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AN EVALUATION OF CHANGE ORDERS IN GHANA WATER COMPANY'S URBAN WATER PROJECTS IN ASHANTI REGION OF GHANA

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ABSTRACT
Numerous factors contribute to change orders and the effects of such are also varied depending on its causes. A survey was therefore conducted to evaluate change orders in Ghana water company's limited (GWCL) urban water construction projects in the Ashanti region. The research specifically aims to: find out the main causes of construction change orders, find out the main effects of construction change orders and finally to find out the main control measures of construction change orders. The targeted population for the study was stakeholders working on Ghana water company's projects in the Ashanti region. They were nine (9) for clients (GWCL), nine (9) for consultants and twelve (12) for contractors. With purposive sampling procedure data gathered is summarized using a computer statistical program (SPSS) and important index calculated in percentage to find out the causes, effects, and controls. It was observed that consultants ranked owner's change of project schedule (83.33%), differing site conditions (80.56%), contractors desire to improve his financial situation (80.56%) and substitution of materials (72.22%) were the principal causes of change orders. Contractors, on the other hand ranked differing site conditions (87.50%), contractor's desire to improve his financial situation (77.08%), weather condition (75%) and stakeholder or community involvement (70.83%) as the principal causes of the change order. However, Owner's (GWCL) strongly agreed with consultants that if change orders are subjected to appropriate approval in writing, its effects or even the need for a change order would be reduced. Owner's (GWCL) change of project schedule, differing site conditions, contractor's desire to improve his financial situation, owner's change of plan, owner's change of scope of project and lack of owner's involvement at the planning phase are among the main causes of the change order. Delay of materials and tools, hold on work in other areas, increase in overhead expenses, increase in cost of the project and delay in completion schedule are the major effects of change orders. For effective control of change orders, all changes to design documents must be checked and well-reviewed and change orders must be negotiated by knowledgeable persons together with the involvement of owners and stakeholders in the planning and execution of construction projects.

KEYWORDS:
Change Orders, Causes of Change Orders, Urban Water Project

INTRODUCTION

A change order is an action that determines and justifies a change to the scope of a building contract that affects the cost and length of a project. [1] defines the change as job, situation, procedure, or methods other than the original design and specification. Most change orders provided during the building process has an important effect on project costs and time and could lead to project delay, dissatisfaction, and discrepancies common in developing countries [2]. [3] are of the view that the reasons of change order include conditions of the subsurface, in contradiction to those stated in contractual documents; changes in regulatory legislation or code after awarding the contract; changes in scope of construction by owners or designers; corrections to design

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errors and omissions; failure to make the materials and equipment accessible and value types. [4] claim that the original reach or design has been changed by change orders. They are either "installed," "deleted," or "replaced" [5]. Many works on transition, change orders and change management have been completed. Most of the studies addressed developments, such as lawsuits and disputes, as legal aspects. For example, in the Nigerian and Oman construction projects, [6] compared change with the causes, consequences, benefits and remedies. This was intended to compare the change order scenario in both countries and then find areas for development. The effects of improvements on labour productivity were also explored by [7]. This study explores the causes of change order in construction projects to decrease their incidence in response to this void. The basic goals are for: investigation of the causes of change order; evaluation of effective change order control measures for construction projects; assessment of the effects of change order on construction projects and review of its level of occurrence.

Change of site orders are very common in building projects and sometimes the best designs are subject to adjustments during construction, often leading to allegations [8]. [9] revealed that changes in the project can be referred to as changes planned and evolving. Expected changes are scheduled in advance and occur as intended when changes happen unexpectedly and are not originally foreseen or expected. Change orders are typically introduced in written and oral forms by the group that comes up with the change [10]. Regarding this, [11] believed external or internal could be the reasons for project change order. External factors may be attributable to technological changes , changes in the preferences and preferences of the client, changes in the exercises of the contender, changes in government and policies, changes in the environment, and changes in the general public 's statistics. Due to changes in administration structures, changes in authoritative destinations, and changes in the long-haul survival structure of the associations involved, internal causes can occur. [12] also believed that change order triggers such as disputes between contract documents, customer change of arrangements or extension, impediments in the prompt decision-making process, insufficient project targets, desired efficiency of contractual employees, and problems related to money of temporary workers. On the other hand, the reasons for change order were categorized into four starting point operators by [13]. There are clients, consultants, contractors, and other adjustments linked to them. This means that from all of them, change order could originate.

