Factors Identification and Conformance of Quality of Cement and Coarse Aggregate used at Gautama Buddha Airport Upgrading Component, Nepal

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ABSTRACT

Quality management system has been challenging in construction of airport project. The objective of study is to assess the factors affecting quality and conformance of Cement and Coarse Aggregate standard used at Construction Site of Gautam Buddha Airport Upgrading Component. This research is based on key informant interview with supervisor and site engineers, questionnaires survey with clients, consultants and contractors who were involved in airport construction projects along with lab test of cement and coarse aggregate of airport construction sites. Statistical tools mean value and relative importance index were used for the ranking of different quality methods. Airport follows specification and standard technical guidelines for the airport construction work. The major factors affecting the quality management in airport construction was Unavailability of competent staff, Low quality drawing and specification and Poor-quality procedure and department for ensuring quality assurance practice Provide training and seminar on quality assurance and Support the setting up of of cube of 3 days, 7 days and 28days is18.8N/mm^2(>16N/mm^2), 27.20N/mm^2(>22N/mm^2) and 39.40N/mm^2(>33N/mm^2) respectively. The average initial setting Time and final setting time of cement is 180 min(>45min) and 351 min(<600min) respectively and average soundness of cement is 2.7mm(<10mm). The test for aggregate, it was found that average Los Angeles Abrasion value of aggregate was 32.8%(<40%), average crushing value of aggregate was 19.88%(<25%), Flakiness index of aggregate found that 19.85%(<25%) and the gradation of aggregate was found that within specification. Quality in airport construction starts from selection of material, inspection, tests employed.

Keywords: Factors, Relative Important Index, Compressive Strength, Flakiness index, Los Angels

1. INTRODUCTION :

The Quality of a product is a degree of conformation of all the relevant features and characteristics of the products to all aspects of a customer's need, limited by the price and delivery that he or she will accept. Quality is addressing the needs of customer through design requirements under the control of regulatory authority for developing the high utility product in an effective manner in comparison to your competitors [1].

Simply speaking, addressing need of client in design and making specification based of design which is better than competitors within same cost following regulatory authority requirements are to be addressed for saying thing of quality. Gautam Buddha Airport Upgrading Component under construction as second airport of Nepal.

Airport must be insured a good quality of construction for the safety of air traffic flow and management so quality of construction is very important for a construction project like international airport. So, the quality management practice must be observed closely at airport ensuring effective construction the researcher is interested to assess the factor affecting quality management practices. Its application and quality of material used at site.

The study will be significance of construction stockholder to assess the factor of quality management as a lesson to be learned for future airport construction project. it will be a quality document for practicing engineers to maintained quality management practice in their respective project. It would also attempt to reveal how quality management systems are established in project procurement and what kind of tests are been performed at site for maintaining the quality of work. The findings are expected to be valuable in future projects.

2. OBJECTIVE:

Overall, all objective of the study is to assess the factors affecting quality and conformance of Cement and Coarse Aggregate standard used at Construction Site of Gautam Buddha Airport Upgrading Component. The specific objective of the study is to:

(1) To assess the factors affecting quality management.
(2)To analyze the strength of cement and coarse aggregate used in construction site.

3. LITERATURE REVIEW:

3.1 Concept

Quality and grade should be understood differently. Grade is a category or a rank given to entity having the same functional use but different requirements. A high-grade service may be or low quality if does not meet requirements and conversely, a low-grade service may be of high quality [2].

Quality can be defined as:

$$Q=P/E \text{ Where, } Q = \text{Quality, } P = \text{Performance and } E = \text{Expectations}$$

If Q is greater than 1, then the project utility is more, the determination of P and E will most likely be subjective with the organization assuring performance and the conformance of the expectation.

