum extensions shall be corrosion resistance, and shall match the Specifications.
- 7.1.4 Aluminum sheets and strips shall be as recommended by approved manufacturer for strength, corrosion resistance, abrasion resistance, application for required finish and control of color.
- 7.1.5 Color coating shall be of controlled aluminum alloy and temper suitable for receiving an electro-statically applied color coating.
- 7.1.6 Structural steel accessories shall be as approved by the consultant.

- 7.1.7 Provide metal for hardware reinforcements of stainless steel, or steel with a hot dipped galvanized finish and secure by welding or stainless steel screws.
- 7.1.8 Metal tamper proof and glazing beads, vinyl inserts and glazing gaskets for securing glass, shall be provided and no fasteners shall be exposed.
- 7.1.9 Doors and windows shall be installed level and not twisted, assemblies are plumb and dimensional tolerances shall be maintained.

8.0 FLOORING & CLADDING WORKS

- 8.1.1 Shop drawings showing the set out, dimensions, sections, and other requirements in coordination with floor finishes drawing shall be submitted and approved by client / consultant.
- 8.1.2 Submit specification and other data for each type of stone work required.
- 8.1.3 Submit sample and mortar for client / consultant approval
- 8.1.4 Installation shall be coordinated with all related activities.
- 8.1.5 Sub-base shall be clean and free from dirt, dust or any loose particles that makes the surface uneven.
- 8.1.6 Do not exceed 2mm thickness slush coat and it must be 15 minutes prior to setting bed.
- 8.1.7 Part of sand and 1 part of Portland cement shall be used for setting bed. Enough water to moisten the surface shall be applied and spread and screed to a uniform 40mm thickness.
- 8.1.8 Joint shall not be more than 6mm wide and covered by creamy mix of 2 part of sand and Portland cement.
- 8.1.9 Pointing mortar shall be cured for 7 days by maintaining moist condition.
- 8.1.10 Do not permit traffic on horizontal stone surface during setting of units for at least 24 hours after final pointing of joints.
- 8.1.11 Not less than 6 days after work completion, stone work shall be cleaned.

8.2 CLADDING

- 8.2.1 Submit cutting and setting coordinated shop drawings showing sizes, dimensions, sections and profiles of stonework units, arrangement and provisions for jointing and installation and other necessary details for lifting devices and reception of other work. Indicate location of each stonework unit on setting drawings with number designation corresponding to number marked on each unit.

- 8.2.2 Submit specification and other data for each type of stonework required, including certification that each type complies with the specified project requirements. Include instruction for handling, storage, installation and protection of each type.
- 8.2.3 BITC shall submit sample of each type of stone shall match in color, grade, texture and finish the units to be delivered and installed together with samples of mortar (and color if required) of each type of stonework required.
- 8.2.4 Sealant shall be two-part polysulphide applied to joint primed manufacturers recommended primer. Supply sealant and primer shall be from the same source.
- 8.2.5 Anchor bolts, nuts and washers shall be fabricated from stainless steel or low carbon steel bolts and nuts and hot dip galvanized.
- 8.2.6 Fabrication shall be detailed on approved shop drawings and in compliance with the recommendations of the applicable stone association. Provide holes and shrinkages cut or drilled for anchors, as necessary to secure stonework in place. Cut and back-check as required for proper fit and clearance. Shape beds to fit supports.
- 8.2.7 Prior to installation stones shall be cleaned before setting by scrubbing with fiber brushes and thoroughly drenched with water and it shall be done by experienced workmen of the trade employing skilled stone fitters at the site for necessary field cutting as stone is set.
- 8.2.8 Installation shall be coordinated with all related activities and consider weather condition.

9.0 INSTALLATION OF FLOOR CERAMIC

- 9.1 Prior to proceeding a close supervision will be made to make sure that:
- a. The substrate is structurally sound and surface are even and free of cracks.
 - b. Walls are aligned within specified tolerances and with square corners.
 - c. To make / correct any unsatisfactory conditions.
 - d . Requirement of water proofing areas are identified.
- 9.2 Shop drawings, manufacturer's standard color chart, data, certificate of compliance along with the samples of Tiles & Grout will be submitted to Client / Consultant's Engineer representative for review & approval.
- 9.3 The floor is thoroughly cleaned to remove grease, oil, loose material or any other substances that might interface with proper bond of primer and tile adhesive. The concrete substrate can be damp but not wet.

- 9.4 Mortar adhesive will be applied in thin layers evenly in order to obtain a uniform thickness.
- 9.5 Tiles will be laid in pattern wing fields both directions in each space or on each wall area will be adjusted to minimize tile cutting. Uniform joint widths will be used. Run of slope shall be maintained to the outlet direction, to the drains or when client, consultant required.
- 9.6 Tile work will be extended into recesses and under equipment and fixtures in the spaces scheduled to receive.
- 9.7 Work at obstructions, edges and corners will be neatly terminated without description of pattern of joint alignment.
- 9.8 Care will be taken that the expansion and control joints are considered as per drawings and joint fillers and sealant are installed, as per recommended by manufacturer.
- 9.9 Metal edge strip will be installed where indicated, where there is change of floor finish and where edge is raised above base flooring to meet the future floor covering.
- 9.10 The tiles will be cleaned with the cleaners recommended by Tile manufacturer and protected during and after the work, before the usual inspection.
- 9.11 Compressive strength and absorption level of ceramic and terrazzo tiles shall be included on material submittal's product data.

10.0 INSTALLATION OF CERAMIC WALL TILES

- 10.1 Preparation of submittals/approval of materials will be made before taking up the work.
- 10.2 The surfaces where the wall finishes are applied will be carefully examined and all unsatisfactory conditions will be corrected.
- 10.3 Ceramic floor tiles, removed from its package will be allowed to acclimatize to the area of installation 24 hours before application.
- 10.4 Center line of all walls will be marked and ceramic tile of approved quality is installed in such a way that no tiles are left less than half tile.
- 10.5 Will be placed consecutively in the order they are cut with the approved adhesive vertically to true line plumb.

- 10.6 Ceramic floor tiles will be installed with an ultimate substrate bond, smooth, clean, without blisters, wrinkle gaps, air pockets, or overlaps. Excessive adhesive is removed and kept clean surfaces before final installation.
- 10.7 Materials for grouting could be either pre-blended compound composed of Portland cement or additives formulated for the type of tile installed or latex Portland cement grout.

