JIMMA UNIVERSITY

JIMMAUNIVERSITY INSTITUTE OF TECHNOLOGY

SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

CONSTRUCTION ENGINEERING AND MANAGEMENT

Assessment of the Major Challenges on on-going Road Construction in Addis Ababa City

A Thesis Submitted to the School of Graduate Studies of Jimma University in Partial Fulfillment of the Requirements for the Degree of Masters of Science in Civil Engineering (Construction Engineering and Management)

By

AYNALEM ABEBE

OCTOBER/ 2016

JIMMA, ETHIOPIA

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BY

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OCTOBER, 2016

JIMMA, ETHIOPIA

DECLARATION

I, the undersigned, declare that this thesis entitled "Assessmentof the major challenges on ongoing road construction in Addis Ababa. is my original work, and has not been presented by any other person for an award of a degree in this or any other University, and all sources of material used for theses have been dually acknowledged.

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As Master research Advisors, we hereby certify that we have read and evaluate this Msc research prepared under our guidance, by AynalemAbebeentitled:Assessmentof the major challenges on ongoing road construction in Addis Ababa.We recommend that it can be submitted as fulfilling the MSc Thesis requirements.

Professor EmerT.Quezon_____ ____/_____/____

Advisor Signature Date

Eng. GetachewKebede_____ _____/_____/____

Co-Advisor Signature Date

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ABSTRACT

Road construction project is the challenging process which needs huge manpower, machineries and technical as well as financial capacity. Construction projects in crowded urban road have faced different challenge to implement the road construction such as high-traffic volume, utility conflicts and relocations and complex right-of-way challenges of urban area construction. Therefore,the main objective of this study was to assess the major challenges of the selectedon ongoing road constructionprojects in the case of Addis Ababa city.

Descriptive and explanatory study methods were carried for this research in order to achieve the objective of the study. Firstly, Guide lines (checklist) for the case study were prepared. It contains the basic information about the selected road construction projects such as: identify the major challenges that observed during the construction implementation process, determining the challenges that influence on road construction.Secondly, the research was conducted by identification of the major challenges through literature review, desk study and site observation on selected road projects. Based on this, the questionnaires were developed and distributed to respondents to collect data from the relevant population (i.e. Client, contractors andconsultants). Thirdly, evaluate the perception of different stakeholders on the issues of the challenges and ranking of the variables. Finally,evaluation of roads was done by checking compliance with the existing construction standards. Upon obtaining the desired data, checking and organization of data has been done. This was followed by thorough discussions in order to draw a conclusion and to forward recommendations based on the findings of the study.

The distributed questioners to respondents were 100% returnedeven though, 73% of the questioners were only valid. From result that obtained, elevenmajor challenges (i.e.right of way problem, utility conflict, schedule constraints, variation order and poor project management, Scarcity of material and financial, high traffic problem, performance of stakeholders, poor public awareness, Design/poor planning and Environmental factors)were identified from the selected road projects by using checklist; however, the highest major challenge was right of way problem. On other hand, Time over run, Budget over run, Creating social problem, Reduce work motivation, Dispute between parties, Project termination and Leadership removal were identified as the most common and recurrent effects of the challenges on the on-going road construction projects. All most all the selected on-going road projects were not compliance with the standard.

Moreover, it is recommended that client should be facilitating timely compensation for the property owners on the right of way of the road. Consultants should provide completed project design where variation order will be negligible. Contractors should follow the standards; Stakeholders need to build strong team to minimize lack of coordination between organizations.

Keywords: Effect of challenges, High traffic problem, Right of way problem,Road Projectand Utility conflict

ABBREVIATIONS

AACRA	Addis Ababa city Road Authority
AAICA	Addis Ababa Infrastructure and Construction Authority
AAWSA	Addis Ababa Water and Sewerage Authority
AACTA	Addis Ababa City Transport Authority
CII	Construction Industry Institute
DCI	Ductile cast iron
EOT	Extension of time
ERA	Ethiopian Rods Authority
EEPCo	Ethiopian Electric Power Corporation
EEU	Ethiopia Electric Utility
ETC	Ethiopian Telecommunications Corporation
GNP	Gross national product
IHA	Infrastructure and Housing Affairs Offices
LADA	Land Administration and Development Authority
LHS	Left hand side
MoFED	Ministry of Finance and Economic Development
NDA	Neighborhood Development Agency
NCHRP	National cooperative highway research program
RHS	Right hand side
RII	Relative Importance Index
ROW	Right of Way
RSDP	Roads Sector Development Program
UK	United Kingdome

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CHAPTER ONE
INTRODUCTION

1.1.Background

The construction industry everywhere faces problems and challenges;these difficulties and challenges are present together with a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and inability to deal with the key issuesin the developing countries[1].

In the context of Ethiopia's geography, pattern of settlement and economic activity, transport plays vital role in facilitating economic development. In particular, it is road transport that provides the means for the movement of people, utilization of land and natural resources, improved agricultural production and marketing, access to social services, and opportunities for sustainable growth. Recognizing the importance of the road transport in supporting social and economic growth and its role as a catalyst to meet poverty reduction targets, the Government of Ethiopia has placed increased emphasis on improvement of the quality and size of road infrastructure in the country [2].

The construction industry in Ethiopia, especially in urban areas is affected by numerous problems. Almost all road projects in Addis Ababa city are over ending with additional cost and time with qualities below that was stipulated in the contract and leading to their deterioration before the designed lifecycle period. There are several causes for these problems and the main ones being the existence of obstructions in the ROW limit, lack of belongingness among the stakeholders and lack of experienced professionals faced during planning, designing, implementation and operation of road projects and the lack of proper managements[3].

Therefore, in this research was made to assess the major challenges on ongoing road construction in Addis Ababa City. These papers reports on identify the major challenges and determine their effects on the ongoing road construction projects.In addition to this, checkingthe existing road construction compliance with standards.Finally, to reduce the road construction challenges in the study area, a number of recommendations have been formulated.

1.2.Statement of the problem

The construction industry is one of the core sectors that provide important components for the development of an economy and a society achieves its goals of urban and rural development.

Construction projects in congested urban corridors have been a challenge for many years. High-traffic volume is just one of many concerns that need to be resolved. Adding significant utility conflicts and relocations, complex right-of-way (ROW), a diverse stakeholder makes normally difficult work even more complicated. Road construction project is a complicated process which requires massive manpower, machineries and technical as well as financial capacity [4].

Addis Ababa road construction projects frequently take longer construction time. Amongthe challenging conditions, crowded working environment which decrease the efficiency of machineries and complex right of way issues are observed. The everyday construction method is currently bringing large interruptions because of extended period of time and disturbance of adjacent businesses.

Stakeholders and the public believed that, the industry within the Public Sector has not efficient and effective in projects deliveryin the Construction industry. This is evidenced by the high number of delayed construction projects distributed all over the country. There is high rate of non-completion of projects, budget overruns and extensions of contract periods.

1.3.Research questions

1. What are the major challenges that affect the implementation of road construction project in Addis Ababa?
2. Which challenges commonly affect the project implementation?
3. What are the effects ofthe challenges on the road construction in Addis Ababa?
4. What arethe existing conditions the selected road construction project in Addis Ababa?

1.4.Objective

1.4.1 General objective

The general objective of this study wasto assess the major challenges on ongoing road construction in Addis Ababa.

1.4.2 Specificobjective

- To identify the major challenges thataffects the implementation of road construction projects inAddis Ababa.
- To examine and rank the major challenges that affect project implementation in Addis Ababa road construction project.
- To determine the effectsof thechallenges on road construction projects.
- To check compliance of the existing road construction with standards

1.5.Scope and limitationofthe study

The scope of the study was to assess the ongoing road construction projects in Addis Ababa city. Moreover, only focus the selected road projects which are ongoing were considered for the study. The challenges on Maintenance road projects and completed road projects are out of the scope of the thesis. The selection of projects was made due consultation with the Addis Ababa City Roads Authority which were believed to faceseveral challenges on ongoing road projects.Furthermore, the respondents of the questionnaires are limited to the client (AACRA), consultants, and contractors who work in Addis Ababa city road construction projects. In addition to this; the studylimited on the most common challenges observed on the selected road projects in Addis Ababa.

1.6. Significance of the study

The importance of this studywasto identify the major challenges of the selected road constructions projects in Addis Ababa and determine their effects on the construction projects progress. It can also act as a source of information for Owners, contractors and consultants and also for future studies on urban road construction problem. This study can be used to attract construction firm’s attention to minimize challenges and enhance sustainability of road construction projects in Ethiopia.

CHAPTER TWO
LITERATUREREVIEWS

2.1.Introduction

The construction industry, by nature, has many special problems and requirements. The importance of taking measures to improve the performance of the construction industry has now been recognized in several countries at various levels of socio-economic development. Dedicated agencies have been formed in many countries to administer the continuous improvement of the industry, although they have different objectives, responsibilities and levels of authority. In the UK, the Construction Industry Board is an industry initiative, whereas its counterpart institutions in developing countries are government agencies. Considering the nature of the industry's needs and problems, and in many developing countries, the resource constraints, formation of an agency does not guarantee the success of construction industry development [1].

The construction industry is one of the main sectors that provide important ingredients for the development of an economy. The construction industry is the tool through which a society achieves its goals of urban and rural development. However it is becoming more complex because of the sophistication of the construction process itself and the large number of parties involved in the construction process, i.e., clients, users, designers, regulators, contractors, suppliers, subcontractors, and consultants [5].

This broad category of construction, sometimes called engineering construction, is characterizedby designs prepared by engineers rather than architects, the provision of facilities usually related to the public infrastructure and thus owned by public-sector entities and funded through bonds, rates or taxes and a high degree of mechanization and the use of much heavy equipment and plant in the construction process [6].

2.2. Classification of Construction Industry

1. Building Construction Industry:-All general contractors and operative builders primarily engaged in the construction of residential, industrial, commercial, or other buildings.

2. Heavy Construction Industry: - All general contractors primarily engaged in heavy construction other than building, such as highways and streets, bridges, sewers, railroads, irrigation projects, and flood control projects and marine construction. This includes special trade contractors primarily engaged in activities not normally performed on buildings, such as highway grading or underwater rock removal [7].

2.3.Construction Projects

A project is a unique process, consisting of a set of co-ordinate and controlled activities with an assumed start and known finish dates, undertaken to achieve an objective conforming to specific requirements including constraints of time, cost and resources [8].

Governments and non-Governments organizations usually embark on different projects with the aim of creating new service or improving the functional efficiency of the existing ones. Such projects require appropriate skills and techniques that encompass good and sound skills to manage limited budgets, monitor shrinking schedules and unpredicted outcomes while at the same time dealing with people and organizational issues. Developmental facilities like housing, roads, and power plants are undertaken with strategic aims of developing infrastructure to facilitate economic growth[9].

2.4. Road construction project

Road construction is part and parcel of construction projects. A road project is a linear repetitive engineered construction project requiring an external organization for its implementation and is a temporary endeavor undertaken to produce a unique product, the road infrastructure[10].

Urban roads serve a variety of mobility needs including general public use, commercial, merchandise, and emergency vehicle traffic. Maintaining traffic flow during construction is an important issue.The number of complex projects in urban areas will likely continue to increase in the future. Aging road infrastructures, right-of-way (ROW) constraints, and increasing urban populations lead to difficulties for construction projects on existing, congested, urban road projects.Overall system mobility must be considered in a congested urban area undergoing construction [4].

Complexity is the key element when looking into the specifics of urban road construction projects. Urban road projects are constructed in a physically constrained environment. Existing road networks are dense and often intertwined with other infrastructures. Scarcity of land in an urban setting implies high land acquisition costs this in turn makes it very difficult to relocate those affected by the road project[11].

2.4.1. Implementation of urban road construction project

Implementation is the execution of planned activities which converts human and physical resources into a product or service of value to the customers. The way in which the project is implemented can have a significant impact on whether it will be successful or not. Projects are influenced by a multiple of factors which can be external or internal to the organization responsible for its management and execution. These include poor project management, inadequate opportunities for potential beneficiaries to participate in project identification and design, poor linkages between project activities and project purpose, insufficient attention to external environment during project design, among others.The external factors making up thisenvironment are the client (customer), consultants, contractors, suppliers, competitors, politicians, national and local government agencies, public utilities, pressure groups, the end users and the general public. Internal influences include the organization management, the project team, internal departments, and stakeholders[12].

2.4.2.Challenges for implementation of urban road construction

2.4.2.1.Utility conflicts

Utilities are the ‘conduits’ or ‘technological systems’ which support the rapid movement of waste, water, energy and information up on which their integration together into economic and social structure depends [13].

Urban corridors are not only congested with vehicles and people but also filled with utilities, each one a potential conflict for the planned work. For many years, the natural pattern has been to install utilities in streets and highways. It can take many forms, whether aerial or underground. Some are privately owned and others owned by municipalities, such as a local water company [4].

Urban utilities infrastructure accounts the water supply, sewerage facilities, drainage systems, power distribution networks, communication transmissions and other related underground, surface and overhead services and facilities [14].

A variety of telecommunications providers have facilities in public ROWs. Power and gas lines are often public utilities regulated by a public utilities commission and found in the highway ROWs. In addition, local irrigation districts, sewer districts, and others may have facilities in urban corridors under construction.Almost all projects require the relocation or adjustment of existing utilities. When conflicts exist, either the utility owner or the agency's contractor must make necessary changes. The extent of relocation depends on the corridor and the nature of the work. Those familiar with urban corridor construction may recall projects where the actual corridor improvements (e.g., new pavement, drainage, traffic signals, and bridge construction) appeared almost incidental to the amount of preliminary utility work. Ultimately, the presence of utilities on these projects represents a potentially high-cost/high-risk factor during construction. Utility conflicts, impacts on the actual construction work, and the best strategies agencies use to prevent negative outcomes on urban projects[4].

In Addis Ababa, when utility companies (i.e. ETC, AAWSA, and EEPCO) needed to install new lines or to improve the existing ones underneath the roads, they used to apply to the Addis Ababa City Road Authority (AACRA) for permit to cut paved roads. Very often permits were not granted promptly. Besides, the permits given were not based on adequate information and database. The concerns of the utility company that secured such a permit were limited only to laying its own utility lines. As a result such developments often took place at the expense of the other utility lines that were already in place. In fact this has resulted in the cutting and destruction of other infrastructure lines that were otherwise functioning in good conditions. It has also resulted in delaying in the implementation of projects thereby adversely affecting overall city infrastructure and services provision[15].

From the perspective of utility companies, delays in ROW acquisition and frequent changes to the design are the main reasons for delays in utility relocation. Past experience with frequent design changes keep utility companies from getting involved earlier in the

project development process, for fear of wasting time, effort, and money on a relocation that a project may no longer need after a design change[16].

Utility companies often lack accurate records on precise locations of underground utility lines. In this case, they will not identify if utility lines are required to be moved, especially in urban areas where utility lines have been installed years ago.In cases where a utility conflict is anticipated, the problems should be studied with utility companies and a contractor to come up with a best possible solution. The project design should be revised and updated in order to expedite the construction and minimize the delays. A delay mostly occurs when the prime contractor cannot work as a result of utility conflicts. That is why it is important for the utility company and the contractor to establish good cooperation between them during the actual construction of the project.Using some type of utility locater is costly to use but it would be even more costly and time consuming if a utility line is detected in the process of construction [17].

Since no proper records exist of the underground utilities like water supply, sewerage lines, electrical and telephone cables etc., these utilities get identified as encumbrance only during the implementation stage of the project. Similarly shifting of overhead electrical and telephone lines (which are visible including poles) takes a long time. This leads to delay as the shifting of these utilities brings in hardships to the general population and suitable alternate arrangements are required to be made. There are numerous government agencies involved from which clearances/approvals/permissions are required to be obtained before the utilities can be shifted or relocated. This takes a great deal of time. There are cumbersome procedures involved and sometimes the relevant laws and regulations are also not very clear [18].

2.4.2.2. ROW problem

Right-of-way (ROW)clearance is defined as those instances where there is an interest in land acquired and includes all necessary procedures to acquire the property. In some cases land and interests in land must be acquired outside existing ROW for or by the utility. ROW acquisition and utility adjustment are almost always on the critical path of an infrastructure project. It is important to identify and focus on all parcels within the ROW, but especially those that might cause delay, such as those that may require eminent

domain acquisition or have other inherent problems. Utilities with a history of slow response in making adjustments should be aggressively managed. It should be noted that ROW and utility adjustment issues may be of concern even in cases where the parcel or utility is owned by a separate public entity. A strategy must be developed to address these problematic parcels and/or utility adjustment [19].

In the context of Addis Ababa city road construction projects the ROW problem is related to land acquisition issue from the community for the purpose of the infrastructure development and relocating of utility facilities. The land required for these projects includes the land to be used for the construction of the road which includes appropriate ROW according to the requirements of the Addis Ababa city master plan standards and other part of the land which will be used by the contractors as local material sources such as quarry site, spoil area, and temporary land for material stock piling, pre-casting yards, warehouse, workshops, parking lots, etc. ROW obstructions are one of the prevailing risks hindering the progress of road construction in urban areas unless intensive intervention measures are adopted [3].

2.4.2.2.1. Land Acquisition, Resettlement and Compensation

Land acquisition is a common constraint in road construction project. Adversely affect the construction process, acquiring land for a project may become a lengthy process, particularly when lands to be purchased are owned by private sectors [21].

Due to the construction time, land acquisition will occur .This will result in loss of infrastructure; commercial activities and disturbance to people. The compensation for the structures, plots, private and public properties etc. has to be made as per law[24].

2.4.2.2.2. Delay in Clearance of Right of Way (ROW)

The main reason for the delay ofROW clearance is the underestimating of the consequences of ROW problems during the beginning of the project. ROW clearance is used to be performed mostly during the mobilizationperiod of the contractor. By the time the contractor has finished its mobilization of resources; little progress is always achieved with regard to ROW clearance. Hence delay of project due to ROW starts at the beginning of the project period. According to CII IR 268-2 (2010) and AACRA annual

publication (2012), the following are the major issues included under ROW:Delay in clearance of ROW properties which includeswarehouses,fences,trees,Crops and grazing lands [3].

Studies in Florida, USA, show the right of way costs for new or expanded roadways exceed the cost for construction. The right of way acquisition process can begin after 60% of the design is completed; however, the process typically begins after 90% of the design work is completed. The roadway design team leader is recommended to be prepared with the backup documentation to support the design decisions made regarding access management and to provide that information to the right of way team. The right of way team often can consist of appraisers, land planners, engineers, accountants, and other experts in the field. Their task is to estimate the fair market value of the property being acquired. The right of way team will carefully review the work completed by the roadway design team. This work will extend onto the property to address any secondary problems that the driveway grade might create. Careful consideration and good, proactive coordination in dealing with the secondary problems by the roadway design team during the plans development phases can reduce the time and costs associated with the acquisition process[22].

2.4.2.3 High-traffic problem (obstruction) during construction period

Congestion is relatively easy to recognize roads filled with cars, trucks, and buses, sidewalks filled with pedestrians. The definitions of the term congestion mention such words as "clog," "impede," and "excessive fullness." For anyone who has ever sat in congested traffic, those words should sound familiar. In the transportation realm, congestion usually relates to an excess of vehicles on a portion of roadway at a particular time resulting in speeds that are slower sometimes much slower than normal or "free flow" speeds. Congestion often means stopped or stop-and-go traffic [23].

Due to the construction activities, proper traffic management may pose a challenge in the project area. This may result in traffic jams and cause inconvenience to the people passing through the project area due to movement of vehicles carrying construction materials. It will also increase the traffic load on the existing road network, thus deteriorating the existing condition of the road. Also, the movement of vehicles along the

haulage routes may cause soil compaction and alteration of percolation, and damage to properties and utilities[24].

Managing the substantial volumes of traffic found in these urban corridors is, perhaps, the most confusing problem for agencies. Sometimes alternative corridors exist to which traffic can be diverted; traffic movement also can be facilitated by other means in spite of the major impacts of actual construction [4].

Generally Temporary roadways and works will be designed to minimize adverse changes to existing property access arrangements and road functionality for other road users. All temporary traffic diversions and controls will be completed before the construction activities interfere with the current traffic arrangements. Any temporary roads will be removed and the area restored to its original condition upon completion of the works. Portable Variable Message Signs will be installed at each end of the Project, prior to any changed traffic conditions due to construction activity. These will be used to inform the public where any road changes as a result of the construction works. Additionally, project signboards will be located at each end of the Project [31].

