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REWORK COST ON BUILDING PROJECTS IN THE SOUTH WESTERN PART OF NIGERIA

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Abstract

Right-first-time is a principle that evaluates the competence of firms, quality of product and the expertise of a professional. Rework is doing something at least one extra time due to non-conformance to requirements, could suggest the abovementioned parameter negatively either on organisation or individual. Human beings are not perfect, based on this, errors occur that may lead to rework on site and should be accommodated adequately for an uninterrupted flow of construction activities and non-delay of delivery of projects. The south western part of Nigeria was the area of study. The quantitative and descriptive research approaches were used. The questionnaire survey and historical data were the two method used for the collection of data for the study. Simple statistical means were used for data analysis. The research findings indicate that incorrect lying of forming course, poor quality of concrete, poor plastering, and construction errors during excavation dominate relative to areas of rework. Therefore, the study suggests that in order to eliminate or reduced drastically the occurrence of rework on future projects, consideration should be given to the following: the setting aside of a sum of money equal to the value of 0.6 – 5.0% of initial contract sum, engagement of knowledgeable foremen or having regular training of foremen, the correct construction processes should be followed in the execution of construction activities, and materials that are of good quality only should be used for constructional purposes.

Keywords: Building project, Rework, final cost, Construction process

1. INTRODUCTION

The construction industry is mainly project based and various complexities are inherent in the construction projects. Quality management principles and tools are critical requirements in conventional construction management practice to accommodate adequately the variability in production, relative to the diverse interests of multiple stakeholders characterised of construction projects, which when lacking may result in frequent changes / variations. As a result, rework is accepted as an inevitable feature of the construction process. A feature that is not healthy for the industry.

Quality of products in organisations reflects directly the overall performance of the organisation and a measure of competitiveness. Increased global competition has resulted in companies accepting the challenge of improving their quality of service and products by implementing total quality management (TQM). The implementation of a TQM philosophy can help a company improve its productivity, and both customer and employee satisfaction.

Ashford (2000) cited by Love and Sohai (2003) defined rework as 'the process by which an item is made to confirm to the original requirement by completion or correction. CIDA (1995) defined rework as 'doing something at least one extra time due to non-conformance to requirements'. Rework can result from errors, omissions, failures, damages and change orders. Love (2002) added that it can also result from the unnecessary redoing / rectifying efforts of incorrectly implemented processes or activities. Rework triggers claims for extra costs and time / schedule overruns (Kumaraswamy and Chan, 1998; CII, 2001b). It can generate costly ripple effects leading to delay and disruption throughout the entire project supply chain. When errors made during their formative stages are discovered necessitating costly rework, particularly, design errors, if undetected, may lead to civil, geotechnical, or structural failures, which can have catastrophic consequences including severe injuries and even fatalities. Rework can adversely affect the profitability, performance, and reputation of those organisations involved, as well as a project's organisational and social outlook (Love, Irani and Edwards, 2004). Based on the foregoing this study was initiated to assess the cost of reworks on building projects in Nigeria.

2. LITERATURE REVIEW

There are four types of rework cost. They are: external failure; internal failure; inspection, and prevention cost. Researches reveals that rework is a significant factor that contributes to project time and cost overruns (Love, 2002); lack of satisfaction of client and organisational adversities. The most direct metric for displaying the impact of rework is the direct cost of the rework (Zhang, 2009). During the construction phase, rework increases the delivery cost of the project. Different studies by Hammarlund and Josephson (1999) and Love and Li (2000) have found the cost of rework in design and construction to range from 2% to 12% of the contract cost, and as high as 25% of contract value (Barber et al., 2000 and Zhang, 2009). Table 1 provides summary consolidated from a set of previous studies on rework establishing the percentage figure of the value of rework on projects.

Table 1: Some extracts of rework impacts from different studies.

Barber *et al.* (2000)	This UK study examined the quality failure costs in two highway construction projects (procured using Design-Build-Finance-Operate). The quality failure costs were 16% and 23% when the cost of delays was also included. If the cost of delay were excluded the corresponding failure costs were 3.6% and 6.6%.
Josephson *et al.* (2002)	The cost of defects identified from seven building projects in a Sweden based study ranged between 2.3% to 9.3% of contract value. In another Sweden based study, the quality failure costs were found to be 6% of original contract value.
Fayek *et al.* (2004)	From the 108 field rework incidences in a Canada based study, the following findings were derived as cost contribution summary: (a) engineering and reviews - 61.65%; (b) human resource capability - 20.49%; (c) materials and equipment supply – 14.81%; (d) construction planning and scheduling – 2.61%, leadership and communication – 0.45%.
Rhodes and Smallwood (2002)	In a South African base study, the cost of rework was found to be 13% of the value of the completed construction. In the same article it was reported that a research conducted by Associated General contractors of America found that the

