To:	**All Business Units, Consultants & Contractors**
Subject:	**CED Permits – Quality Control Section Procedures**
Our Ref:	**CIRCULAR-41468/2008/KIO**
Date:	**09, October 2008**

Dear All,

In order to streamline the Quality Control Inspection Process and add to the efficiency, we are pleased to provide you with the following documents pertaining to the process:

- Quality Section Procedure.
- A comprehensive checklist of some of the Quality Section major inspected items.

We are confident that your improved familiarity with our procedures and their various elements will help you communicate better with CED.

The documents referred above will be effective immediately and until superseded by a further communication.

Yours faithfully,

RASHID AL FALASI
SENIOR MANAGER –PERMITS
TRAKHEES – PCFC

Cc: M-file

CHECKLIST

PILES

[1] TESTING FREQUENCY

	Complying (Yes/No)	Remarks
1.1) Reinforcing Steel		
1.2) Concrete		
1.3) Slurry		
1.4) Pile Load Test (Dynamic)		
1.5) Pile Load Test (Static)		
1.6) Pile Integrity Test		
1.7) Cross Hole Logging Test		
1.8) Ultimate Load Test		

CHECKLIST

CONCRETE MASONRY BLOCKS

(Solid, Hollow, Light Weight, Hourdi)

Type of Blocks: Dimensions:

[1] MATERIAL APPROVAL

	(Yes/No)	Quantity	Remarks
1.1) Approved by the consultant			
1.2) Specifying the source name			
1.3) Source certified from DM			
1.4) DM Certificate provided with each delivery			

[2] TESTS (DMS1 Part 1:2003)

Performance requirements for Masonry Blocks	Complying (Yes/No)	No. of Specimens	Remarks
2.1) Dimensions			
2.2) Cl and SO_3 Content			
2.3) Compressive Strength			
2.4) Drying shrinkage			
2.5) Water Absorption			

[3] FREQUENCY OF SAMPLING AND TESTING

	Complying (Yes/No)	Remarks
3.1) Frequency of tests		

CHECKLIST

POLYSTYRENE SANDWICH BLOCKS

[1] MATERIAL APPROVAL

	(Yes/No)	Remarks
1.1) Approved by the consultant		
1.2) Specifying the source name		
1.3) Source certified from DM		
1.4) DM Certificate provided with each delivery		

[2] TESTS (DMS1 Part 1:2003)

2.1) Polystyrene core properties	Complying (Yes/No)	No. of Specimens	Remarks
2.1.1) Size and Shape			
2.1.2) Apparent density			
2.1.3) Thermal conductivity			
2.1.4) Reaction to Fire			

2.2) Sandwich Block Properties	Complying (Yes/No)	No. of Specimens	Remarks
2.2.1) Size and Shape			
2.2.2) Cl and SO_3 Content			
2.2.3) Thermal Properties			
2.2.4) Compressive strength			

[3] FREQUENCY OF SAMPLING AND TESTING

	Complying (Yes/No)	Remarks
3.1) Frequency of tests		

CHECKLIST

BACKFILLING

[1] GENERAL

	YES	NO
1.1) Backfilling details and location are clearly shown on the approved shop drawing.		
1.2) Backfilling material is tested and approved for specification compliance.		
1.3) Method statement is approved for the backfilling.		
1.4) Compaction/Tamping equipments checked for the adequacy of the compaction requirements		
1.5) Waterproofing system properly applied/installed and approved in case of backfill around structure.		
1.6) Marking is done to control the specified layer thickness.		
1.7) Original Ground Level or as indicated on drawing to start the backfilling is checked/tested and approved		
1.8) Proper moisture maintained for each layer of material to enable thorough compaction as specified.		
1.9) Compaction test (field density) carried out at specified frequency.		
1.10)Compaction test achieved specified compaction % of the maximum dry density.		
1.11)Compacted layer is approved prior to proceeding next layer.		

REMARKS:

CHECKLIST

REINFORCEMENT STEEL

[1] MATERIAL APPROVAL

	(Yes/No)	Remarks
1.1) Approved by the consultant		
1.2) Third party approved (Cares or equivalent)		
1.3) Source Name Specified		
1.4) Supplier Name Specified		
1.5) Complying with the Project Specifications		

[2] TESTS (BS 4449:2005)

2.1) Physical Properties	Complying (Yes/No)	Remarks
2.1.1) All the information for the material (Heat Number, Marking..)		
2.1.2) Yield strength		
2.1.3) Tensile Strength		
2.1.4) Cross Sectional Area		
2.1.5) Mass per meter		
2.1.6) Elongation at fracture		
2.1.7) Elongation at maximum force		
2.1.8) Cross Sectional Area		
2.1.9) Mass per meter		
2.1.10)Bend and Rebend		

2.2) Chemical Properties:		
2.2.1) Carbon Content		
2.2.2) Sulfur Content		
2.2.3) Phosphorus Content		
2.2.4) Nitrogen Content		
2.2.5) Carbon Equivalent Value		

2.3) Frequency of test		

[3] VISUAL INSPECTION

	Complying (Yes/No)	Remarks
3.1) Visual Inspection for cracks, fins, rust ...		

