

Bagmati Province Government
Ministry of Water Supply, Energy and Irrigation
Water Resources and Irrigation Development Division Office
Dhading

Quality Assurance Plan

Contract details

- 1) Name of the sub-project :
- 2) District :
- 3) Contract No :
- 4) Total Contract Amount Nrs. :
- 5) Total amount for civil works Nrs. :
- 6) Date Of Agreement :
- 7) Completion Period :
- 8) Intended Completion date :
- 9) Name of Contractor :

Date :

1. Background

The Quality Assurance Plan is a document which assured the EA that the completed civil works of contractor will be as per the employer's requirements, technical specification and the engineering norms. It will clearly describe the working procedures, workmanship, testing and quality control process which the contractor will adopt in carrying out the construction works so that the material and works shall comply with the requirements of the contract and the technical specification. It will be in the form of bar chart and will be effective after receiving the approval from EA. Contractor will proceed with the works at site only after getting the written permission from the EA.

Required form and formats which will show the employer's requirements (specification of the works) and actual achievements at site will be prepared during the construction phase as per quality assurance plan. Basically the contractor will follow the process as below describe;

1. First of all the contractor will get the technical specification of all the external material (manufactured in factories) which will be used in construction works. The specification will be received from the manufacturer/dealers. Preferably construction materials with NS marks will be proposed. Minimum 3 Nos of sample specification will be submitted to EA to get the concurrence for best one. Material might be as follows
 - a) Cement
 - b) Re-bar
 - c) GI wire
 - d) Geo textile
 - e) Bricks
 - f) Hume pipes
 - g) HDPE pipes
2. Similarly contractor will ask the permission from EA for source of local material before the transportation. Local material might be as follows
 - a) Stone
 - b) Gravel
 - c) Sand
 - d) Soil
 - e) Etc
3. After receiving the request letter for permission EA on their judgment May make visit to the factory for external material and sources for local materials to verify the proposed detail of quality. Expenditure will be borne by the contractor.
4. On the basis of verifying visit EA will give permission to use the proposed materials. After getting the Permission for both external and local materials the contractor will transport the materials to the site.
5. First lot of materials will be examined technically at site by EA in contractor's cost. If the sample will found satisfactory, EA will give permission to transport the balance materials.
6. Testing of materials and by product of materials will be examined regularly during the construction period as per the employer's requirement and technical specification.
7. Contractor will try all the time to produce qualitative works during the construction period and assure in no case quality of constructed items will be done lower than the employer's requirement. If found, contractor assures reconstruct the same in his own cost.

2. Inspection and Approval To Proceed

The approval books contain a series of headings that will guide the contractor and the official team through the process of preparation, inspection and approval. They are effectively a site checklist and a record of the process.

The contractor will complete the entry, with the date and signature. The book is then submitted to the office representative for checking. If he is satisfied that the work may begin then he sign the books accordingly. On the events that some items are not satisfactory the official representative could be indicated this in appropriate column and then give a corresponding instruction in the site order book describing the location and nature of the corrective works that are necessary. When the correction is

made the contractor will resubmit the book for approval. If the preparation is satisfactory the official will sign accordingly.

The site record books are in three types

1. Summary of testing
2. Inspection and approval to proceeds
3. Records

The formats for the record books for construction supervision have been prepared by contractor and approved by IDD/IDSD chief. Each template includes sample entries for illustration.

The actual format for the additional books and form will be developed by contractor's official and agreed employer's site staff in order to ensure that particular needs are meet.

The contractor will provide suitable books for QAP. All books will be kept at site all the times.

Table 1: Following record books are proposed to be used during the implementation.

Book	No	Description
Testing	T-1	Materials delivery and testing
		T-1.1 Coarse aggregate
		T-1.2 Fine aggregate
		T-1.3 Cement
		T-1.4 Reinforcement
		T-1.5 Gabion wire
		T-1.6 Geo textile
	T-2	Concrete Compressive strength Register
		Embankment
		Backfill
Inspection/Approval	A-1	Form work Inspection Checklist
	A-2	Reinforcement Inspection Checklist
	A-3	Gabion box Checklist
Record	R-1	Concrete pour Record
	R-2	Correspondence Register
	R-3	As Built Drawing Register

3. Records

The records books are similar to the Approval books. The detailed entry is completed by the contractor, and this is endorse/approved by official representative. If he disagrees with the contractor's assessment he should make a corresponding entry in the site order book.