	average cost of rework (from nine industrial projects) was 12.4% of the project cost.
Love and Edwards (2004)	Construction Industry Development Authority in Australia found that average cost of reworks of projects without a formal quality management system is 6.5% of contract value (and the high value for a project under lump sum procurement is 15%). However, the average cost of rework for projects with a quality system was found to be 0.72%. In another Australian based study (Love, 2002) 161projects were studied and the mean of direct and indirect rework cost were found to be 6.4% and 5.6% of the original contract value, respectively. However, this study revealed that project procurement type may not have significant influence on the rework cost.
Marosszeky (2004)	In this Australian based study (in New south Wales), the rework cost on the average were found as 5.5% of contract value, that include 2.75% as direct costs; 1.75% indirect costs for main contractors, and 1% indirect costs for subcontractors.

(Source: Palaneeswaran, 2006)

3. RESEARCH METHODOLOGY

Public and private projects in the south Western part of Nigeria, particularly in Ondo and Lagos states were those surveyed and the area of coverage for this study. The sampling frame consists of Architects, Builders, Quantity Surveyors and engineers. The details of respondents were obtained from the various professional state chapters institutes. These include: the Nigerian Institute of Architects (NIA), the Nigerian institute of Building (NIOB), the Nigerian institute of Quantity Surveyors, and the Nigerian society of Engineers (NSE). Probability samplings were used in the selection of respondents, and were contacted through mail. A total of one hundred and forty-five (145) well-structured questionnaires were administered to professionals, and one hundred and twenty (120) was returned filled, representing 80% response rate. The survey and historical research approach were adopted for the collection of data for the study. Relative to the qualifications of respondents; those with B.Tech / B.Sc predominate (70%), followed by M.Sc / M.Tech (13%), Diplomas (OND / HND) (12%), and PhD (5%). Respondents with over 10 years of working experience predominate (54%), next is respondents with 5 year working experience (27%), and those with over 30 years of experience (11%).

Based on the years of experience of respondents, it can be deemed, that respondents have handled many projects. This infers that they are knowledgeable relative to the area of this research and information's obtained can be relied on. Descriptive statistics was employed in the analysis of data for this study.

4. FINDINGS AND DISCUSSION

This section presents the data from field survey; historical, data and their analysis.

Table 2: ***Contractor-Related Factors relative to the causes of rework.***

S/N	CONTRACTOR-RELATED FACTOR	NOT SEVERE	LESS SEVERE	SEVERE	MORE SEVERE	MOST SEVERE	Mean score	Rank
1	Wronging laying of forming course 1 (block work)	3	21	12	42	78	4.33	1
2	Poor quality of concrete	13	4	21	68	30	4.22	2
3	Poor plastering	11	17	32	40	10	3.88	3
4	Deflection of part of slab	2	15	24	41	38	3.82	4
5	Lack of attention to quality	2	11	30	45	32	3.78	5
6	Lack of support to site management	6	30	58	19	7	3.76	6
7	Ineffective coordination and integration of components	4	25	12	32	47	3.75	7
8	Incorrect laying of slab reinforcement	3	24	31	10	52	3.70	8
9	Lack of straightness of beam at the top and bottom	7	10	34	16	43	3.69	9
10	Incorrect forming of deck	10	19	20	23	48	3.67	10
11	Collapse of projections	15	9	24	$26	46	3.66	11
12	Collapse of beam after construction	4	12	24	63	17	3.64	12
13	Use of poor materials in Sand						3.58	13
14	Defective materials as a result of handling	12	11	40	18	39	3.51	14
15	Wrong opening for windows and doors	7	17	35	35	26	3.47	15
16	Consultant initiated changes	7	14	31	52	16	3.47	15
17	Non-verticality of column	3	17	30	62	8	3.46	17
18	Use of poor materials in Steel						3.85	18
19	Collapse of part of slab	14	6	49	20	31	3.40	19
20	Contractor's request to improve quality	17	13	27	31	32	3.40	20
21	Construction error during excavation	4	30	28	31	27	3.39	21
22	Incorrect laying of electrical pipes in slab	5	16	59	7	33	3.39	22
23	Incorrect positioning of lighting switches and socket outlet.	2	18	48	41	11	3.34	23
24	Omissions during construction	8	18	48	19	27	3.33	24
25	Poor Safety considerations	15	34	12	19	40	3.29	25
26	Honeycombing of column and beam	19	12	27	44	18	3.25	26