CHECKLIST

QUALITY CONTROL PLAN

[1] QUALITY CONTROL PLAN (1400, 1.05)	Non-existent	Partially Implemented	Implemented	Max. Marks Achievable or Score - N/A
1.1) Are the QC Plan and applicable procedures approved and readily available to staff?				
1.2) Is there a current test and inspection schedule that indicates those inspections and tests required to be carried out on materials for inclusion in the works?				

[2] INSPECTION AND TEST PLANS (ITPs) (1400, 1.07)

2.1) Has the Contractor developed an Inspection and Test Plan for works that are regulated and controlled by specification(s)?				
2.2) Has the ITP been approved and does that Inspection and Test Plan identify the required inspections and tests per the applicable Specification Section, testing frequency, accept/reject criteria, required records to document compliance, and procedures/instructions to be used for control of each activity?				

[3] DOCUMENT AND SUBMITTAL CONTROL (1400, 1.08)

3.1) Is the QC Plan up-to-date? (e.g. roles and responsibilities, org. chart, procedures list)				
3.2) Does the contractor provide quality control procedures, method statements, and current documents at the locations where they are to be used? (Note: this will include codes/standards referenced in the specifications, method statements, and inspection/test plans)?				

[4] IDENTIFICATION AND CONTROL OF ITEMS AND MATERIALS (1400, 1.09)

4.1) Has the Contractor developed and maintained a receiving/inspection log which contains, at a minimum: purchase order number, supplier's name, quantity, item description, reference to applicable contract requirements, date received, heat or serial number or other identification as applicable, verification that all required supporting documentation has been received, QC acceptance sign-off and date, and non-conformance number (if applicable)? (Test Certificates and Certificates of Compliance).				
4.2) For stored items, is the Contractor's identification method consistent with the expected duration and type of storage?				

CHECKLIST

QUALITY CONTROL PLAN

[5] EQUIPMENT/MATERIAL HANDLING AND STORAGE (1400, 1.15)

5.1) Does the Contractor handle, store, and preserve equipment and material from the time of receipt to the time of acceptance by the Employer?				
5.2) Does the Contractor identify equipment and material requiring special handling or testing? (Factory Inspection tests prior to shipment)				

[6] INSPECTIONS AND TESTS (1400, 1.10)

6.1) Does the Contractor use an approved material testing laboratory accredited by Dubai Municipality Construction Quality Control and Research Section for testing?				
6.2) Is the Contractor performing inspections, sampling, and testing of materials in accordance with the specified standards in the approved Inspection and Test Plan?				
6.3) Does the Contractor have adequate QC personnel on-site during all production shift operations to perform the inspection and tests?				
6.4) Are the inspections conducted by personnel not responsible for performing the work as designated by the Contractor?				
6.5) Are Contractor's inspection and test personnel using approved procedures and instructions (latest revision) at the time of the inspection or test?				
6.6) Do Contractor's inspection and test records include as a minimum: name of items inspected/tested, quantity of items, inspection/test procedure reference, date, name of inspector/tester, observations/comments, specified requirements, acceptability, deviations/non-conformances, corrective actions, evaluation of results, and signature of authorized evaluator?				
6.7) Does the Contractor clearly document and identify the inspection and test status of materials and equipment throughout construction?				

[7] MEASURING AND TEST EQUIPMENT (1400, 1.11)

7.1) For measuring and test equipment (M&TE), does the Contractor provide a unique identification number or mark permanently affixed to each item, and calibrate each M&TE item at intervals recommended by the manufacturer?				
7.2) Does the Contractor maintain a log of all M&TE which includes: equipment description, identification number, date of the last calibration, and date that the next calibration is due?				

CHECKLIST

QUALITY CONTROL PLAN

[8] NON-CONFORMANCE MONITORING (1400, 1.12)

8.1) Has the Contractor developed a system to identify, document, control, and process non-conforming material and equipment?				
8.2) Does the Contractor maintain a non-conformance log to track all non-conformance?				
8.3) Does the Contractor's non-conformance log contain the following as a minimum: sequential reference number, date issued, originator, description of item deemed to be in non-conformance, description of the non-conformance, recommended and final disposition, date closed, QC Manager's initials, and remarks (if applicable)?				
8.4) Does the Contractor clearly identify each non-conforming item with a status tag or other distinguishing mark when required?				

[9] QUALITY CONTROL REPORTS/AUDITS (1400, 1.14)

9.1) Are daily Quality Control Reports submitted?				
9.2) Does the Contractor have a current audit plan/schedule?				