[14] and [15] found that change order determines the execution of the project and time and cost overruns are the main consequences. In addition, [16] found that many change order activities cause the contractual worker to achieve lower than arranged levels of productivity. [17] argue that steps and methodologies should be used to decrease change in the planning process, while control charters can be used to maximize change order in favor of customers. Similarly, [18] indicates that if all preparatory work is performed prior to tendering, such as site and soil inspections, change order may be minimized. It has been observed that most Ghana water company limited (GWCL) projects undergo some challenges due to change orders and this has prompted the research into the evaluation of change orders into the urban water project with the aim to evaluate change orders in Ghana water company’s urban water construction projects, with the targeted population being stakeholders working on GWCL projects in the Ashanti region.

The National Water Policy has the policy to improvise access to potable water, which includes: rehabilitation and expansion of existing infrastructure, achieving equity in access to water supply for Peoria-urban and poor to meet their basic needs at an affordable cost, improving operations and management, and lastly reducing the high level of physical losses. As part of Government policies to improve water supply, funds were raised through the Ministry of finance to investment such project, though the Ministry of Water Resources, Works and Housing to Ghana Water Company Limited as the implementing entity. “Most of these projects are Turnkey type projects which are “often used to indicate a lump sum contract, including design, procurement, and construction of most of the donors and implementing bodies are foreign companies. This coupled with lots of challenges in the relation of changes, which leads to inadequate design resulting in many changes to plans, specifications, and contract terms, and lack of understanding of the social, cultural, and physical environment.

This research aims to study the construction management issue in the construction industry, specifically urban water projects, and to find out the causes of the change order, the effects it has on the construction process, and the controls, which will assist owners, consultants, and contractor in the construction industry for similar situations in future. Furthermore, the study will help stimulate growth in the construction industry by minimizing change orders in the industry especially urban water projects in Ghana. Finally, its significance to

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national development cannot be overemphasized as this strategic innovation by stakeholders can foster economic growth and development in the country. In finding the solution to problems of this nature the research work will prepare the ground for further research.

METHODOLOGY

The targeted population for the study was stakeholders working on Ghana water company projects in the Ashanti region. They were nine (9) for clients, nine (9) for consultants, and twelve (12) for contractors. The sampling technique for this research was a census, with a purposive sampling technique to select key management staff to administer a questionnaire because of the in-depth information needed. Both primary and secondary data were used for the research work but with much emphasis on primary data, questionnaires were sent to the client (owner), consultants, and contractors. Questionnaires were completed by project managers, construction managers, project coordinators, resident engineers, and field engineers.

The structure questionnaires were designed to address the three (3) research questions; What are the causes of construction change orders? What is the effect of construction change orders? What will be some of the control measures of construction change orders? The questionnaires were closed-ended multiple choices using the Likert scale ranking. The researcher collected thirty (30) responses from which nine (9) were from the owner, nine (9) from consultants, and another twelve (12) from contractors. The questionnaires were separated between the three (3) groups; owner, consultants, and contractors and further coded for ease entering of data. The data obtained were summarized using SPSS and importance index calculated using the formula proposed by [2] to evaluate how the study population responded to questionnaires and interviews with tables. The questions are analyzed through quantitative content analysis.

The three sets of questionnaires on the causes, effects, and control of change orders were scored using a scale proposed by [19]. In this scale, weighted percentages were assigned to each response. The four-point scale from 'Very often' to 'Never' was weighed with an internal scale from 100% – 25%. To calculate Importance Indexes, causes, effects and control of change orders were scored as proposed by [2] as follows:

'Very often' represents one hundred percent (100%)
'Often' represents seventy five percent (75%)
'Not often' represents fifty percent (50%)
'Never' represents twenty five percent (25%)

[19] indicated that, transforming responses to weighted percentages is necessary before calculating Importance Index (II).

Importance Index (II) of each category was calculated using the formula proposed by [2].