27	Quality failure	11	19	29	52	9	3.24	27
28	Lack of proper monitoring and evaluation	13	21	26	45	15	3.23	28
29	Errors during construction	13	19	38	27	23	3.23	29
30	Overlooked site condition	26	6	29	34	25	3.22	30
31	Poor site practices	14	33	19	42	12	3.04	31
32	Deflection of beam	6	30	58	19	7	2.93	32
33	Contractor initiated changes	20	23	47	12	18	2.88	33
34	Incorrect laying of mechanical pipes	36	12	49	17	6	2.54	34

(Source: Aiyetan, 2014)

Table 2 presents the rating of respondents relative to thirty-four contractors' related causes of rework in the form of a MS based upon percentages responses to a scale 'not severe' to 'most severe' according to respondents. It is significant that in term of the mean MS, with the exception of deflection of beam; contractor initiated changes, and incorrect laying of mechanical pipe, all the MSs are above the midpoint of 3.00, which indicates that the extent of occurrence of rework on project is significant in rating contractor related factors that are responsible for the occurrence of rework on building projects. Wrong laying of forming course in block work is first in ranking. This may be as a result of poor workmanship, non-usage of plumb when setting the bricks and wrongly done setting out. Poor quality concrete ranks next and this can result from the use of expired cement in the concrete mix, poor checking procedure for materials on site and also negligence in duties by the foreman. Poor plastering ranks third among the factors. This may be as a result of the use of poor quality materials in the mortar, unevenness of the wall surface after plastering, development of cracks and general poor workmanship. Deflection of part of slab is ranked fourth among the factors that cause reworks. The reason for this can be the usage of poor quality timber in form work which eventually results in sagging of some part of the slab. Lack of attention to quality is ranked fifth among the causes of reworks on building projects. Lack of support to site management and Ineffective coordination and integration of components can be seen as the sixth and seventh factors that cause reworks. In contrast, Incorrect laying of mechanical pipes, Contractor initiated changes, Deflection of beam, Poor site practices, Overlooked site condition, Errors during construction, Lack of proper monitoring and evaluation, Honeycombing of column and beam, Poor Safety considerations, Omissions during construction, Incorrect positioning of lighting switches and socket outlet and Incorrect laying of electrical pipes in slab, Incorrect laying of slab reinforcement contribute less to the occurrence of rework.

Table 3 Historical data on public building projects in Lagos and Ondo States.

S/N	Location of project	Initial contract sum (million ₦)	Additional works (million ₦)	Rework cost (million ₦)	Final contract sum (million ₦)	Cost overrun (million ₦)	% of rework in final sum	Initial contract period (weeks)	Final contract period (weeks)	Time overrun (weeks)	% Time overrun	Areas of Reworks
1	Lagos	110.23	34.37	10.5	155.1	44.87	6.77	56	193	137	70.98	Collapse of beam, Poor plastering, M & E, Poor quality of concrete,
2	Lagos	13.4	1.1	0.5	15	1.6	3.33	53	53	0	0	Poor plastering, M & E, Collapse of beam, Roofing
3	Lagos	410.52	5.06	2.72	418.3	7.78	0.65	104	113	9	7.96	Poor plastering, Collapse of beam
4	Lagos	120.35	0.42	0.23	121	0.65	0.19	100	186	86	46.24	Poor plastering, Collapse of beam , M & E, Poor quality of concrete
5	Lagos	40	1.2	1.23	42.43	2.43	2.9	82	101	19	18.81	Poor plastering, M & E, Collapse of beam
6	Lagos	210	3.2	2.23	215.43	5.43	1.04	142	156	14	8.97	Poor plastering, Collapse of beam, Poor quality of concrete
7	Lagos	80	1.25	0.25	81.5	1.5	0.31	128	260	132	50.77	Painting, Poor plastering, M & E
8	Lagos	1000.4	85	32	1117.4	117	2.86	520	728	208	28.57	Poor plastering, M & E, excavation
9	Lagos	9.8	1.05	0.96	11.81	2.01	8.13	510	520	10	1.92	Poor plastering, Collapse of beam, Painting
10	Lagos	4.5	0.63	0.48	5.61	1.11	8.56	104	107	3	2.8	Roofing, Poor plastering, Poor quality of concrete,
11	Lagos	300	32	18	350	50	5.14	138	431	293	67.98	Poor plastering, Honeycombing, M & E, excavation
12	Lagos	98	5.2	3.7	106.9	8.9	3.46	52	58	6	10.34	Poor plastering
13	Lagos	35	1.58	0.42	37	2	1.14	42	88	42	52.27	Poor plastering, Collapse of beam ,M & E
14	Lagos	33.17	1.33	0.9	35.4	2.23	2.54	72	88	16	18.18	Poor plastering, Painting
15	Lagos	16.74	1.62	0.78	19.14	2.4	4.08	16	18	2	11.11	Poor quality of concrete, Poor plastering, M & E, Collapse of beam
16	Lagos	295	2.1	1.64	298.74	3.74	0.55	112	203	91	44.83	Collapse of beam, Poor plastering, Painting, Roofing
17	Lagos	3.5	0.53	0.18	4.21	0.71	4.28	8	9	1	11.11	Poor plastering, M & E, Collapse of beam
18	Lagos	502	36	18	556	54	3.24	102	113	11	9.73	Wronging laying block work, Poor plastering, Honeycombing

