

MABSEED AND ENGINEERING
SERVICES LIMITED

QUALITY
ASSURANCE
MANUAL

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2.0 GENERAL QUALITY ASSURANCE AND QUALITY CONTROL
POLICY

It is the policy of Mabseed Engineering Ltd to execute its operations at all times to international standards, meeting agreed client quality requirements.

Therefore, Mabseed Engineering Ltd implements a documented procedures system to ensure that:

1. Executive and Quality Control procedures are suitably drawn up in order to meet the Construction Quality requirements, in compliance with the Contract Documents.
2. Execution and Quality control procedures are made available to the relevant recipients.
3. Latest issues of applicable drawings and documents are used at all stages of the construction, and obsolete drawings and documents are withdrawn.
4. Activities are performed according to relevant execution procedures.
5. Specified activities are verified according to relevant Quality Control Procedures.

6. Responsibility for each control task is clearly identified.
7. Defined verifications are made at each stage of the construction, in such a way that no stage can be started without the previous one having been verified.
8. Verification is recorded in the specified manner.

3.1 **QUALITY ASSURANCE AND CONTROL REPOSIBILITIES**

In general Quality Assurance and Quality Control {QA/AC} is under the responsibility of the Design and Contracts Department Head, with project activities being monitored by the Project Manager who ensures that all works are executed according to contract specifications and requirements.

Issues, which are considered for a project, include:

1. Control of engineering documents, including reviews distribution, storage, accessibility and update.

2. Preparation and distribution of construction plant and work procedures
3. Control and interphase between disciplines and between Contractors and Subcontractors (if any).
4. Review and submission of proposed changes to the design.
5. Control of non-conforming materials.
6. Surveillance and control of work processes.
7. Control of non-conforming materials.
8. Surveillance and control of work processes
9. Control of quality, including inspection and communication between personnel involved in quality and those involved in material control and construction.
10. Control of reports (e.g. inspection and tests)

3.2 It is therefore important that QA/OC is implemented with a thorough training and upkeeping of the qualification of personnel.

QA will function as an independent unit, headed by Mabseed Engineering Ltd's QA/QC Manager, who in addition to ensuring that the provisions described in Section 2.0 above are implemented will be responsible for:

1. Establishing and maintaining the construction Quality system.
2. Verifying that the specified requirements are met.

3. Implementing or monitoring the implementation of the actions and controls necessary to ensure the efficiency of the Quality System.
4. Planning and performing Quality Audits.
5. Reviewing and compiling the Quality Records into a suitable construction Quality Control file.
6. Reporting regularly to Management on the effectiveness of the Quality system.
7. Ensure that site work is carried out under safe conditions.

3.3 **QUALIFICATION OF QUALITY ASSURANCE / CONTROL MANAGER.**

4.1 **Procurement**

Materials procurement phases are:

- 1) Ordering goods well in advance and specifying dates of receipts.
 - 2) Procuring materials for direct usage, which deals with checks on statistical data of physical stock, consumption, daily weekly or monthly requirements and placing orders.
 - 3) Despatch and transportation planning and execution
- 4.1. Personnel links in the material procurements process:
- 1) The Project Manager will liaise with the Head Office for funds and material required from abroad and company office, stores, warehouse and workshop.
 - 2) The Site Agent will liaise with Project Manager for direct purchase of materials.
 - 3) The Site Engineer will liaise with Site Agent on Production, requirements, arrangement, transportation and storage.

4.2 Material Procurement and Storage

Effective planning control, timely procurement and delivery is the key to successful and economical project execution.

Material to be produced for projects can generally be divided into categories below:

a) Materials required for civil works

- | | |
|---------------------|-------------------------|
| i) Cement | ii) Sand |
| iii) Aggregates | iv) Reinforcement steel |
| v) Water | vi) Timber |
| vii) Spacers | viii) Structural steel |
| ix) Tools & Tackles | x) Consumables |
| xi) Spares | xii) Others |

b) Materials required at the construction site:

- i) Equipment for the job
- ii) Concrete ingredients like above
- iii) Anchor pipes
- iv) Timer
- v) Precast elements from base
- vi) Reinforcement steel
- vii) Fuel oil and consumables
- viii) Spares; and
- ix) Many others

c) Materials for a project will be procured in a planned and systematic sequence to ensure that the correct materials are available at the time required.

4.3 Inspection Plan

The following tables describe the items of inspection relating to the construction/work activities. For each item of inspection, the responsibilities are distributed using the intervention codes listed below:

Piling Works	Foremen	Site Agent	Laboratory	Surveyor	Project Manager	QA Adv.	Client
		P		A		R/F	
Bench marks setting out	P	C			SR	R/F	
Piles location setting out	P	V					
Cement/aggreg. Supply	P	V				R/F	
Reinf. Steel Supply	P	R			SC		
Rig. Installation	P	SC			SC	R/F	
Reinf. Installation	P	R			SR	R/F	
Mix report	P	R					
Concrete transport	P	SC					
Slump test	W	R	P			R/F	
Crushing test	R	SR	P			R/F	
Concrete placing	P	W			SC		
Piling record	P	C			SR	R/F	
Piles cut-off	P	C			SC		