Importance Index % (II) = [(100R1 + 75R2 + 50R3 + 25R4)] / [(R1+R2+R3+R4)]

Where:

II = Importance Index (%)
R1 = number of 'very often' responses from respondents
R2 = number of 'often' responses from respondents
R3 = number of 'not often' responses from respondents
R4 = number of 'never' responses from respondents.

The causes, effects and controls of change orders were ranked based on their important indexes. The first range rank in each case was assigned the highest index.

To consider ethics in the study, the right thing to do is self-determination, anonymity, confidentiality, and informed consent was observed throughout the research to render the study ethical. A verbal introduction and permission were made to the various stakeholders in research and respondent were informed of the purpose of the study. The procedures used to collect data assured that there were no potential risks or costs involved. Respondent was informed of their right to voluntarily consent or decline to participate and to withdraw participation at any time without penalty.

Research Setting

The study was conducted on Ghana Water Company's urban water projects in Ashanti Region of Ghana. It involves the client Ghana Water Company Limited, Consultants and Contractors on various projects.

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Table 1.0 Consultant and Contractor for GWCL Projects

Item	Project	Activity	Location	Owner (Client)	Consultant	Contractor
1	3K Project	Supply, Rehabilitation and Expansion Works	Kumawu, Konongo and Kwahu-Tafo.	Ghana Water Company Ltd	Antwi-Donkor and Krakue (ADK)	Tahal Consulting Engineers
2	Mampong Project	Rehabilitation and Expansion of Water Supply	Ashanti Mampong	Ghana Water Company Ltd	Civil and Planning Group (CPG)	Utility and Environmental Management (UEM)
3	Kumasi Project.	Waters Supply Rehabilitation and Expansion	Barekese, Kumasi	Ghana Water Company Ltd	Civil and Planning Group (CPG)	Ballast Nadam

Field Survey

Ghana Water Company Limited

With its established-on 1st July 1999, following the conversion of Ghana Water and Sewerage Corporation into a state-owned limited liability company under the Statutory Corporations (Conversion to Companies) Act 461 of 1993 as amended by LI 1648. Ghana Water Company Ltd. (GWCL) is responsible for providing, distributing, and conserving water for domestic, public, and industrial purposes.

Moreover, the company is mandated to establish, operate, and control sewerage systems in Ghana. But now urban water is being managed by the newly formed Urban Water Company Limited, under the new arrangement, Ghana Urban Water Limited has its Managing Director, a Head Office and 13 regional offices all headed by General Managers. The General Managers are responsible for providing water supply services in 82 districts which are under the supervision and control of District Managers. Research work will be carried out with staffs who are involved directly on the project in both district and regional level of Ghana Urban Water Company Limited.

In a Strategic Investment Plan prepared for systematic development of all urban water supply systems in the country, it is estimated that about $717 million will have to be invested in water production to help increase current urban coverage to about 100% country-wide by 2025, with the help of donor agencies. As part of government plans the Ashanti region also benefited and contractors has been awarded contract to execute such projects. With Ghana Urban Water Company being the client for all the urban project in Ashanti Region of Ghana.

Ghana Water Company Limited Projects

3 K Project

The 3K (Kumawu, Konongo and Kwahu) Water Supply Rehabilitation and Expansion Project, is being funded by Messrs Bank Hapoalim BM of Israel, under a mixed loan agreement entered by the Ghana government. Kumawu Project would involve the construction of intake pumping stations, new water treatment plant, storage reservoirs, transmission and distribution of mains and booster station. The new project will benefit the following community: Aframso, Jaduako, Kwaman, Bodomase, Besoro, Woraso, Kumawu and Timate.

Konongo works involves the rehabilitation of existing treatment, construction of new clarifier, Weir, Intake and LLPS, transmission and distribution of mains. The following environs will benefit: Odumase, Konongo, Juansa and Domeabra benefiting from the expansion to increase the capacity water supply. Under the Kwahu Ridge Project, a new intake with electro-mechanical equipment would be constructed at Asempaneye, while the existing Kotoso water treatment plant would be rehabilitated and expanded to serve the people in Kwahu Ridge.

Ghana Water Company Limited has engaged Antwi-Donkor and Krakue (ADK) Consortium as their representative on 3K project; ADK is one of the leading Consulting firms in Ghana with a multipurpose team. They have their head office in Cantonments, Accra. But because of the intensity nature of project have their project office at Kumawu in the same premises with Tahal the main contractor, with an experience engineers to assure quality and standard on the project. They act on behalf as consultant and to make sure the project archives its objectives.