3.2 Factor Affecting the Quality Management

Setting up venture prerequisites at the undertaking origin stage could influence the nature of finished task. As referenced, that, nature of any development venture was meeting the prerequisites of the planner, constructor and administrative organizations just as the owner. The accompanying Figure 1 shows the task prerequisites of the architect, constructor, administrative organizations and the owner, that could be meet by upgrading the undertaking quality as found in key writing. Appropriately, a cautious harmony between the owner's necessities of the undertaking expenses and timetable, wanted working qualities, materials of development, and so forth and the plan Perficient's requirement for satisfactory time and financial plan to meet those prerequisites during the plan cycle was fundamental. Owner s balances their necessities against monetary contemplations and, at times, against possibility of disappointment. The plan proficient was committed to secure general wellbeing and wellbeing with regards to the last finished project. The constructor was liable for the methods, strategies, procedures, successions, and techniques of development, just as security safety measures and projects during the development cycle. The finish of undertaking as per the task necessities could be guaranteed by the nature of its development. Task prerequisites are the key primary elements impacting development venture quality. Be that as it may, it very well may be impacted by numerous elements. As indicated by an investigation by, the executives' duty and authority in development associations could influence development quality. It was on the grounds that, the helpless administration rehearses legitimately and by implication lead to decay of development profitability and at last impact on venture quality. In development terms, cost, plan, and potentially quality objectives are built up for each undertaking. Undertaking administrators are compensated based on meeting these objectives. Further, the quality groups give organizations the organized condition fundamental for effectively actualizing and consistently applying the quality in development. As additional expressed, degree of collaboration of gatherings taking an interest in the plan stage was discovered to be the most significant factor

that influences quality cooperation among gatherings, for example, Structural Engineers, Electrical Engineers, Environmental Engineers, Civil Engineers, Architects, and owner s was basic to arrive at the quality objectives for plan. Further, in the development stage, degree of collaboration of gatherings taking an interest in the development cycle was discovered to be very important [2].