11.0 THERMAL AND MOISTURE PROTECTION

- 11.1 BITC will appoint a specialist Subcontractor to execute the job of Thermal and Moisture Protection for each of the building.
- 11.2 The roof surfaces to be covered will be smooth, hard, dry and free from high spots and depressions. Roof surfaces will be swept clean and free dust, loosened cement scale, oil, grease, foreign substance and debris.
- 11.3 Roof surfaces will be examined for opening holes or services which might allow asphalt adhesives or sealant to drip or flow through the deck and vertical projections. Such openings will be filled or covered before any roofing material is applied.
- 11.4 The roofing membrane shall be fiber reinforced and loose laid over the Intermediate membrane without stretching. Sheets of the membrane will be positioned to provide a minimum of 100 mm edge lap with adjacent sheets. Sheets will be permanently joined at the overlap with splicing cement and in seam cement as recommended.
- 11.5 Install membrane strips for reinforcements which are fiber reinforced and have high elasticity at roof cant strips.
- 11.6 Sheets will be fastened at perimeter of each roof section and parapet wall by means of rubber fastening strips.
- 11.7 Parapet flashing will be provided and installed as recommended, The splice between the flashing and the membrane roof sheets will be sealed with laps slant before flashing bounded to the vertical surfaces with bonding adhesive.
- 11.8 Insulation will be installed over the roofing membrane as recommended all insulation shall be dry when installed. Insulation board shall be laid with joints staggered between parallel courses.
- 11.9 Insulation will be tapered around roof drains. Gravel stops, protective mat and ballast will also be provided as part of thermal and moisture protection as recommended.

12.0 PAINTING

- 12.1 This section covers painting where indicated on the drawings, where required and as specified herein.
- 12.2 Manufacturer's standard color chart, data, submittal for paint coating system, samples color panels will be submitted for review and approval.
- 12.3 The following notes will be taken care while painting.
- a. Paint dry surfaces only.
 - b. Paint only under suitable weather (free of sand and dust)
 - c. Cover/protect surfaces not regarding paint.
 - d. Fill dents, cracks, hollow places, open joints and other irregularities, with a filler suitable for the purpose and after setting, sand to smooth finish.
 - e. Do not exceed paint manufacturer's recommended coverage per liter.
 - f. Apply paint with care to a uniform and proper film thickness shoving no runs. holiday's sags crawls or other defects.
 - g. Apply paint with brush/rollers with a minimum of Brush marks and finish surfaces in a uniform sheen color and texture to match approved sample.
 - h. Allow coats to dry thoroughly before subsequent coats are applied unless otherwise specified/recommended allow minimum 24 hours between coat applications.
 - i. Prime surfaces not more than 8 hours after cleaning.
- 12.4 Care to be taken that the dry film thickness for each finish type including prime and finish coats is not less than the total dry film thickness recommended by the manufacturer.
- 12.5 Cleaning of all the surfaces not requiring paint will be done arid entire job will kept clean before the usual inspection.

13.0 INSTALLATION OF UNDERGROUND POTABLE WATER LINES- EXTERIOR

- 13.1 BITC will carry out survey with Client/Consultant representative for tie in points and make aware of the existing gate valve, underground utilities and other.
- 13.2 Installation drawings shall be submitted showing the required invert elevations, width of trenches etc. prior to work execution.
- 13.3 Thorough check up of the trenches marking shall be made given due considerations to the width and depth of the excavation required.

- 13.4 Prior to excavation, a permit will be secured by us from Client/Consultant representative and ensure that the equipment to be used are readily available.
- 13.5 Pipes and fittings to be used will be examined and ensure that they conform with the approval.
- 13.6 Check delivered materials are stocked properly, area is that stable ground and does not contain any corrosive material, no cracks on internal lining etc.
- 13.7 Ensure bedding is neatly done prior to pipe laying and check hydrostatic testing, submit checking request to Client) Consultant to witness the test.
- 13.8 See to it that backfilling/compaction is done in accordance with the specifications.
- 13.9 Flushing i Chlorination shall be checked and witness sampling by the designated independent testing laboratory representative together with Client/Consultant Engineer.
- 13.10 Submit results to Client/Consultant.

14.0 INSTALLATION OF UNDERGROUND GRAVITY SEWER LIYES- EXTERIOR.

- 14.1 BITC will carry out survey with Client /Consultant representative for tic in points.location of manholes, and other underground utilities.
- 14.2 Installation drawings shall be submitted showing the required elevations, width of trenches prior to work execution.
- 14.3 A Thorough check-up of the trenches markings shall be made given due considerations to the width and depth of the excavation required.
- 14.4 Prior to excavation, a permit will be secured by us from Client/Consultant representative and ensure that the equipment to be used are readily available.
- 14.5 Pipes and fittings to be used will be examined and ensure that conform to the approval.
- 14.6 Check delivered materials are stocked properly.
- 14.7 Ensure bedding is properly done prior pipe laying and check gravity testing, submit checking request to Client! Consultant representative.

14.8 Brick tiles, warning tapes and leakage test shall be done prior to backfilling. See to it that backfilling is done in accordance with the specifications.

14.9 Flushing, tie in and function shall be checked & witness by Client/Consultant representative.

15.0 PLUMBING - INSTALLATION OF DRAINAGE PIPES – INTERIOR

15.1 Setting out of drainage pipe will be checked prior to excavation giving due consideration to excavation giving due consideration to width and depth of trenches.

15.2 Installation drawings shall be submitted showing the required elevations & width of trenches prior to work execution.

15.3 A permit will be secured by us from Client/Consultant representative prior to excavation.

15.4 Pipes and fittings to be used shall be examined and ensure they conformed to the approval.

15.5 Checked delivered materials are stocked properly.

15.6 Bedding is properly done prior to pipe laying and check gravity testing, submit checking request to Client / Consultant representative.