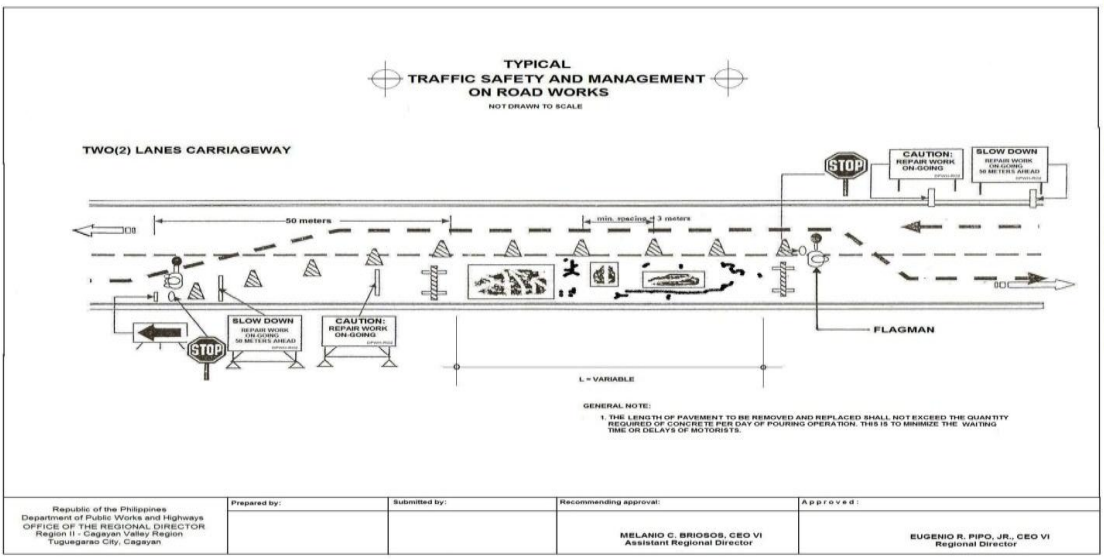

Figure 4.30 source From the DPWH Philippines

2.4.2.4 Performance of stakeholder issues

The construction industry is complex in its nature because it comprises large numbers of parties as clients, contractors, consultants, stakeholders, and regulators. Despite this

complexity, the industry plays a major role in the development and achievement of society's goals. It is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrializedcountries, many local construction projects report poor performance due to many evidential project-specific causes such as: unavailability of materials; excessive amendments of design and drawings; poor coordination among participants, ineffective monitoring and feedback, and lack of project leadership skills. Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety. Many factors ashaving influence on project cost performance, these include: project manager's competence, top management support, project manager's coordinating and leadership skills, monitoring and feedback by the participants, decision-making, coordination among project participants, owners' competence, social condition, economic condition, and climatic condition. Coordination among project participants, however, was identified as the most significant of all the factors, having maximum influence on cost performance[26].

A negative attitude to a construction project by stakeholders can severely obstruct its implementation. Such obstruction will cause cost overruns and exceeded time schedules due to conflicts and controversies concerning project design and implementation. Inadequate management of the concerns of stakeholders often leads to conflicts and controversies about the implementation of a construction project [27].

2.4.2.4.1Contractor capacity

Road contractor's performance problem appears in many aspects in developing countries. Many road projects fail in time performance, others fail in cost performance and others fail in other performance indicators. In the past there were many road projects which finished with poor performance because of many evidential reasons such as: obstacles by client, non-availability of materials, road closure, amendment of the design and drawing, additional works, waiting the decision, handing over, variation order, amendments in Bill of Quantity and delay of receiving drawings. There are other indicators for problems of road contractor's performance in developing countries such as project management,

coordination between participants, monitoring, and feedback and leadership skills. In addition, political, economic and cultural issues are three important indicators related to failures of road projects' performance in the Country [28].

The major issues of concern during urban road construction are mentionedas follows:

Concerns on the capacity of the contractors

- Management organization needs adjustment towards professionalism (the General Managers position of the construction company is to be hold by professionals like civil engineers related fields.
- Less effort towards curbing the prevailing high turnover of professionals and skilled workers.
- Poor recording keeping of activities related with construction
- Financial capacity of the contractors to be built, financial institutions need to Facilitate the liquid assets.
- Poor practice of subletting parts of the works to Subcontractors.
- Little effort towards the establishment of specialized contractors like for asphalt work, concrete works, pipe production, prefabricated elements, quarry, crushed aggregate, formwork, earthwork, rock blasting, etc.

2.4.2.4.2. Consultantcapacity

The major issues of concern during urban road construction are mentionedas follows[3].

Concerns on the short comings of the consultants are

- Faulty designs, errors in quantity estimation, discrepancy in the drawings andSpecifications, etc.
- Lack of commitment and feeling ownership of the project
- Follow the contractor‘s work accomplishment rather than proactively contributing valuable input towards the achieving the project objectives.

2.4.2.4.3.Clientcapacity

The major issues of concern during urban road construction are mentionedas follows:

Concerns on the capacity of the client

- Absence of pre-project planning
- Lack of strong contract Administration (better to allow all road projects including
- maintenance works to be done by contractors and focus on contract administration And ROW clearances)
- Shortage of professionals competent enough to thoroughly check the designssubmitted by the consultants.
- Frequent change of requirements
- Delay in responding to questions raised by the contractors and consultants
- To closely work with relevant offices so that master plan for road classificationsneeds to be verified based on the actual topographic data and traffic volume
- Absence of updating traffic management study for road network based on the Current developments
- Lack of giving priority for road intersections, taxi bays, parking areas to minimize the prevailing traffic jams
- Lack of updating integrated drainage network study in relation to the roadnetworks,
- Non standardization of drawings and details
- Project procurement method to be revised to avoid award for lowest bid price offers, etc.[3].

2.4.2.5. Scheduleconstraint

Road construction operations, rules governing the actions and interactions of the resources should be identified, developed, classified and modeled through a comprehensive analysis of several road construction projects. For every road construction operations (activities), project templates in advance should be defined and developed. Through the templates, which summarize productivity, factors influencing the

productivity of resources and the sequence of works, the basics towards complete executions planning and scheduling are achieved [29].

Project scheduling involves charting the resources requirements or anticipated progress in completing component activities over the project's time horizon. Scheduling is an inevitable part of life and essential part of every plan. Without scheduling, managers cannot be certain that they are actually processing towards their goals. It could be said that scheduling put the plan on calendar basis. Therefore, a time schedule outlines the project work programmed; hence, it is a time table of work planned. Development of accurate work schedules is a challenge to managers due incompetence into consideration the factors that affect work scheduling. Construction project with effective work schedule is a recipe for progress monitoring and control as it depicts the activities to be executed on a time scale. Without scheduling of work activities, it could be difficult to monitor activity progress and take corrective and control actions on the control milestone. It will also provide platform for measurement of the actual work progress and comparing it with the schedule work progress,determine if there is any deviation for corrective action. Project control puts the project plan on course again after determination of activities variance [30].

Construction planning and scheduling tasks are fundamental and challenging activities in the management of executing construction projects. It involves choice of construction technologies, definition of work tasks, estimation of the required resources and durations for individual tasks, and identification of any interactions or constraints among the different tasks. A good construction plan is the basis for developing the project budget and the schedule of work. Poor estimates or schedules can easily result in large construction cost increases or delays[31].

2.4.2.6. Environmental problem

Road construction is by its nature a complex task that needs a thorough planning and controlled management throughout the lifetime of the project. Its progress can be affected by lots of reasons that results the project to lag behind its scheduled time. Rainy seasons are one of the focal reasons that delay construction projects especially for roads. During rainy seasons, the ground will not be suitable for execution of works, machinery

movement and over all construction works. Since most parts of Ethiopia have three months of rainy season each year, these times of the year are usually known to disturb ongoing road constructions. rainy seasons are also known to have their own negative impact on road delay of the construction Due to this, construction time is extended and detour roads does not give the expected services resulting in inconvenience of transport[32].

2.4.2.7. Poor project management

Poor project management is a problem on the implementation of road construction. This situation comes from the lack of experience of the project manager; Poor of site management reflected the weakness and incapability of contractors. And also Skillful and experience human resource is insufficient in site management.

2.4.2.8 Variation order

Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the project area. Also low utilization of the available spaces and not designing the structures taking into account, the prospective and futuristic needs can result in structures with low social acceptability and functionality[24].

A construction contract is a business agreement that is subject to variability. Contractual clauses relating to changes allow parties involved in the contract to freely initiate variation orders within the ambit of the scope of the works without alteration of the original contract. Variation orders involve additions, omissions, alterations and substitutions in terms of quality, quantity and schedule of works.Unfortunately, because construction projects involve complex operations which cannot be accurately determined in advance, variation orders occur. Variation orders are issued to correct or modify the original scope of work because changes during construction of projects are unavoidable.Variations in construction projects are very common and likely to occur from different sources, by various causes, at any stage of a project, and may have considerable negative impacts on items such as costs and schedule delays. A critical variation may cause consecutive delays in project schedule, re-estimation of work statement, and extra demands of equipment, materials, labor, and overtime. Variations, if

not resolved through a formalized variation management process, can become the major source of contract disputes, which is a severe risk contributing to project failure[33].

2.4.2.9. Scarcity of financial & material resources

Construction materials can be purchased by two procedures, either purchasing directly, or purchasing for entire lump sum contract. However, purchasing materials before due time is very important in the construction, because the delay in purchasing will delay the completion date, and interrupt the schedule. Consequently, the contractor will be exposed to penalty which might sometimes cause contractor to fail thus monitoring and evaluation is essential [34].

2.6.3. Effects of the challenges on road construction projects

Delay is one of the biggest problems construction firms face. Delays can lead to many negative effects such as lawsuits between owners and contractors, increased costs, loss of productivity and profits, and contract termination. The construction companies in many countries around the world experience significant delays. So what is construction delay? Construction delay can be defined as time overrun or extension of time to complete the project. It is a situation when the actual progress of a construction project is slower than the planned schedule or late completion of the project. However, delay situations are complex in nature because multiple delays can occur concurrently and because they can be caused by more than one party, or by none of themprincipal parties. One delay may contribute to the formation of other delays. In complex and big projects having many activities, delays are analyzed only based on the two major parameters i.e. time and cost because recording each activity schedules is difficult. Since the delay in infrastructure projects affects the economy of the country, it is important for the projects to be completed within the budgeted cost and time[35].

These causes of construction delay were categorized into the following eight major groups[36].

1. Client related factors: finance and payments of completed work, owner interference, slow decision making and unrealistic contract duration imposed by owners.
2. Contractor related factors: delays caused by subcontractor, site management, improper construction methods, improper planning and errors during construction, and inadequate

contractor experience.

3. Consultant related factors: contract management, preparation and approval of drawings, quality assurance and waiting time for approval of test and inspection.

4. Material related factors: quality of material and shortage in material.

5. Labor and equipment related factors: labor supply, labor productivity and equipment availability and failure.

6. Contract related factors: change orders and mistakes or discrepancies in contract document.

7. Contract relationship related factors: major disputes and negotiations, inappropriate overall organizational structure linking to the project and lack of communication between the parties.

8. External factors: weather condition, regulatory changes, problem with neighbors and unforeseen site condition

2.6.3.1. Time over run

The timely completion of road infrastructure projects is an important objective. A significantannoyance to the public occurs when projects are not completed in a timely manner and when actual progress of the construction work is longer than necessary, thereby prolonging the inconvenience and disrupted business access. Economic & social welfare and safety are all related to timely completion. In spite of the importance of timely completion, construction delays remain a common occurrence[37].

Client-related and contractor-related factors have impact on the time overrun. Factors such as inadequate planning by the contractors, improper site management by the contractors, inadequate project handling experience of contractors, and delay in the payments for the work completed directly affect the completion of the project and cause time overrun[36].

2.6.3.2. Cost over run

Cost overruns have obvious effects for the key stakeholders in particular, and on the construction industry in general. To the client, cost overrun implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental/lease costs or prices. To the

professionals, cost overrun implies inability to deliver value for money and could well tarnish their reputations and result in loss of confidence reposed in them by clients. To the contractor, it implies loss of profit for non-completion, and defamation that could jeopardize his/her chances of winning further jobs, if at fault. To the industry as a whole, cost overruns could bring about project abandonment and a drop in construction activities, bad reputation, and inability to secure project finance or securing it at higher costs due to added risks [38].

All these consequences undermine the viability and sustainability of the construction industry. The effects of cost overrun are not confined to the construction industry but are reflected in the state of the overall economy of a country. They state that delays and cost overruns in construction projects prevent the planned increase in property and service production from taking place, and this phenomenon in turn affects, in a negative way, the rate of national growth[39].

2.6.3.3. Termination of a project

Terminationis a permanent stoppage of work of all or a portion of the contract and the contract is terminated. For a party to possess the right for termination, a termination clause must be specifically included in the contract. Most contracts allow the owner the right to terminate the contract, while some contracts grant the contractor this right[40].

2.6.3.4. Dispute between parties

Disputes are the effects of major causes of poor performance in construction projects such as causes of client related, contractor related, and consultant related and external related that might be arisen during the construction projects among the project parties. Lack of communication may also leads to misunderstandings, conflicts, and disputes. Hence, it necessitates the project managers to have effective communication skills that are one of the significant soft skills (People skills) with the project parties involving in construction projects [41].

2.6.4 Existing construction standards to on-going roadconstruction

The demolition, disconnection, removal or part removal, disposal and or storage of buildings, bridges, drainage structures, retaining walls, wells, buildings, service ducts,

foundations, fencing, walls, kerbs, old pavements, abandoned pipelines, disused public utilities and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the contract[42].

2.6.4.1. Construction requirement for Right of way problem

Construction requirement for demolition and removal of existing structures

A. Existing structures and installations shall be demolished as described in the contract or as instructed by the engineer. The existing structures and installations shall be removed such a way as to leave no obstruction to the new works. Those structures and installations, which are to be partially demolished, shall be shored, braced and supported in such a manner that the integrity of the structure shall be maintained. All supports should be kept outside the right of way.
B. The contractor shall carefully remove and store materials salvaged from demolished structures and installations. Unless otherwise stated in the contract, such materials shall become the property of the owner. This material shall be carefully transported and stored in an acceptable manner upon the owner's adjacent property or at location to be identified by the engineer.
C. Whenever materials are stored within right-of-way, the contractor shall be responsible for its care and preservation until its authorized removal. The contractor shall satisfactorily dispose of all material designated by the engineer as having no salvage value by means of its legal removal from the site, burning using a high intensity burning process that produces few emissions, burying in trenches or pits in approved areas within the right-of-way in accordance with the requirements
D. The contractor shall remove structures and installations or part of structure and installations, which obstruct with the installation of a new structure or installation.
E. Unless otherwise directed by the engineer any voids below ground level in existing structures or installations shall be filled with natural sand or crushed fine aggregate. Latrine pits, septic tanks etc. shall be cleaned out and disinfected and

the contents disposed of generally in accordance with the requirements for hazardous materials before the filling with approved materials [43].

2.6.4.2. Construction requirements for existing public utility

(a) Disconnections

Before the commencement of demolition operations, the Contractor shall notify the Engineer who shall arrange for the disconnection of all disused public utilities, including electricity, telephone, sewer, water and other facilities encountered.

(b) Protection of Existing Public Utilities

Existing utilities, which are to remain in place, such as sewers, drains, water pipes, conduits, poles, etc. are to be carefully protected from injury and are not to be displaced.

(c) Relocation of Existing Public Utilities

The Contracting Authority shall arrange with the appropriate authorities for the necessary relocation of any public utilities, which would otherwise obstruct the Works [42].

The lack of integration of urban infrastructure and services planning in Ethiopia could be said to have its basis in three major areas: lack of technical knowhow, poorinstitutional arrangements and weak legal frameworks.Due to uncoordinated planning and design and weak institutional arrangements redoing Faulty designs and rebuilding utility lines have wasted a significant amount of resources. Frequent cutting of city streets by various utility companies has severely affected the Environmental quality and the efficiency of the urban transport system[1].

In order to promote the exchange of information before excavation start, governments might consider introduction of "a single information system" based permitting legislation for all the municipal services and utilities providing authorities within the city. Another option for municipalities might be to set up a "common clearing-house for inquires and to issue digging licenses". Such licenses might also be an effective way of "controlling digging activities" [44].

As the planning dimension, the institutional dimension used to assess the partners' coordination as the main point of interest. The concept of institutional coordination is used to express official inter and intra-sectoral relationships among the city administration and utility infrastructure providing institutions in the course of the city's utility infrastructures provision. The problem of the institutional dimension is characterized in terms of: inefficient use of resources(financial, material, land, labor and time resources), an expenditure of large amount of money for the relocation utilities compensation, problem in access of the revised city plan, lack of institutional coordination when one institution builds the other destroys, inconsistency in compensation payment, cumbersome procedures during the process of utility infrastructure relocation and during the work of the city redevelopment projects [37].

2.7.3. Prepare Temporary traffic management Planduring the construction phase

The extent of work includes the design, construction, maintenance and provision of temporary road ways and side tracks, the provision of traffic controllers ,lights ,barrierssigns ,road markings, fences, diversions, and any other items required for the safe and easy passage of all public traffic shall apply where any public place or road is affected by the works .Unless otherwise specified all temporary traffic arrangements required by works and under the contract are included under this specification. The contractor must follow to the requirement of the specification, and the drawing where planning and carrying out traffic control and shall conduct operation with the least possible obstruction and inconvenience to the public. The contractor should have under construction no greater length or amount of work than can be prosecuted properly with due regards to the right of the public .To the extent possible, the contactor shall finish each section before beginning work on the next [45].

A. Install and maintain temporary traffic control devices adjacent to and within the project as required by the traffic control plan. The engineer installs and maintains the traffic control devices as follow

1. Furnish and install traffic control devices before the start of construction operations.
2. Install only those traffic control devices needed to for each stage or phase;
3. Relocate temporary traffic control devices as necessary

4. Immediately replace any devices that is lost, stolen, destroyed

B.Traffic safety officer

The safety of the travelling public is of utmost important and every effort must be made to ensure that all road signs, barricades,delineators,flag men and speed controls are maintained and effective and that courtesy is extended to the public at all times.

1. Exercise control in terms of traffic safety over the safe movement of personnel,

Visitors and plant on sites including wearing high visible clothing, the operation of amber flicker lights and the display and cleanliness of "construction vehicle" signs, all as specified.

2. Compile and maintain a complete daily record of traffic signs installed and the traffic signs sequence at each location during the execution of the contract[45].

CHAPTER THREE
RESEARCH METHDOLOGY

3.1. Study area

The study of this research was carried out in Addis Ababa which is the capital city of Ethiopia. Geographically, Addis Ababa is located at the center of the country. It is located in the plateau of mountain ranges at an altitude of 2200 to 3000 m above mean sea level and the topography ranges from rolling to hilly area with relative steep gradients. The city administration extends over 540 square kilometers with 10 Sub-cities and 116 Woredas for administrative purpose. In addition to this, the city is allocated 220 km^2 for green area (i.e. Forests, Parks, River Buffers, and Urban Agriculture). Vegetation cover of the city is 80km^2, and dominant species is Eucalyptus trees and rich in rare but diverse flora and fauna[44].

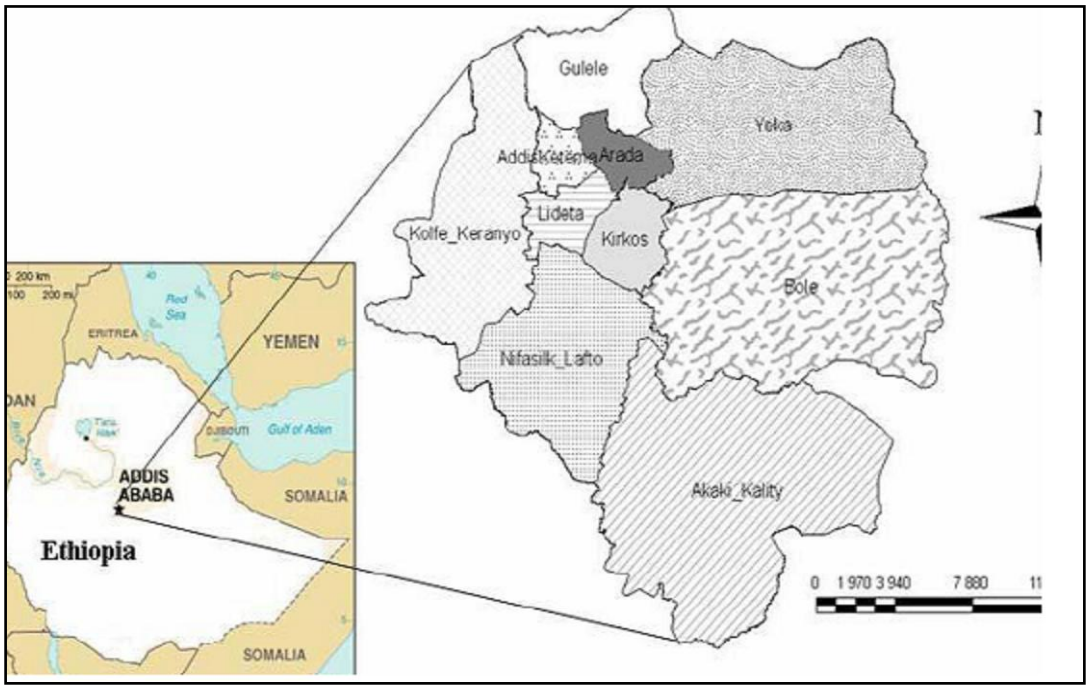

Figure 3.1Location of city administrative units of Addis Ababa[44].

3.2. Research Design

The research design used in this study were descriptive and explanatory survey types because it dealt with causal relationship between the variables and it has been to describe

the major challenges of ongoing road construction and effect of the challenges on the selected road construction projects.

3.3. Study Population

The study populations for this research were the selected tenon-going road projects in Addis Ababa city during research period.

3.4 Sampling techniques

A purposive sampling technique was employed to select the relevant sample units intentionally for the problem and interview some top managers among respondents. In addition, a sample of available design and contract documents of selected projects believed to face with severe for challenges were taken for desk study based on same technique.