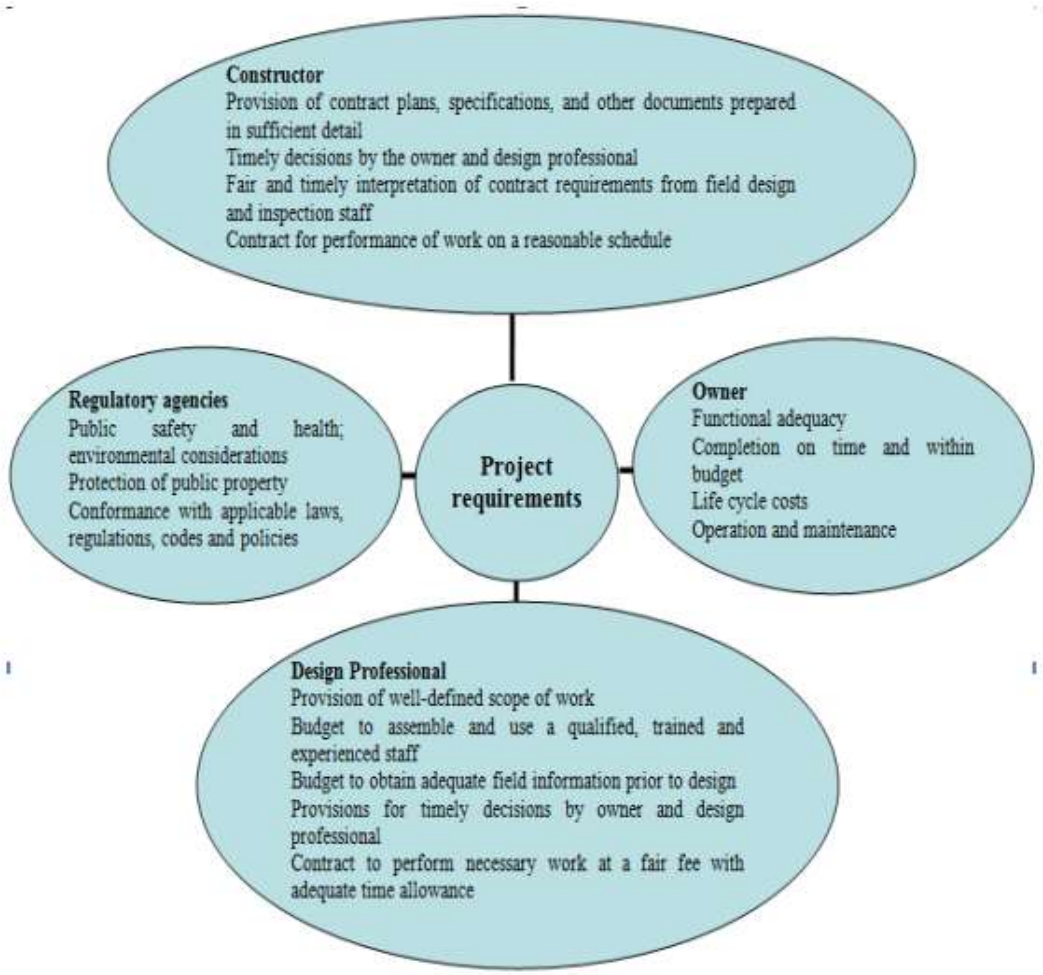


Fig 1: Project Requirements

Building up the undertaking prerequisites for quality starts at venture origin. A cautious harmony between the owner 's necessities of the task expenses and timetable, wanted working attributes, materials of development, and so on and the plan proficient's requirement for sufficient time and financial plan to meet those prerequisites during the plan cycle is basic. Owner s balance their prerequisites against monetary contemplations and, sometimes, against possibility of disappointment.

The plan proficient is committed to secure general wellbeing and wellbeing with regards to the last finished undertaking. The constructor is liable for the methods, strategies, methods, groupings, and methodology of development; just as wellbeing safeguards and projects during the development cycle Project necessities are the key factors that characterize quality during the time spent development. The cycle of development can be separated into three principle stages, to be specific, the arranging and configuration stage, the development stage, and the upkeep and activity stage.

The constructor was answerable for the methods, strategies, methods, groupings, and methodology of development, just as security safety measures and projects during the development cycle. The finishing of venture as per the task prerequisites could be guaranteed by the nature of its development. Venture prerequisites are the key fundamental variables affecting development venture quality. In any case, it tends to be impacted by numerous variables. As indicated by an investigation by, the executives duty and initiative in development associations could influence development quality. It was on the grounds that, the helpless administration rehearses legitimately and by implication lead to decay of development efficiency and eventually impact on venture quality. In development terms, cost, plan, and potentially quality objectives are set up for each task. Undertaking chiefs are compensated based on meeting these objectives. Further, the quality groups give organizations the organized condition vital for effectively executing and constantly applying the quality in development. As additional expressed, degree of cooperation of gatherings partaking in the plan stage was discovered to be the most significant factor that influences quality collaboration among gatherings, for example, Structural Engineers, Electrical Engineers, Environmental Engineers, Civil Engineers, Architects, and proprietors was fundamental to arrive at the quality objectives for plan. Further, in the development stage, degree of collaboration of gatherings partaking in the development cycle was discovered to be very important [3].

Setting up the venture prerequisites for quality starts at venture commencement. A cautious harmony between the proprietor's prerequisites of the venture expenses and timetable, wanted working attributes, materials of development, and so forth and the plan proficient's requirement for satisfactory time and spending plan to meet those necessities during the plan cycle is fundamental. Proprietors balance their prerequisites against monetary contemplations and, at times, against possibility of disappointment. The plan proficient is committed to ensure general wellbeing and security with regards to the last finished venture. The constructor is liable for the methods, strategies, methods, successions, and techniques of development, just as security safety measures and projects during the development cycle Project necessities are the key factors that characterize quality during the time spent development. The cycle of development can be separated into three primary stages, specifically, the arranging and configuration stage, the development stage, and the upkeep and activity stage.

4. METHODOLOGY:

Research Conceptualization : The research is an experimental quantitative and descriptive. The major constructs of the research methodology is given in Table 1.