CHECKLIST

MASS CONCRETE

Thickness of Raft:

[1] METHOD STATEMENT

	(Yes/No)	Remarks
1.1) Method of Statement (Submitted)		
1.2) Method of Statement (Approved)		
1.3) Temperature Monitoring (Included)		

[2] TEMPERATURE CONTROL

	(Yes/No)	Remarks
2.1) Temperature Monitoring (applied)		
2.2) Special Precautions (applied)		
2.3) Maximum Temperature Controlled (Within Limits)		
2.4) Differential Temperature Controlled (Within Limits)		
2.5) Any Defects		
2.6) Measures to be taken in case of defects		

REMARKS:

CHECKLIST

CONCRETE TESTING SITE LABORATORIES

[1] HUMAN RESOURCES

	Name	Designation / Qualification	Certification / Training	Competent (Yes/No)	Remarks
1.1) Supervisor					
1.2) Technician 1					
1.3) Technician 2					
1.4) Technician 3					

[2] TEST METHODS AND PROCEDURES

	Test Method	Latest Version Used (Yes/No)	Standard Copy Available	Compliance with Frequency of Testing (Yes/No)	Remarks
2.1) Concrete Slump					
2.2) Concrete Temperature					
2.3) Concrete Density					
2.4) Air Content					
2.5) Flow Table					
2.6) Sampling of Concrete Specimens					

[3] FACILITIES, EQUIPMENT AND SUPPLEMENTAL PROCEDURES

	Comply (Yes/No)	Calibrated (Yes/No)	Remarks
3.1) Thermometer			
3.2) Concrete Moulds			
3.3) Concrete Slump			
3.4) Tamping Rod			
3.5) Slump Plate			
3.6) Measuring Tape			
3.7) Pressure Meter			
3.8) Density Bucket			

CHECKLIST

CONCRETE TESTING SITE LABORATORIES

[4] PREPARATIONS AND CONDITIONS

	Reading / Method	Comply (Yes/No)	Remarks
4.1) Floor leveled and free of vibrations	---		
4.2) Initial Curing Temperature			
4.3) Protection of specimens			
4.4) Initial Curing Duration			
4.5) Proper tagging of specimens			
Date	---		
Time	---		
Location	---		
Grade of Concrete	---		
Name of Technician demoulding specimen	---		
4.6) Curing Tank Condition (Temperature, Cleanliness)			

[5] LABORATORY RECORDS AND REPORTS

	Available (Yes/No)	Comply (Yes/No)	Remarks
5.1) Calibration Certificates			
5.2) Records of staff qualifications			
5.3) Concrete pour records			
5.4) Concrete Mix Designs			
5.5) Concrete Delivery Notes			

CHECKLIST

MEMBRANE AND PRIMER

Type of Membrane:

[1] MATERIAL APPROVAL

	(Yes/No)	Remarks
1.1) Approved by the consultant		
1.2) Complying with the project Specification		
1.3) Source Name Specified		
1.4) Supplier Name Specified		
1.5) Applicator portfolio		

[2] TESTS

2.1) Physical Properties of Primer Coating	Complying (Yes/No)	Remarks
2.1.1) Coating thickness (DFT)		
2.1.2) Coating thickness (WFT)		
2.1.3) Adhesion to Concrete		
2.1.4) Service Temperature		

2.2) Physical Properties of Bituminous Membrane	Complying (Yes/No)	Complying (Yes/No)
2.2.1) Roll Size		
2.2.2) Thickness,mm		
2.2.3) Unit Weight kg/m²		
2.2.4) Carrier (Polyester, fiber) weight g/m²		
2.2.5) Penetration at 25 °C		
2.2.6) Elonga Transversal		
2.2.7) Elonga Longitudinal		
2.2.8) Tensile strength Transversal		
2.2.9) Tensile strength Longitudinal		
2.2.10)Tear Resistance		

2.3) Chemical Properties of Bituminous Primer:	Complying (Yes/No)	Complying (Yes/No)
2.3.1) Solid Content %		
2.3.2) Rubber Content %		
2.3.3) Effect on potable water		
2.3.4) Water Content %		
2.3.5) Toxicity Effect		

AGGREGATES TESTING

Source of Aggregates:

C/A: M/A: C/S: D/S:

Aggregate Properties	Testing Method	Test Results					Project Specification Limits				Frequency Complying (Yes/No)
		Coarse Aggregate		Fine Aggregate			Coarse		Fine		
		Coarse	Medium	Crushed S.	Dune S.		20mm	10mm	5mm	Dune	
1) Grading (Fineness Modulus)	BS 812-p103 (Dry)										
2) Material finer than 0.075 mm sieve	BS 812-p103 (Wet)					max					
3) Clay Lumps & Friable Particles	ASTM C 142					max					
4) Light Weight Pieces	ASTM C 123					max					
5) Organic Impurities	BS 1377 / ASTM C 40					---					
6) Water Absorption	BS 812-p2					max					
7) Specific Gravity (Apparent)/(SSD)	BS 812-p2					min					
8) Shell Content	BS 812-p106					max					
9) Sand Equivalent	ASTM D										
10)Particle Shape:											
Flakiness Index	BS 812-p105.1					max					
Elongation Index	BS 812-p105.2					max					
Prestressed and steam cured											
11)Acid Soluble Chlorides	BS 812-p117										
Reinforced Concrete						max					
Mass Concrete						max					
Prestressed and steam cured						max					
12)Acid Soluble Sulfates, SO_3	BS 812-p118					max					
13)Soundness	ASTM C 88										
Magnesium Sulfate, $MgSO_4$						max					
Sodium Sulfate, Na_2SO_4						max					
14)Mechanical Strength											
10% fines value	BS 812-p111					min					
Impact value	BS 812-p112					max					
L.A. abrasion	ASTM C 131/C 535					max					
15)Drying Shrinkage	BS 812-p120					max					
16)Potential Reactivity	ASTM C 289, C 227, C 1260										
Aggregates chemical method											
Cement-Aggregate combination											

CHECKLIST

CONCRETE ON-SITE

Concrete Materials and Required Mixture Proportioning

[1] CONCRETE MIXTURES (MIX DESIGN)

Mix Designation	Mix Code	Location	Required Strength

[2] VALUE ADDED INGREDIENT MATERIALS REQUIRED

Type	Brand	% by weight of cementitious	Compliance
2.1) Super plasticizer			
2.2) Retarder			
2.3) Accelerator			
2.4) Corrosion inhibitor			
2.5) Fly Ash (Class C)			
2.6) Fly Ash (Class F)			
2.7) GGBS			
2.8) Silica Fume			
2.9) Other			

[3] PROJECT/STANDARD SPECIFICATIONS REQUIREMENTS

	Standard	Requirement	Tolerance	Frequency	Compliance
3.1.1) Sampling procedure			---	---	
3.1.2) Slump (mm)					
3.1.3) Concrete Temperature (°C)					
3.1.4) Ambient Temperature (°C)	---				
3.1.5) Density - wet (kg/m^3)					
3.1.6) Air Content (%)					
3.1.7) Concrete Delivery Time (min)					
3.1.8) Jobsite slump adjustments	Not Allowed	Not Allowed	---	---	

	Standard	Requirement	Tolerance	Frequency	Compliance
3.2) Compressive Strength:					
3.2.1) Sampling location	---				
3.2.2) Location leveled and free of vibrations			---	---	
3.2.3) No. of cubes/sample			---	---	
3.2.4) No. of field cured cubes			---	---	
3.2.5) No. of lab cured cubes			---	---	
3.2.6) No. of reserve cubes			---	---	
3.2.7) Ages of testing			---	---	
3.2.8) Making cube specimens					
3.2.9) Proper tagging of cubes					
3.2.10)Protection of cubes					
3.2.11)Initial Curing Temperature					
3.2.12)Initial Curing Duration					
3.2.13)Final Curing Temperature					
3.2.14)Transportation to testing lab					
3.3) Testing Technician Qualified					
3.4) Ready-mixed concrete:					
3.4.1) Water gauge of truck mixers					

3.5) Batch Ticket information:

	Compliance
3.5.1) Name & number of RMC depot	
3.5.2) Serial number of the ticket	
3.5.3) The date	
3.5.4) Truck number	
3.5.6) Name of purchaser	
3.5.7) Name & location of site	
3.5.8) Grade or mix description	
3.5.9) Specified workability	
3.5.10)Maximum free water/cement ratio	
3.5.11)Nominal maximum size of aggregate	
3.5.12)Details of the composition (cement…)	
3.5.13)Type or name of admixture	
3.5.14)Quantity of concrete in cubic meters	
3.5.15)Time of loading	
3.5.16)Batched weights	

3.6) Concrete report on site includes:

	Compliance
3.6.1) Time of arrival of mixer	
3.6.2) Time of completion of discharge	
3.6.3) Location of pouring	
3.6.4) Slump of concrete	
3.6.5) Temperature of concrete	
3.6.6) Ambient temperature	
3.6.7) Density of fresh concrete	
3.6.8) Batch, cubes are sampled from	
3.6.9) Number of cubes molded	

3.7) Acceptance / Rejection Criteria for Fresh Concrete

3.7.1) Person authorized for rejection	
3.7.2) Rejection Criteria	
Slump	

3.5.17)Declaration of conformity with specs.	Density
	Air Content
	Concrete Temperature
	Time limit
	Other

CHECKLIST

CONCRETE TRIAL MIX

[1]

Material	Type / Brand	Source	SSD Weights	Final Weights	Batch Weights
1.1) Cement					
1.2) Cem. Material 1					
1.3) Cem. Material 2					
1.4) Water					
1.5) Coarse Agg.					
1.6) Medium Agg.					
1.7) Crushed Sand					
1.8) Natural Sand					
1.9) Admixture 1					
1.10)Admixture 2					
			0.0		