15.7 See to it that backfilling is done in accordance with the specifications.

15.8 Flushing shall be checked & witness by Client / Consultant representative.

16.0 INSTALLATION OF HOT & COLD WATER PIPING SYSTEM

16.1 Setting out of pipe routes both under and above ground shall be checked prior to work execution.

16.2 Installation drawing shall be submitted and ensure that approval is on hand.

16.3 Materials to be used shall be examined and ensure that conformed to the approval. Checked delivered materials are stocked properly

- 16.4 Check for straightness, slope to the installed piping, if properly executed, no rupture if exposed joints is visible.
- 16.5 Check hydrostatic testing, submit checking request to Client/ Consultant representative to witness the test.
- 16.6 Flushing and chlorination shall be checked by the Client I Consultant to include sampling by the designated independent testing laboratory representative.
- 16.7 Support sleeves, seals, expansion joint shall be performed as per specifications.
- 16.8 Submit result to Client/ Consultant.

17.0 INSTALLATION OF PLUMBING FITTINGS AND FIXTURES

- 17.1 Manufacturers product data, sample, set out drawings shall be submitted for client/consultant approval.
- 17.2 Ensure that the delivered materials and fixtures conformed to the codes and standards as per technical specifications.
- 17.3 Toilet tissue dispensers shall be recessed-mounted multi roll dispenser, shall be as per contract and specifications.
- 17.4 Liquid soap dispensers shall be installed below basin, rigid polyethylene translucent with 0.47 liter capacity.
- 17.5 Warm air driers, towel bars, perennial spray, grab bars, and mop and broom holders shall be as per contract and specifications.
- 17.6 Conduit functional test after flushing witnessed by the client / consultant.

18.0 INSTALLATION OF FIRE FIGHTING SYSTEM

- 18.1 Ensure that the installation drawing is on hand.
- 18.2 All material delivered shall be checked if they conformed to the approval.
- 18.3 Verify pipe routing and supports to be as approved shop drawing.
- 18.4 Check pipe alignment and slope on horizontal pipes for complete drainage of the system.
- 18.5 Flushing and hydrostatic system shall be checked and witnessed by Client/Consultant representative.

18.6 Initial testing shall be done by the authorized representative of the supplies of fire fighting materials.

18.7 Request for the inspection shall be made during the time and commissioning to be performed by the supplier's engineers.

19.0 DUCT BANKS AND UNDERGROUND CONDUITS.

19.1 A survey shall be carried out as the location of the existing manholes along with Client Consultant inspector.

19.2 Setting out the routing of the trenches shall be done as per approved drawings and shall be checked by us as well with the Client / Consultant inspector.

19.3 Trenching shall be carried out to the required depth either manually or with machine so as to comply with the notes of the excavation permits.

19.4 Polyethylene sheet is used as barrier between soil and concrete.

19.5 The approved conduits / fittings cement shall be installed so as to provide a minimum slope of 75 mm (3 inches per 30 m (100 ft)) towards hand- holes and manholes.

19.6 Necessary precautions shall be taken to prevent accumulation of the water inside the conduits.

19.7 The grounding conduct shall be installed before pouring of concrete.

19.8 The top of the duct banks concrete shall be painted with red color.

19.9 Conduits shall be properly spaced by using the approved type of spacers and it shall be distributed properly to avoid bending of conduits.

20.0 CONDUITS EMBEDDED IN CONCRETE SLABS AND UNDER FLOOR SERVICE CHANNEL

20.1 Approved shop drawings and approved materials shall be used throughout the execution of work.

20.2 Accurately mark the location of the stub outs at walls, equipments etc.

20.3 Care is to be taken that not more than 3 numbers of 90 degree bends are used. 50 mm diameter and above shall be limited to 2-90 degrees bends.

20.4 Conduits crossing expansion joints shall be provided with expansion fittings.

- 20.5 Ensure that the template installation meets the required standard practice and workmanship.
- 20.6 Ensure that all conduit runs have been checked for any blockage and clean before pulling any wire.
- 20.7 Double check all joints prior to concrete pouring.
- 20.8 Provide caps to stub outs prior to concrete pouring.
- 20.9 Floor service channel shall be covered with steel chequered plate. It shall be flushed with the finish floor level.
- 20.10 Cable, cable trucking for all utilities inside the service channel shall be attached properly to the channel wall. From gridline 15 to 24, conduits are to be laid inside service channel and from grid 24 to 32, conduits shall be laid on the cable tray hanged on the bottom of first floor level.

21.0 SURFACE MOUNTED CONDUITS

- 21.1 Ensure to follow approved shop drawings and use only approved materials.
- 21.2 Survey the exposed conduit routes where it shall be perpendicular or parallel to walls and beams. Ensure that the routes are properly coordinated with other disciplines.
- 21.3 For conduit work proper tools shall be used.
- 21.4 The supports shall be properly installed and correct type of fittings shall be provided as required.
- 21.5 Exposed end shall be plugged till wiring is done. Conduit markers are installed.
- 21.6 At expansion joints, provide expansion fittings and make sure that it is effectively bonded to continuous grounding.
- 21.7 Conduits runs shall be snugly installed on surfaces. Where gaps are unavoidable, use the correct type of support.

22.0 CONDUITS IN CMU WALLS

- 22.1 In all concrete masonry units (CMU) walls, galvanized rigid steel conduits (RSC) shall be used.
- 22.2 Appropriate size of conduits shall be installed at pre marked locations.
- 22.3 The walls shall be cut by cutting wheel using grinding machine.
- 22.5 The appropriate type of tools shall be used for the type of work, and only as to its purpose of use.
- 22.6 Existing stub outs shall be cleaned and marked. The layout of conduit distribution shall be strictly followed.
- 22.7 Mounting height of boxes shall be properly checked and to correct its position.
- 22.8 The plaster thickness shall be counted when installing the boxes so that the end cover of the electrical device will fit correctly. Use extension box is necessary.

23.0 CABLING AND WIRING

- 23.1 Inspect the building wires and cables prior to installation. It must have the complete markings as per the project specifications.
- 23.2 Merger test and check the continuity of the wires and cables. Refer to the project specifications for the standard resistance values at certain voltages in checking the allowed insulations resistances.
- 23.3 For cable pulling check the manufactures data for the allowed maximum pulling tension.
- 23.4 Put pulling compound in the conduit prior to pulling cables. Pulling compound must first be submitted for approval before use.
- 23.5 At circumstances where winch machine will be required to pull the cables, extra precautions shall be required so that the machine will not exceed the pulling tension. The machine must first be inspected and approved prior to use.
- 23.6 All feeders and branch circuits shall be color coded. Provide colored shrinkable tubes at terminals to match the color coding of the cables.
- 23.7 All conduits and ducts shall first be cleaned by using blowers with applied pressures prior to pulling of cables.