The respondents included in the survey consist of a total number of 30 professionals: 10 from Client(AACRA),10 from contractors and 10 from consultants.The list of contractors and consultants currently involved in road construction projects were obtained from Addis Ababa City Road Authority (AACRA), and some of the respondents are listed in appendixC.

3.5 study variables

Dependent Variable

The dependent variable, which is the output and its result, depend on the independent variables, which directly related to the general objectives.

- Challenges of Ongoing Road Construction

Independent variable

These independent variables are more relating with specific objectives but each specific objective is affecting one another.

- Utility conflict
- ROW problem
- High trafficproblem

3.6 Data Collection Procedures

Firstly, Guide lines (checklist) for the case study were prepared then the research was conducted by identification of the major challenges through literature review, desk studyand site observationon selected road projects. The guide lines contain basic information about the selected road construction projects such as; identify the major challenges that observed during the construction implementation process, determining the challenges that influence on road construction, evaluation of roads by checking compliance with the existing construction standards as well as conclusion about the above issues.From these findings, questionnaires were developed and distributed to respondents then attempted to collect data from the relevant population (i.e. Client, contractors& consultants) to evaluate the perception of different stakeholders on the issues of the challenges, ranking of the variables. Upon obtaining the desired data, checking and organization of data has been done. This was followed by thorough discussions in order to draw a conclusion and to forward recommendations based on the findings of the study.

The desk study was undertaken by the researcher to obtain actual data from the source documents which included in the contract documents, supplementary agreements, progress report and site visit as well as to have appropriate data about the selected Road project that are found in Addis Ababa. The other instrument employed was to asking professional opinion and relevant data through questionnaires.

The questionnaire survey was take place by distributed questionnaires to the selected Client, contractors and consultant's whereas, the interviewconducted to some top managers which involved in the road construction in Addis Ababa.

In this study, the questionnaire consist both closed and opened questions in order to identification of the major challenges and their effects on selected on-going. The participants were requested to allocate marks from 0 to 4 (a 5-point Likert's scale).It employed the five point type Likert ordinal scale to measure level of usage by responding firms from "Very low Challenge" to "Very highChallenge" that is, 1= Very

lowChallenge, 2= low Challenge, 3= Medium Challenge, 4= high Challenge , 5= Very highChallenge .Each number has its own Wight. Interviews were also conducted to gather more information.

3.7 Data processing and analysis

The categorized data were then coded and analyzed using Microsoft Excel software. The Relative Importance Index (RII) was calculated using the formula.The five point Likert scales (0, 1, 2, 3, and 4) is used to calculate the relative importance index for each challenges and which was then used to determine the relative ranking for the challenges.

The basic tools of analysis for the collected data to achieve the objectives of this research are summarized as follows

The Relative Importance Index method (RII) was used identify the major challenges of ongoing construction and determine the effect of the challenges of road projects in the city of Addis Ababa respectively. Therelative importance index can be computed by applying the relationship as shown below[45].

$$RII = \frac{\sum W}{A * N} \quad \text{……Equestion-1}$$

Where: W is the weight given to each factor by respondents and ranges from 1 to 5

$W = wi * xi$; Where: i= response category index

wi= the weight assigned to i^{th}response = 1, 2, 3, 4, 5, respectively.

xi= frequency of the i^{th}response of the total responses for each factors.

A is the highest weight = 5 N is the total number of respondents

Ranks of the identified challenges and effects of the challenges are calculated based on relative importance index, as perceived by different parties are tested for correlation. The purpose of a correlation test is to see if there is difference in ranking between two groups of respondents and to avoid being deceived by chance of occurrences and impact as ranked by single part. The tests also helped to evaluate whether agreement of opinions exist among respondents

Spearman's-rank correlation coefficient for measuring the agreement/or difference in ranking between two groups of respondents scoring each factor is applied; because of its advantages of not requiring the assumption of normality and or homogeneity of variances. In this research it is used to show the degree of agreement between the different parties involved in the survey: contractors, clients and consultants[46].

The` ranking correlation coefficient ranges from -1 to +1. A correlation coefficient of 1 indicates a perfect linear correlation i.e. good or strong correlations while -1 indicates negative correlation implying high ranking in one group is associated with low ranking on the other. Correlation coefficient value near to zero indicates little or no correlation. This correlation coefficient is used to measure and compare the association between the rankings of two parties, while ignoring the ranking of the third one.

The Spearman's- rank correlation coefficient (rs) for agreement in ranking between the two parties is given by the following formula [46].

$$rs = 1 - \frac{6\sum d^2}{N(N^2 - 1)} \quad \text{..... (Equation-2)}$$

rs =Spearman's rank correlation coefficient.

d =the difference in ranking between the contractors, consultants and clients and

N= is number of variables

The rank correlation coefficient is used for measuring the differences or agreement in ranking between two groups of respondents scoring the various factors (i.e. clients versus consultants, clients versus contractors and consultants versus contractors).

3.8. Data quality assurance

In order to assure the quality of data, the researcher administered the questionnaires to the relevant respondents in an effort to achieve the necessary information. Moreover, data collectors were trained on the aspects of the questionnaire and how to handle the

respondents and the data carefully. During the data analysisto obtain quality of data the researcher would be assured by giving attention to the following points.

- Before collecting data, all the source of population availability has to be checked and respondents' daily work schedules have to be respected.
- All the questions has to be put in simple & clear ways
- All the system for quality control /assurance of data collection has to be worked out effectively

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1. Basic information on respondents

This section is mainly designed to provide general information about respondent'spositionand experience in road construction projects. Thirty (30) questionnaires were distributed to the respondents as follows: ten to client (AACRA) employees, ten to consulting firms and ten to contractor organizations. The comprehensive analysis of total respondent's was (73%)valid responses were collected.

Table 4-1: Response rate by category

Respondents Category	Questionnaires Distributed	Questionnaires Returned	Percentage (%)	Valid response	Valid Response rate (%)
Contractor	10	10	100	7	70
Consultant	10	10	100	7	70
Client	10	10	100	8	80
Total	30	30	100	7	73

The survey was conducted by visiting the ten (10) selected ongoing road projects and gathering necessary information from each site by preparing checklist for each site. Distribution of questioners was done mainly through personal networking with construction professionals, and by assigning data collector. Moreover, respondents were contacted both in person by participation on the site for the distribution and frequently contacted through phone calls.

4.1.1.Respondent position in the organization

Figure 4.1was illustrated that , 7% of the respondents where at Project manager position, 20% of the respondents where site engineers, 27% project coordinator,30% Resident engineer and 16% of the respondents where others who work in the organization.

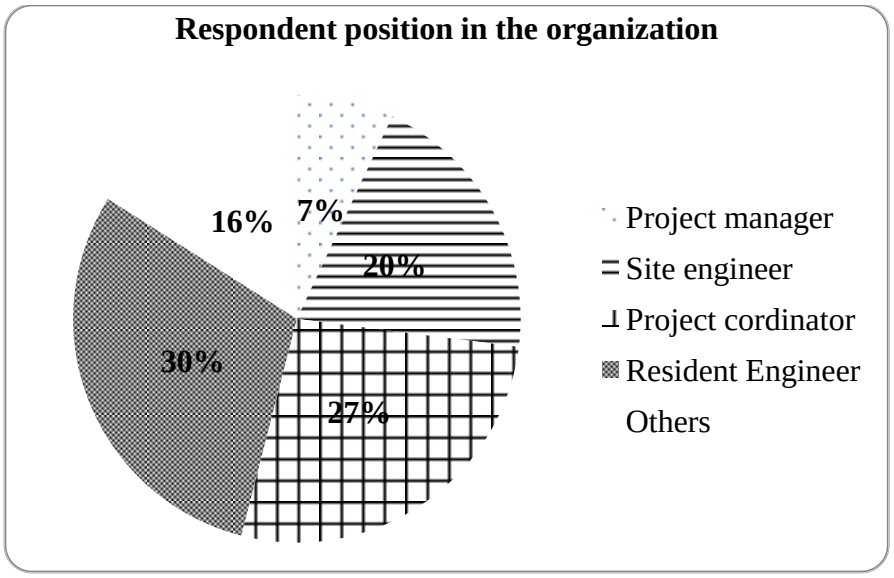

Figure 4-1: Respondent position in the organization

4.1.2.Percentage of Respondent Experience

The percentage ofrespondents Experience in Addis Ababa road construction projects showed below in figure4-2. In the Figure, 30% of the respondents found to have a work experience of 3 years and below and 73% of the respondents had 3-8 years of road work experience. Similarly, the remaining 17% of the respondents were found to have a work experience of 8 years and above as Figure 4.2below.

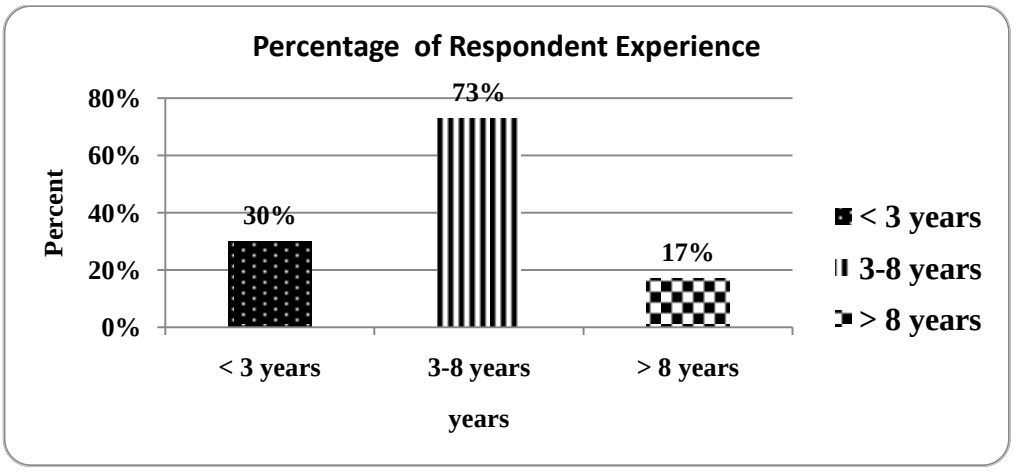

Figure 4-2:Experience of the respondents in Addis Ababa road construction projects

4.2.Checking the challenge that affect implementation of on-going road construction projects

The project is faced challenge to implement the construction works. Before identifying the major challenges of ongoing road construction projects and determine their sever effects, the existence of challenges in road projects has to be confirmed first. Hence, the first step in this research was devoted to check whether a major challenge affecting implementation was and still is a problem or not in Addis Ababa road construction projects. Accordingly, the result obtained is presented in the table below.

Table 4-2: Challenge affecting implementation was and still is a problem or not in Addis Ababa road construction projects.

Are there Challengesthat affect implementation in Addis Ababa road projects?	**Client**		**Contractor**		**Consultant**	
	Frequency	%	Frequency	%	Frequency	%
YES	10	100	10	100	10	100
NO	0	0	0	0	0	0
Total	10	100	10	100	10	100

Table above shows, From the Selected Road Projects100 % of the respondents for this research have recognized that there are challenges thatare being a problem for the implementation of road construction in Addis Ababa city.

4.3Assessing the Selected on-going Road Projects

4.3.1. Selected ongoing Road projects Actual progress information

The selected road projects includes project length, project width,Contract Commencement period,Original Contract Completion date,Revised Contract Completion date,Time Elapsed, Physical works progress,Financial progress. Those documents used tocontrol the status (i.e. progress) of the on-going construction work.

Table 4.3 showed that,the list of tenroad projects that are ongoing road projects, which suffer for different challenges including the project name, Types of roadHierarchy, project length, Physical progress and sub city of the on-going road projects.

Table 4-3: Physical performances of selected road projects

No.	Project Name	Types of road Hierarchy	Planed Project Length (km)	Physical Progress(Actual) (%)	Sub city
1	Cmcround about – karalo junction asphalt concrete road construction project	Sub-Arterial road	1.992km	84.68%	Yeka
2	2nd police station- kidestemariam church- minilik hospital asphalt road project	Sub-Arterial road	1.312km	30.13%	Arada
3	Yerergoro school- cmc at st. Michael church- kotebewendyrad school Asphalt concrete road project.	Arterial road	5.44km	63.15%	Between On bole &yeka
4	Koyefeche condominium lot 1 and 2 asphalt concrete roads construction project	Feeder road	5.89km	62.08%	Kalitiy
5	Radio beacon- kotebefisashmataria Asphalt concrete road construction project	Feeder road	1.33km	50.3%	Bole
6	Augusta- betel-alembank Asphalt road project	Arterial road	1.8km	1.9%	Kolfekeranio
7	Mexico - amestegna police Asphalt road project	Sub-Arterial road	0.640km	5%	Kirkos
8	Kadisco paint factory to crown hotel Asphalt road project	Sub-Arterial road	1.73km	2.4%	Akakikalitiy
9	Gazebo- Meskel flower Asphalt road project	Sub-Arterial road	5.82km	52.60%	Kirkos
10	Besrategebriel- abo roundabout Asphalt road project	Sub-Arterial road	1.441 km	5.03%	Nefas silk lafto

The above table illustrated thatthe physical progress of the selected road projects such as:CMC-roundabout up to Karalo junction 84.68%,2nd police station-Kideste Mariam 30.13%,Yerergoro–CMCmichaelchurch 63.15%,Koyefeche condominium lot 1& lot 2 62.08%, Radiobecon- Kotebefisashmatari50%,Agusta–betel-alembank 1.9%,Mexico-amestegna police 5%,Kadisco paint factory-Crown hotel 2.4%,Gazebo-Meskel flower 52.6% and BiserateGebriel-aboround about 5.03%.The above physical progress was

estimated according to the engineer's evaluation which comes from the actual progress sum of works in different categories such as earth works, pavement layers, drainage and structures, incidental works, day works and utility.

The actual physical progress percentage was calculated from weighting average percentage of the works categorized, but the engineer's evaluation differs from site to site. The method of estimation was shown in appendix B.

4.3.2. Identified challenge on the on-going road construction project during assessment

The projects for assessing were selected from AACRA in addition to this,desk study was conductedon contractual documents and progress reports of the respective projects found in AACRA's contract document department, to supplement the result from questionnaire survey by using checklist to have an overview on the extent of the problem.Results from the desk study shown that Addis Ababa city road construction projects wereexperiencing delays because of different challengeswhereas,the selected in Addis Ababa city roads projects facingthe following challenges:

4.3.2.1. CMC Roundabout – Karalo Junction Asphalt Concrete Road Construction Project

Table 4-4: Project Data for CMC Roundabout – Karalo

Project Title	CMC Round About – Karalo Junction Asphalt Concrete Road Construction Project
Project end station	1+992 (near Karalo)
Road width	28mts
Client	Addis Ababa City Roads Authority
Consultant	BEST Consulting Engineer's P.l.c
Contractor	YemaneGirmayGeneral Contractor
Contract signing date	26thJune 2014
Commencement date	14th July 2014
Original Contract period	180 calendar days (6 months)
Original Contract Completion date	09thJanuary 2015
Revised Contract Completion date	19 July2016
Original Contract Amount	ETB 106,276,763.04
Revised contract amount	ETB 120,625,177.71
Time Elapsed	747 Cal days
Physical works progress	84.68%
Financial progress	80.09%

The CMC Round About – Karalo Junction Asphalt Concrete Road Construction Project is one of the road construction projects undertaken by the Addis Ababa City Roads Authority .The road is mainly intended to serve as a link road to the two main roads namely the Hayat -Megenagna and Megenagna- Kotebe roads.

Figure 4.4: CMC Roundabout – Karalo Junction Asphalt Concrete Road Construction

Problemsobserved from the site were ; obstruction of fiber Cable and main water supply line at Sta. 0+120 and the Septic tank of Sunshine real state at Sta. 1+100 on the LHS.Utility relocation was still remaining which created discontinuity of the routine earthwork, pavement and drainage works. It also affects the next activities and ultimately the time of project completion and delivery.Delay in the construction of Sub base, Base course, the Asphalt surfacing operations associated with the failure of the Contractor regarding the timely delivery of the materials satisfying the project specifications, The production of Base course material not sufficiently cover the total length of the project which brings interruption of the work.

Due to the existence Row problem three houses from km 1+650 to end of project and no solution have been given from YekaKifleketema about their removal because of this reasonutility companiescould not mobilize to relocate their properties.

The construction work especially the outlet excavation work at km 0+963 box culvert have been interrupted due to Unfavorable weather condition, Shortage of sub base material has become a main problem to complete the pedestrian walkway due to this challenges theproject delayed2 years from the contract completion period.

4.3.2.2. 2nd Police Station -Kidestemariam church- Minilik Hospital Asphalt Road project

Table 4-5: Project data for CMC Roundabout – Karalo

Project title	2nd police station- Kidestemariam church-Minilik Hospital Asphalt road project
Client	AACRA
Contractor	Enyi General Contractor
Consultant	Best consulting Engineers Plc.
Original contract amount	ETB 74,930,291.79
Contract signing date	21th May 2015
Contract Commencement date	1st October 2015
Original contract period	365 calendar days(12 months)
Original Contract completion Date	1st October 2016
Time elapsed	228 months (12 months)
Physical works progress	30.13%
Financial Progress	23.27%

Problems encountered on second project were; Non removal of right of way obstruction house and fence, Utility not relocated at the appropriate time of the project such as Copper and optical fibre cables crossing the road at km 0+420**,** 200mm , DCI (ductile cast iron) pipe crossing the road at km 0+ 420**,** 100mm and water pipe line(km 0+420-km 0+460 & km 0+580 RHS) right hand side**,** Electric pole and wires(km 0+810-0+920 LHS) left hand side**,**electric and Tele-cables(at km 1+720)was shown in Appendix**(**Figure 7: Utility related ROW observation.)

Utility institutions (i.e. Tele, Electric and AAWSA) due to their lack of coordination may causes of utilities are not to bedisconnected, relocate and install at the appropriate time of

the construction phase. Due to such reason the project face for different challenges.The project was delayed 1year from the contract completion period.

Figure 4.5:2NDpolice station- kidestemariam church- Minilik hospital asphalt road

4.3.2.3. Yerergoro school- cmc at st. Michael church- Kotebewendyrad School Asphalt Concrete road project.

Table 4-6: Project data for Yerergoro school- cmc at st. Michael church

Project tittle	Yerergoro school- cmc at st. Michael Church – Kotebewendyrad school Asphalt concrete road project
Road width	20m
Client	AACRA
Contractor	Satconconstruction plc.
Consulting	Classic consulting engineers' plc.
Construction contract signed	06 July, 2012
Commencement of the project	26 July,2012
Original Construction period	730cal days(up to 21 April 2014)
Interim extension of time	634cal
Extension construction period	1364 cal days (up to 21 April 2016)
Original contract amount	374,957,328.78 ETB
Revised contract amount	248,720,486.71 ETB
Physical progress of work	63.15%

Figure 4.6: Yerergoro school- CMC at st. Michael Church –Kotebewendyrad School Asphalt concrete road project.

Problems encountered weredelay in removal of houses and fences at junctions (at km2+300), Delays in removal of utility lines (telephone and electric line) from the Row limits near the junctions approach and at the junctions of km 2+ 300, km4+600 and km 5+440. Delay in construction of the asphalt layer by the subcontractor, there are more than1km (7m width) road sectionprepared by the main contractor and waiting for asphalt works.

Due to incomplete and late removal of obstruction especially electric pole, telephone cable and water supply line.by the concerned authorities or stake holders especially on junction at km 2+300, km4+600 and km5+440 various works of the project have been delayed.because of these effects the contract completion time was extended by 21 months as shown inFigure 2A of Appendix F. Severe delay in removal of utility lines (Electric and telephones poles) from project Junction.

Figure 4.7: km4+600 DCI pipe not relocated by EEU junction work.

It's noted that due to possession of the site as a result of delay in approval of master plan and delays in removal of the obstruction in the Row limit, the contractor is guaranteed an extension of time of a total of 634cal day.

The engineer representative has repeatedly reported about the ROW problems and difficulties that will be faced on the on-goingworks. There is still unresolved right of way issue basically on junctions and currently the situation is very critical as the contractor is finalizing the major road way works of the remaining sections. The project delayed by 2 years.

4.3.2.4. koyefeche condominium lot 1 and 2 asphalt concrete roads construction project

Table 4-7: Project data for koyefeche condominium lot 1 and 2 asphalt

Project title	koyefeche condominium lot 1 and 2 asphalt concrete roads construction project
Client	AACRA
Consultant	Best Consulting Engineers Plc
Contractor	Melcon construction PLC
Contract signing date	March 12,2015
Contract commencement date	march 24, 2015
Original contract period	180 Cal days (6 months)
Original contract completion period	Sep 20,2015
1st revised contract completion date	January 02,2016
2nd revised contract completion date	April 8, 2016
3rd revised contract completion date	June 30, 2016
Time elapsed	464 cal days
Original contract amount	ETB 285,471,813.03
Variation orders	ETB 63,094,523.28
Physical work progress	62.08%
Financial progress	54.88%

The total length of the road is 5.89km and designed to be constructed to asphalt concrete standard .The project has entirely 5 routes under two lots of different formation width. The first contract(lot 1) include 3 route access road1, access road 2 & route 3 with road length of 0.72 km,0.52 km,&1.30 km respectively.This lot has total road width of 40m comprising 2* 7=14m dual carriageway,2*5=10m walk way,& 16m median for future expansion. The second contract(lot 2) consists two parts namely route 1 and route 2 with respective road length 2.63 km & 0.72km.unlike to the first contract lot 2 has total width of 30m comprising 2*10=20m dual carriage way,2*4.5=9m walk way and 2m median.