The contractor the 3K Project Tahal Group B.V. is an international company that provides engineering services in the Netherlands, Israel and other part the of the world with its subsidiary company Tahal Consulting Engineers currently carrying out a design and build project in urban water supply system in Ghana. Tahal

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consulting engineers has it main office in Accra Airport Residential area with their site office in Kumawu in Sekyere Kumawu District of the Ashanti region with both local staff and foreign national on the project.

Mampong project

Civil and Planning Group – CPG is a firm of Consulting Engineers specialising in the fields of Civil, Structural, Highway, Bridge, Railway and Water Engineering. The firm has extensive engineering experience in Botswana, Democratic Republic of Congo, Ghana, Lesotho, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe, which encompasses new projects as well as rehabilitation and reconstruction projects, covering the following areas. CPG is experienced in projects for national implementing authorities such as Water Resources and has been engaged by Ghana Water Company to represent them on the projects in Kumasi and Mampong water supply project and have their offices in Barekese and Mampong project site respectively.

The project is estimated to cost 23.112 million dollars, involves the rehabilitation and expansion of water source, rehabilitation of existing 2,500 m3 a day treatment plant, and the expansion of water treatment plant to10,500 m3 per day. Apart from the municipal capital, Mampong, other communities that will benefit are Daaho, Daaman, Bosofour, Besease, Kyeremfaso, Krobo, Mpenya, Dadease, Bonkron, Nsuta and Beposo would benefit.

The"Mampong project is being executed by Messrs Utility and Environmental Management (UEM). UEM Group is an international multi-disciplinary environmental services company that specializes in providing turnkey services in the water and wastewater collection, treatment, and disposal. UEM group provides complete, single source services from engineering, design to construction installation with full responsibility on a performance guaranteed, water, wastewater, or domestic waste treatment facility. UEM has engaged the services of professionals in various discipline and cultures such as American, Indians and Ghanaians for the project they currently have their project office at Ashanti Mampong."

Kumasi Project

The Kumasi Water Expansion Project involves the expansion and renovation of water purification plants, water pipes, water reservoirs, and pumping stations in and around the city of Kumasi in Ghana. These involve the construction of a 123,000 cubic meter reservoir at Suame, a 5,200 cubic meter booster station at Achiase, laying of 84 kilometres of pipelines, replacement of pumps and other equipment to raise the capacity of treatment plants at the Barekese head-works to increase the supply for the metropolis from 21 to 27 million gallons. The Government of Netherlands under its ORET funds is providing support for the works being done by Dutch contractors, Ballast Nedam Company.

Ballast Nedam Ghana BV is executing this project on behalf of the Ghana Water Company Limited. Ballast Nedam has a leading position in construction and infrastructure. The company operates mainly in the Netherlands and internationally in various areas of expertise. Its current office location is at Airport residential area Accra and their project site office is at Barekese, Kumasi with both local and foreign nationals.

RESULTS AND DISCUSSION

Causes of Change Orders of Respondents

The Important Indexes (II) and rankings of respondent's response with respect to the major causes of construction change orders were presented in table 2, 3 and 4 below.

Table 2: Importance Indexes and Ranking of Causes of Change Orders (Clients)

	Causes	II (%)	Ranking
1	Projects objective not well define	58.33	9
2	Client's change of project schedule	72.22	6
3	The lack of coordination and communication.	75.00	3
4	Lack of Client's involvement at the planning phase	75.00	3
5	Lack of Client's involvement at the design phase	41.67	10
6	Client's change it scopes on the project	77.78	2
7	Materials or procedures substituted	75.00	3
8	Client's change specification	72.22	6
9	Change of plans by owner	80.56	1
10	Client's financial problems on the projects	36.11	11
11	Client's involvement during construction phase	66.67	8

Field Survey

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To clients, Client's change of plan (80.56%), Client's change of scope of the project (77.78%), and lack of Client's involvement at the planning phase were the most important causes of the construction change order. This conforms to what was reported by [20], that change order is usually due to lack of involvement of the owner in the initial stages. They indicated that the client's financial problem was the least (36.11%) important cause of the construction change order. This might be because most respondents (Client's) perceived that, people would start a project only when they have sufficient funds to undertake such a project.