Table 1. Research Matrix

SN	Objectives	Data Sources	Methodology	Analysis
1)	To access the factor's affecting quality management of GBAUC	Literature review, Project manager's and other employee's experience.	Questionnaire Survey, KII, field visit	the factor's affecting quality management of GBAUC
2)	To analyze the strength of cement and coarse aggregate used in GBAUC	Lab tests	Test of material cement, and coarse aggregate at lab	quality of material of cement, and coarse aggregate

In this study, Factor of Quality was assessed and strength of Cement and Coarse Aggregate was conformed. Later on, it is analyzed and interpreted the significance of findings to provide conclusions and recommendations.

5. STUDY AREA :

Bhairahawa International Airport Construction

Construction of Runway Size: 3,000m x 45m exclusive of 7.50m shoulder at both sides and Construction of Taxiway Size: 1,900m x 30m with RESA (300x90) on different layer (fill type-1, sub-base course, base course,

bituminous base course, asphalt concrete binder course, tack coat). Construction of apron (148x350) on different layer (Fill type-1, sub-base, cement treated base course, PCC). Construction of building: ITB 15,169 Sq.m. (arrival and departure), Sub Station/ Admin/ control tower 2,141 Sq. m and CFR 1,608 Sq.m. Construction of drainage system parrallel to runway , taxiway and diersion of Ghagra Khola along with Airport boundary.Construction of internal and external periphery road,airport access road, CFR access road [4]. As shown in below figure number 2 the Project 3-D Master Plan and response collected based on table number 2 are as follow [5].

Table 2: List of responses received

S.N.	Categories	No. of responses received		
		Clients	Consultants	Contractors
1	Engineers,	6	6	8
2	Supervisors	3	3	4
	Sub-Total	**9**	**9**	**12**
	Total	**30**		

Fig 2: Project 3-D Master Plan

6. DATA COLLECTION AND ANALYSIS:

Data Collection

The primary data were collected by field visit, interview, questionnaire of the personnel Client, Consultant and contractor (Engineers/Supervisors) involved in the construction of GBAUC.

Schedules Questionnaire

Factors affecting quality management in Airport construction and responsible parties for ensuring/enforcing quality assurance plan and the benefits and effects of adhering and non-adhering to quality standard in Airport construction were assessed through schedule questionnaire survey.

Key Informant Interview

Interview with the site project manager, site engineer, lab technician and supervisors were taken were taken from airport construction. It was done by snowball sampling. For the validity and reliability of the questionnaire, key informant interview (KII) were taken with the experts of related sector officers. This interview was taken by meeting the expert of related field.

Lab Tests

Analysis of quality of cement and coarse aggregate were done at site lab. The Lab tests performed for cement at site are: Compressive Strength Test, setting time test, Soundness test and Normal consistency test following IS Code as adopted from [6]. Similarly, for Coarse aggregate Los Angeles abrasion test, Crushing value test, Gradation test, Water absorption test and Flakiness index test. Documents and reports of airport construction, Quality Assurance plan (QAP) of airport construction, Guidelines provided by airport for construction and several academic articles were reviewed [7].

Data analysis

The statistical method used for analyzing the data can be briefly explained as:

Mean Value (X)

The minimum, maximum and the average arithmetic mean (X) values for each issue in the question have been calculated for each group to identify the extreme and average opinion on the issue.

Relative Importance Index (RII)

Using the following equation, the relative importance index of each sub- factor was calculated as:

$$\mathbf{RII} = \frac{\sum_i^n \mathrm{Wi}}{\mathrm{N} * \mathrm{A}}$$

Where,
WI= the rating given to each factor by the respondents ranging from 1-4
N= Total no. of respondent
A= Large rating score from respondent

7. RESULTS AND DISCUSSION:

Factors Affecting Quality Management in Airport Construction

The factors affecting quality management in Airport Construction were Unavailability of competent staff, Low quality drawing and specification and Poor-quality procedure and department. As per table 3, Clients and contractors give major factor affecting quality management in Airport Construction was Poor quality procedure and department. The factors affecting according to consultants are Bureaucracy, Low quality drawing and

specification and Material/Equipment specification. The KII gives Unavailability of competent staff, Design complexity, Low quality and poor availability of resources and Supplier impact ware major factors affecting quality management in Airport Construction.