KEY

A : Assists
 C : Checks
 F : Files
 P : Performs, provides action
 R : Reviews
 SC : Spot checks (random)

SR	:	Spot review (random)
V	:	Visual inspection
VD	:	Visual and dimensional check
W	:	Witness

5.0 **QUALITY CONTROL**

The quality control items adopted for projects are:

1) Cement / Concrete

- Manufacturer's certificate of production and tests
- Initial and final setting time
- Compressive strength test
- Chemical constituents
- Fineness

2) Sand and Aggregates

- Sulphate soundness
- Los Angeles abrasion test
- Specific density
- Crushing values
- Grading analysis & F.M
- Flakiness

3) Steel

- Manufacturers-test certificate
- Tensile strength
- Bending and proof stress

4) Water

- Chemical analysis
- Usability in concrete works

6.1 **INSPECTION AND TESTING**

6.2 A . Inspections and tests throughout the performance of the construction works shall be made in accordance with the Contract Documents, with subsequent approval specifications and procedures, with Quality Assurance

and Quality Control plans, and in compliance with applicable laws and good workmanship practices.

B. Mabseed Engineering Ltd shall maintain at the work site and make available to Client's Representatives a complete set of the approval reference documents.

C. Mabseed Engineering Ltd shall perform necessary inspections and tests to determine that the contractual requirements are met, and that the works are carried out in a workmanlike manner.

D. Mabseed Engineering Ltd shall supply the necessary testing equipment, with related calibration systems, products appliances, utilities, and manpower.

E. Mabseed Engineering Services Ltd shall ensure that all technical staff conducting test and calibration are supervised by site Engineer/Client Representative.

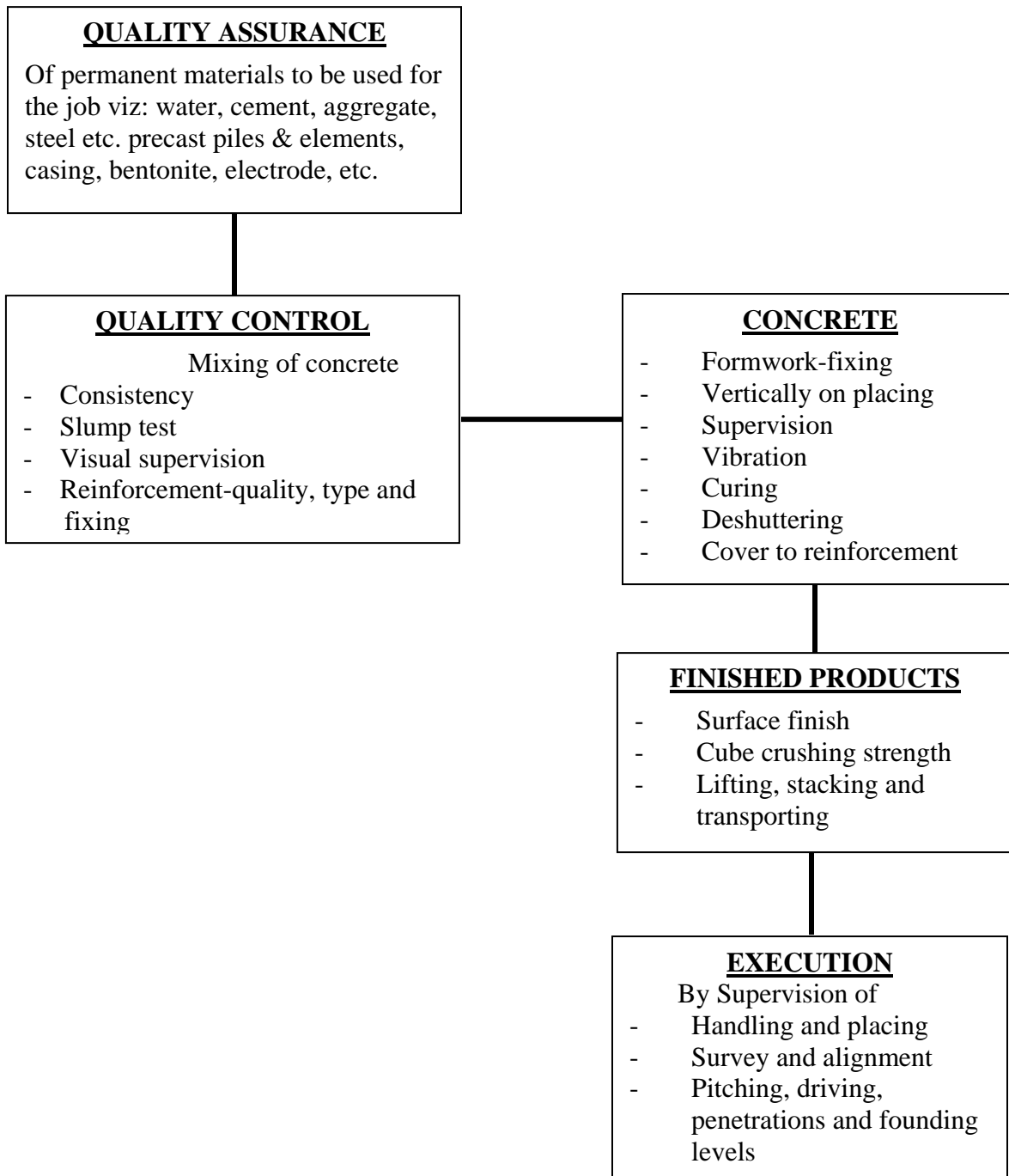
6.3 **PROCEDURES**

QA/QC procedures adopted by Mabseed are generally in accordance with British and other relevant standards such as:

- a. Cement-BS 12 (Portland cement – ordinary)
- b. Sand/Aggregate-BS 822 (Aggregates from natural sources for concrete)
- c. Steel-BS 4499 (Hot rolled steel for reinforcement to concrete)
- d. All laboratory tests-BS 1377 (Method of testing soil for civil engineering purpose).

The above is however not exhaustive which implies that this document is general in nature. The company however, executes works in special cases, according to specifications provided by its Clients.

The general quality activity network is as follows:



6.3.1 **Storage**

Generally for projects, important items which requires consideration are listed below:

- 1) Cement shall be delivered in quantities sufficient to prevent any disruption of the works, but not large enough to cause excessive storage time on site. The supervision shall regularly verify that each consignment is kept separate from the others and used in the same order as delivered to site. The supervisor will also make sure that cement packing is kept until use, and that the storage place remains dry.
- 2) Aggregates shall be delivered to site in separate sizes, according to the specified aggregates range of sizes. The supervisor shall make sure that different sizes are kept in separate bins, and shall proceed to random verifications of size and aspect.
- 3) All tools, tackles, spares and minor consumables will be stored in racks and bins in the warehouse.
- 4) Water and fuel will be stored in tanks and will be kept in shade with warning signs such as no-smoking, inflammable materials etc. for fuel.
- 5) Oil and lubricants will be stored and stacked in a neat order displaying warning signs to fuels.
- 6) Gases such as oxygen and acetylene shall be stored separately in cylinders kept under shade, and closed properly. They shall be stored upright always. All inflammable goods will be stored far away from electrical generating systems and live cables and wires.

6.3.2 **Concrete Mixing and Testing**

Concrete for piles and civil works shall be generally prepared in accordance with the following procedures:

- A. Concrete for the piles will be procured from an agreed batch plant, located at an acceptable distance from the site or possibly already on site for other works.
- B. The mix shall be as per Client's specifications.
- C. The concrete mixes shall be inspected daily to verify the mix proportions against the specified concrete grade, as per Client's Specifications.

The Supervisor will have tests made from time to time at pouring place, and test cubes prepared for crushing test every fifty batches.

Slump test shall also be performed prior to pouring at its point of utilizing and should fall within range specified.

6.4.1 **Layout of the work**

Careful attention is always given to the proper setting out of each part of the works, in respect of coordinates and elevation. All setting out shall refer to bench marks and datum points as directed by Client.

6.5.1 **Piling Works**

Piling works shall be executed with the utilization of the required number of rigs necessary to meet the time schedule.

Piles will generally be executed according to Client's Specification and to the subcontractors proposed Method Statement.

6.6.1 **Reinforcing Steel**

Reinforcing bars are always inspired upon receipt by Mabseed Engineering Ltd materials controller for compliance with purchase order specifications, which is in accordance with Contract Specification, or other agreed requirements.

6.7.1 **Recording**

During the execution of civil piling works, the supervisor shall make sure that the documents listed here below are prepared in due course.

- A Mix proportion reports
- B Slump test results
- C Test tube sample taking
- D Crushing test results
- E Foundation pouring dates
- F Dimensional verifications
- G Pile driving logs and records

The supervisor will then check for all here below listed documents that they:

- H Are signed as required, and

- I Their originals transmitted to Mabseed Engineering Ltd
Quality Assurance Manager.

6.8.1 **Reports**

In general, reporting shall consist of the following:

1. A day-to day field report to be kept for all activities on site, followed with production report.
2. Where applicable a summary of the report would be compiled and forwarded to the Client on weekly basis.
3. **Monthly reports would comprise of:**
 - a. Progress summary and status of targets
 - b. Any other information pertaining to the project.
4. **Final report would comprise of:**
 - a. As built drawings
 - b. Execution report
 - c. Any other in relevance.
5.
 - a. The day-to-day reports shall be recorded by our Site Engineers.
 - b. Weekly reports would be made by the Site Agent and Safety Officer.
 - c. The monthly reports would be monitored by our Site Agent/Project Manager.

6.9 Proprietary Right / Confidential Information.

6.10 **Meetings**

When required, site meetings will be held between the Project Manager and his team and the Client's Representative to discuss methods of improving quality assurance and control on site.

The agenda of quality control could be, but not limited to:

- 1) Discuss the materials in question

- 2) Client's Representative's method of achieving standards
- 3) Hear the Supervisor in charge for his comments and observations
- 4) Method to improve
- 5) Conclusion