Figure 4.8:Koyefeche road project

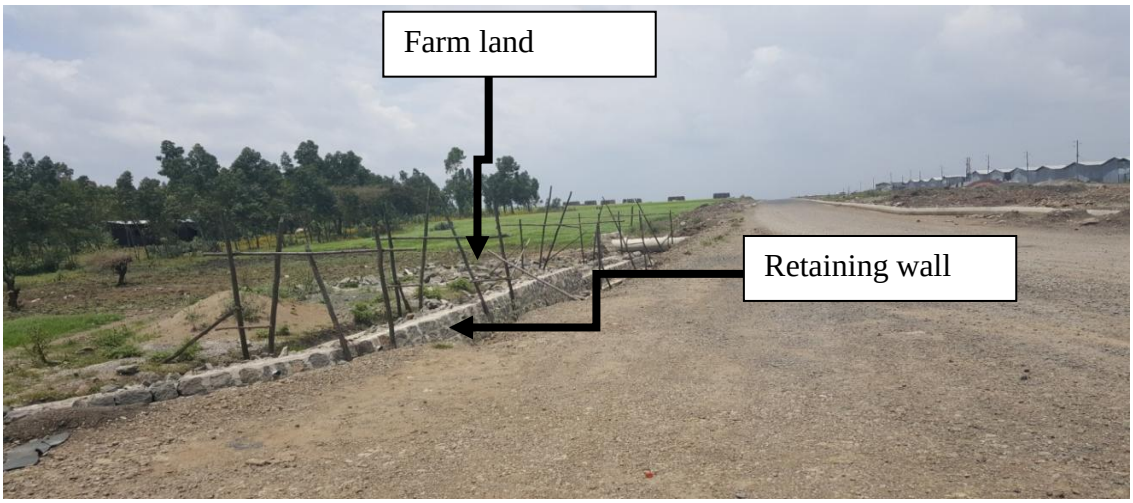

Figure 4.9:Koyefeche road project route 3 Lot 1

Problem encountered such as Houses and fences located in Row limit access road 1are still remaining as obstructions. The late removal process of farm lands are identified at route 3of lot 1 for the construction of retaining wall and junctions has been also delayed.AndalsoFences and houses of Akaki-kality sub-city housing project office which is located in Row limit of route 4 were not removed.The removal and/or relocation of remaining obstructions is still one of the major causes of delay in progress of the project. Late possession of the site for Row affected sections of the project road may result in raising potential claims for time extension and additional payments for related problems The project delayed by 1 year.

4.2.3.5. Radiobeacon-kotebeFisashmataria asphalt concrete road project

The project is located in Addis Ababa city bole sub city and it connects the ends of two roads running from St. George church round about to end of summit condominium and yerer round about to lemiIndustry Park.

Table 4-8: Project data for Radio beacon-kotebeFisashmataria

Project name	Radio beacon-kotebeFisashmataria asphalt concrete road construction
Client	AACRA
Contractor	DiribaDefersha General contractor
Consultant	Eng. ZewdieEskinder&Co.plc
Typical Width	50m including walkway
Contract commencement	March 24,2015
Contract time for completion	240 calander days
Contract date for completion	December 02, 2015
Revised time for completion as per Eot 01	405 calander days
Revised time for completion as perEot 02	525 calander days
Revised date for completion as per Eot 01	May.02, 2016
Revised date for completion as per Eot 02	August.29,2016
Contract amount	131,558,191.34 ETB
Revised contract amount	132,647,148.61ETB

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Figure 4.10: Radio Becon – Kotebefesashmataria road project

It's observed that there are Row problems at sta0+070-0+130,Through different correspondences both the contractor and consultant tried to finalize removal of this obstruction. However, some mud houses at 0+100 not removed.The other problem encountered was Unfavourable weather condition**,** Additional utility and underground services works.The project delayed by more than 1 year.

4.2.3.6. Augusta- Betel-Alembank Road Project

The road project is located in the western part of AddissAbaba city in the kolfekeraneyo sub-city of the city administration.it starts at betel round about, passes through the betel teaching general hospital and ends at alem bank round about.

Table 4-9:Project Data for Augusta- Betel-Alembank Road Project

Project title	Augusta- BeteL-Alem Bank Asphalt Road Project
Project width	20m width
Carriage way	6.75m
Median	50cm
Walk way	3m for both sides
Client	AACRA
Contractor	AACRA own force team
Consultant	AACRA design department
Commencement Date	June/2007 e.c
Completion date	June/2008 e.c
Physical progress	20%

The problem encountered wasobstruction of right of way, No relocation of utilities, Design change, High traffic problem, and Unfavorable weather condition. The project delayed by 1 year

Figure 4.11: Agusta –Betel-Alem bank project

4.2.3.7. Mexico - Amestegna police station Road project

Table 4-10: Project data for Mexico - Amestegna police station Road project

Project title	Mexico - Amestegna police station extended Road section
Project walkway width	4m
Funding	Addis Ababa City Government
Client	AACRA
Contractor	IFH Engineering P.L.C
Consultant	Core Consulting Engineering P.L.C
Date of supplementary contract signature	March 16/2016
Date of commencement	March 17/2016
Original contract period	60 calendar days
Original completion date	May 19/2016
Revised Completion date	June 30/2016
Time elapsed	71 calendar days

Figure 4.12: Mexico – Amestegna road project

The Problems encountered in Mexico–Amestegna road project was masonry work Location aroundDe'africHotel(Km 0+ 480 RHS) are under progress. Container house 6 in number at 0+ 600km RHS Junction Not removed.EELPA &tele pole at different location along the section, Basement house From 0+382km to 0+407 km, Underground EEPCO, Ethio-telecom & AAWSA utility lines Inside carriage way and walkway (Across and along the route) Not removed as shown in Figure 4 of Appendix Fdue to this, the project delayed by 2 months.

4.2.3.8. Kadisco paint factory to crown hotel road project

The road project is located in the southern part of Addis Ababacity in Akakikality sub-c.ity. It starts at kadisco factory and ends at crown hotel. Over the last few years, the A.ddis Ababa city administration has continued with a wide program of construction,rehabilitation, and modernization of the road infrastructure network.

Table 4-11: Project data for Kadisco paint factory to crown hotel

Project title	Kadisco paint factory to crown hotel road project
Project width	25m
Carriage way	9.25m each side
Walk way	3.25m on both side
Funding	Addis Ababa city administration
Client	AACRA
Contractor	AACRA own force
Consultant	AACRA design department
Date of signining of contract	Nov,2014
Commencement date	Feb,2015
% financial accomplishment	72.65%
% physical progress	20%

The project kadisco-crown hotel road is 1.73km long road project. It shall have a width of 25m with a divided carriageway of 9.25m on each side.it also shall have a 3.25m wide walkway on both sides.it has side drainage structures of reinforced concrete pipes run both sides of the roadway along the entire length.Thecarriage shall be asphalt concrete and walk ways on each side were planned tobe coble stone for pedestrian use.

Figure 4.13: Kadisco paint factory to crown hotel road project

The Problem encountered was Right of way problem,Poor performance of stakeholders,Variationorder, and Poor public awareness.The project delayed by 1 year.

4.2.3.9.Meskel flower- gazebo- road project

Section from Meskel flower to Gazebo - has 25mts total carriage way width including 3.5mts walkway on each sides and 1m medians.

Table 4-12:Project data for Meskel flower- gazebo- road project

Project title	Lidetatsebel- tembaho monopole- Bulgaria Mazoria- gazebo-Meskel flower road project
Project end station	4+ 230 (Gazebo) and 1+ 420(Meskel flower)
Client	AACRA
Contractor	CRBC Addis Engineering Plc
Consultant	Best Consulting Engineer's Plc
Construction Contract Signed	06 July, 2012
Commencement of construction	17 September, 2012

Construction period	730 calendar days
1st time extension	365 colander days
2nd time extension	264 calendar days
1st revised completion date	06 July , 2015
2nd revised completion date	21 March 2016
Total work progress	52.60%

Figure 4.14:Meskel flower to Gazebo

The problems encountered in Meskel flower to Gazebo road construction were:ROW obstruction clearing works fromMeskelflower to Gazebo,km 0+000 – 0+ 450 left side, and also Right of way obstruction clearing works from Bulgaria to gazebo,Km 1+ 900-4+ 200 both sides,Utility relocation such as sewer lines and fibre optics are very critical and are affecting the on-going works,from Km 0+ 000 to 1+ 000 left side,High traffic problem on the working area.The project delayed by 1 year.

4.2.3.10. BesrateGebriel- Abo Roundabout asphalt road project

Table 4-13:Project datafor BesrateGebriel- Abo Roundabout

Project Title:	The Construction Works for B/Gebriel-Abo Rounabout asphalt road project.
Width of road	30m
Client	Addis Ababa City Roads Authority
Consultant:	Beza Consulting Engineers Plc
Contractor	IFH Engineering PLC
Project Award Date	22 May,2015
Commencement date	Nov 02,2015
Contract period (all)	365 calendar days
Original completion date	May 21,2016
Time Elapsed (days)	192 calendar days
Time Elapsed (%)	52.602%
Work progress (%)	5.03%

The proposed road project is found in the Addis Ababa City Administration under NefasilkLafto Sub city and the proposed route is Bisrate Gabriel Roundabout – ABO Roundabout. The estimated total length of the road will be 1.441 km. Based on the obtained data's from the site Bisrate Gabriel roundabout- Abo round about road is residential areas.The project areas are among the densely populated and high traffic loaded areas of the city. Moreover, these areas are major residential with highly developed infrastructure networks and facilities.

The contractor started the work after the client approved consultnat traffic management plan which was made jointly with the contractor. This plan include the safety of the all road users including the workers at the site

Figure 4.15: The Construction Works for B/Gebriel- Abo roundabout asphalt road project.

The Problems encounteredB/Gebriel- Aboroundabout asphalt road project are: existence of the utility lines on the carriageway and can't work at full capacity.Right of way obstructions exist in the form of small houses,fences ,container shops, there is High traffic problem on the construction area.There is poor public awareness,Variation order is a commonproblem. Electric pole,underground utility lines, and transformers are not relocated.Unless due attention is paid to these obstructions, project progress is still hider and can also affect the further work progress. The project delayed by 2 years.

4.2.4. General summary of the Finding of the ongoing road project

The case study conducted on the selected roads in Addis Ababa city can be face for the delay.Based on the information that obtained from the checklist, Reports, desk study and field observation. The challenges that lead to problems were summarized as follows

The right of way clearing problem,Utility conflict between agencies(i.e. Tele, EEU and AAWSA),High traffic problem on the working area,Design/poor planning,Poor public awareness,Schedule constraint,Variation order,Scarcity of financial and materials,Complex stakeholders issue and Environmental factors.

Table 4-14: The major identified challengesduring assessment period

No.	Challenges
1	Utility conflict
2	Right of way problem
3	Hightrafficproblem/volume
4	Complex stakeholders issue
5	Schedule constraints
6	Environmental factors
7	Poor project management
8	Variation orders
9	Scarcity of financial, materials
10	Poor public awareness
11	Design/poor planning

4.3.Analysis and ranking ofidentified major challengesthat affecting project implementation

Analysis the results of assessment for the selected projectsto meet the second objective of the thesis; it is related to the first specific objective that focused identifying the major challenges on on-going road projects and finally, ranking based on their frequency occurrence in order to achieve this objective.

Desk study of on-going road projects was performed as one of the tools, in addition to literature review, visitingsiteand checklist then become the bases for the questionnaire/survey. For this study, ten asphalt road projects of the city were selected and analyzed. The approach used to select sample projects for the desk study was purposive sampling in which a sample that serves the real purpose and objectives of the research is selected. All of these ten projects face challenges during construction period and from identified the major challenges,which challenge highly affect implementation selected road projects by using relative Importance Index (RII) equation.

Table 4-15: Major challenges of road construction projects

Challenges	Client		Contractor		Consultant		overall RII	RANK
	RII	RANK	RII	RANK	RII	RANK		
Right of way problem	4.4	1	4.6	1	4.6	1	4.53	1
Utility conflict	3.8	2	4.2	2	4.2	2	4.07	2
Schedule constraints	3.6	6	3.54	5	3.8	3	3.65	3
Variation order	3.7	4	3.4	6	3.5	5	3.53	4
Poor project mang.	3.3	8	3.6	4	3.6	4	3.50	5
Scarcity of financial, materials	3.1	10	3.7	3	3.5	5	3.43	6
High traffic problem	3.7	4	3	9	3.3	7	3.33	7
Complex stakeholders issue	3.8	2	3.1	7	3	10	3.30	8
Poor public awareness	3.5	7	3.1	7	3.3	7	3.28	9
Design/poor planning	3.3	9	3	9	3.2	9	3.16	10
Environmental factors	3.1	10	2.5	11	2.6	11	2.73	11

The above table illustrates that,eleven majorchallenges of on-going road construction projects. Challenges on the road project have been ranked by the client's, contractors' and consultant'srespondents. From the summarizedresult of the challenges on the road construction, Right of way problemwas ranked in the first position by the client, contractor and consultant respondents with RII =4.4,RII = 4.6 and RII= 4.6 respectively, therefore this challenge have the highest place on affecting implementation of the selected road project.

Contractors, consultants, and client respondents agreed that projects were delayed because of Right of way problem. This problem can be considered as an obstacle for time performance of construction projects. This challenge is very High challenge for the respondents on their project area .The AACRA usually feel with this sensitive problem in its projects. Construction projects in the city of Addis Ababa suffered from time performance problem because of right of way [47].

Urban projects are definitely affected by the acquisition of ROWs. Most common among the impacts are cost over- runs and schedule implications. Owner expectations and the

relocation of commercial owners were noted by the agencies as being particularly questionable. In looking at a project schedule and what could delay construction it is clear that once a Record of Decision is in hand that ROW acquisition can become the critical path [48].

Utility conflict has been ranked by the clients, contractor and consultants respondents' in the second position with RII =3.8, RII = 4.2 and RII= 4.2 respectively. This problem can also be considered as major challenge for road construction projects. Utility conflicts occur at a high rate on most projects. In 2001, a similar survey to that of utility issues are the main causes of construction delays. Transportation agencies, utility owners, and the public will always have conflicts that must be addressed. Although these conflicts are generally resolved before construction the financial impact on public agencies is significant. In another NCHRP study effort, it was determined that in the United States up to $120 million per year in contractor claims result from utility issues[4].

Scarcity of resources, materials has been ranked by both the clients and contractor respondents' in the tenth and three position with RII =3.1and RII= 3.7 respectively. But it has been ranked by consultant respondents' in the fifth position with RII=3.5. This problem can be considered as an obstacle for implementation of projects. Contractors in the city of Addis Ababa suffered from delay because of settlements around the city and materials shortage [47].

Poor public awareness and design/poor planning was ranked on the seventh, and ninth position respectively by all the respondents with having RII of3.5, 3.1 and 3.3, RII of 3.3, 3, and 3.2 from client, contractor and consultant respondents respectively, because it have a little influence on the selectedroad projects.

Environmental factor was ranked on tenth place by the client with RII value of 3.1 and it was ranked on eleventh place by both the contractor and consultant respondents with RII value of 2.5, 2.6 respectively. Therefore this challenge has the least place on affecting implementation of the selected road projects.

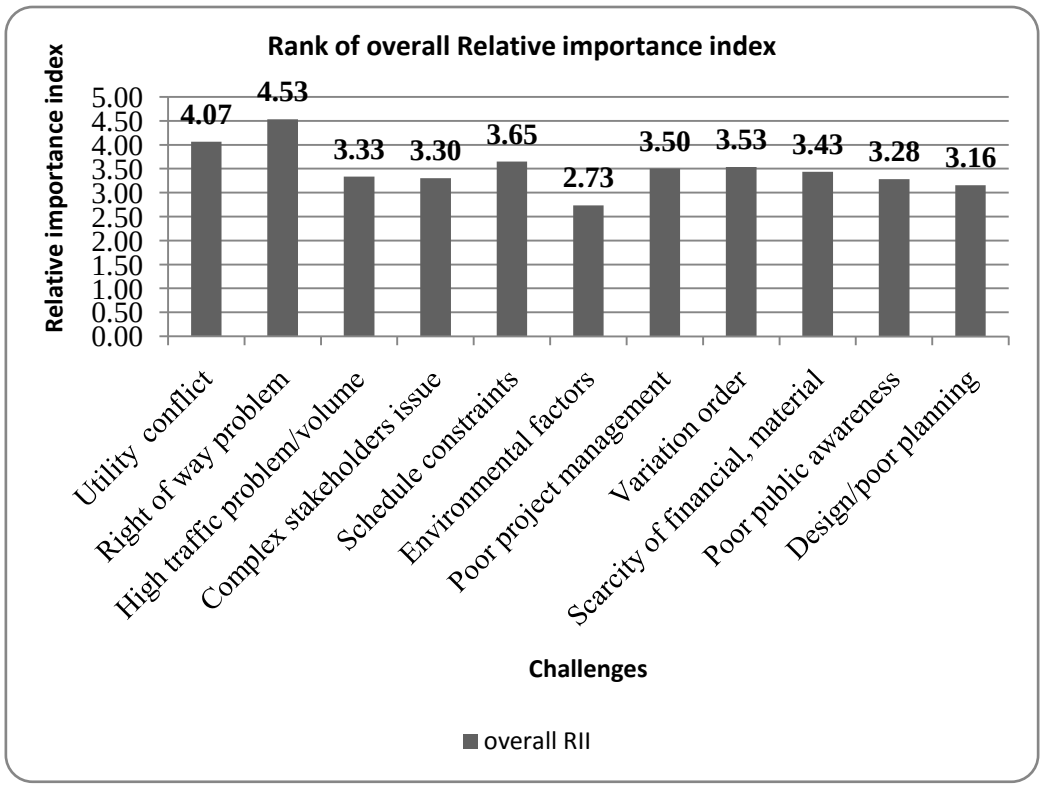

Figure4.17: Rank overall RII of the challenges

The figure abovesummarized rank of overall RII and the result shows the major challenges Identified.according to their rank of overall RII results; right of way (4.53),utility conflict(4.07),schedule constraints (3.65),variation order(3.53),poor projectmanagement(3.5), Scarcity of material, financial (3.43),High trafficproblem(3.33),performance of stake holders(3.3),poor public awareness(3.28),Design/poor planning(3.16) and Environmental factors(2.73)

Were ranked respectively in descending order.Right of way problem has been ranked in the first position by contractors, client & consultant.This result indicates that it have very high challenge to complete the project on time. The right of way problem creates disputes between the parties of project, and then the time of completion will be affected even more.

4.3.1 Test for Agreements on the identified challenges that affecting implementation of the selected road construction projects in Addis Ababa

This part of the study checks whether there is a significant degree of agreement among the three parties (the client, contractors and consultants) in ranking challenges affecting implementation of the selected road projects. Spearman rank correlation coefficient is used as a measure of agreement among raters based on the relative importance index. Using the formula given in equation 1of this research; degree of agreement between client and consultant, contractor and consultant and client and contractor were checked and presented in the Table below. Spearman's correlation works by calculating correlation on the ranked values of this data. Using the aboveTable 4.15and equation 1, Spearman correlation coefficients (r_s) are calculated and tabulated as shown in Table 4.16 a significance association between the sets of ranks from calculated Spearman's rank correlation coefficients (r s) is assessed, in order to see whether there is agreement between two groups of respondents in ranking the factors; the level of significance 95% ($\rho = 0.05$) is used. This allows verifying whether there is "agreement" between respondents' response.

Table 4-16**:** Summary of spearman's rank correlation coefficients for identified challenges

Respondent Category	**Client**	**Consultant**	**Contractor**
Client	1		
Consultant	0.44	1	
Contractor	0.45	0.9	1
Number of pairs of values in the data set		n=11	

For n=11& significance level of 95% ($\rho = 0.05$); Critical value of r s = 0.536 (appendix D) Results of spearman's rank correlations revealed that the perception of stakeholders (parties) vary greatly on the challenges affecting implementation in selected Road in Addis Ababa road construction projects. The result in general indicated that there is a weak correlation among parties as compared in ranking identified challenges. This could

be due to difference in exposure to the challenges affecting implementation in selected Road construction projects.

In this result it is indicated that there is a strong correlation between contactor and consultant with rs value of 0.9. The reason behind this is most of the consultants supervise the contractors work thoroughly, so both the contractor and consultants have exposure to the identified challenges that are affecting implementation of the road projects.

From the correlation result in Table 4.16it can be seen that there was a very weak correlation between consultants' and client's response as well as between contractors' and clients' responses. One of the reasons could be lack of exposure to the work by the client and the stake holders.

4.3.2. Factors causes of the major Challenges that affect implementation in road construction with their

This section focused on the identification of factor leading challenges thataffect implementation on road construction projects in the city of Addis Ababa. For this studybased on literature review, fifteen (15) indicators were considered and listed. The factors were summarized and collected from progress reports and others were added from literature.