Table 3: Factors affecting quality management in Airport Construction

Factors	Clients		Consultants		Contractors		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Market share of organization	0.722	45	0.722	44	0.833	29	0.759	45
Liquidity of organization	0.833	28	0.778	39	0.938	19	0.850	28
Cash flow of project	0.917	17	0.889	22	0.958	10	0.921	21
Project design cost	0.889	23	0.917	12	0.979	1	0.928	19
Material and equipment cost	0.917	17	0.944	5	0.979	1	0.947	7
Project labour cost	0.944	7	0.917	12	0.958	10	0.940	12
Project overtime cost	0.889	23	0.889	22	0.938	19	0.905	25
Escalation of material prices	0.917	17	0.917	12	0.979	1	0.938	16
Lack of contractor supervision	0.889	23	0.917	12	0.938	19	0.914	22
Poor relationship and partnering among project participants	0.806	29	0.833	28	0.792	35	0.810	32
Reduced Subcontractor responsibility	0.861	27	0.861	26	0.813	30	0.845	29
Inappropriate method of contractor	0.944	7	0.917	12	0.958	10	0.940	12
Poor quality procedure and department	0.972	2	0.944	5	0.979	1	0.965	3
Lack of auditing system	0.944	7	0.917	12	0.958	10	0.940	12
Poor Training system	0.778	36	0.806	33	0.792	35	0.792	37
Low quality continues improvement	0.944	7	0.833	28	0.875	28	0.884	26
Lack of process improvement	0.778	36	0.889	22	0.917	24	0.861	27
Lack of Management commitment	0.917	17	0.917	12	0.938	19	0.924	20
Lack of quality policy	0.944	7	0.833	28	0.958	10	0.912	23
Low effective project management system	0.806	29	0.861	26	0.813	30	0.826	30
Bureaucracy	0.778	36	1.278	1	0.771	41	0.942	11
Supplier impact	0.917	17	0.500	45	0.979	1	0.799	36
Low quality drawing and specification	0.972	2	0.972	2	0.958	10	0.968	2
Design complexity	0.944	7	0.917	12	0.979	1	0.947	7

Difficult data collection system	0.806	29	0.806	33	0.813	30	0.808	33
Poor performance of quality tools	0.917	17	0.889	22	0.917	24	0.907	24
Difficult application of quality system	0.944	7	0.917	12	0.958	10	0.940	12
Lack of Quality training/meeting	0.778	36	0.806	33	0.792	35	0.792	37
Unavailability of competent staf	1.000	1	0.972	2	0.979	1	0.984	1
Nature uniqueness	0.778	36	0.806	33	0.792	35	0.792	37
Project size and complexity	0.972	2	0.944	5	0.979	1	0.965	3
Material/Equipment specification	0.944	7	0.972	2	0.958	10	0.958	5
Project Environment	0.806	29	0.833	28	0.813	30	0.817	31
Low quality and poor availabilit of resources	0.889	23	0.944	5	0.979	1	0.938	16
Lack of motivation	0.806	29	0.833	28	0.771	41	0.803	34
Incompatible tendering procedures	0.944	7	0.944	5	0.958	10	0.949	6
Low tendency to teamwork	0.778	36	0.778	39	0.792	35	0.782	42
Employee attitudes	0.944	7	0.917	12	0.938	19	0.933	18
Recruitment and competence development	0.972	2	0.944	5	0.917	24	0.944	9
Belonging to work	0.778	36	0.806	33	0.792	35	0.792	37
Employees motivation	0.806	29	0.778	39	0.813	30	0.799	35
Application of health and safety factors in organization	0.972	2	0.944	5	0.917	24	0.944	9
Project location is safe to reach	0.778	36	0.778	39	0.750	43	0.769	43
Reportable accidents rate in project	0.778	36	0.778	39	0.750	43	0.769	43
Assurance rate of project	0.806	29	0.806	33	0.750	43	0.787	41

Responsible for Ensuring Quality Assurance Practice in Airport Construction:

As shown in table 4. The main responsible for ensuring quality assurance practice form client and consultant is Support the setting up of quality assurance department in construction and also from consultant is Provide training and seminar on quality assurance and Enforce statutory requirement and from contactor is Enforcement of quality standards by government and/or other agency in project delivery and Severe penalty for non-compliance to quality standards by government/professional bodies and overall the main responsible for ensuring quality assurance practice are Provide training and seminar on quality assurance and Support the setting up of quality assurance department in construction firms. While doing KII and site observation it was found that the main responsible for ensuring quality assurance practice in airport construction are Support the setting up of quality assurance department in construction firms, provide training and seminar on quality assurance and Enforce statutory requirement.

Table 4: Responsible for ensuring quality assurance practice in Airport Construction

Necessary Measures	Client (%)			Consultant (%)			Contractor (%)			Overall (%)		
	YES	NO	Sometimes	YES	NO	Sometimes	YES	NO	Sometimes	YES	NO	Sometimes
Provide training and seminar on quality assurance	89	0	11	100	0	0	92	0	8	94	0	6
Support the setting up of quality assurance department in construction firms	100	0	0	100	0	0	83	0	17	94	0	6
Enforcement of quality standards by government and/or other agency in project delivery	89	0	11	89	0	11	92	0	8	90	0	10
Severe penalty for non compliance to quality standards by government/professional bodies	78	0	22	89	0	11	92	0	8	86	0	14
Enforce statutory requirement	89	0	11	100	0	0	83	0	17	91	0	9

Table 5: Benefits to be derived from application of Quality standard

Benefits	Clients		Consultants		Contractors		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Production of better designs	0.972	2	0.944	2	0.854	8	0.924	5
More effective planning	0.944	5	0.917	4	0.917	4	0.926	4
Improved quality of deliverables	1.000	1	0.972	1	0.938	2	0.970	1
Enhanced reputation for good design and construction for contractors	0.917	8	0.861	6	0.958	1	0.912	6
Improved site management	0.944	5	0.833	8	0.833	9	0.870	8
Increased project performance	0.972	2	0.917	4	0.917	4	0.935	2
Efficient management of construction problems	0.833	9	0.861	6	0.813	10	0.836	10
Fewer delays of projects and disruptions	0.972	2	0.806	10	0.938	2	0.905	7
Lower cost of remedial and repeat works	0.944	5	0.944	2	0.896	6	0.928	3

provision of feedback for use in future projects	0.833	9	0.833	8	0.875	7	0.847	9

Benefits of Quality standard in Airport Construction

In Table 5, Clients and consultant ranked Method "Improved quality of deliverables" as a main priority for benefits to be derived from application of quality standard in airport construction whereas contractor ranked "Enhanced reputation for good design and construction for contractors" as 1st priority. But overall Improved quality of deliverables as 1st rank and Increased project performance as 2nd rank. During site observation and KII it was found that the Lower cost of remedial and repeat works, improved quality of deliverables and increased project performance are major benefits to be derived from application of quality standard in airport construction.

Effects of not Adhering to Quality standards in Airport Construction :

Questionnaire survey was done with clients, consultants and contractors and find out the effects of not adhering to quality standards in airport construction are Cost overrun on projects, Structural failures leading to death and Poor infrastructural constructed. As per Table 6, Clients give major effects of not adhering to quality standards in airport construction are Cost overrun on projects, Poor infrastructural constructed and affects the nation's development growth. The effects of not adhering to quality standards in airport construction according to consultants are Structural failures leading to death, affects the nation's development and the contractors give major effect of not adhering to quality standards in airport construction is Structural failures leading to death. The KII gives Cost overrun on projects; Poor infrastructural constructed are major effects of not adhering to quality standards in airport construction.