23.8 Cable in pull boxes, manholes, hand holes, cable trays & cable ladders shall be provided with approved type of tag to identify the destination of the cables.

24.0 PANEL BOARDS

24.1 Check the completeness of the panel boards and it must comply with the project with the project specifications, approved shop drawings and submittals.

24.2 Check the bus bars which must be color coded.

24.3 The voltage and current ratings, short circuit ratings of both main and branch circuit breakers, the lug sizes for cable terminations shall be checked.

24.4 Right locations and height shall be vertical and to be marked on the wall.

24.5 The panel board must be fixed squarely on the wall by using a level.

25.0 LIGHTING

25.1 Check the lighting fixtures if it complies with the approved specifications and submittals.

25.2 Check of any damage and replace it with a new one.

25.3 For lighting fixtures with fallout, check the decibel and it must comply to specified noise level.

25.4 Upon delivery at site, the lighting fixtures must be placed & stored in a safe place where it will not be subjected to physical damage and moisture.

25.5 The conduits / flexible conduits from junction boxes to lighting fixtures shall be installed as per the standard engineering practice.

25.6 Installation heights, grounding connections, vertical and horizontal alignment shall be ensured.

25.7 Required testing procedure shall be carried out using calibrated LUX meter.

IV. QA/OC MANAGER'S RESPONSIBILITIES:

1. Implement a Management system that ensures conformance to specified requirements.
2. Perform a system review to ensure that the quality system is suitable and effective.
3. To ensure that the quality plan is implemented and the activities meet contractual requirements applicable code and standards.
4. To assist in preparation of Inspection and Test plan (ITP) along with record to be used for major activities on this project.
5. Coordination with all relevant departments in connection with Quality matters.
6. To ensure effective Inspection? Testing carried out by inspector/technicians as per latest approved drawing, specifications, submittal, QC plan, etc.
7. To ensure quality records/document as required by the contract is maintained.
8. To assist the QC inspector in order to resolve the quality related by problem on site.
9. To ensure all inspection! testing required are carried out and approved prior matters are concerned.
10. Issue nonconformance reports when necessary and to follow up for its agreed disposition to close out the NCR.
11. To manage quality control staff efficiently and effectively wherever quality matter are concerned.
12. To coordinate with the consultant in order to resolve quality related problem on site.
13. To assist the QC engineer to prepare daily QC report as per requirements.
14. To ensure proper coordination with the testing laboratory to carry out the test reports.
15. To ensure off-site inspection is managed properly when required.
16. To ensure proper and effective coordination is developed with the consultant related to Inspection and Quality Control.

V. QC ENGINEER'S RESPONSIBILITIES:

17. To inspect the work as per specifications, latest approved drawings.
18. To carry out all inspections, witnessing, monitoring, surveillance etc. as per requirements of inspection and test plan (TIP)
19. To verify the work being implemented on the job site complies with the requirements of the latest approved drawings and specifications.

20. To check and verify that the latest approved documents are being used at the work place on site. All drawings stamped “for construction” are at the work place and must be of latest version/revision. Other than “for construction”, drawings shall be removed from the work place and shall be well identified.
21. To coordinate with the production personnel at all stages of work when quality is involved.
22. To check with the documents control register the status for all relevant documents and latest version/revision such as, shop drawings, as-built, change request, method statement, material submittals, procedures etc.
23. To liaise with the consultant when required to carry out inspection and obtain approval as per request for inspection for an activity.
24. Report to the QA/QC Manager when quality related problems are not resolved on site.
25. To ensure safety is practiced on site, any safety hazard noticed shall be reported to the safety officer and concerned personnel on site, Initiated to rectify/clear the hazard.
26. To report immediately any non conformity observed/noticed on site to the concerned personnel for immediate rectification/correction. In case rectification/correction is not possible immediately then a written report shall be made to the QA/QC Manager.
27. Write daily brief QC reports highlighting inspections carried out, observations, deficiencies, rectification and action taken by the QC Engineer.
28. To check and verify all materials to be used on the project are approved by the consultant prior any applications and submit MIR to the consultant.
29. Control the delivery time of concrete.
30. Approval of concrete delivered to site should be done prior of casting.
- 31.. To follow the NCR’s issued by the consultant or P.M

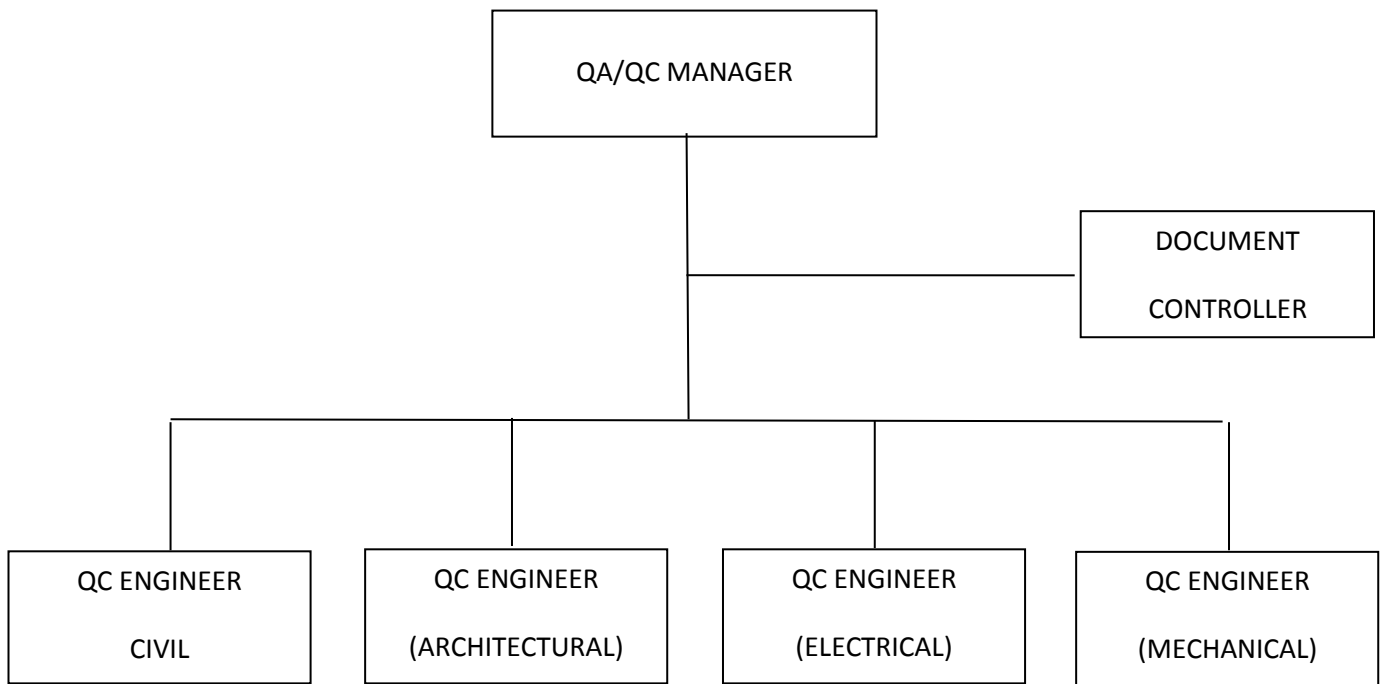
VI. ORGANIZATION:

The Quality Assurance /Quality Control organizational chart shows the titles and reporting relationship of all QA/QC personnel. The QA/QC Manager is responsible for managing a system for quality control, which monitors and verifies the implementation of the Drawings, Specifications and Quality Plan. The QA/QC Manager reports to the Project Manager (Organization chart). Individual Qc Engineers shall perform inspections as directed by the QA/QC Manager in accordance with the Inspection and Test plans.

All QC personnel have the responsibility and authority to identify and verify the compliance with the drawings and specifications. Where deficiencies are observed, QC personnel shall verbally notify the appropriate production personnel to obtain immediate rectification.

Where immediate rectification is not possible, the QC person shall record it in the inspection record for action at later date. For simple readjustments and rework, this shall be recorded in the inspection request report. For significant deficiencies, a system of non conformance reporting shall utilized and lead consultant agreement to corrective action as required.

Submit the above mentioned NCR form for client/consultant review and approval.



VII. QUALITY PROCEDURE:

This procedure describe the requirements for steps by steps procedure in quality controlling which all checklist will be documented and controlled for proper sequence as required by the consultant.

1.1 WORK INSPECTION PROCEDURE:

- 1) QC Engineer for each discipline to check the work and verified prior to the inspection of client/consultant.
- 2) QC Engineer to obtain the approval from all discipline engineers prior to ordering of concrete.
- 3) Do not place concrete in any pan of the works until the client/consultant's approval is received.
- 4) QC Engineer should verify the exact concrete to be ordered.
- 5) QAJQC Plan should mention the authorized person to order the concrete quantity
- 6) The QC Engineer to ensure that fresh concrete is not poured against cast in place concrete which has been in position for more than 30 Minutes unless construction joint is formed in accordance with this specification.
- 7) When concrete placing is interrupted for any reason and the duration of the interruption cannot be forecast or is likely to be prolonged. QC Engineer to take the necessary action to form a construction joint so as to eliminate as far as possible feather edges and sloping top surfaces and compact thoroughly the concrete already placed.
- 8) Verify products incorporated with the works conform to submit data And contract requirements and that necessary materials and Equipment are readily available.
 - a. The QAJQC Manager should transmit to client/consultant the following steel reinforcement procedures;
 - a. The Manufacturers mill certificate for ultimate strength, elongation and cold bending together with the chemical analysis of the steel may be called for by the Engineer for any consignment of reinforcing steel direct from the Manufacturers'.

- b. Where steel is obtained from an indirect supplier. the Engineer may require test in an approved laboratory to prove compliance with the appropriate American Standards.
- c. Any reinforcement which does not comply with the Specification will be removed immediately from site.
 - c.1 Release to pour inspection
 - c.2 Field Density Test for Backfilling
 - c.3 Concrete Sampling, Curing & Testing procedure
 - c.4 Electrical Inspection
 - c.5 Mechanical Inspection
 - c.6 Architectural Inspection

1.2 Survey Procedure:

1. Prior to establish a layout for survey, the survey engineer will coordinate to the QA/QC Engineer for the following procedure.
 - a. To prepare and coordinates points to the building/site and to be submitted to client/consultant for approval.
 - b. The QA/QC Engineer shall submit the calibration test result for the survey Engineer.
 - c. The QA/QC document controller will keep record & files for all survey works for audit finding report purposes.
 - d. All temporary construction movement establish on site/perimeter will be check closely for further control of elevation and oordinates.

Check list

- 1.1 Checklist will be developed for each major activity requires inspection. This check list is based on the requirements of specifications, approved drawings, approved materials, checklist for relevant activity, approved method statement and approved relevant documents. This checklist is part of quality control inspection to verify on the work inspection request each individual requirement as listed on the quality control inspection portion.

The checklist will submit to the consultant for review and approval.

- 1.2 The Contractor shall submit to the consultant a Notification for Inspection prior to pouring of concrete with the approved mix design and attachment such as sketch, shop drawing prior to inspection.
- 1.3 The Document controller (contractor side) shall receive and sign all incoming documents or submittal and stamps to secure proper documents control, and any outgoing documents, letter, correspondents, notification1 inspection checklist, change request shall be forward to the consultant document controller.
- 1.4 Any revision or shop drawing shall be documented and forward to the consultant a transmittal form for an evaluation and comments.
- 1.5 Any Material/structure found for deficiency shall issued a non conformance report or hold point prior for final inspection. And without any action compliance to the issued NCR will be issued a corrective action report to a person involve to the project.
- 1.6 Preparation of daily QA/QC report for any activities on site, including Inspection checklist, comments for the consultant, non conformance ,shop drawing etc.
- 1.7 The Document controller shall prepare and submit a monthly process control sheet as required by the consultant and secure every minutes of meeting for internal documents.
- 1.8 The QC Engineer shall prepare an Inspection checklist for equipment material receiving report, and a photocopy of Material condition on site to be supported by checklist for any comments and to be transmitted to the consultant for evaluation and approval.
- 1.9 The QA/QC Manager shall provide a list for all personal documents of QC engineer supported by their duties arid responsibilities and a monthly training and evaluation performance as stated and required by the consultant.