The ranking of the factors shown in the Table below were done based on rate of occurrence using relative importance index. The Relative Importance Index (RII) for each potential factors influencing road projects during implementation period were calculated using equation (1) − section 3of this thesis to rank the factors based on overall factors

Table 4-17: RII and rank of all factors from contractors, consultants, client (AACRA), and overall respondents' point of viewfrom all categories.

Factor	Client		contractor		consultant		OVER ALL	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
slow clearance of right of way	4.6	1	4.9	1	5	1	4.83	1
Lack of coordination of utility services	4.5	2	4.7	2	4.5	2	4.57	2
Delay of compensation	3.8	7	4.5	3	4	3	4.10	3
Slow and decision making & tedious project approval process	3.8	7	4	4	3.8	6	3.87	4
Relocation of utility services	3.9	4	3.8	6	3.8	6	3.83	5
Very loose coordination and integration among stakeholders	3.6	9	4	4	3.9	4	3.83	5
Design change/ variation order	3.9	4	3.4	9	3.9	4	3.73	7
Design change of the utility services	4.2	3	3.5	8	3.2	12	3.63	8
management process system	3.6	9	3.6	7	3.5	9	3.57	9
Lack of public awareness	3.87	6	3.4	9	3.1	13	3.46	10
High traffic jam	3.4	11	3.1	11	3.6	8	3.37	11
Lack of alternative roads	3.2	12	3.1	11	3.3	10	3.20	12
Poor back ground in project management	3.1	13	2.8	13	2.9	14	2.93	13
Slow movement of heavy construction equipment's	3	14	2.3	14	3.3	10	2.87	14
Lack of flag man/coordination	1.9	15	2	15	2.6	15	2.17	15

This group contains 15 factorsfrom all categories of that are factors for the challenges of road construction projects. The factors for the challenges of road project has been ranked by the client's, contractors' and consultants respondents The result summarized as for the challenges of road construction from the respondents rate of RII slow clearance of ROW has been ranked by the clients, contractor and consultants respondents' in the first position with RII =4.6,RII = 4.9 and RII= 5 respectively.All client, consultants and contractors feel with thisslow clearance of ROW sensitive problem in their projects. Lack of coordination of utility service was rankedby the clients, contractor and consultants respondents' in the second position with RII=4.5,RII = 4.7 and RII= 4.5 respectively. High traffic jam was ranked by the client and contractor in the 11th place and it was ranked in 8th placeby the consultants. Lack of flag man /coordination was ranked by the client, contractor and consultant respondents in the 15^{th} place with RII 1.9, 2, 2.6 respectively. It have been ranked in the last place by all of the respondents because it

have the least influence as a factor, for the challenges on the selected ongoing road projects.

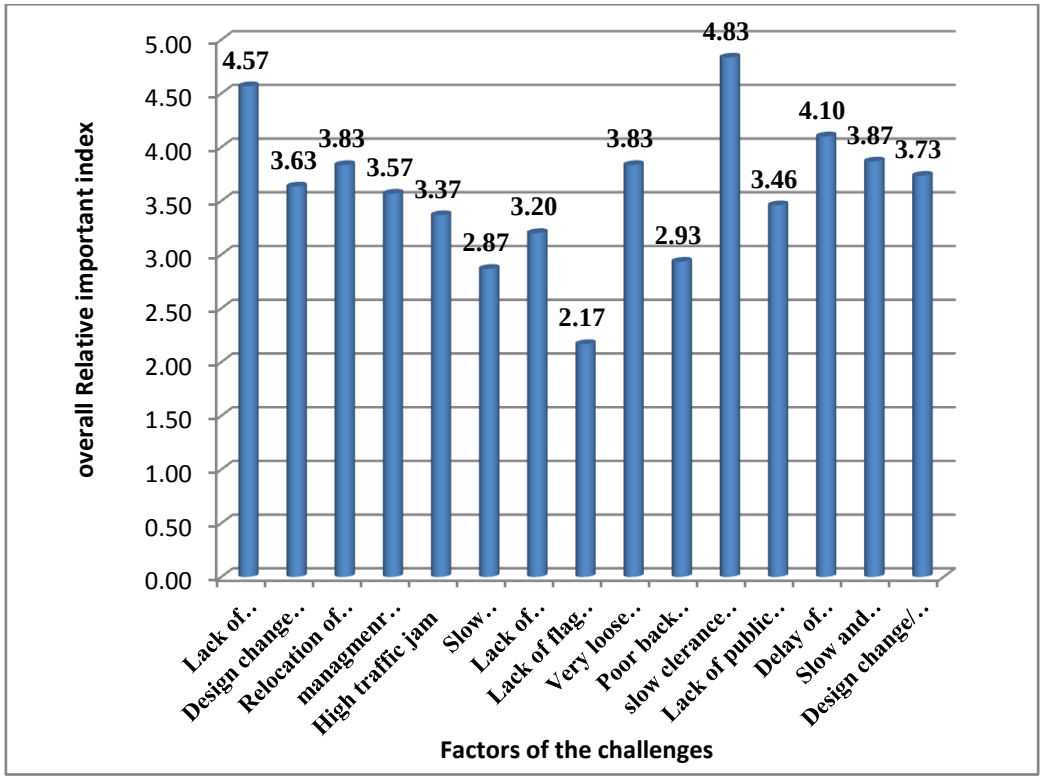

Figure 4.18: Overall RII for the factors

The figure summarized rank of overall RII for the factors, the result shows challenges Identified and listed below according to their rank of overall RII results in descendingorder; slow clearance of right of way (4.83),lack of coordination of utility service(4.57),delay of compensation (4.10),slow and decision making and tedious project approval process(3.87),relocation of utility service(3.83),very loss coordination and integration among stakeholders(3.83), design change or variation order(3.73),design change of utility service(3.63),management process system(3.57),lack of public awareness(3.46),high traffic jam(3.37),lack of alternative roads(3.2), poor background in project(2.93) slow movement of heavy construction equipment(2.87) and lack of flag man coordination(2.17).

Therefore from the rank of overall RII for the factors, we can understand that slow clearance of ROW problem was at the first place and lack of flag man coordination was listed as the least factor from the selected 10 ongoing road project sites.

4.4.Determination effect of the challenges on road construction project

Road construction projects influence by those identified major challenges that influence the implementation on-going project. Effects of determined from checklist, Questioner which are caused by the challenges were presented to the respondent'sto rank. Accordingly, based on the response from each party the Relative Importance Index (RII) for each common potential effect was calculatedand desk study in addition to this by review the literature. Lists of seven common effects

Table 4-18: Rank effects of the challenges on road construction project from all Respondents' point view

Effects	Client		Contractor		Consultant		Overall RII	Average Rank
	RII	Rank	RII	Rank	RII	Rank		
Time over run	4.1	1	4.5	1	4.7	1	4.4	1
budget overrun	4	2	3.6	2	3.6	3	3.7	2
Creating social problems	3.7	6	2.4	4	3.8	2	3.3	3
reduce work motivation	3.8	3	2.3	5	3.4	4	3.2	4
dispute between parties	3	5	2.7	3	3.2	5	3.0	5
project termination	3.6	4	2.2	6	2.8	7	2.9	6
leadership removal	2.6	7	1.9	7	3.1	6	2.5	7

Time over run has been ranked by the client respondents in the first position with RII of 4.1 and has been ranked by contractors and consultant respondents also in the first position with RII of 4.5 and 4.7 respectively. And also Budget overrun has been ranked by the client and contractors,consultant respondents with RII of 4, 3.6 and 3.6 in second position has been ranked by the respondents respectively.

However, this effect is highly influence on the implementation of road construction.In construction delay could be defined as the time over run either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common difficult in construction projects. To the owner, delay means loss of revenue through

lack of production facilities and rent-able space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases [38].

The effects of cost overrun are not limited to the construction industry but are reflected in the state of the overall economy of a country. They state that delays and cost overruns in construction projects prevent the planned increase in property and service production from taking place, and this phenomenon in turn affects, in a negative way, the rate of national growth[49].

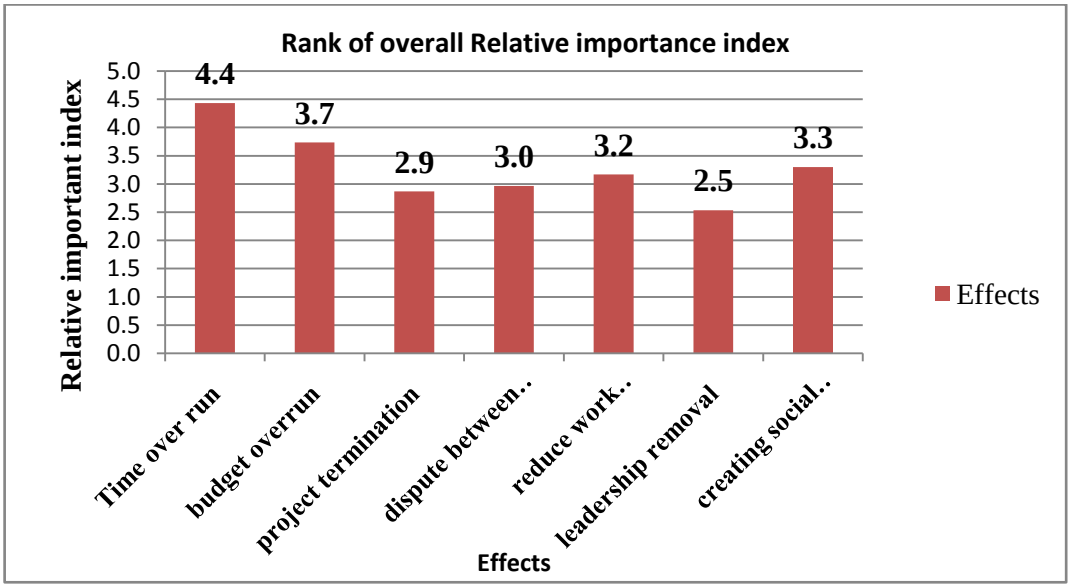

Figure 4.19: Rank of overall Relative important index

The figure summarized rank of overall RII the result shows that effects are determined. Listed below according to their rank of overall RII results; Time over run(4.4),Budget over run(3.7),Creating social problem (3.3),Reduce work motivation(3.2),Dispute between parties(3.0), Project termination (2.9),Leadership removal(2.5).The result shows thatTime over run is Very high impact in AddisAbaba road construction projects from the respondents rate .

Generally the respondents are observed that time and cost overrun is one of the major effects on the Addis Ababa cityroad projects.Creating social problem, Reduce work

motivation disputes between parties, Terminate the project and Leadership removal are also the effects on road construction.

4.4.1. Test for agreements on effects of the identified challenges

Using spearman's rank correlations for the 7 potential effects listed above each effect by the respondents are summarized in Table 4.18 to calculate the correlation coefficients.

Table 4-19**:**Summary of spearman's rank correlation coefficients for effects caused by identified challenges

Respondent Category	Client	Contractor	Consultant
Client	1		
Contractor	0.43	1	
Consultant	0.5	0.79	1
Number of pairs of values in the data set			n=7

For n=14& significance level of 95% (ρ = 0.05); Critical value of r s = 0.786 (appendix D) Results of spearman's rank correlations revealed that the perception of stakeholders (parties) vary greatly on ranking the determined effects caused by the identified challenges on the implementation of road projects in Addis Ababa city.

In this result it is indicated that there is a strong correlation between contractor and consultant with rs value of 0.79. The reason behind this is as mentioned for the identified challenges i.e. most of the consultants supervise the contractors work thoroughly, so both the contractor and consultants have exposure to the effects caused by the identified challenges that are affecting implementation of the road projects.

From the correlation result in Table 4.19it can be seen that there was a very weak correlation between consultants' and client's response as well as between contractors' and clients' responses. One of the reasons could be lack of exposure to the work by the client and the stake holders.

4.5.Checking compliance with the existing construction standards on the selected road construction projects

4.5.1. Construction requirement for Right of way problem

Evaluated the existing of the selected road construction projects with the standard that provided by AACRA requirements.

Table 4-20: Construction requirement for Right of way problem

Standard requirements	Existing practice	Project Name.
-Existing structures and installations shall be demolished as described in the contract such a way as to leave no obstruction to the new works [43].	-The demolished structures were not removed so they are being an obstruction to the work -Existing houses on the road way were not demolished because the government did not give compensation for the house holders in time.	All the selected ten projects
Structures which are to be partially demolished, shall be shored, braced and supported in such a manner that the integrity of the structure shall be maintained. All supports should be kept outside the right of way [43].	There are some structures are not demolished completely in addition to this, they are not shored, braced and supported.	-Cmc roundabout - 2nd police sta. - Mexico -Kadisco -Gazebo
- Unless otherwise directed by the engineer any voids below ground level in existing structures or installations shall be filled with natural sand or crushed fine aggregate [43].	Voids below the existing structure were not filled appropriately.	- 2nd police sta. - Mexico -Gazebo Besrategebriel
- Latrine pits, septic tanks etc. shall be cleaned out and disinfected and the contents disposed of generally in accordance with the requirements for hazardous materials before the filling with approved materials[43].	The waste coming from the breakage of the septic tanks during construction, were not cleaned or disinfected	-Gazebo

Figure 4.20 Void on Mexico- Amestegna police station and besrategebriel

Figure 4.21:Partially demolished building on Cmckaralo junction and kadsico

Figure 4.22: Affected existing houseson Betel-alembank and Cmckaralo junction

During the assessment period, the road mentioned in the above table shown not comply the with standard requirement projects due to factors such as; partially demolished structures remaining on the site were not removed so they are being an obstruction to the work, Voids below the existing structure were not filled appropriately and the affected existing houses on the road way were not demolished because the government did not give compensation for the house holders (property owner) on time.

4.5.2 Construction requirements for existing public utility

Table 4-21: Construction requirements for existing public utility

Standard requirements	Existing practice	Project Name
Before the commencement of demolition operations, the contractor shall notify the engineer who shall arrange for the disconnection of all discussed public utilities [42].	-There is no integration between theinstitutions during construction time.	2nd police station
The contracting authority shall arrange with the appropriate authorities for the necessary relocation of any public utilities, which would otherwise obstruct the works[42].	-No relocation of utilities, obstructing works on walkway and carriage way construction	-Cmc - 2nd police sta. - Mexico -Kadisco -Gazebo -yeregoro -augusta
The arrangement is required to begin from the sides of streets and then need to end on the side of individual property lines as in the order of: drainage line - electric power distribution line- telecommunication transmission lines and then at the end the water supply distribution system with the minimum required distances of 0.50-1.0 meters between two consecutive utility lines [14].	-Narrow space for utility services during the design stage. -wrong arrangement of the utility lines	All selected road projects

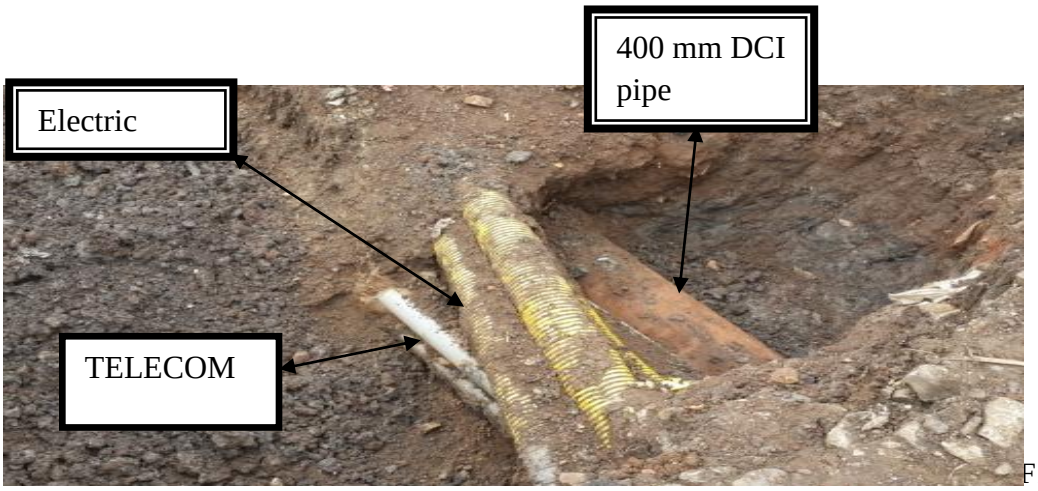

Figure 4.23:Narrow space for utility services during the design stage and wrong arrangement of the utility line (2nd police station–kidestemariam)

Figure 4.25slow clearance of Electric pole and Tele wire box (Kadiskopaint factory – Crown Hotel, Meskel flower- Gazebo)

Figure 4.26: Bundles of underground optical fibers and copper cables at 0+420km which crosses the road project (2nd police station – kideste Mariam)

From the site survey and check list (guide list) most of the selected roads did not comply with the standards set by AACRA. The Addis Ababacity utility infrastructures providing authorities as well as the city administration were not familiarized about the standards for utility infrastructures arrangement and minimum horizontal distances between utilities.

Utilities Electric, communications, gas, water, and sewer lines will normally be located within the ROW of highways. In order to prevent utility maintenance from interfering with highway traffic, noundergroundutilities should be located beneath any part of the pavement, except where crossings are required. Where these underground utilities must cross beneath highways, theyshould be so designed and constructed as to minimize future repairs and consequent interference with traffic. Obstructions including signs and poles for overhead utilities shall be located outside the limits of usable shoulder on highways designed without barrier curbs. Generally, utility poles should not be located in medians on divided highways [50].

4.5.3 Compliance of Temporary trafficmanagement plan standards

Table 4-22: compliance of Temporary trafficmanagement plan standards

Standard requirements	Existing practice	Project name
-Install and maintain temporary traffic control devices adjacent to and within the project as required by the traffic control plan[43].	Temporary traffic control devices were not installed.	All selected projects
-The safety of the travelling public is of utmost important and every effort must be made to ensure that all road signs, barricades, delineators, flag men and speed controls are maintained and effective and that courtesy is extended to the public at all times [43].	There were not enough Traffic safety officers to control the site ways and side tracks, the provision of traffic controllers, lights, barriers ,ramps, signs, road markings ,fences ,detours, and anyother items required for the safe and easy passage of all public traffic were not applied	All selected projects

Figure 4.27 High traffic volumesand no road way sign available

Figure 4.29: Abo Round about BisratGebriel road project

As we can see from the figure above, Accident happened at chainage 1+100 for inappropriate back movement without guidance from safety works. The selected roads have High traffic volume, temporary road way signs are not available on the project progress area and also there are no safety officers. Therefore, they do not comply with the standards set by AACRA.

4.6. Practices concerning major challenges of ongoing Road Construction Projects

This section has attempted the respondent gave their response separately about their practice in their company. The respondents agreed that projects were delayed because of challenges. This problem can be considered as an obstacle for completion of a project at a given time. The following areas of interest have been identified and investigated for discussion based on the results of the responses to the questionnaires. These include:

1. Prepare Traffic management Approach during the construction phase

Table 4-23:Prepare Traffic management Approach

Does your organization Prepare Traffic management approach?	Client		Contractor		Consultant	
	Frequency	(%)	Frequency	(%)	Frequency	(%)
YES	7	70	7	70	7	70
NO	3	30	3	30	3	30
Total	10	100	10	100	10	100

Based on the questioner survey 70% of the stakeholders prepare traffic management plan and the rest 30% did not have a traffic management plan because the sites were located where there is less traffic volume.

Proper traffic management plan will be needed to avoid traffic jams/public problem, Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and problem to the local residents, Coordinated planning of traffic diversions by the traffic police and the Transport Department in accordance with the construction program with advance warnings to the affected residents and road users, The executing agency is required to maintain cooperation between the Traffic Police, travelers and the contractor to facilitate traffic movement during construction stage [51].

2. Organization working progress with in the original time schedule and cost estimate

Table 4-24: organization working progress is within original schedule and cost estimate

Do you think organization working progress is within original schedule and cost estimate?	**Client**		**Contractor**		**Consultant**	
	Frequency	%	Frequency	%	Frequency	%
YES	0	0	0	0	0	0
NO	10	100	10	100	10	100
Total	10	100	10	100	10	100

From the questioner survey data the above table and chart shows 100% of the respondents agree that the working progress is not within the original time schedule and cost estimate due to the challenges that identified. The organization of working progress is affected by numerous problems due to this reason the projects not moves forward with in original schedule and cost estimate.

3. Utility services during design stage to avoid the utility conflict on Addis Ababa road construction project and lack of coordination of utility services affect the organization

Table 4.25: lack of coordination of utility services

Does planning of utilityservice was done to avoid utility conflict?	**Client**		**Contractor**		**Consultant**	
	Frequency	%	Frequency	%	Frequency	%
YES	1	10	0	0	3	30
NO	9	90	10	100	7	70
Total	10	100	10	100	10	100

Based on the questioner survey the above table and chart shows 70% of the stakeholders prepare utility service plan during design stage and the rest 30% doesn’t prepare utility service design due to lack of coordination between the stakeholders.

4.7. Interview Survey

To successfully conduct this research it is needed to look into the issue from different perspectives and to collect views of professionals who have vast experience in road construction in Addis Ababa City. Among the reasons for selection of interviews as a data collection tool is that based on the survey conducted in the UK construction industry, it has been established that among the various tools and techniques interviews, workshops, brainstorming master-program, personal experience and checklists are more acceptable than the others [52].