Table 6 : Effects of not adhering to Quality standards

Effect	Clients		Consultants		Contractors		Overall	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Cost overrun on projects	0.972	1	0.944	3	0.938	2	0.951	1
Untimely Project Finished	0.944	4	0.917	5	0.792	6	0.884	6
Structural failures leading to death	0.917	6	0.972	1	0.958	1	0.949	2
Poor infrastructural constructed	0.972	1	0.944	3	0.917	3	0.944	3
Damage to reputation	0.944	4	0.917	5	0.896	4	0.919	5
Affects the nation's development growth	0.972	1	0.972	1	0.833	5	0.926	4

Compressive strength of cement

During cube test at site, the result was found satisfactory .It was found that average Compressive strength of cube of 3 days strength was found 18.8 N/mm^2, 7 days strength was found 27.20 N/mm^2 and 28 days strength was found 39.40 N/mm^2 .The compressive strength acceptance criteria of Compressive strength of cube of 3 days strength is 16 N/mm^2, 7 days strength is 22 N/mm^2 and 28 days strength is 33 N/mm^2 [7].

Soundness of cement.

During Soundness test of cement at site, the result was found satisfactory. It was found that average soundness of five reading of cement is 2.7mm. The soundness of cement acceptance criteria of airport specification and standard guidelines are < 10 mm [6].

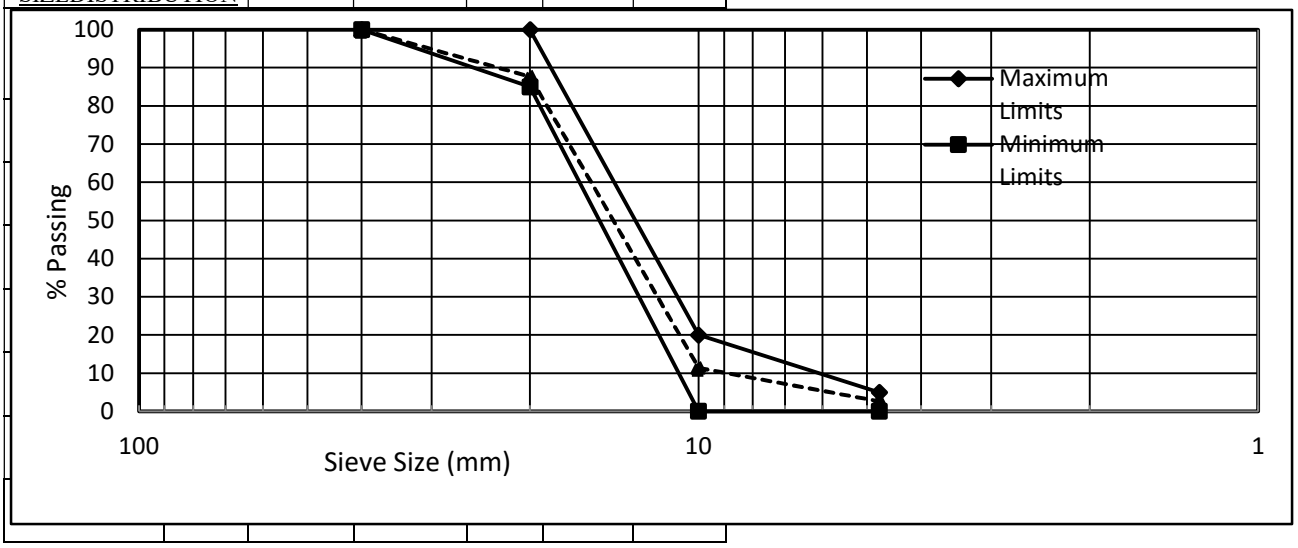
Setting Time of cement.

During setting Time test of cement at site, the result was found satisfactory. It was found that average initial setting Time and final setting time of cement is 180 min. and 351 min. respectively and from KII the initial and final setting time of cement was found that within airport specification and standard guideline that is initial setting

time is > 45 min and final setting time is < 600 min.