Table 2: The minimum frequency of sampling of concrete for compressive test

Quantity of concrete in the works m3	Number of samples
1-5	1
6-15	2
16-30	3
31-50	4
50 and above	4 plus additional sample for each 25 m3

Two Test specimens shall be made for testing at 28 days. Additional one sample shall be required for testing at 7 days. One or two may required for other proposes such as to determine the strength of concrete at 14 days or at the time of removal of form works. It will depend on the importance, size and volume of works.

For small works and or for continuous concreting works, slum test will be very much appropriate for quality control at site. The contractor will conduct slump test for each batch of the concrete mixing at site. Other test also conducted as per requirements and instruction of EA at site.

Test Result of Sample

The test result of the sample shall be the average of the strength of all specimens. The individual variation should not be more than ± 15 percent of average.

Table 3: Min. compressive strength of concrete

Concrete Mix	Min. compressive strength at 28 days (kg/ cm ²)	Min. compressive strength at 7 days (Kg/ cm ²)
1:1.5:3	200	134
1:2:4	150	100
1:3:6	100	67
1:4:8	75	50

Table 4: Slump Test Requirements

Type of structure		Slump (cm)
Reinforcement concrete	In general case	5-12
	If cross section is large	3-10
Reinforcement concrete		3-8
Dam concrete		2-5

Cement Test

Table 5: Initial and final setting time ASTM C150 specified set times

Test Method	Setting Type	Time specification
Vicat's apparatus	Initial	≥ 60 minutes
	Final	≥ 10 hours

Cement Cube Test

50-mm cube specimen may be used for the determination of compressive strength of all cement specimen from the same sample shall be reported to the nearest 0.01Mpa.

Table 6: Gabion sampling

No. of coil in a lot	No of coils for Physical requirements	Permissible defective
Up to 25	2	0
26-50	3	0
51-150	5	0
151-300	8	1
301 and above	13	1

Physical test are size, surface condition tensile strength, bend, wrapping and zinc coating test.

Table 7: Equivalent diameter in mm as per NS- 2045

SWG	6	7	8	9	10	11	12	13	14
Dia.mm	4.88	4.75	4.06	3.66	3.25	2.95	2.64	2.34	2.03

Tolerance in box size is 5% in length & width, 2.5 cm in depth

4. Testing

A summary of basic testing requirements is given in Table 7. There are additional requirements for specific items and components and these are prescribed on the appropriate clauses of specification.

Table 8: Testing Requirements for materials for use in structures

Materials	Test	Result	Test carried	Frequency
1.Cement	Fineness	Standard 88 µm sieve residue 0.4%	At Lab	One per delivery
	Setting Time	Initial- >60 minutes Final- >10 hour	At Lab	
2.Coarse Aggregate	Flakiness	< 30	At Lab	As directed
	Specific gravity	2.4	At Lab	
	Absorption		At Lab	
	10% Fines		At Lab	
	Grading	As per specification	At Lab	
	Compressive strength	400 kg/cm2	At Lab	
3.Fine Aggregate	Organic content	As per specification	At Lab	As directed
	SG and Absorption			
	Grading			
4.Concrete	Compressive strength Slump Test	As per Table 3 & 4	At Lab At Site by IDD	As per table 3
5.Reinforcement	Tension	As per specification	At Lab	Two sample each batch
6.G.I. Wire	Zinc Coating	As per specification	At Lab	As per table 5
	Tensile Strength	40-55 Kg/mm2		
7.Geo-textile	Tensile Strength	>9.5 KN/m		Two sample For Each batch
	Trapezoidal tear	>225 N		
	Vertical flow 50mm head	110mm/s		
	Apparent opening	>0.27mm		
8.Embankment Filling	Density	>90% for embankment >95% for service road	At site by IDD	Per 4000 Cu. m of earth
	Field density		At site by IDD	
	Specific Gravity		At Lab	
	Grain size Analysis		At Lab	
	Liquid limit		At Lab	
	Plastic Limit		At Lab	
	Moisture Content		At Lab	
9.Backfill	Plasticity Index	>20	At Lab	Per 4000 Cu. m of filling
	Liquid Limit	>40	At Lab	

The materials, Delivery & Testing Record Book will be maintained and completed by Contractor and counter signed/approved by the appropriate representative of IDD/IDSD.

5. Work Schedule

Work schedule for quality assurance plan has been prepared according to the technical requirements, working season and anticipated completion period. Contractor has tried to prepare the schedule on the basis of remoteness and working environment of site. Some steps are listed below could be adopted to prepare the work schedule for timely completion of the project.

1. First month should be estimated for mobilization and preparation of QAP. In this month the contractor will manage the source of internal and external construction materials, seeks permission (if necessary), also manage the fund for the works.