The interview survey was conducted on four institutions AACRA, AWSA, EEU &TELE. During interview period the researcher conduct the interview by selecting the department of whom it may concern about the utility case.

The institutions install the utility lines by using both skilled and unskilled manpower.Duringinstalling the alignments to follow the street standards using surveying instruments, tape,rope and sometimes using GPS.Theinstitutions communicate each other formally by writing latter, using phone call and other communication devices.

The institutions have a stages to communicate .This are at the planning stage, after the planning stage and before the implementation stage, at the implementation stage and for facilitation problem. Generally from the respondentsgathering the institutioncommunicates at the implementation stage and for facilitation problem. Utility institutions communicateformallyto safe guard the existing utility lines. Due to the topography and Row, Design changes of the utility locations during construction phase may happen. The lack of coordination of utility services affect the road construction,The cause of utility conflict between the institutions from the respondent perspective was: There is no formal (procedural) or meeting time schedule between the institutions, Design change, Lack of communication between agencies, Improper planning or institutions not planning together, The biggest conflict arises when the organizations only keep their best interest rather than implementing the standard, Lack of coordination of institutions, Lack of space for utility lines during design stage.

Likewise, in the case of Ethiopia the supply of infrastructure and services is continually Lagging behind the population growth rate. Ethiopian Urban centers are characterized

by, among others, lack/shortage of basic urban infrastructure and services. It is also vividly observed that the existing scanty infrastructure and services in the urban centers are deteriorating mainly as a result of poor design and installation practices and due to lack of timely maintenance. On top of this, lack of coordinated and integrated infrastructure and services planning and implementation has exacerbated the problems observed in the infrastructure development effort of the country [53].

For the future, theinstitutions stated an objective to prepare (follow) procedures before implementation of the road projects, exchange information andintegrate worksat each stage. The necessities of utility institutional coordination are:

1. Institutional benefit: it will help the institutions for proper utilization of the yearly budget; it reduces re work and time wastage
2. Urban level benefit: to satisfy the community need and to keep the future development of the town.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Based on the data gathered from the desk study and the analysis obtained from questionnaire survey,100%of express their agreement towards the issue that there arechallenges affecting implementation of road construction in Addis Ababa city.

Results obtained from of the study showed that; Right of way ,utility conflict, schedule constraints, variation order, poor project management, Scarcity of materials and finance, high traffic problem, performance of stake holders, poor public awareness, Design/poor planning, and Environmental factors were identified as major challenges affecting the implementation of road construction. From these challenges,Right of way problem was the first major challenge of the road construction projects based on the client, contractor and consultant respondents with RII =4.4,RII = 4.6 and RII= 4.6 respectively. Utility conflict wasthe second major challenge of the road project based on the clients, contractor and consultants respondents' in position with RII =3.8, RII = 4.2 and RII= 4.2 respectively. Hence,these challenges have placed as the major's one that affecting implementation of the selected construction road project.

This study obtained that, the effect of major challenges on the on-going construction road projects were Time over run,Budget over run, Creating social problem, Reduce work motivation, Dispute between parties, Project termination and Leadership removal with 4.4,3.7,3.3,3.2,3.0,2.9 and 2.5 RII value respectively. As ranked by frequency occurrence of the relative importance index (RII) value the result shown that;Time over run was Very high impact in AddisAbaba road construction projects.

The institutions are not familiar with the Addis Ababa city infrastructure standards so theydid not complywiththe standards for utility infrastructures arrangement, ROW requirements and traffic management approach.There is lack of coordination between the institution (AACRA,AWSA,TELE and EEPCO /EEU)

5.2. Recommendation

In respect to this research finding, the following basic recommendations are expected to be exercised by key role players of the construction industry, i.e, Clients,ConsultantsContractors and utilityinstitutions in order to minimizechallenges on ongoing Addis Ababa road construction projects. It is therefore forwarded the recommendation to the following concerned parties

CLIENT/AACRA

An independent organization which has authority to coordinate all institutions that have a role in the road construction should be established in order to minimize right of way and utility conflict problems. In order to avoid time overrun and budget overrun, the client shall properly evaluate the design submitted by consultants and bring the issue to a public debate before awarding construction work. In this case the ultimate need of the client and the public considerable variation and change of order will be avoided.

Before the construction starts, the client has to fulfill all the necessary requirements for deliveringthe site. Failure to deliver the site will cause time and cost overrun.

Compensation must be given before the work starts for the property owner toreduce delay of the construction work.In spite of this, Institutions and stake holders should be instructed to comply with AACRA standard.

CONTRACTOR

Site conditions should be studied before start of construction,the contractor should comply with the standards to progress the work effectively &with a good quality. Regardless of this, the Movement of vehicles carrying construction materials should be limited during the day time to reduce traffic jam and delay on the construction working progress.

The public should also be informed on the existence of road construction and alternative routes must be made andshould have a strong accountability to minimize challenges that cause delay on the road construction.

CONSULTANT

Detailed site investigation should be done at the design phase towards the actual field data to minimize the challenges from occurring. They should also hold themselves responsible for collection of accurate data and ideal solution during design work.

Consultants should have a strong accountability of monitoring projectand provide completed project design where variation order will be negligible.

Utility institutions/AWSA, EEU AND TELE

The concerned utilityinstitutionsshould have meetings and discussion in every phase of the road projects to reduce the conflict and delay of the road projects. And also The walkway is recommended to have sufficient width to allow space for all relevant utility infrastructure, landscape elements,parking spaces, future carriageway widening and cycle paths. The street side/walkway utilities are recommended to install before the development of the area .If so this will reduce unnecessary expenses. Delay and utilities disruption.Preparing training program for the institution workers how to use the standards and comply the standards at every stage of the implementation period.

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APPENDIX A

Sampled Questionnaires

The aim of this questionnaire is toassess the major challenges on ongoing road constructionprojects in Addis Ababa. The research is conducted for fulfilling the requirements for the degree of MSc in Construction Engineering and Management at Jimma University. This questionnaire is required to be filled with exact relevant facts as much as possible.

This questionnaire consists of four parts:

PART ONE: A.General Information

B. Basic questions on ongoing road construction projects.

PART TWO: A. Identifymajor challenges that affecting implementation in Addis Ababa road construction projects.

B.Challenges that affecting implementation in Addis Ababa road construction project with their factors.

PART THREE: Determine Effects (impacts)of the challenges on road construction projects.

PART FOUR: Interview Survey

All information provided in this questionnaire will be treated with strict confidentiality and allowed to serve only for the purpose of the academic research under consideration. Interested participants of this study will be given feedback on the overall research results after the completion of the research work.

Sincerely yours,

AynalemAbebe

aynimelo@gmail.com

Msc.CEM Department of civil engineering Jit, Jimma University

PART ONE

A. General Information

Please put (✓) and/or fill in the blanks as appropriate

1. Name of the project:_____

2. Name of Organization:_____

3. Type of Organization:

☐ Client ☐ Contractor ☐ Consultant ☐

Other, Please specify: _____

4. Current Job title in the organization/company:

☐ Project Manager ☐ Site Engineer ☐ Project Coordinator

☐ Resident Engineer

☐ Other, Please specify: _____

5. Years of experience of the road construction Projects in Addis Ababa:

< 3years ☐ 3-8years ☐ > 8years ☐

B. Basic information on Road Construction Project

1. Do you think challenges that affecting implementation in Roads construction is a problem in the city of Addis Ababa?

YES ☐ NO ☐

2. Whatis the effects of the challenges on road construction projects?

_____

_____

3. Does your organization propose any traffic management approaches to minimize the problem during construction?

Yes ☐ ☐

4. Do you think enough planning work is done by utility services during design stage to avoid the effect of utility conflict on urban road construction? Yes ☐

Why? ☐ _____

_____

_____

_____

5. How do you see the effect of traffic congestion in decreasing the efficiency of machineries ordered by the contractor?

_____

_____

_____

6. Do you think lack of coordination of utility services affect your organization? If say yes, state your reason_____

_____

7. Do you think your organization working progress within the original time schedule and cost estimate? Yes ☐ No ☐

If you say no why?_____

_____

_____

8. What possible measures do you suggest in order to manage (reduce) the challenges of ongoing road construction projects in Addis Ababa?

_____

_____

PART TWO

A. Objective of the study: identify the major challenges that affecting implementation (ongoing project) in Addis Ababa road construction projects.

Please tick "✓" and scale each representing the following rating:

(5) Very High (4) High (3) Average (2) Minor (1) Never

Questions: From your experience in the sector, what are the **Challenges that affecting implementation in Addis Ababa road construction projects?** Rank them in order of frequency of occurrence?

	Challenges	Frequency/rate of occurrences				
		1	2	3	4	5
1	Utility conflict					
2	ROW problem					
3	High traffic problem					
4	Performance of the stakeholder					
5	Schedule constraint					
6	Environmental factors					
7	Poor project management					
8	Variation order					
9	Scarcity of financial ,material					
10	Poor public awareness					
11	Design/ poor planning					
12	Others					

B. Challenges that affecting implementation in Addis Ababa road construction project with their factors**.**

Below are lists of groups affecting the implementation of road construction projects with their factors? From your experience, please express/rate your opinion,the major challenges of road construction projects in Addis Ababa city. Please tick (✓) the appropriate box

		Rate of occurrence Challenges

Item	Groups of Factors	(1) Very low	(2) Low	(3) Medium	(4) High	(5)Very high
A	**Utility Conflict**					
1	Lack of coordination of utility services					
2	Design change of the utility location					
3	Relocation of utility services					
4	Management process system					
B	**traffic problem**					
1	High traffic jam					
2	Slow movement of heavy construction equipment's					
3	Lack of alternative roads					
4	Lack of flag man/ coordination					
5	Very loose coordination and integration among stakeholders					
6	Poor background in (project) management					
C	**Right of Way (ROW) problem**					
1	Slow clearance of ROW					
2	Lack of public awareness					
3	Delay of compensation					
4	Slow and decision making & tedious project approval process					
5	Design change / Variation order					

PART THREE

Determine Effects (impact) of the challenges on road construction projects.

Objective of the study: To determine theeffectsof the challenges on road construction projects.

Please tick "✓" and scale each representing the following rating:

(5) Very High (4) High (3) Average (2) Minor (1) Never

Questions: From your experience,determine what are the effects of the challenges on your road construction project? Rank them in order of frequency of occurrence?

Item	Effects	Frequency/rate of occurrences				
		1	2	3	4	5
1	Time overrun/Schedule					
2	Budget overrun/Cost					
3	Project termination					
4	Dispute between parties					
5	Reduce work motivation					
6	Leadership removal					
7	Creating social problems					

PART FOUR

Interview Survey

Name of organization_____

1. How technically your institution install the utility lines? Explain

- Using skilled manpower

- Using unskilled manpower

- Both

---

2. How did you keep the alignments to follow the street standards? Explain

-Using surveying instruments

- With a simple rope, rod and measuring tape

- None

_____

3. How frequently communicate with utility, road, transport and land administration Agencies to exchange information? Express in percentage

_____

4. When do you communicate with the agencies? Explain

- At the planning stage

- After the planning and before the implementation stage.

- At the implementation stage and for facilitation problems

None_____

5. How do you communicate with other utility institutions to safe guard the existing utility lines? Explain

- Informally

- Formally

- Both

- None

_____

6. State the necessity of utility institutions coordination with regard to:

Theinstitutional benefit:
_____

_____

Local(Urban)levelbenefit:

_____

_____

7. State your opinion about the present condition of institutional coordination.

_____

8. Does your institute have future objectives for institutional coordination? Yes, No If yes, state

_____

9. State your opinion about the causes of utility conflict between the organizations? Explain briefly

_____

10. Do you think lack of coordination of utility services affect your organization? If say yes state your reason.

_____
_____

11. Do you think there is relocation of utility problem? If say yes reason out

_____
_____

12. In what reason the design change of the utility locations happens during construction time?

_____

13. What possible measures do you suggest in order to manage (reduce) the challenges of ongoing road construction projects in Addis Ababa? By considering the utility services conflict?

_____
_____

Thank you for your cooperation!

APPENDIX B

Raw Data Collected by Questionnaire Survey from Respondents

Table AB1: Ranking the challenged of the selected on-going road projects

	Client					RII	Rank	Contractor					RII	Rank	Consultant					RII	RANK	overall RII	RANK
Challenges	1	2	3	4	5			1	2	3	4	5			1	2	3	4	5				
Utility conflict	0	1	1	7	1	3.8	2	0	1	2	1	6	4.2	2	0	1	1	3	5	4.2	2	4.07	2
Right of way problem	1	0	1	0	8	4.4	1	1	0	0	0	9	4.6	1	1	0	0	0	9	4.6	1	4.53	1
High traffic problem	0	1	3	4	2	3.7	4	0	3	4	3	0	3	9	0	0	7	3	0	3.3	7	3.33	7
Complex stakeholders issue	0	1	3	3	3	3.8	2	0	2	6	1	1	3.1	7	0	2	7	0	1	3	10	3.3	8
Schedule constraints	0	2	2	4	2	3.6	6	0	2	2	6	1	3.54	5	0	1	2	5	2	3.8	3	3.65	3
Environmental factors	1	0	6	3	0	3.1	10	1	5	2	2	0	2.5	11	2	2	4	2	0	2.6	11	2.73	11
Poor project management	0	2	4	3	1	3.3	8	0	1	4	3	2	3.6	4	0	0	6	2	2	3.6	4	3.5	5
Variation order	0	1	3	4	2	3.7	4	0	2	2	6	0	3.4	6	0	1	3	6	0	3.5	5	3.53	4
Scarcity of financial, material	1	1	5	2	1	3.1	10	0	0	5	3	2	3.7	3	1	0	3	5	1	3.5	5	3.43	6
Poor public awareness	0	1	5	4	1	3.45	7	1	2	2	5	0	3.1	7	0	2	3	5	0	3.3	7	3.28	9
Design/poor planning	0	1	3	5	1	3.27	9	2	0	4	2	1	3	9	1	0	6	2	1	3.2	9	3.16	10

Table AB2: Ranking the Effects of challenged of the selected on-going road projects

	Client					RII	Rank	contractor					RII	RANK	consultant					RII	RANK	over all RII	RANK
Effects	**1**	**2**	**3**	**4**	**5**			**1**	**2**	**3**	**4**	**5**			**1**	**2**	**3**	**4**	**5**				
Time over run	1	0	2	1	6	4.1	**1**	0	0	2	1	7	4.5	**1**	0	0	1	1	8	4.7	**1**	4.43	**1**
budget overrun	0	0	3	4	3	4	**2**	0	2	2	4	2	3.6	**2**	1	0	2	6	1	3.6	**3**	3.73	**2**
project termination	0	2	3	2	3	3.6	**4**	4	3	1	1	1	2.2	**6**	1	3	4	1	1	2.8	**7**	2.87	**6**
dispute between parties	0	3	4	3	0	3	**5**	1	2	6	1	0	2.7	**3**	0	1	6	3	0	3.2	**5**	2.97	**5**
reduce work motivation	0	1	1	7	1	3.8	**3**	2	6	0	1	1	2.3	**5**	1	1	2	5	1	3.4	**4**	3.17	**4**
leadership removal	1	3	5	1	0	2.6	**7**	4	4	1	1	0	1.9	**7**	1	1	4	4	0	3.1	**6**	2.53	**7**
creating social problems	0	1	4	2	3	3.7	**6**	3	3	2	1	1	2.4	**4**	0	1	2	5	2	3.8	**2**	3.3	**3**

Table AB3: Cmcround about – karalo junction asphalt concrete road construction project physical progress according to the site engineer's evaluation

Work categories	Weighting average (contract) %	Physical (actual) progress
1. Earthworks	12.49%	34.55%
2. pavement layers	37.35%	26.15%
3. drainage and structures	25.66%	20.53%
4. incidental works	14.05%	2.25%
5. day works	0.89%	1.2%
6. utility	1.32%	0
Overall physical progress%	100%	84.68%

APPENDIX C

List of Name of Organizations

Clients

AACRA– Addis Ababa city road Authority

List of Contractors

1.YemaneGirmay General Contractor

2.Enyi General Contractor

3.Satcon construction plc

4. Melcon construction plc

5.DiribaDefersha General contractor

6. AACRA own force team

7. IFH Engineering P.L.C

8.CRBC Addis Engineering Plc

List of Consultants

1. BEST Consulting Engineer's P.l.c
2. Classic consulting engineers plc
3. Eng. ZewdieEskinder&Co.plc
4. AACRA design department
5. Core Consulting Engineering P.L.C
6. Beza Consulting Engineers Plc
7. AACRA Design team

APPENDIX D

Critical Values of Spearman's Rank Correlation Coefficients

Note: when there is no exact number of subjects, use the next lowest number

Table The Spearman rank correlation coefficient

The table gives the critical values of the spearman rank correlation coefficient, for different numbers of pairs of observations.

	significance level: two-tailed/non-directional			
	0.20	0.10	0.05	0.01
	significance level: one-tailed/directional			
Number of subjects(data set)	0.10	0.05	0.025	0.005
5	0.800	0.900	1.000	-
6	0.657	0.829	0.886	1.000
7	0.571	0.714	0.786	0.929
8	0.524	0.643	0.738	0.881
9	0.483	0.600	0.700	0.833
10	0.455	0.564	0.648	0.794
11	0.427	0.536	0.618	0.755
12	0.406	0.503	0.587	0.727
13	0.385	0.484	0.560	0.703
14	0.367	0.464	0.538	0.679
15	0.354	0.446	0.521	0.654
16	0.341	0.429	0.503	0.635
17	0.328	0.414	0.488	0.618
18	0.317	0.401	0.472	0.600
19	0.309	0.391	0.460	0.584
20	0.299	0.380	0.447	0.570
21	0.292	0.370	0.436	0.556
22	0.284	0.361	0.425	0.544
23	0.278	0.353	0.416	0.532
24	0.271	0.344	0.407	0.521
25	0.265	0.337	0.398	0.511
26	0.259	0.331	0.390	0.501
27	0.255	0.324	0.383	0.492
28	0.250	0.318	0.375	0.483
29	0.245	0.312	0.368	0.475
30	0.240	0.306	0.362	0.467
35	0.222	0.283	0.335	0.433

Source: (Naoum, 2001)

APPENDIX E

JIMMA UNIVERSITY

JIMMA UNIVERSITY INSTITUTE OF TECHNOLOGY

CIVIL ENGINEERING DEPARTMENT

MSC PROGRAMME IN CONSTRUCTION ENGINEERING AND MANAGEMENT

Title……

Guide line for case study

Introduction

The construction industry everywhere faces problems and challenges. However, in the developing countries, these difficulties and challenges are present alongside a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues. There is also evidence that the problems have become greater in extent and severity in recent years [1].

Project name……

1. Brief information of the case

   Client……

   Contractor……

   Consultant ……

   Project Cost ……

   ContractPeriod……

Date of Signing of Contract……

   Date of Commencement (according to the contract)……

   Contractual Date of Completion…….

   Project status up to now……..

2. Identify the challenges of implementation in road construction

   ……

   ……

   ……

……

……

……

3. Determine the effects of the challenges during the implementation period

……

……

……

……

4.Checking compliance with the existing construction standards on the selected road construction projects

Table 4.20: Construction requirement for Right of way problem

Standard requirements (AACRA Standard)	Existing practice	Project Name.
-Existing structures and installations shall be demolished as described in the contract such a way as to leave no obstruction to the new works.		
Structures which are to be partially demolished, shall be shored, braced and supported in such a manner that the integrity of the structure shall be maintained. All supports should be kept outside the right of way.		
- Unless otherwise directed by the engineer any voids below ground level in existing structures or installations shall be filled with natural sand or crushed fine aggregate.		
- Latrine pits, septic tanks etc. shall be cleaned out and disinfected and the contents disposed of generally in accordance with the requirements for hazardous materials before the filling with approved materials		

Table 4.21: Construction requirements for existing public utility

Standard requirements	Existing practice	Project Name
Before the commencement of demolition operations, the contractor shall notify the engineer who shall arrange for the disconnection of all discussed public utilities [42].		
The contracting authority shall arrange with the appropriate authorities for the necessary relocation of any public utilities, which would otherwise obstruct the works [42].		
The arrangement is required to begin from the sides of streets and then need to end on the side of individual property lines as in the order of: drainage line - electric power distribution line-telecommunication transmission lines and then at the end the water supply distribution system with the minimum required distances of 0.50-1.0 meters between two consecutive utility lines[14],		

Table 4.22: compliance of Temporary trafficmanagement plan standards

Standard requirements(AACRA).	Existing practice	Project name
-Install and maintain temporary traffic control devices adjacent to and within the project as required by the traffic control plan		
-The safety of the travelling public is of utmost important and every effort must be made to ensure that all road signs, barricades, delineators, flag men and speed controls are maintained and effective and that courtesy is extended to the public at all times.		