Water Content

Aggregates	W.A. (%)	M.C. (%)
C/A		
M/A		
C/S		
N/S		

Fresh Density / Yield

Vol. of Bucket (L)	
Wt. of Concrete (Kg)	
Fresh Density (kg/m^3)	
Relative Yield:	

[2] Slump Control

2.1) Time Elapse (min):	Initially	30	45	60	90
2.2) Slump (mm):					
2.3) Concrete Temp (°C):					

Air Content:	

[3] Compressive Strength

Age:	3 Day	3 Day	3 Day	7 Day	7 Day	7 Day	28 Day	28 Day	28 Day
3.1) Weight (kg)									
3.2) Dimension (mm)									
3.3) Density (kg/m^3)									
3.4) Area (mm^2)									
3.5) Force (kN)									
3.6) Strength (MPa)									
3.7) Average Strength									

[4] Concrete Durability

Specimen number	Testing Method	1	2	3	Average
4.1) Water Permeability (mm)	DIN 1048-5				
4.2) Water Absorption (%)	BS 1881-122				
4.3) RCP (coulombs)	ASTM C 1202				
4.4) Total Acid Soluble Chloride (% by wt. of cement)	BS 1881-124				
4.5) Total Acid Soluble Sulfate (SO_3) (% by wt. of cement)	BS 1881-124				
4.6) Initial Surface Absorption Test - ISAT (ml/m^2.sec)	BS 1881-208				
@ 10 min					
@ 30 min					
@ 60 min					

CHECKLIST

CLAY BLOCKS WITH THERMAL INSULATION

[1] MATERIAL APPROVAL

	(Yes/No)	Remarks
1.1) Approved by the consultant		
1.2) Source Name Specified		
1.3) Source certified from DM		
1.4) DM Certificate provided with each delivery		

[2] TESTS (DMS 17:2004)

2.1) Thermal insulation material Properties	Complying (Yes/No)	No. of Specimens	Remarks
2.1.1) Size and Shape			
2.1.2) Apparent density			
2.1.3) Thermal conductivity			
2.1.4) Reaction to Fire			

2.2) Block Properties	Complying (Yes/No)	No. of Specimens	Remarks
2.2.1) Dimensions			
2.2.2) Density			
2.2.3) Thermal Properties			
2.2.4) Compressive strength			
2.2.5) Water Absorption			

[3] FREQUENCY OF SAMPLING AND TESTING

	Complying (Yes/No)	Remarks
3.1) Frequency of tests		

CHECKLIST

AAC BLOCKS

[1] MATERIAL APPROVAL

	(Yes/No)	No. of Specimens	Remarks
1.1) Approved by the consultant			
1.2) Source Name Specified			
1.3) Source certified from DM			
1.4) DM Certificate provided with each delivery			

[2] TESTS (DMS 1 Part 2:2004)

Performance requirements for Masonry Blocks	Complying (Yes/No)	NO of Specimens	Remarks
2.1) Dimensions			
2.2) Cl and SO_3 Content			
2.3) Compressive Strength			
2.4) Drying shrinkage			
2.5) Thermal conductivity			

[3] FREQUENCY OF SAMPLING AND TESTING

	Complying (Yes/No)	Remarks
3.1) Frequency of tests		

CHECKLIST

PT GROUTING

[1] GENERAL	YES	NO
1.1) Check the structure/element ID and date of stressing (12Hrs - 7days).		
1.2) Check RFI is submitted with approved stressing report.		
1.3) Make sure grouting equipment meets specifications and has adequate capacity for the job.		

[2] HSE / MISCELLANEOUS		
2.1) Check all the grouting works conducted in safe and environment friendly way as per the requirements of the relevant safety code. Are resources and/or arrangements available as per approved Risk Assessment Plan.		
2.2) Don't stay close to grout plant without wearing appropriate PPE.		
2.3) Always check pressure washer and large water supply available.		
2.4) In case of leakage of duct, repair the welding with black duct tape (apply several layers) and consult the Engineer.		
2.5) In case of grout blockage call the Engineer for back up solution.		
2.6) Consistent monitoring of the activity is ensured.		
2.7) Sufficient lighting and safety markers and barriers installed to ensure safe working conditions prior to starting the works.		
2.8) Is weather OK for grouting?		

[3] MATERIAL, EQUIPMENT AND MACHINERY FOR GROUTING		
3.1) Does test conducted on grout for required properties and at specified frequency during grouting operation?		
3.2) Check the grouting pump working conditions and accessories like pressure guage,shut off valve, screen and length of the pipe etc.		
3.3) Check the standby grouting equipments like grouting pump, water tanks and equipments for duct flushing.		
3.4) Check the material (Cement, Non-shrink grout, Water+Ice) quantity and temperature are meeting the requirement or not.		
3.5) Check the condition and cutting of tendons. Grouting must be done 12 hrs to 7 days after tensioning.		
3.6) Make sure grout materials are as per contract requirement and comply with the requirement of its properties for fluidity, bleed, volume change, strength, sieve test, w/c ratio and grout temperature.		