1.10 Field Density Test for Backfill of Material

1.10.1 The field density test for backfill materials are controlled by the use of request Inspection form. A request for inspection is submitted by the QC engineer to the consultant to inspect the layer of backfilling

1.10.2 A field density test is performed according to approved standard, specification by the consultant, or ASTM D1 55D in site laboratory.

1.1 Concrete sampling, Cylinder curing and testing Procedure.

1.11.1 This procedure describes the quality requirements and required actions for taking concrete samples, curing of concrete cylinders and the procedures for testing concrete.

1.11.2 The QC Engineer will request a Notification (inspection checklist) to the consultant, is supplied to the laboratory, checklist will indicate time, date, package and structure of the pour.

1.11.3 When the concrete arrives at the site, the following tests are performed.

- a. Slump test according to ASTM C143
- b. Temperature check of concrete

1.11.4-If the test are within the acceptance criteria for the Design mix of The concrete, the concrete will be acceptable to be poured.

1.1 1.5-During the concrete pour, cylinder samples will be taken according to ASTM C31,C192,C172.

- a. One(1) sample of 8 cylinders will be taken for each 75m³ of concrete or as otherwise agreed with the consultant.

- b. Columns require one (1) set of three cylinders from each concrete mix.

1.11 .6 Each sample will be labeled by an identification label on the surface of the cylinder.

1.1 1.7 The cylinder samples will be moved to the Laboratory and removed from the mold and identified by writing on the cylinder.

1.11 .8 The sample will be placed in a curing tank and cured in accordance with ASTM C31/C3IM

1.9-Cylinder samples will be tested in accordance with requirements of ASTM 39 to the following schedule.

- a. 7days after concreting (3 cylinders)
- b. 28 days after concreting (3cylinders)
- c. 3 days after concreting (2 cylinders)

These are usually for the slabs for removal of props in slabs.

1.11.10 Results of compressive tests are to be recorded in the Laboratory log.

The results from the Laboratory log will be proided to the QA/QC Manager.

1.11.11 Hot weather concreting

- a) Use of sliced, flaked or crushed ice to reduce temperature of mixing water. All ice shall be melted before adding to concrete.
- b) Shading of aggregates
- c) Moistening of aggregates with potable water.
- d) Cooling of formwork and reinforcement
- e) Using cement with a temperature of less than 77°C.
- f) Use of white or light reflective paints on mixer drums and water storage tanks.
- g) Shading of the mixing area.

INDEPENDENT LABORATORY

Independent Testing Laboratory will perform all the related tests concern to BITC.

LIST OF TESTS TO BE CONDUCThD AT SITE

1. Moisture Contents
2. Sieve Analysis
3. Atterberg Limit
4. Field density test by Nuclear Method
5. Concrete slump and temperature test.
6. Compressive strength of concrete cylinder/cube
7. Casting of concrete cylinder/cube
8. Absorption and specific Gravity

9. Method finer than # 200
10. Clay lumps and friable particles

LIST OF EQUIPMENT PROVIDED ON SITE

1. Soil Testing Equipment's
 - Set of ASTM Sieves: 1½"M, ¼", #4, #10, #20, #40, #60, 100, #200
 - Atterberg Limit apparatus
 - Moisture cans and Drying pans
 - Laboratory Oven
 - Balances — Cento gram, Triple beam, Solution balance
 - Bucket for sample collection
2. Concrete testing/Sampling Equipment's:
 - Slump cone, rod, base plate, scoop with thermometer
 - Set of Concrete Cylinder molds (18nos.)
 - Compression Machine for Crushing of Conc. Cylinder
 - Melting pot with base plate (Client provide the capping compound for cylinder capping)
3. CPN Nuclear Gauge for compaction test

THE OFF SITE TESTS WHICH WILL BE PERFORMED BY THE INDEPENDENT LABORATORY

A. Soil

1. Sieve Analysis
2. Atterberg Limit
3. Modified Proctor (M.D.D.)
4. Max. & Mm. relative density
5. California bearing ratio (3 points soaked)
6. Field Density test by Sand cone method
7. Field Density test by Nuclear method
8. Consolidation
9. Direct shear

B. Concrete + Mortar

1. Slump and Temperature & casting of Cylinder/Cubes
2. Compressive Strength of Hollow Blocks (Gross)
3. Compressive Strength of Hollow Blocks (Net)
4. Compressive Strength of Kerb Stone including cutting
5. Compressive Strength of Cement Terrazzo Tiles — Flexural Strength
6. Compressive Strength of Conc. Cylinder with Capping
7. Compressive Strength of Concrete Cube
8. Concrete Mix Design (excluding Quality Control)

9. Mortar Mix design for Plastering (excluding Quality Control)
 10. Concrete coring including visual classification and testing
- C. Aggregates
- I. Sieve Analysis
 2. Material Finer than Sieve # 200
 3. Clay Lumps and Friable Particles
 4. Los Angeles Abrasions
 5. Specific Gravity and Water Absorption
 6. Soundness of Aggregate (by $MgSO_4$) 5 cycles
 7. Flakiness and Elongation
 8. Sand equivalent
 9. Dry Rodded Unit Weight
- D. Cement
1. Fineness of Cement by Sieve # 200
 2. Consistency & Time of Setting
- E. Asphalt
1. Marshal stability/flow (each set of 3)
 2. Loss of stability (each set of 3)
 3. Extraction and gradation of Asphalt Concrete mix
 4. Theoretical Specific Gravity
 5. Thickness and density of Asphalt core (including coring)
- F. Chemical Analysis
1. Sulfate, Chloride, pH
 2. Water Soluble Salt
 3. Organic impurities
 4. Potential Alkali Reactivity
 5. Type of Cement
 6. Cement content
 7. Chemical test of water for Concrete Purpose
- G. Steel testing
1. Tensile strength of steel bars (rain 3 bars test)
 2. Elongation of Steel bars (mm. 3 bars Lest)
 3. Bend test (mm. 3 bars test)
 4. Carbon test (mm. 3 bars test) time required two weeks

Electrical Inspection:

1.1 Purpose

This procedure describes the requirements of inspection of electrical Equipment

1.2 Types of Inspection.

To verify that electrical items are being located, assembled, or connected in compliance with the latest “Approved for Construction” drawings, Manufacturer’s instructions, and procedures .

1.3 Installation Inspection:

Checks should be performed to verify that electrical items have been correctly installed and will function properly so that the initial starting of items and pre-operational testing can proceed with a minimum amount of problems and delays.