19	Lagos	12.48	2.1	0.78	15.36	2.88	5.08	24	54	30	55.56	Collapse of beam, Poor plastering, Roofing
20	Lagos	17.99	0.55	0.23	18.77	0.78	1.23	38	44	6	13.64	Poor plastering, Collapse of beam, Wronging laying block work,
21	Lagos	29.88	0.91	0.39	31.18	1.3	1.25	52	55	3	5.45	Poor plastering, M & E, Roofing
22	Lagos	172.38	10.64	7.36	190.38	18	3.87	94	129	35	27.13	Poor plastering, Poor quality of concrete
23	Ondo	8.11	2.65	0.43	11.19	3.08	3.84	32	40	8	20	Poor plastering, M & E, Painting
24	Ondo	4.5	0.38	0.11	4.99	0.49	2.2	12	12	0	0	Poor plastering, Furniture and Fittings, M & E
25	Ondo	183.16	25.84	8.65	217.65	34.49	3.97	18	26	8	30.77	Wronging laying block work, Collapse of beam, Poor plastering, Furniture and Fittings
26	Ondo	67.36	5.62	4.64	77.62	10.26	5.98	42	65	23	35.38	Furniture and Fittings, Poor plastering, M & E, Painting
27	Ondo	82.3	19.87	3.74	105.91	23.61	3.53	42	52	10	19.23	Poor plastering, Painting
28	Ondo	51.65	0	0.87	52.52	0.87	1.66	38	82	44	53.66	Poor plastering, M & E, Collapse of beam, Painting
29	Ondo	98.4	9.34	5.9	113.64	15.24	5.19	38	43	5	11.63	Poor plastering, M&E, Poor quality of concrete
30	Ondo	108	4.7	2.45	115.15	7.15	2.13	76	82	6	7.32	Poor plastering, M & E
31	Ondo	1.8	0.23	0.08	2.11	0.31	3.79	4	4	0	0	Collapse of beam, Poor plastering, M & E, Poor quality of concrete
Total		**4,120.62**	**296.47**	**130.35**	**4,547.44**	**426.82**	**102.87**	**2851**	**4122**	**1271**	**760.17**	

(Source: Aiyetan, 2014)

Table 3 reveals cost overrun, the final contract period, percentage rework cost, and areas of reworks. It is noteworthy that 10% of the projects were completed within the time schedule, though not within the stipulated budget. Project time overrun ranges between 1 (one) week to 208 weeks (4 years). It is notable that six projects had time overrun above 50% of the initial project period. On the average the project time overrun is 24.5% of the initial project period. All the projects experienced cost overrun, it range between N0.31M to N44.87M. Averagely, the project cost overrun is N13.77M. From these cost overruns on the project, the rework cost was found to range between N0.19M to N8.56M.

Relative to the areas of reworks on the projects investigated. It could be observed that all components of the building experienced rework. These reworks denote activities in the process cycle of building construction. For example, there were construction errors starting from excavation, through to the roof trusses and up to the plastering of the project.

It should be noted that only the direct costs of rework for the failures observed were estimated, the indirect rework costs such as site overheads and work undertaken for the site from contractor's office have not been included in estimates for rework of quality failures. This means that there is an under-estimate of their full rework cost through the exclusion of overheads.

Table 4: Areas of reworks from historical data.