Table 7 : Gradation of Crushed Aggregate test

Type of Material	: 20 mm Crushed Aggregate (TinauKhola)					
Sample Location	: Chaitanya Ready Mix Concrete Plant					
Total Wt, gm	10000					
A. SIEVING DATA						
Sieve Size (mm)	Weigh Retain d	Cmmulat ve Weigh Retained	Cummulat ve Retained (%)	% Passi g	Specification Limit IS 383	
					Minimu m	Maximu m
40.0	0	0	0.00	**100.0**	100	100
20.0	1229	1229	12.29	**87.71**	85	100
10.0	7630	8859	88.59	**11.41**	0	20
4.75	877	9736	97.36	**2.64**	0	5
pan	264	10000	100.00	**0.00**		
B. GRAIN SIZEDISTRIBUTION						



Test of Coarse Aggregate.

Los Angeles Abrasion test of Aggregate.

During Los Angeles Abrasion test of aggregate at site, the result was found satisfactory. It was found that average Los Angeles Abrasion value of aggregate was 32.8% and from KII the Los Angeles Abrasion value of aggregate was found that within airport specification and standard guideline that is < 40% [8].

Aggregate crushing value test.

During Aggregate crushing value test at site. the result was found satisfactory. It was found that average crushing value of aggregate was 19.88% and from KII the crushing value of aggregate was found that within airport specification and standard guideline that is < 25% [9].

Gradation of Crushed Aggregate test

During Gradation of Crushed Aggregate at site, the result was found satisfactory. It was found that Gradation of Crushed Aggregate was within specification and standard guideline as shown in table 7.

Flakiness index Test of Aggregate

During Flakiness index test of aggregate site. the result was found satisfactory. It was found that 19.85%. Flakiness index test of aggregate was within specification and standard guideline is <25% as shown in table number 8 [9].

Table 8 : Flakiness index Test of Aggregate

Size of aggregates		Weight of the fraction consisting of at least 200 pieces(gm),W	Weight of aggregate in each fraction passing thickness gauge(gm), X	Weight of aggregate in each fraction retained on thickness gauge (gm)
Passing through IS sieve (mm)	Retained on IS sieve (mm)			
40.00	31.50	0.0	0.0	0.0
31.50	25.00	0.0	0.0	0.0
25.00	20.00	1660.0	282.0	1378.0
20.00	16.00	1930.0	355.0	1575.0
16.00	12.50	1988.0	342.0	1646.0
12.50	10.00	1033.0	333.0	700.0
Total Wt., gm		6611.0	1312.0	5299.0
Flakiness Index (%)			(X/W)*100 =	19.85
		Specification Limit		< 25 %

8. CONCLUSIONS :

The unavailability of competent staff, low quality drawing and specification and Poor-quality procedure and department were major factors affecting the quality management at Construction of airport. The Provide training and seminar on quality assurance and Support the setting up of quality assurance department in construction firms are major factor were found to be responsible for ensuring quality assurance practice. The Improved quality of deliverables, Increased project performance and lower cost of remedial and repeat works were major benefits to be derived from application of quality standard. The Cost overrun on projects, structural failures leading to death and Poor infrastructural constructed were major effects of not adhering to quality standards in airport construction. During the test of cement and coarse aggregate at site, the result was found satisfactory. It was found that average Compressive strength of cube of 3 days, 7 days and 28 days is 18.8N/mm^2(>16N/mm^2), 27.20N/mm^2(>22N/mm^2) and 39.40N/mm^2(>33N/mm^2) respectively. The average initial setting Time and final setting time of cement is 180 min(>45min) and 351 min(<600min) respectively and average soundness of cement is 2.7mm(<10mm). The test for aggregate it was found that average Los Angeles Abrasion value of aggregate was 32.8% (<40%), average crushing value of aggregate was 19.88% (<25%), Flakiness index of aggregate found that 19.85% (<25%) and the gradation of aggregate was found that within specification.

9. RECOMMENDATIONS:

For ensuring optimum quality management in airport projects, timely ISO audits and inspection must be done regular basis. ICAO supervision should be emphasized for taking care of safety indicator and construction quality during operation of airport. Hence, Quality management in airport construction process can be made effective through the joint effort of all the stakeholders' clients, consultants and contractors involved with comprising all attitudes and responsibilities. Meeting, group discussion, reviews and idea sharing as well as effective control

measures and supervision can help for better bonding and understanding of all the stakeholders.

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