Table 3 Importance Indexes and Rankings of Causes of Change Orders (Consultants)

No.	Cause of Change Order	II (%)	Ranking
1	Projects objective not well define	58.33	16
2	Client's change of project schedule	83.33	1
3	The lack of coordination and communication.	69.44	6
4	Lack of Client's involvement at the planning phase	66.67	9
5	Lack of Client's involvement at the design phase	50.00	22
6	Stakeholder (Community) Involvement.	69.44	6
7	Client's change plans or scope on the project	59.44	15
8	Materials or procedures substituted	72.22	5
9	Client's financial problems on the projects	83.33	1
10	Conflict between contract documents	61.11	12
11	Change in design by consultant	69.44	6
12	Contractor's scope of work not well defined	55.56	17
13	Value engineering	50.00	22
14	Technology changes	55.56	17
15	Differing site condition	80.56	3
16	Contractor desire to improve his financial situation	80.56	3
17	The contractor's financial difficulties	61.11	12
18	The required labor skills are not available	55.56	17
19	The required equipment and tools are not available	66.67	9
20	Workmanship or material not meeting specifications	66.67	9
21	Safety Consideration	61.11	12
22	Weather condition	55.56	17
23	New government regulation	52.78	21

Field Survey

Table 4 Importance Indexes and Rankings of Causes of Change Orders (Contractors)

No.	Cause of Change Order	II (%)	Ranking
1	Projects objective not well define	50.00	19
2	Client's change of project schedule	60.42	11
3	The lack of coordination and communication.	66.67	8
4	Lack of Client's involvement at the planning phase	70.83	4
5	Lack of Client's involvement at the design phase	68.75	6
6	Stakeholder (Community) Involvement.	70.83	4
7	Client's change plans or scope on the project	68.75	6
8	Materials or procedures substituted	60.42	11
9	Client's financial problems on the projects	37.50	22
10	Conflict between contract documents	58.33	15
11	Change in design by consultant	64.58	9
12	Contractor's scope of work not well defined	54.17	18
13	Value engineering	56.25	16
14	Technology changes	50.00	19
15	Differing site condition	87.50	1
16	Contractor desire to improve his financial situation	77.08	2
17	The contractor's financial difficulties	37.50	22
18	The required labour skills are not available	62.50	10

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19	The required equipment and tools are not available	60.42	11
20	Workmanship or material not meeting specifications	56.25	16
21	Safety Consideration	60.42	11
22	Weather condition	75.00	3
23	New government regulation	50.00	19

Field Survey

From table 2, it was observed that the Client's change of project schedule (83.33%) and Client's financial problems on the project were very important causes of construction change orders (83.33%). Also, they indicated that differing site conditions (80.56%), contractors desire to improve his financial situation (80.56%), and substitution of materials (72.22%) were as well important concerning the causes of change orders. Lack of Client's involvement at the design stage was as well a very important (70.83%) cause construction change orders to respondents. This might be due to the respondent's perception that, if the Client is directly involved in the inception and design, the probability of changing the order would below. These results conform to the findings of [21] who observed that consultants considered owners' financial problems (52.94%), the substitution of materials (60.29%) among the major causes of the change order.

To contractors (table 4) on the other hand, the most important causes of construction change orders are differing site conditions (87.50%), contractor's desire to improve his financial situation (77.08%), weather condition (75%), and stakeholder or community involvement (70.83%). This might be because different sites would present different cost elements and in the situation whereby contractors use a fixed price for a type of project before assessing the field or site condition, the cost is likely to be varied if the contractor realizes that he would incur an additional cost which would reduce his profit. This conforms to a report by [22] who found that differing site conditions can be an important cause of delays in large construction projects. Also, where stakeholders or a community with varied opinions are involved there is a likelihood of a change order. It was further observed that lack of Client's involvement could be a major cause of change order. This agrees with what was reported [23], that change order is usually the result of insufficient planning at the project definition stage, or because of lack of involvement of the owner in the design phase.