S/N	Area or rework	Frequency of occurrence	Average rework cost (Million ₦)	Rank
1	Poor plastering	31	2.63	**1**
2	Construction error during excavation	23	2.60	**2**
3	Wronging laying of forming course (block work)	36	2.43	**3**
4	Honeycombing of column and beam	30	2.01	**4**
5	Furniture and Fittings	7	1.93	**5**
6	Use of poor materials in Steel	12	1.57	**6**
7	Roof trusses and covering	28	1.40	**7**
8	Painting	4	1.12	**8**
9	Incorrect laying of slab reinforcement	16	1.09	**9**
10	Poor quality of concrete	7	1.07	**10**
11	Incorrect laying of electrical pipes in slab	15	0.97	**11**
12	Non-verticality of column	18	0.95	**12**
13	Incorrect forming of deck	4	0.93	**13**
14	Use of poor materials in Sand	9	0.74	**14**
15	Lack of straightness of beam at the top and bottom	6	0.71	**15**
16	Wrong opening for windows and doors	14	0.59	**16**
17	Incorrect laying of mechanical pipes	17	0.59	**16**
18	Collapse of beam after construction	1	0.35	**18**
19	Deflection of beam	3	0.29	**19**
20	Incorrect positioning of lighting switches and socket outlet	4	0.19	**20**

(Source: Aiyetan, 2014)

Table 4 presents a ranking of areas of rework on building projects. The area / activity, which is first in ranking and indicates the activity most prone to rework is plastering. There are two likely causes of this phenomenon are: firstly, blocks not properly laid, and the second, non-taking of gauge before commencing on the actual plastering of the building. The second in ranking pertaining to areas of rework in the building process is construction errors during excavation. The probable cause of rework from this activity stems from omission during setting out or non-coordination of dimensions and building drawings. The third in ranking regarding area of rework in the building process is wrong lying of forming course (block work). The cause may be partly lack of adequate supervision and incompetency on the part of the foreman, relative to understanding building drawing. The fourth ranked common defect resulting into rework is honeycombing of column and beam.

Honeycombing could result from coarse concrete mix produced, and lack of adequate compaction. The use of head pan for casting of concrete over a long distance is mostly the cause of honeycombing. Jolting of aggregates occurs, a process whereby heavier aggregates settle at the base of headpin and the lighter one remain at the top. The pouring of such concrete result into separation of aggregates i.e improper mixing of the constituents of concrete and result in honeycombing. The three least ranked areas of reworks are: incorrect positioning of building switches and socket outlets, deflection of beam and collapse of beam after construction. The first from the bottom, which is incorrect positioning of building switches and socket outlets, may occur from mistakes in consideration the right outlet. The second ranked from the bottom, which is beam deflection. This may result from incorrect levelling of the bottom of beam at the false work stage. The third ranked from the bottom is collapse of beam after construction. There are three factors that could be responsible for this: (a) poorly finished quality of concrete which cannot support its weight, (b) under design, and insufficient support. Attention should be paid to ensure quality concrete production, adequacy regarding reinforcement and good condition timber that will provide adequate strength or the use of steel props.

From the historical data, areas of reworks were compiled and categorised into the various building elements and the various cost were extracted relative to the various elements, based on this, Table 5 was developed. Table 5 indicates the final cost and rework cost. The element that has the highest final cost is substructure (N822.52M), next is frame and upper floors and finishes (N650.68M) and N594.61M) respectively. The element with the highest rework cost is frames and upper floors (N29.46), next is finishes (N28.10M), mechanical installations (N13.87M) and substructure (N12.34M). The element with the least rework is door and windows (N1.32M). Following this element is furniture and fittings (N2.73M). Reworks from these elements are not frequent, and may be due to non-complexity of work of these elements. Based on the historical data, rework cost is between N0.19M to N2.63M.

Table 5: Building elements and their contributions to rework.

Elements	Initial cost (₦)	Additional works (₦)	Rework cost (₦)	Cost Overrun (₦)	Final cost (₦)	% of rework cost overrun	% of rework cost in final cost
Substructure	758.34	51.85	12.34	64.19	822.53	19.22	1.50
frames and upper floors	594.75	26.47	29.46	55.93	650.68	52.67	4.53
Roof and covering	234.74	20.36	13.01	33.37	268.11	38.99	4.85
Wall	389.58	23.32	9.76	33.08	422.66	29.50	2.31
Doors and Windows	213.00	15.91	1.32	17.23	230.23	7.66	0.57
Furniture and Fittings	297.31	19.65	2.73	22.38	319.69	12.20	0.85
Mechanical installation	343.65	14.78	13.87	28.65	372.30	48.41	3.73
Finishes	486.95	79.56	28.10	107.66	594.61	26.10	4.73
Painting	242.00	19.33	4.50	23.83	265.83	18.88	1.69
Electrical installation	397.80	12.37	9.18	21.55	419.35	42.60	2.19
External works and drainage	162.50	12.87	6.08	18.95	181.45	32.08	3.35