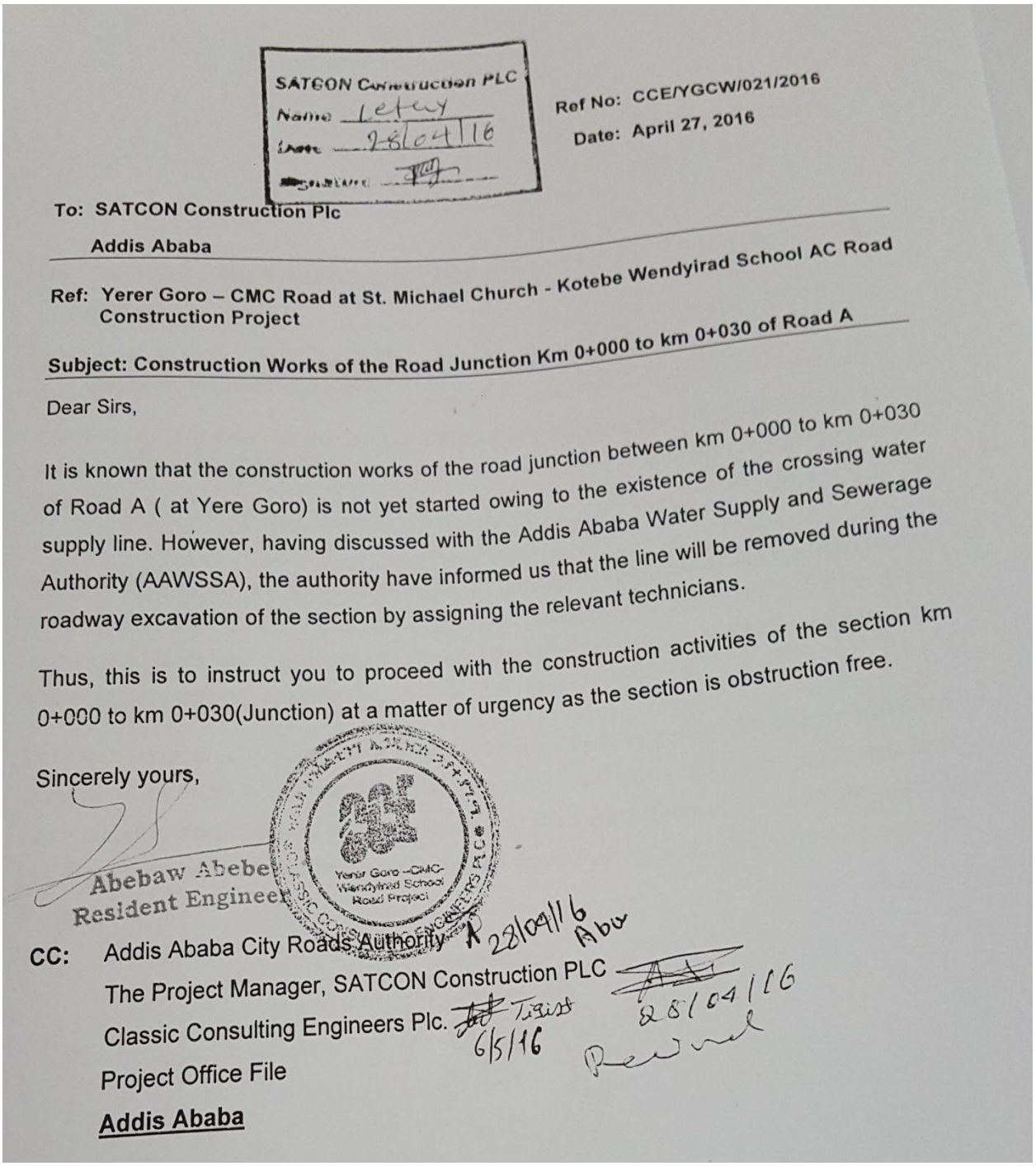
5

.conclusion:……

……

APPENDIX F

Letters of the organizations



SATCON Construction PLC
Name Letey
Date 28/04/16

Ref No: CCE/YGCW/021/2016
Date: April 27, 2016

To: SATCON Construction Plc
Addis Ababa

Ref: Yerer Goro – CMC Road at St. Michael Church - Kotebe Wendyirad School AC Road Construction Project

Subject: Construction Works of the Road Junction Km 0+000 to km 0+030 of Road A

Dear Sirs,

It is known that the construction works of the road junction between km 0+000 to km 0+030 of Road A (at Yere Goro) is not yet started owing to the existence of the crossing water supply line. However, having discussed with the Addis Ababa Water Supply and Sewerage Authority (AAWSSA), the authority have informed us that the line will be removed during the roadway excavation of the section by assigning the relevant technicians.

Thus, this is to instruct you to proceed with the construction activities of the section km 0+000 to km 0+030(Junction) at a matter of urgency as the section is obstruction free.

Sincerely yours,

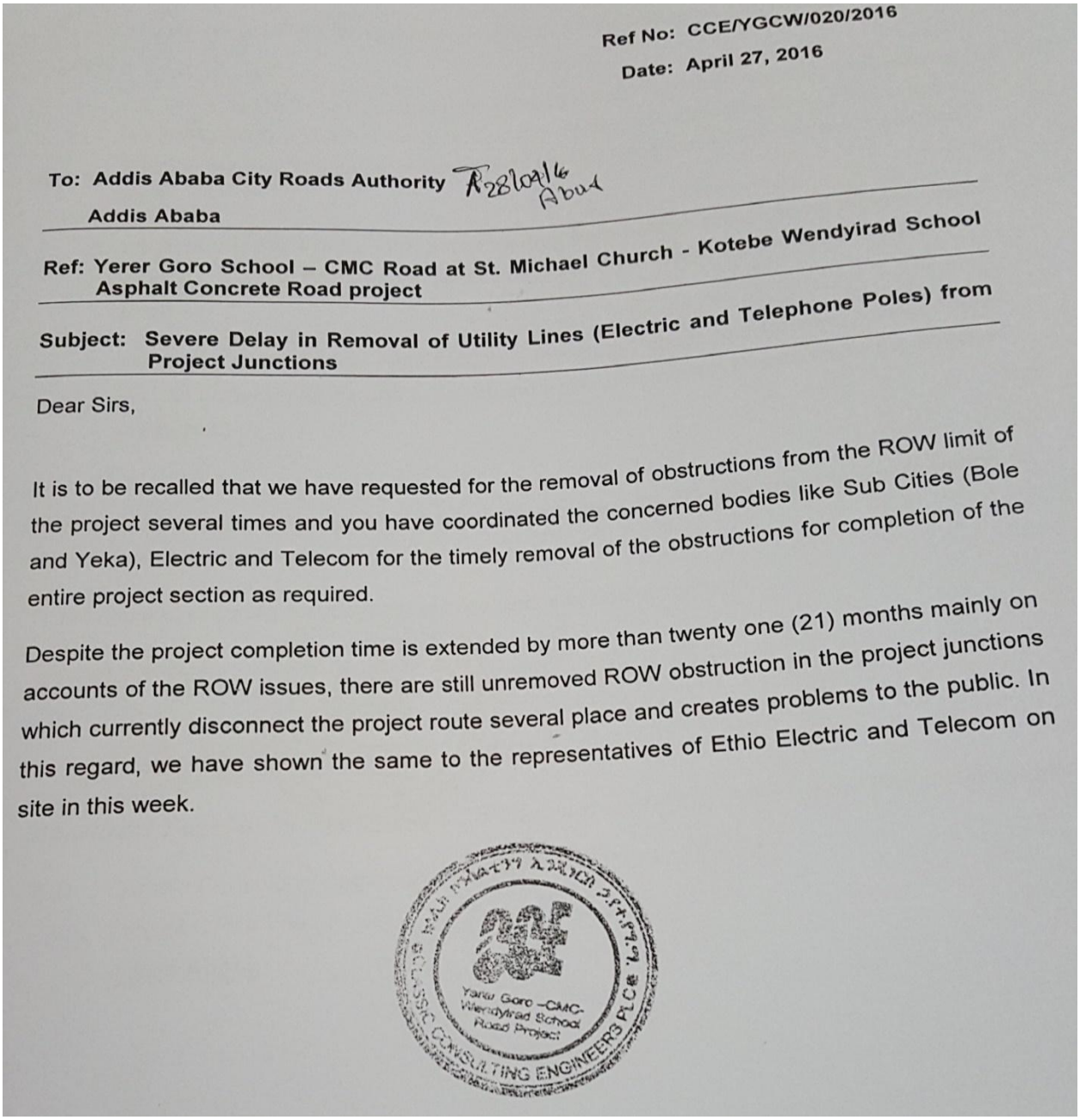
Abebaw Abebe
Resident Engineer

Yerer Goro –CMC-Wendyirad School Road Project

CC: Addis Ababa City Roads Authority
The Project Manager, SATCON Construction PLC
Classic Consulting Engineers Plc.
Project Office File
Addis Ababa

28/04/16 Abu
6/5/16 Tsiist
28/04/16

Figure 1: Construction works of the road Junction Km 0+000 tokm 0+030 of road (at yereGoro)



Ref No: CCE/YGCW/020/2016
Date: April 27, 2016

To: Addis Ababa City Roads Authority
Addis Ababa

Ref: Yerer Goro School – CMC Road at St. Michael Church - Kotebe Wendyirad School Asphalt Concrete Road project

Subject: Severe Delay in Removal of Utility Lines (Electric and Telephone Poles) from Project Junctions

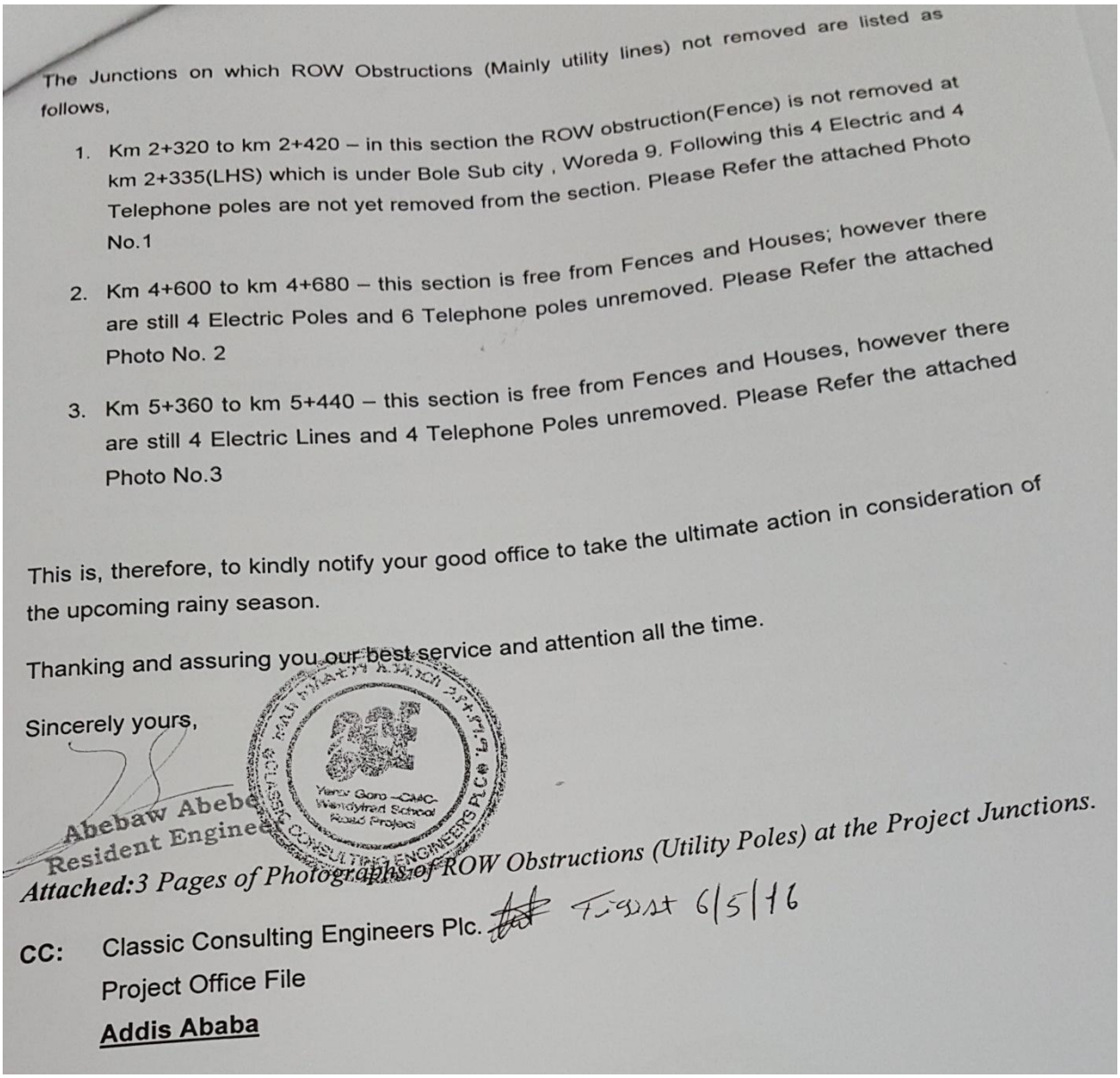
Dear Sirs,

It is to be recalled that we have requested for the removal of obstructions from the ROW limit of the project several times and you have coordinated the concerned bodies like Sub Cities (Bole and Yeka), Electric and Telecom for the timely removal of the obstructions for completion of the entire project section as required.

Despite the project completion time is extended by more than twenty one (21) months mainly on accounts of the ROW issues, there are still unremoved ROW obstruction in the project junctions which currently disconnect the project route several place and creates problems to the public. In this regard, we have shown the same to the representatives of Ethio Electric and Telecom on site in this week.

Yerer Goro –CMC-
Wendyirad School
Road Project

Figure 2a: Severe delay in removal of utility lines (Electric and telephones poles) from project Junction.



The Junctions on which ROW Obstructions (Mainly utility lines) not removed are listed as follows,

1. Km 2+320 to km 2+420 – in this section the ROW obstruction(Fence) is not removed at km 2+335(LHS) which is under Bole Sub city , Woreda 9. Following this 4 Electric and 4 Telephone poles are not yet removed from the section. Please Refer the attached Photo No.1
2. Km 4+600 to km 4+680 – this section is free from Fences and Houses; however there are still 4 Electric Poles and 6 Telephone poles unremoved. Please Refer the attached Photo No. 2
3. Km 5+360 to km 5+440 – this section is free from Fences and Houses, however there are still 4 Electric Lines and 4 Telephone Poles unremoved. Please Refer the attached Photo No.3

This is, therefore, to kindly notify your good office to take the ultimate action in consideration of the upcoming rainy season.

Thanking and assuring you our best service and attention all the time.

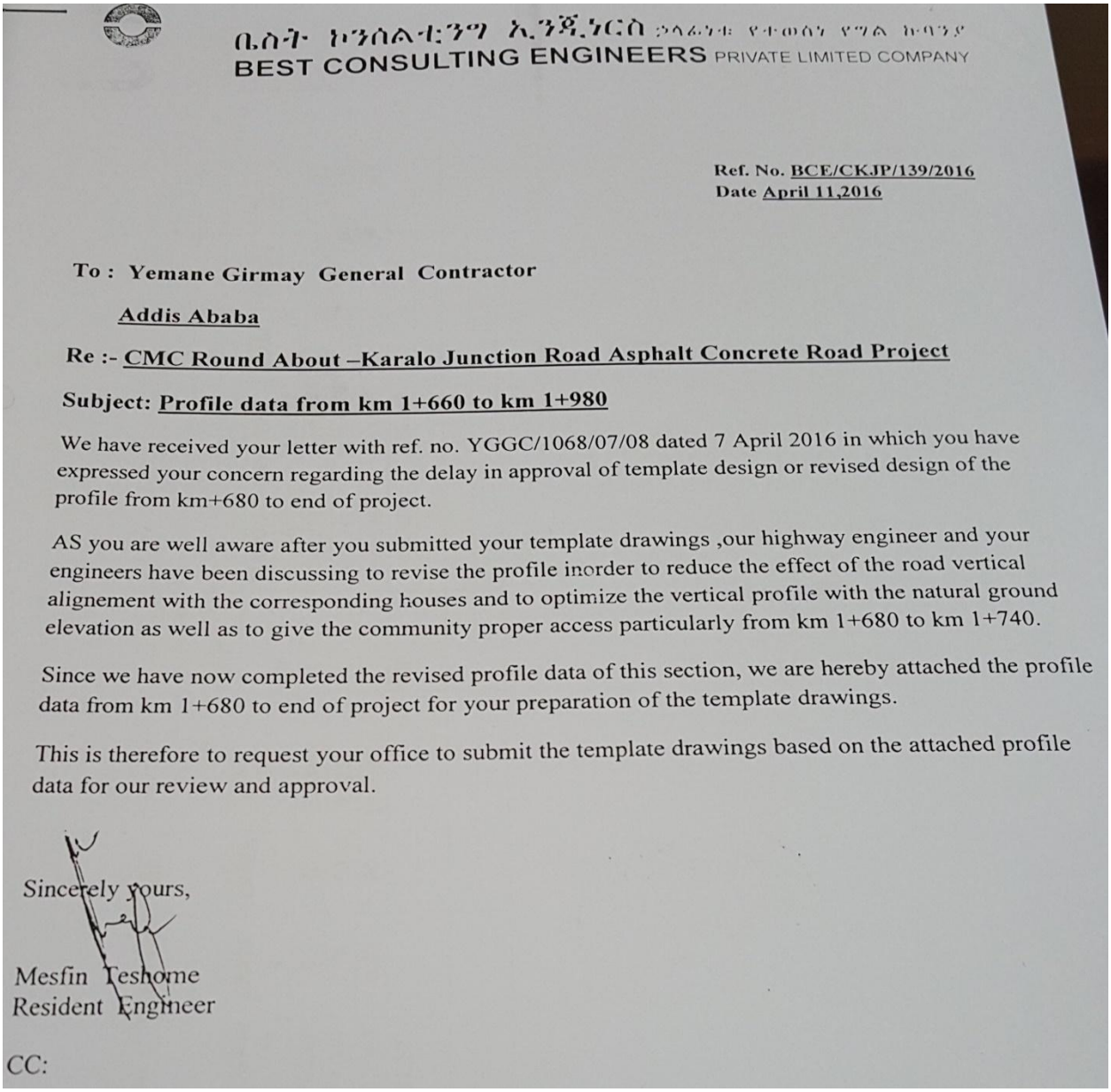
Sincerely yours,

Abebaw Abebe
Resident Engineer

Attached:3 Pages of Photographs of ROW Obstructions (Utility Poles) at the Project Junctions.

CC: Classic Consulting Engineers Plc. Tigist 6/5/16
Project Office File
Addis Ababa

Figure 2a: Severe delay in removal of utility lines (Electric and telephones poles) from project Junction.



ቤስት ኮንሰልቲንግ ኢንጂነርስ ኃላፊነቱ የተወሰነ የግል ኩባንያ
BEST CONSULTING ENGINEERS PRIVATE LIMITED COMPANY

Ref. No. BCE/CKJP/139/2016
Date April 11,2016

To : Yemane Girmay General Contractor

Addis Ababa

Re :- CMC Round About –Karalo Junction Road Asphalt Concrete Road Project

Subject: Profile data from km 1+660 to km 1+980

We have received your letter with ref. no. YGGC/1068/07/08 dated 7 April 2016 in which you have expressed your concern regarding the delay in approval of template design or revised design of the profile from km+680 to end of project.

AS you are well aware after you submitted your template drawings ,our highway engineer and your engineers have been discussing to revise the profile inorder to reduce the effect of the road vertical alignement with the corresponding houses and to optimize the vertical profile with the natural ground elevation as well as to give the community proper access particularly from km 1+680 to km 1+740.

Since we have now completed the revised profile data of this section, we are hereby attached the profile data from km 1+680 to end of project for your preparation of the template drawings.

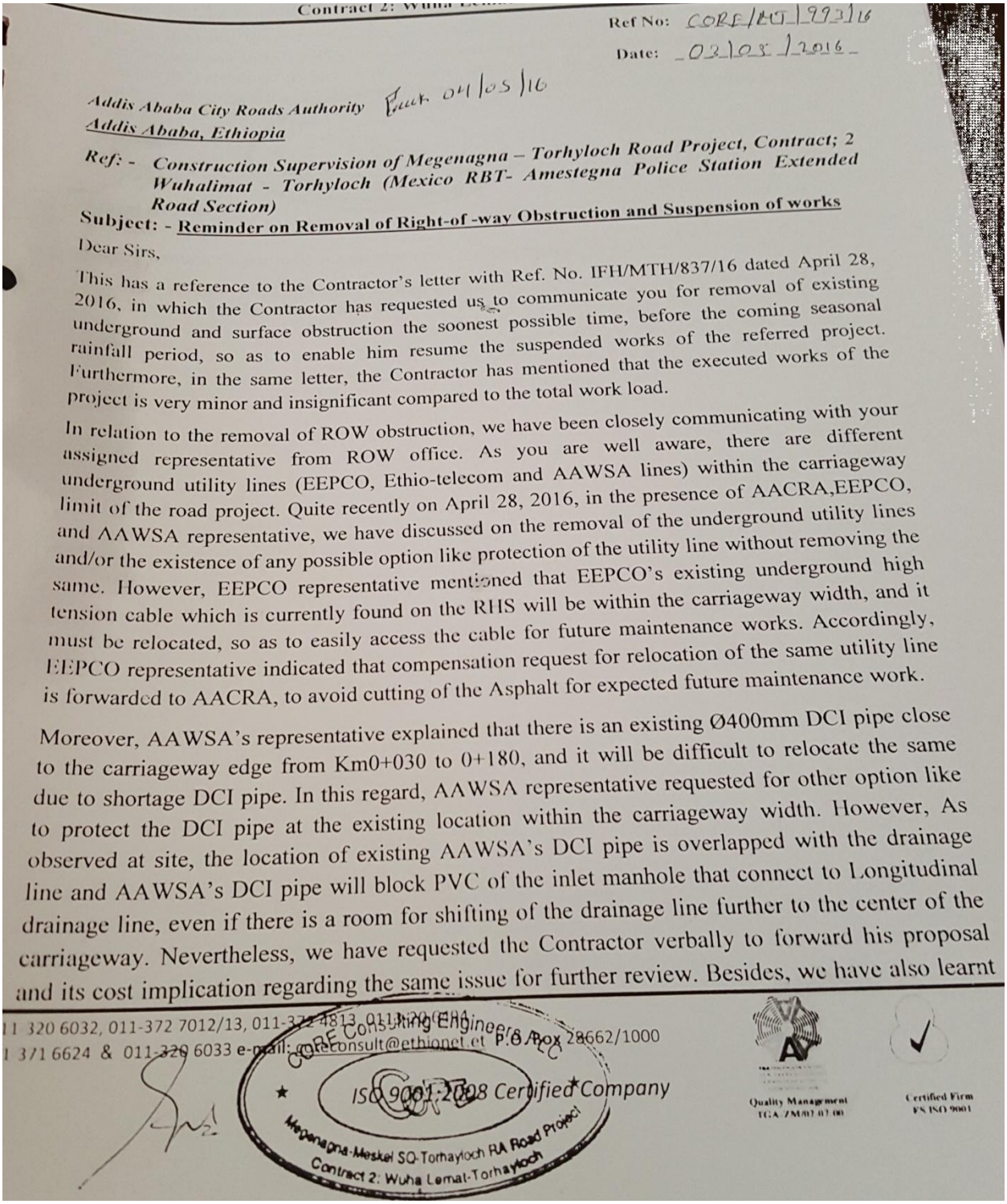
This is therefore to request your office to submit the template drawings based on the attached profile data for our review and approval.