1.4 Final Inspection:

Following the installation of electrical items, the checking inspection and Testing activities should be performed to verify that the Completed systems are in conformance with specified requirements.

This is a final verification that the requirements defined by drawing, specification and other contact documents are reflected in the completed installation/ it is also time to verify that field modifications and other changes made and controlled during installation activities have been incorporated in the As built documents.

Item	Activities	Responsibility	reference
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Request Process:

A. TECHNICAL INFORMATION

1. The Technical Group will supply QA/QC with Technical Approved construction drawings.
2. The Project Engineer determines one of the types of inspection. 1. in Progress, 2. Installation 3. Final

3. The Site Electrical Engineer fills out the Notification part of the form and attaches Supplemental inspection and test sheets To the WIR.
4. Send WIR package to QC. Site Engineer
5. The package should contain or reference all applicable drawings. Specification references Including descriptive interface drawings and or service drawings.
6. BITC QC reviews the QC WIR, for completeness and provides his signature on the form.
7. BITC QC then submits the package to the Consultant clerk.
8. The Consultants provides signature: date, time of notification received from BITC QC. The returns the package to BITC. QC.

WORK IN PROGRESS:

9. BITC QC will inspect the work areas and WORK IN PROGRESS by doing the following general Activities. Verify that electrical items are located, installed, Assembled or connected in compliance with the latest Approved for construction. Drawings.

Inspection performed should include as appropriate, but Not limited to the following:

- a. Item identification
- b. Location and orientation of components
- c. Level and alignment
- d. Clearances and tolerances
- e. Tightness of connection and fastenings
- f. Physical integrity
- g. Clearness
- h. Adequacy of protective measures to assure that the Item was not damaged during installation.
- i. Adequacy of house keeping, barriers, and protective Equipments to assure that the items will not be damaged Or contaminated as a result of adjacent construction Activities.

Note:

If a large complicated system is to be inspected, QC Engineer to spot check bolting and other repetitive steps Of installation. If the sample indicates correct installation Accept the whole.

INSTALLATION INSPECTION:

Installation checks shall be performed to verify the electrical Items have been correctly installed and will function properly.

These activities shall include as appropriate, but not limited To the following:

- a. Verification of installation correctness and the ability to function.
- b. Rotation of prime movers is correct.
- c. Electrical circuits control, and relay settings are correct.
- d. Phasing of electrical buses are correct.
- e. Instrumentation is calibrated and in service as required.
- f. Item is correctly valued and isolated.
- g. Proper communications are established for control
- h. Tags are issued, where appropriated, for isolation/control
- i. Limit switches, interlocks and stops are properly adjusted.
And set.

FINAL INSPECTION

BITC QC Checks and inspection should be performed to verify The operational readiness and completeness of components And systems, these systems should be identified. tagged and Released for operational testing.

These checks and inspection should be performed to verify The following:

- a. Equipment and material have not sustained external Physical damage.
- b. The installation has been made in accordance with the Specified requirements.
- c. All nonconforming items have been satisfactory dis-positioned.
- d. Internal and external restrictions and obstruction to Flow any full travel have been removed

- e. Supports and restraints are properly installed.
- f. Interfacing connections with adjacent system Compatible.
- g. Original materials and component identification Have been preserved with provisions for trace ability throughout the installed systems.
- h. Safety feature such as interlocks, cable separation Guards, working devices, and lockouts have been Installed.
- i. Snag lists preparation and corrective measures are Completed, operational check and final sign off.

RECORD.

Code	TITLE	Filing	Indexing	Retention	Location	No.
System	Method	Period				

1. QC WIR Loose WIR No. Until end QA/QC sheet Project File
2. Supplemental test/file w/ WIR No. Until end QA/QC Inspection sheet
QC wir Project Fi

Viii. NON CONFORMANCES

1.1 Purpose:

This procedure describes the Management of noncon forming conditions. The procedure provides for identifications, documentations, dispositions and rectification of the disposition and closure of a Nonconforming condition.

1.2 Scope:

A Non conforming condition is based on a deviation from the acceptability of contract specifications, drawings, procedures or accepted standards. A non conformance can be a material item, a process item and/or hardware item.

1.3 A NCR (Non Conformance Report) shall be initiated when a project personnel observes a non conforming condition during:

- a) The Inspection process
- b) Observations during monitoring the irk process.
- c) Direct notifications from Inspectors, consultants.
- d) Audit and surveillances.

1.4 When a Non conforming condition is identified during an inspection or test the QC Engineer or Test engineer shall fill out the NCR form.

1.5 When a Non conformance is identified from QA, Technical, Construction, and Consultant, the person who has made the nonconformance observation will report the non conforming condition.

1.6 The QAIQC Manager will have the information typed on a NCR form based on the data supplied from the observer.

1.7 The QA/QC Engineer or QAIQC Manager shall record the issuance of NCR form

- Package No.
- Location
- Issued date
- Drwg No./Specification reference.
- Issued by

1.8 The QC Engineer or the QA/QC Manager will give the draft of NCR to the Document controller for typing and the assignment of a NCR Number from the NCR tracking log.

1.9 The Document Controller will obtain the QC Engineers the NCR authors and/or QA/QC Manager's signatories, as applicable.

1.10 The QAJQC Manager will evaluate the NCR to determine if any nonconformance is a potential condition that requires a corrective action report to quality. If there is a need to issue a corrective action report (CAR), The QA/QC Manager shall proceed as required by procedure.

1.11 Internal Document:

The Document controller shall receive and stamp all incoming correspondents, letter, shop drawing, Non conformance and duly examine briefly the correspondent's type of Numbering system to be record and file in the record checklist on individual file rack and provide an individual copy of file index on every record.

1.12 Disposition:

The assigned technical Engineer will evaluate the NCR to determine whether one or a combination of the following can apply:

a. Accepted as is

If the actual condition meets the design requirements (the statement must state why it meets the design requirements from a Engineering stand point. This should be based on Engineering facts, calculations not opinion).

c. Repair

Provide a repair procedure that will bring the non conforming condition to the design requirements and to be sent to the proper authority or consultant for evaluation and approval.

d. Rework

Provide a procedure how to rework the installation to bring it to design requirements.

e. Reject

Provide a procedure how to remove the non conformance from the project

f. Scrap

Provide instructions how to scrap the non conforming materials.