[4] GROUTING		
4.1) Check enough cement and additives are available for all grouting operation		
4.2) For External Tendons: Check inside span duct during grouting (look for welding failure and at outlet)		
4.3) Check the ducts for any kind of blockage, and clean it by flushing.		
4.4) Before mixing check the material quantity is enough or not and check the minimum specified mixing time.		
4.5) After mixing take test and check Fluidity and grout temperature, which should comply the requirement.		
4.6) Check the ambient temperature < 32oC		
4.7) During grouting check the pressure it should be as per approved method statement, and maintain the pressure so that it will cover required length of grouting.		
4.8) If same grout mix is use beyond 30 minutes, fluidity and temperature will be checked again and should comply the acceptable limit.		
4.9) Check the temperature and fluidity at outlet it should meet the requirements.		
4.10) Make sure there is continuous agitation of grout during grouting.		
4.11) Monitor the grout pressure. Pressure should gradually increase as the duct is filled.		
4.12) Before closing the shut off valve visually check grout should free from air voids and it should be a continuous flow. 10 minutes after completion of grouting, the vents at the highest point(s) will be opened to check for escaping air or bleeded water.		
4.13) Close outlet valve before closing inlet valve.		
4.14) After outlet shutdown the duct should be pressurized for at least I minute at a pressure not exceeding the specified pressure value.		

4.15) One hour after checking for escaping air or bleed water, the tendon grout will be topped up using the two vents at the high point of the tendon. This will be done by releasing both vents, pumping grout into on end and allowing discharge from the other.		
4.16) The grout will be left for 48 hrs after which the end grout caps will be identified, removed and the anchorage end is photographed and added to the record of all tendon grouting.		
4.17) Take cubes for checking the compressive strength of the grout. Grout Compressive Strength in 7 days to achieve specified strength.		
4.18) Take the samples for bleeding test. Bleeding should be less than specified value.		
4.19) Take the samples for Sedimentation test.		
4.20) Take the samples for Volume change test. Volume Change should be between the specified limits.		
4.21) Assure the Sedimentation Test. In the Sedimentation test, the variation in density should be with in the allowed limit.		

REMARKS:

CHECKLIST

POST TENSIONING OPERATION

	YES	NO
[1] GENERAL		
1.1) Does contractor submitted shop plans, calculation sheets and notice of material receipt in a timely manner?		
1.2) Does the review of working drawings has been completed and approved in close coordination with designer?		
1.3) Does tendon path and corresponding calculation has been checked?		
1.4) Compare physical lay out of end anchorage details on shop plan with details shown on the contract plan.		
1.5) Check length of tendon or bars as calculated.		
1.6) Stressing sequence and location of stressing operation shown on the working drawing has been reviewed.		
1.7) Check for possible conflict with duct at columns, caps, abutmets and hinges, due to reinforcing steel, hinge restrainers, utilities and deck drains.		
[2] HSE		
2.1) No Works behind the jack during stressing at any time		
2.2) Check if wedges properly bite the strand and are fully engaged in the block hole		
2.3) No workers behind the dead anchorage during stressing at any time		
2.4) In case of strand failure, stop stressing immediately and call the Engineer		
2.5) Verify safety barrier and sign-boards posted and area cordoned off for unauthorized Entry		
[3] MATERIAL INSPECTION		
3.1) Does material has been received and physically identified-Verify the approval of the PT Materials: Manufacturers, Suppliers, Properties, Tests (Mill, Initial and Frequency Tests).		
3.2) Check material to see that it is what for contract and working drawing call for by number, size, length etc.		
3.3) Determine if required rust inhibitor agent has been applied to prestressing steel - check for rust.		
3.4) Check condition of ducts thoroughly.		
3.5) Check storage site for adequate protection of materials.		
[4] BEARING PLATES AND TRUMPETS		
4.1) Verify anchorages, wedges and settings in correct positions. Check that block-outs are formed to correct slope/batter. Use alignment tool to check if bearing plates are perpendicular to the ducts.		
4.2) Make sure anchor plates are correct size.		
4.3) Check that the trumpets are properly secured to the bearing plates.		
[5] PLACEMENT OF DUCTS		
5.1) Check adequacy of end anchorage form work. Check the size of anchorage hardware. Plates should be fastened to forms at the proper angle, grout tight, and secured.		
5.2) Make sure each Girder contains correct number of ducts, and ducts are the same size as called for on the working drawings.		
5.3) Check joints for adequate grade of waterproofing tape. Be sure adequate ties are to hold the ducts from floating during placement of PCC. Stagger joints to maintain proper profile.		
5.4) Check final profile of rigid duct. Consider camber in forms when visually inspecting the tendon drape. The first 4.6 meter from end anchorage should also be given special attention to eliminate severe angular changes. Correction may be required due to sup		
5.5) Check installation of intermediate grout vents if required due to duct length. These ground vents should be placed at high point outside the limit of the bent cap.		
5.6) Check that snap ties, tie bolts, etc. have not been placed through just above or below duct.		
5.7) Make sure that all defects in the duct (breaks, crushed areas etc.) have been repaired prior to concrete pour.		
5.8) Seal tendon openings to prevent water or debris from entering the duct.		
[6] PLACEMENT OF TENDONS		
6.1) There should be an adequate area to pull the strand. The strand should be protected from contamination during fabrication. Inspect the strand for the rust.		
6.2) Avoid unusual angle points when pulling the tendons into the ducts. Make use of rollers or pulleys.		