Sincerely yours,

Mesfin Teshome
Resident Engineer

CC:

Figure3: Profile data from km 1+660 to km 1+980 (Delay in approval of template design)



Contract 2: Wuha Lemat-Torhayloch

Ref No: CORE/ROG/993/16

Date: 03/05/2016

Addis Ababa City Roads Authority Rec. 04/05/16
Addis Ababa, Ethiopia

Ref: - Construction Supervision of Megenagna – Torhyloch Road Project, Contract; 2 Wuhalimat - Torhyloch (Mexico RBT- Amestegna Police Station Extended Road Section)

Subject: - Reminder on Removal of Right-of -way Obstruction and Suspension of works

Dear Sirs,

This has a reference to the Contractor's letter with Ref. No. IFH/MTH/837/16 dated April 28, 2016, in which the Contractor has requested us to communicate you for removal of existing underground and surface obstruction the soonest possible time, before the coming seasonal rainfall period, so as to enable him resume the suspended works of the referred project. Furthermore, in the same letter, the Contractor has mentioned that the executed works of the project is very minor and insignificant compared to the total work load.

In relation to the removal of ROW obstruction, we have been closely communicating with your assigned representative from ROW office. As you are well aware, there are different underground utility lines (EEPCO, Ethio-telecom and AAWSA lines) within the carriageway limit of the road project. Quite recently on April 28, 2016, in the presence of AACRA,EEPCO, and AAWSA representative, we have discussed on the removal of the underground utility lines and/or the existence of any possible option like protection of the utility line without removing the same. However, EEPCO representative mentioned that EEPCO's existing underground high tension cable which is currently found on the RHS will be within the carriageway width, and it must be relocated, so as to easily access the cable for future maintenance works. Accordingly, EEPCO representative indicated that compensation request for relocation of the same utility line is forwarded to AACRA, to avoid cutting of the Asphalt for expected future maintenance work.

Moreover, AAWSA's representative explained that there is an existing Ø400mm DCI pipe close to the carriageway edge from Km0+030 to 0+180, and it will be difficult to relocate the same due to shortage DCI pipe. In this regard, AAWSA representative requested for other option like to protect the DCI pipe at the existing location within the carriageway width. However, As observed at site, the location of existing AAWSA's DCI pipe is overlapped with the drainage line and AAWSA's DCI pipe will block PVC of the inlet manhole that connect to Longitudinal drainage line, even if there is a room for shifting of the drainage line further to the center of the carriageway. Nevertheless, we have requested the Contractor verbally to forward his proposal and its cost implication regarding the same issue for further review. Besides, we have also learnt

11 320 6032, 011-372 7012/13, 011-372 4813, 011-320 6033 e-mail: corecon... P.O.Box 28662/1000
1 371 6624 & 011-320 6033 e-mail: corecon...

CORE Consulting Engineers PLC
ISO 9001:2008 Certified Company
Megenagna-Meskel SQ-Torhayloch RA Road Project
Contract 2: Wuha Lemat-Torhayloch

Quality Management
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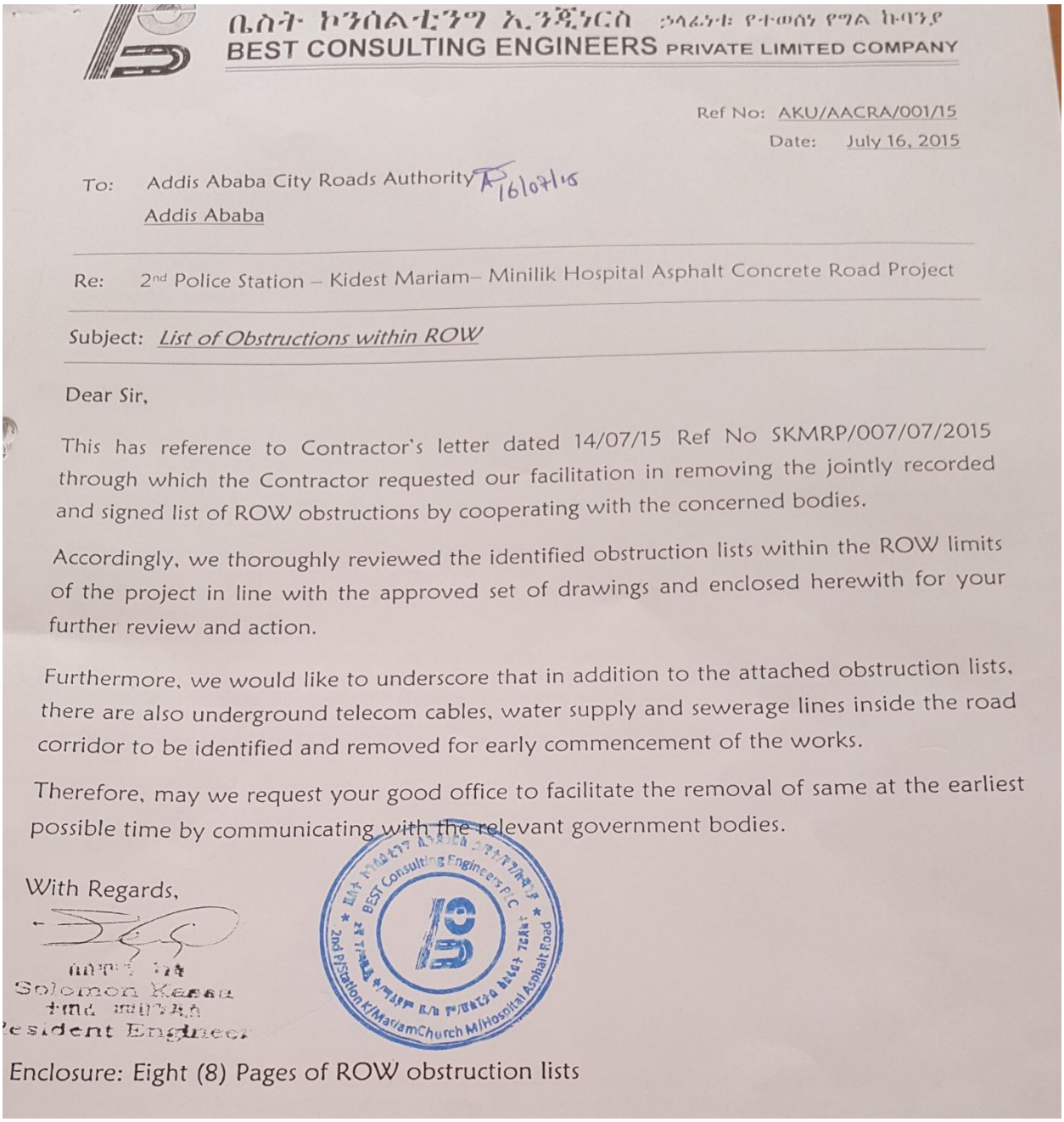
Figure 4: Removal of ROW obstruction and suspension of works.



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BEST CONSULTING ENGINEERS PRIVATE LIMITED COMPANY

Ref No: AKU/AACRA/001/15
Date: July 16, 2015

To: Addis Ababa City Roads Authority 16/07/15
Addis Ababa

Re: 2nd Police Station – Kidest Mariam– Minilik Hospital Asphalt Concrete Road Project

Subject: *List of Obstructions within ROW*

Dear Sir,

This has reference to Contractor's letter dated 14/07/15 Ref No SKMRP/007/07/2015 through which the Contractor requested our facilitation in removing the jointly recorded and signed list of ROW obstructions by cooperating with the concerned bodies.

Accordingly, we thoroughly reviewed the identified obstruction lists within the ROW limits of the project in line with the approved set of drawings and enclosed herewith for your further review and action.

Furthermore, we would like to underscore that in addition to the attached obstruction lists, there are also underground telecom cables, water supply and sewerage lines inside the road corridor to be identified and removed for early commencement of the works.

Therefore, may we request your good office to facilitate the removal of same at the earliest possible time by communicating with the relevant government bodies.

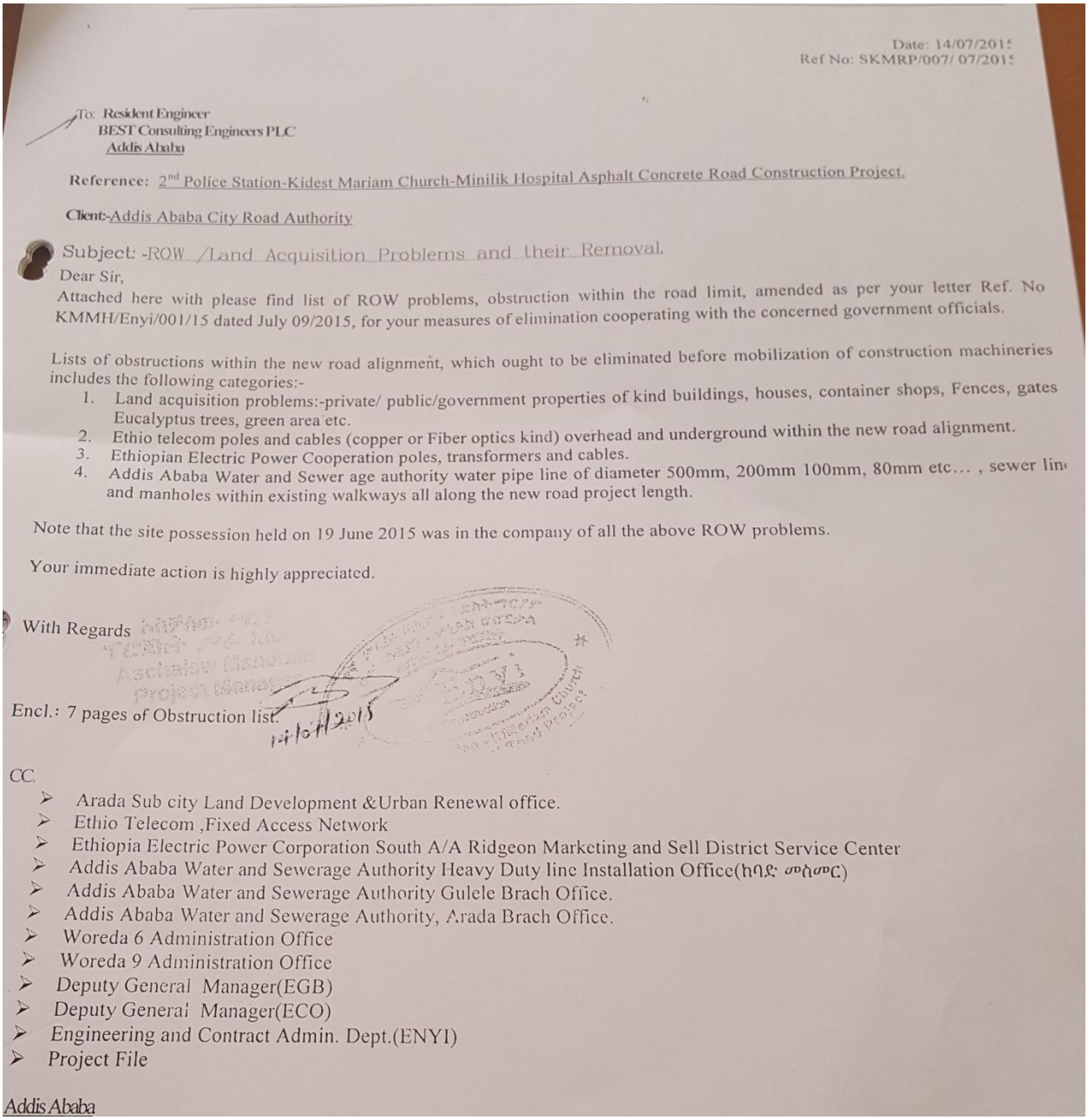
With Regards,

Solomon Kassa
Resident Engineer

BEST Consulting Engineers P.L.C
2nd P/Station/K/MariamChurch M/Hospital Asphalt Road

Enclosure: Eight (8) Pages of ROW obstruction lists

Figure 5 : List of obstruction within ROW



Date: 14/07/2015
Ref No: SKMRP/007/ 07/2015

To: Resident Engineer
BEST Consulting Engineers PLC
Addis Ababa

Reference: 2nd Police Station-Kidest Mariam Church-Minilik Hospital Asphalt Concrete Road Construction Project.

Client:-Addis Ababa City Road Authority

Subject: -ROW /Land Acquisition Problems and their Removal.

Dear Sir,

Attached here with please find list of ROW problems, obstruction within the road limit, amended as per your letter Ref. No KMMH/Enyi/001/15 dated July 09/2015, for your measures of elimination cooperating with the concerned government officials.

Lists of obstructions within the new road alignment, which ought to be eliminated before mobilization of construction machineries includes the following categories:-

1. Land acquisition problems:-private/ public/government properties of kind buildings, houses, container shops, Fences, gates Eucalyptus trees, green area etc.
2. Ethio telecom poles and cables (copper or Fiber optics kind) overhead and underground within the new road alignment.
3. Ethiopian Electric Power Cooperation poles, transformers and cables.
4. Addis Ababa Water and Sewer age authority water pipe line of diameter 500mm, 200mm 100mm, 80mm etc… , sewer lin and manholes within existing walkways all along the new road project length.

Note that the site possession held on 19 June 2015 was in the company of all the above ROW problems.

Your immediate action is highly appreciated.

With Regards

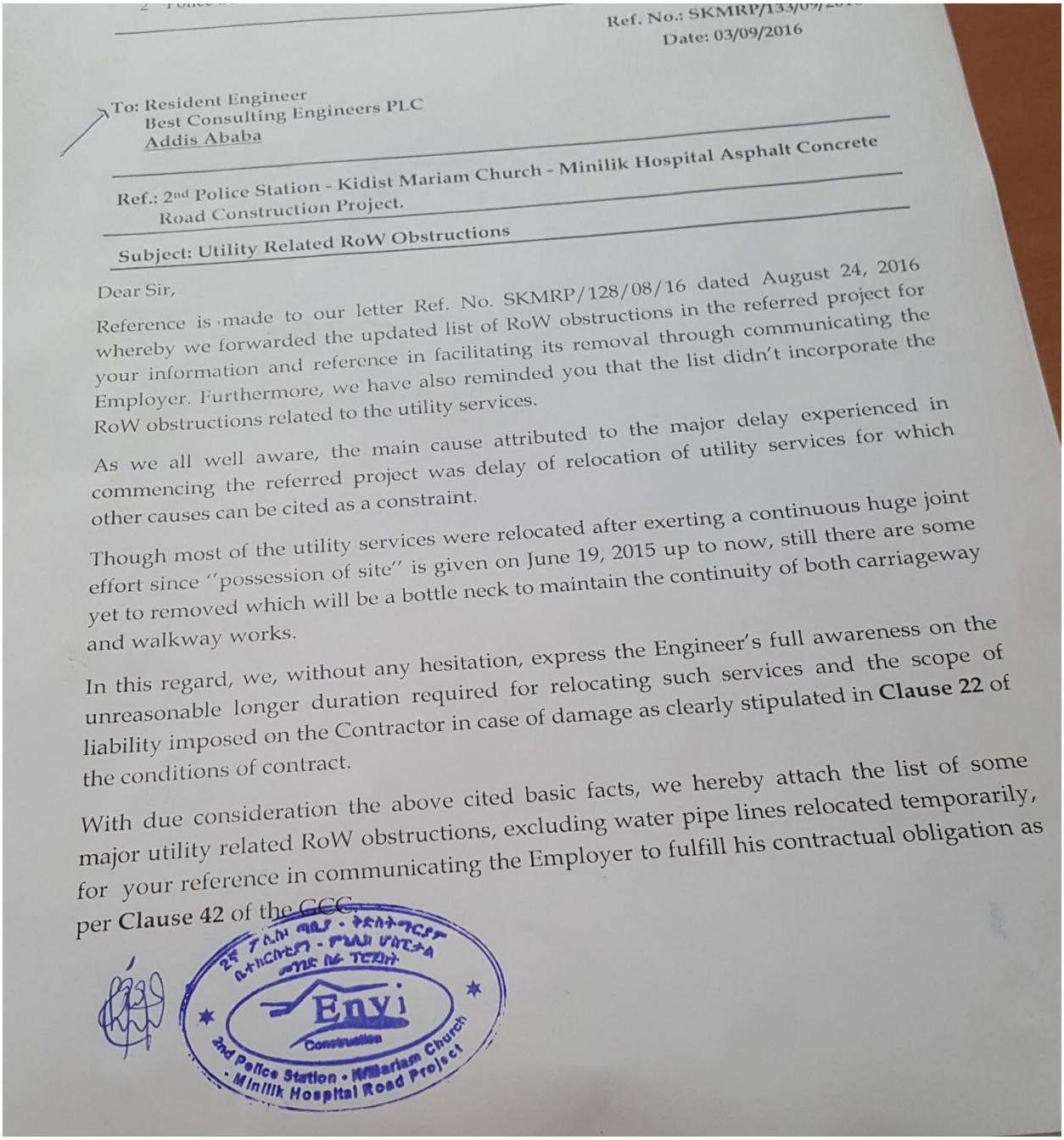
Encl.: 7 pages of Obstruction list.

CC.

- Arada Sub city Land Development &Urban Renewal office.
- Ethio Telecom ,Fixed Access Network
- Ethiopia Electric Power Corporation South A/A Ridgeon Marketing and Sell District Service Center
- Addis Ababa Water and Sewerage Authority Heavy Duty line Installation Office(ከባድ መስመር)
- Addis Ababa Water and Sewerage Authority Gulele Brach Office.
- Addis Ababa Water and Sewerage Authority, Arada Brach Office.
- Woreda 6 Administration Office
- Woreda 9 Administration Office
- Deputy General Manager(EGB)
- Deputy General Manager(ECO)
- Engineering and Contract Admin. Dept.(ENYI)
- Project File

Addis Ababa

Figure 6: Land acquisition and their removal



Ref. No.: SKMRP/133/09/2016
Date: 03/09/2016

To: Resident Engineer
Best Consulting Engineers PLC
Addis Ababa

Ref.: 2nd Police Station - Kidist Mariam Church - Minilik Hospital Asphalt Concrete Road Construction Project.

Subject: Utility Related RoW Obstructions

Dear Sir,

Reference is made to our letter Ref. No. SKMRP/128/08/16 dated August 24, 2016 whereby we forwarded the updated list of RoW obstructions in the referred project for your information and reference in facilitating its removal through communicating the Employer. Furthermore, we have also reminded you that the list didn't incorporate the RoW obstructions related to the utility services.

As we all well aware, the main cause attributed to the major delay experienced in commencing the referred project was delay of relocation of utility services for which other causes can be cited as a constraint.

Though most of the utility services were relocated after exerting a continuous huge joint effort since ''possession of site'' is given on June 19, 2015 up to now, still there are some yet to removed which will be a bottle neck to maintain the continuity of both carriageway and walkway works.

In this regard, we, without any hesitation, express the Engineer's full awareness on the unreasonable longer duration required for relocating such services and the scope of liability imposed on the Contractor in case of damage as clearly stipulated in **Clause 22** of the conditions of contract.

With due consideration the above cited basic facts, we hereby attach the list of some major utility related RoW obstructions, excluding water pipe lines relocated temporarily, for your reference in communicating the Employer to fulfill his contractual obligation as per **Clause 42** of the GCC.

Envi Construction
2nd Police Station - Kidist Mariam Church - Minilik Hospital Road Project

Figure 7: Utility related ROW observation.