1.13 Provide the name of the responsible person of the group assigned to take action for correcting the non conformance.

1.14 The Technical Engineer will send the copy of the disposition NCR to QA/QC.

1.15 The QA/QC will evaluate the disposition to determine whether the action is complete and correct.

1.16 The QA/QC Manager will provide an information copy to the Consultant that gives the Technical recommendations to the contractor's engineering.

1.17 Constriction shall then schedule this work to make the correction and confirm the name of a responsible person. They will state when they expect the work to be completed via a copy of the NCR.

1.18 When the construction work is completed, the construction shall send a copy of the NCR to QA/QC.

1.19 VERIFICATION:

- a. The QC Engineer shall verify that the work has been completed in accordance with the NCR disposition procedure
- b. Upon written notification on a NCR copy from the QC Engineer. QA/QC Engineer, the QA/QC Manager shall close out the NCR.

1.20 TRACKING OF NCR

The QA/QC Manager shall initiate and maintain a NCR tracking log to facilitate monitoring and closing out nonconformance in a timely manner.

1.21 MONTHLY REPORT:

The QA/QC Manager shall submit a monthly report to the owner, the Consultant, Project director and Project Manager that includes a listing of all NCR issued and closed in that month along with a short summary of each Nonconformance, stating the nature of and the corrective action taken to Correct each nonconformance.

A statistical analysis will be performed to determine a trend on repeating types of non conformance's. This will provide information for a trend report to be presented monthly.

IX. CORRECTIVE ACTION REPORT:

1.1 PURPOSE:

This procedure provides the method to implement corrective and preventive action for items that are contrary to the Quality Assurance requirements.

1.2 SCOPE

Corrective action encompasses:

- a. Effective handling of customer complaints and reports of the product nonconformities.
- b. Investigation of the cause of nonconformities relating to a product, process, and quality system and the recording of the results of the investigations.
- c. Determination of the corrective action needed to eliminate the cause of nonconformities.
- d. The application of controls to ensure that the corrective action is taken and is effective.
- e. Steps taken to prevent the same type of nonconformities from happening in the future.

1.3 I.3 GENERAL STATEMENTS:

- a. Any activity that is contrary to the requirements of the Quality Assurance Program will be recorded on a Corrective action Report(CAR) .
- b. There three (3) areas in the project that will contribute to issuance of a Corrective Action Report. (see scope)
- c. Those non conformities that are based on a very serious condition identified by a nonconformance report (car), which is based on process non conformance's and product problems from purchased material. (Responsibility QA/QC MANAGER).
- d. The QA/QC Manager will review the Corrective action and preventive action statements given by the responsible individual.
- e. QA/QC Manager will send a copy of the CAR signifying acceptance of corrective action and permission to implement corrective action.
- f. The QA/QC will request QA/QC Department personnel to provide follow up evaluation.
- g. If the follow up evaluation is approved, the QA/QC Manager will close out the CAR.
- h. The QA/QC Document controller will maintain a file by CAR Number and revision.

X. QUALITY RECORDS:

This procedure describes the quality assurance (QA) requirements for Collection, storage and retrieval of quality records generated by the owner/consultant and their Subcontractor's and vendors/suppliers, as applicable.

1.1 Record Collection:

- a. Quality records generated by the Construction.. Subcontractors, and vendors/suppliers are maintained by Quality records.
- b. The record holders shall ensure that the records are acceptable using the following criteria.
 - Record shall be legible and of reproducible quality.
 - Records shall be legibly identified with data as described in the procedures.
 - Records shall be submitted on durable paper or equivalent material such as film when there are negatives.

- c. For records such as computer tapes, diskettes or CD's where Requirements of 2 do not apply, the record submitter shall ensure that the records are properly identified and verified.

1.2 RECORD FILING AND STORAGE:

- a. Records should be filed and stored satisfactory in accordance with the file index established by Uniform file index.
- b. Records should firmly attach in binders or in folders or envelopes and protected from moisture, excessive heat or pressure.
- c. Records placed in storage shall be stored according to instructions given in each procedure. Records later superseded; made obsolete or withdrawn shall be maintained unchanged in the filing system.

XI. QUALITY ASSURANCE PROCEDURE:

This procedure describes the controls and quality requirements for the preparation, approval, and control of the Document distribution list and for the preparation and distribution of the Uniform file index. The procedure controls distribution and indexing as well as revisions thereto.

Preparation and Approval:

- 1.1 The Project Manager or Designee shall consult with the Technical Manager, QA/QC Manager, Project Engineers and others, as needed and shall prepare the Document Distribution List, and reflect distribution requirements indicated by quality procedures assurance program.
- 1.2 The QA/QC Manager shall review the Document Distribution List for adequacy when satisfied he shall sign and date the list as approver and shall transmit it to the Technical Manager.
- 1.3 The DDL shall then be distributed in accordance with the persons responsible for distribution of listed documents shall be indicated in appropriate quality procedures.

2.0 Process control sheet:

- 2.1 The QA/QC Manager shall ensure that all incoming and outgoing checklist, nonconformance, change request etc. shall be in a standard file index record log to secure proper document control.
- 2.2 The Inspection request records are developed specifically for the work in hand at the same time as the Inspection checklist and can include verification and comments boxes etc. they always make specific reference to the area of work inspected and to the drawings/specifications to which the inspection was performed.

Inspection checklist and completed forms are quality records of the works and are numbered and tilled in accordance with the agreed index.

3.0 DRAWING CONTROL:

- 3.1 .Upon receipt of an approved drawing, the Technical Manager or Designee shall update the Master drawing list with the current information, and shall arrange for distribution of the drawing in accordance with the document distribution list.
- 3.2 When an unapproved drawing is received, the Technical Manager or designee shall inform the submitter of the unacceptable status. The Technical Manager or Designee shall not process the drawing until approval has been received.
- 3.3. Approval drawings received from outside source shall be distributed for comments using comments transmittal form, and comments shall be resolved before the drawings are issued for construction.

3.4 Comments shall be requested from the Consultant using Transmittal form.

3.5. The list for submitted drawings shall be checked for accuracy and completeness. The Project engineer or designee shall indicate this verification by dated signature.

3.6. The Technical Manager or Designee shall resolve consultant comments.

3.7 Only construction issue