Effects of Change Orders of Respondent

From table 5, it was observed to consultants, most important effects of construction change orders were the delay of materials and tools (83.33%), hold on work in other areas (80.56%) and delay in completion schedule (77.78%). This might be true because a change order means a variation or deviation which may require a restart of work. This would undoubtedly delay the project, thereby 'seizing the tools and materials' which could be used at other projects sites, thus work in other areas has to be put on hold. These findings confirm what was reported by [24] that change orders during the project may affect the project progress and quality. Similar results were obtained by [25]. They observed that 50% of the projects surveyed were delayed because of change orders.

Table 5: Importance Indexes and Rankings of Effects of Change Orders (Consultants)

No.	Effect of Change Order	II (%)	Ranking
1	"Decrease in productivity"	50.00	10
2	"Delay in completion schedule"	77.78	3
3	"Disputes between owner and contractor"	72.22	6
4	"Decrease in quality of work"	47.67	11
5	"Increase in cost of project"	77.78	3
6	"Additional revenue for contractor"	55.56	8
7	"Delay of materials and tools"	83.33	1
8	"Hold on work in other areas"	80.56	2
9	"Increase in overhead expenses"	66.67	7
10	"Delay in payment"	55.56	8
11	"Demolition and re-work"	75.00	5

Field Survey

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Table 6: Importance Indexes and Rankings of Effects of Change Orders (Contractors)

No.	Effect of Change Order	II (%)	Ranking
1	"Decrease in productivity"	72.92	4
2	"Delay in completion schedule"	72.92	4
3	"Disputes between owner and contractor"	58.33	9
4	"Decrease in quality of work"	54.17	10
5	"Increase in cost of project"	79.17	1
6	"Additional revenue for contractor"	70.83	6
7	"Delay of materials and tools"	68.75	7
8	"Hold on work in other areas"	75.00	3
9	"Increase in overhead expenses"	79.17	1
10	"Delay in payment"	45.83	11
11	"Demolition and re-work"	68.75	7

Field Survey

To contractors, the most important effects of construction change orders are increased in overhead expenses (79.17%), an increase in the cost of the project (79.17%) and hold on work in other areas (75%). This agrees with what was reported by [26] that the most common effect of change orders during the construction phase is the increase in project cost. [27] also reported similar incidents. They observed that any major additions or alterations in the design may eventually increase the project cost.

Table 7: Importance Indexes and Rankings of Effects of Change Orders (Clients)

	Effects	II (%)	Ranking
1	"Decrease in productivity"	75.00	8
2	"Delay in completion schedule"	77.78	6
3	"Disputes between owner and contractor"	69.44	10
4	"Decrease in quality of work"	75.00	8
5	"Increase in cost of project"	97.22	1
6	"Additional revenue for contractor"	94.44	2
7	"Delay of materials and tools"	88.89	4
8	"Hold on work in other areas"	86.11	5
9	"Increase in overhead expenses"	94.44	2
10	"Delay in payment"	33.33	11
11	"Demolition and re-work"	77.78	6

Field Survey

Client's indicated that the most important or major effects of construction change orders are an increase in the cost of the project (97.22%), an increase in overhead expenses (94.44), and additional revenue for the contractor. This might be true because in most cases, construction change orders lead to restart of work. This would undoubtedly increase the cost of the project. Where this change in order was a result of the client's fault, then the contractor would demand extra payment, and this might generate additional revenue for the contractor. This conforms to what was reported by [28]. They reported change orders eventually lead to an increase in the cost of the project.

Controls of Change Orders

It was observed from table 8 below that consultants were of the view that among the factors, the most important procedure or method to control construction change orders was that, all changes to design documents must be checked and well-reviewed (80.56%).

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Table 8: Importance Indexes and Rankings of Control Procedures of Change Orders (Consultants)

No.	Procedure	II (%)	Ranking
1	"The procedures for handling change orders is clear from the beginning"	47.22	10
2	"Change order approval is timely"	55.56	7
3	"Change order is negotiated by knowledgeable persons"	66.67	2
4	"Change are not made without appropriate approval in writing"	66.67	2
5	"The scope of change order is made clear"	66.67	2
6	"Involve all stakeholders on project."	63.89	6
7	"All changes to design documents are checked and reviewed for justifications"	80.56	1
8	"Gray areas of design document are highlighted and reviewed before contract award"	66.67	2
9	"Freeze the design after a certain stage"	44.44	11
10	"Encourage team effort among all parties"	55.56	7
11	"Work breakdown structure (WBS) or other technique is used to track cost of changes"	50.00	9

Field Survey

Also, they indicated that if change orders are negotiated by knowledgeable persons and the change is made only after appropriate approval in writing, it would go a long way in helping control change orders or minimize their effects. This supports what was reported by [29]. He found that cost control, design control, document control, schedule control, quality control, and change order control are among the most effective methods of change control.