6.3) Make sure tendons are installed in their proper locations.		
6.4) Consider "rust free" period and possible need for corrosion inhibitor.		

[7] PRIOR TO STRESSING OPERATION

7.1) Check Platform: Fixing, handrail.		
7.2) Check workers wear harness.		
7.3) Check walkie-talkie is working.		
7.4) Verify concrete strength at load transfer.		
7.5) \Verify installation of tendons are done in accordance with the approved Shop Drawings.		
7.6) Verify stressing equipment, apparatus and gauges are calibrated and tested (Required calibration curves for specific jack/gauge combinations has been furnished).		
7.7) Check fixation of jack: chain block, lifting frame fixation.		
7.8) Check wedges at dead anchorage are hammered.		
7.9) Verify correct set-up stressing equipment and monitoring gauges.		
7.10) Check out Pressure cell.		
7.11) Set up prestressing table to document a complete record of each tendon stressed.		
7.12) Check to see if the stressing is from one end, both ends, or simultaneously from both ends.		
7.13) Make sure stressing sequence has been discussed and finalized.		
7.14) Inspect the deck surface for excessive cracking and repaired areas not in compliance with the specification.		

[8] DURING STRESSING OPERATION

8.1) Verify measurement and recording of elongation data is done properly		
8.2) For Segmental Bridges: Check inside span deviation segment diaphragm and duct displacement during stressing		
8.3) Verify correct stressing sequence is followed.		
8.4) In case of over-estimated tendon's elongations, stop stressing immediately and call the Engineer for possible lift-off test		
8.5) Paint the strand on both ends and check for slippage.		
8.6) Inspect the deck surface for excessive cracking and repaired areas not in compliance with the specification.		
8.7) If elongation falls out side the limit find out why?		
8.8) If any anchorage hardware fails?		

REMARKS:

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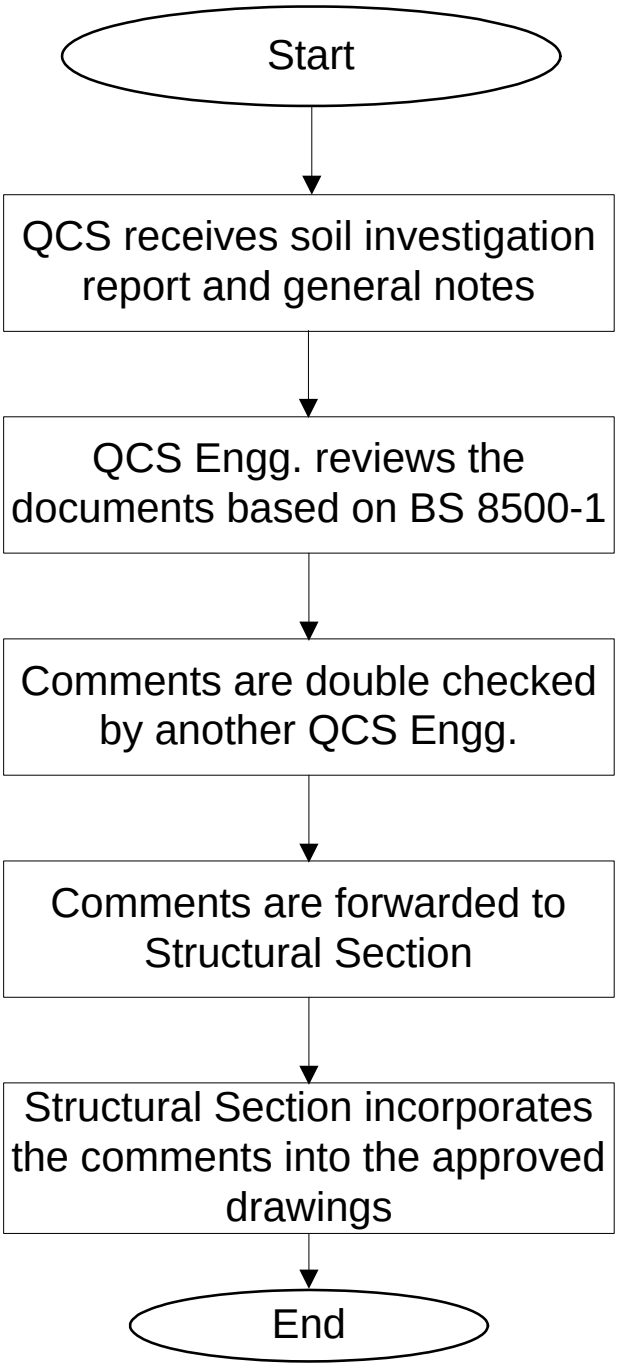
Quality Control Section – Flowchart