(Source: Aiyetan, 2014)

From Table 5 the building element with the highest rework cost is frames and upper floors (N29.46M) , and that which has the least rework cost is doors and windows (N1.32M), and of their initial cost. These could be represented in percentages as 5.0% and 0.6%. This finding agrees with those of Barber *et al.* (2000); Josephson *et al.* (2002), and Marosszeky (2004) as reflected on Table 1.

4.1 Comparison of rework cost relative to survey and historical data

From the historical data, poor plastering is first in ranking among areas of frequent rework on building construction and third in ranking from the contractors' perception of causes of rework. Construction error during excavation is ranked second among frequent areas of rework from historical data and twenty-one position in ranking from the contractors' rating. Wrong lying of forming course is ranked third from the historical data and ranked first from the contractors' rating of frequent causes of rework.

Based on the above analysis, there exist similarities among both findings relative to causes of rework. It implies, that attention should be given to construction activities at the substructure stage, laying of forming courses, plastering and quality of materials for concrete. Foremen that understand building drawings should be engaged; those without this knowledge should be trained via short programme. The correct procedure of plastering should be enforced, while carrying out plastering work. Adequate supervision should be given to forming courses.

4.2 Consequences of rework

There are consequences relative to rework that are a lot harder to express in terms of money or costs. Love (2002) enumerated on the indirect consequences of rework, which include: end-user dissatisfaction, inter-organizational conflicts, stress, fatigue, work inactivity, de-motivation, loss of future work, absenteeism, poor moral, reduced profit and damage to professional image. These all have adverse impact on project delivery relative to time, cost, quality and construction industry image, and on the part of the contract, his image, competitive advantage, profitability, and survival.

5. DISCUSSION OF RESULT

Based on this study, it can be concluded that rework occurs most at the construction stage stemming from the level of expertise of the skilled workers. This agrees with the study by Love and Sohai (2003) that identify that rework occurs at the construction stage mostly as a result of damages to work and improvement required to bring work to an acceptable standard.

It was found in this study that rework cost ranges between 0.6 – 5.0%. When compared with finding from study documented in Table 1, the range of rework cost in Nigeria is within the same range with that of most country in the world. Contrary, in the study of Love and Li (2000) it ranges between 20 – 80%. In another study by Love and Edwards (2004) rework cost was found to be 52% of the cost increases experience in projects. Alwi *et al.* (1999) found two main factors to be causes of rework, lack of supervision and skills by labourers. These results in mistakes and poor quality work production, necessitating rework. Based on these, it can be deemed that with adequate supervision rework may be drastically reduce to a negligible percentage.

6. CONCLUSION AND RECOMMENDATION

The data obtained of this study were analysed and conclusions were drawn. Conclusions to the study are in two parts, relative to the questionnaire survey and the historical data.

From the questionnaire survey, wrong lying of forming course, poor quality of concrete and poor plastering are the three main areas of occurrence of rework. From the historical data, poor plastering, construction errors during excavation and wrong lying of forming course prevalent.

Based on the elements of building with rework cost, the study found that the building element, which has the highest rework cost, is frames and upper floors (N29.45M), and the element with the lowest rework cost is doors and windows (N1.32M). The study found that rework cost ranges between 0.6 – 5.0% of initial contract sum. Based on the conclusion made from the analysis of data, the following are recommended: Since rework occurs mostly at the construction stage and to avoid disputes among parties relative to project cost. The process of award / selecting a contractor should emphasis strongly the competence of the contractor relative to past projects, quality of staff, tools and equipment owned, relevant advanced construction technologies and quality assurance of the contractor to ensure work could be done right-first-time. Relevant construction technology will engender correct construction processes should be followed in the execution of construction activities and ensure materials that are of good quality only are used for constructional purposes. On the other hand, client should set aside a sum of money for rework occurrence to ensure an uninterrupted flow of work or avoid delay on project, to mitigate the instance of rework. This range of 0.6 – 5.0% should be used in the calculation of money to be set aside.

The foremen that are knowledgeable, have understanding of building drawing should be engaged and if otherwise, they should be trained to be able to read building drawing.

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