Table 9: Importance Indexes and Rankings of Control Procedures of Change Orders (Contractors)

No.	Procedure	II (%)	Ranking
1	"The procedures for handling change orders is clear from the beginning"	58.33	9
2	"Change order approval is timely"	60.42	7
3	"Change order is negotiated by knowledgeable persons"	68.75	3
4	"Change are not made without appropriate approval in writing"	68.75	3
5	"The scope of change order is made clear"	66.67	5
6	"Involve all stakeholders on project."	79.17	1
7	"All changes to design documents are checked and reviewed for justifications"	60.42	7
8	"Gray areas of design document are highlighted and reviewed before contract award"	54.17	10
9	"Freeze the design after a certain stage"	70.83	2
10	"Encourage team effort among all parties"	66.67	5
11	"Work breakdown structure (WBS) or other technique is used to track cost of changes"	52.08	11

Field Survey

Contractors were rather of the view that, among the factors spelled out, if stakeholders were involved in the planning and execution of the project, change order could be controlled to a large extent. Their argument might be founded on the premise that if all stakeholders are involved, deliberations on the projects would be done before 'take-off', and in effect, they would act as witnesses. They, however, agreed with the consultants that if change orders are made subject to appropriate approval in writing (documented), it would minimize the need for such a change and even their effects.

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Table 10: Importance Indexes and Rankings of Control Procedures of Change Orders (Clients)

No.	Procedure	II (%)	Ranking
1	"The procedures for handling change orders is clear from the beginning"	75.00	8
2	"Change order approval is timely"	55.00	11
3	"Change order is negotiated by knowledgeable persons"	75.00	8
4	"Change are not made without appropriate approval in writing"	91.67	1
5	"The scope of change order is made clear"	77.78	6
6	"Involve all stakeholders on project."	83.33	2
7	"All changes to design documents are checked and reviewed for justifications"	80.56	3
8	"Gray areas of design document are highlighted and reviewed before contract award"	72.22	10
9	"Freeze the design after a certain stage"	80.56	3
10	"Encourage team effort among all parties"	77.78	6
11	"Work breakdown structure (WBS) or other technique is used to track cost of changes"	80.56	3

Field Survey

Client's strongly agreed with consultants that if change orders are subjected to appropriate approval in writing, its effects or even the need for a change order would be reduced. This agrees with the report by [30] that document control is one of the effective ways of change order control.

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CONCLUSION

From the results obtained, it could be concluded that:

- Client's change of projects schedule, client's financial problems on the project, differing site conditions, contractors desire to improve his financial situation, the substitution of materials, lack of client's involvement at the design stage, weather condition, stakeholder or community involvement, client's change of plan, and lack of client's involvement at the planning were very important to respondents with respect to causes of construction change orders.
- Delay of materials and tools hold on work in other areas, delay in completion schedule, increase in overhead expenses, increase in the cost of the project were very important to respondents with respect to the effects of construction change orders.
- Involvement of stakeholders and clients at the planning and execution stage of the project and were the important procedures for the control of construction change orders.

RECOMMENDATION

As this research concluded, lack of client involvement is the important cause of change orders on urban water projects in the Ashanti region. It is important that the owner is involved during the planning and design phase of the project to avoid future changes that impact schedule and cost. Although weather conditions cannot be controlled, its impact can also be controlled to some extent. The project leader should ensure that projects are executed under favourable weather conditions. Where the project extends into a period of unfavourable condition with fast track control.

Differing site condition was a very important cause of construction change orders to respondents. The consultant or designer should make it a point to run all necessary survey and test to prove site condition before prior to the design phase of the project to avoid the following effects which were rank high.

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