Review of Concrete Mix Specifications



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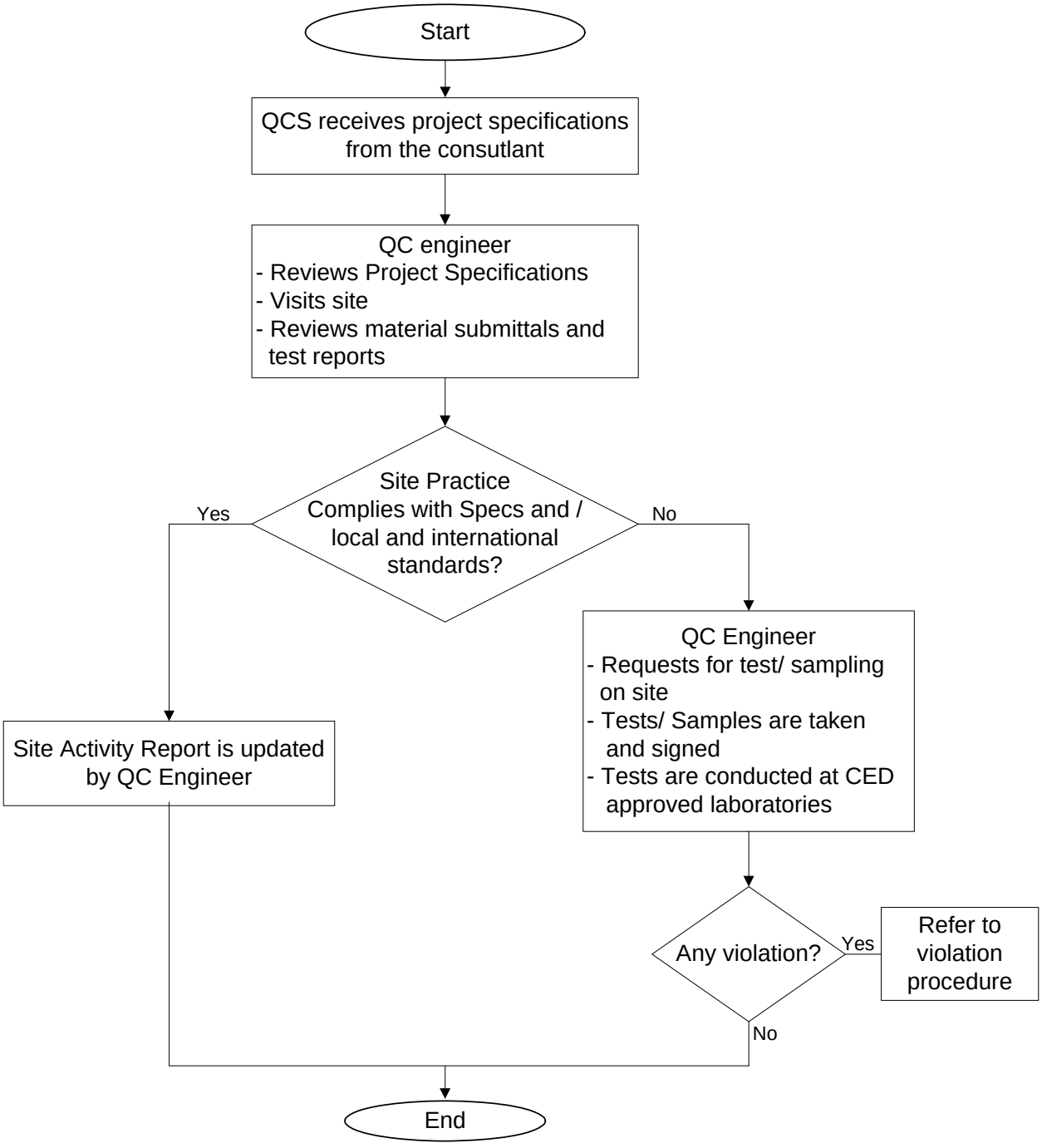
Review of Project Specifications/Materials Submittals



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Technical Disputes and Complaints