

# An Analysis of the Key Factors Causing Delays on RCC Building Construction Projects in “Malkot Village” Kalikot District, Nepal

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**Abstract** Project delay is an issue of major concern as Nepalese construction industry are experiencing a wide spread of delays. The aim of this research was to access the key factors causing delays and their effects on RCC building construction projects in malkot of kalikot district. Reinforced Cement Concrete (R.C.C) is a composite material consisting of concrete and steel. Malkot is a high mountainous and a remote area of kalikot district. There is no any road track to reach Malkot from Karnali Highway. For this numerous research paper were analyzed and case study of different ongoing construction sites of malkot and kalikot district were carried out. Methodology was designed as per requirement of the study. The primary data were collected by medium of structured interviews, Questionnaire survey and observation of construction sites. The questions were categorized into four main groups related to designer (engineer), contractor, client and external factors. Questionnaire survey were conducted across stakeholders that included among others; designer (engineer), contractors and clients on four selected building projects to gather their views on causes of delay in delivery of projects. This research analyzed the causes of delay for remote areas and accessed their impacts on delay using relative importance index (RII) for each related responses for each category. The study concluded that external factors category had the highest impact (RII=0.909), followed by client related (RII=0.905), then contractor related (RII=0.860) and designer (engineer) related (RII=0.827) exhibited the least impact. Identification of key delay impact factors and its successful management can help to avoid extra costs and deliver building projects on time especially in a high mountainous and remote areas.

**Keywords** RCC Building Construction, Delays, Geographical remoteness, External Factors of Delay, Relative Importance Index

## 1. Introduction

Building construction projects are relatively complex and expensive endeavors that take a long time from start of the investment decision to the delivery of the end product (Komurlu & Arditi, 2021). The Success of a building construction project depends on scope, time and budget (Komurlu & Arditi, 2021). However, many project experience extensive delays and thereby exceed initial time and cost estimates (Ahmed, 2016). Delay is a chronic and real-world managerial problematic situation (Jashaami, 2021). In construction, delay could be defined as the time overrun either beyond completion date specified in a contract or beyond the date that the parties agreed upon for delivery of a project (Shahsavand, Marefat, & Parchamijalal, 2018). Delay can cause such predicaments as increased construction costs, loss of profits due to low productivity, lawsuits

between contracting parties and contract termination (Yap, Goay, Woon, & Skitmore, 2021).

A number of studies have been conducted in regard to delays in construction projects for decades and identified various factors that are responsible for delays in delivering construction projects globally. Several studies have identified that incomplete drawing, inadequate experience of consultant (Designer), rigidity of designer, design error by designer, late issuance of design and drawings by designer, insufficient communication between client and designer were the major causes of designer related delay factors. Previous studies identified that price escalation, labor strikes, government regulations, slow permit by government, changes in government regulations and civil war were the major causes which is related to external conditions and factors. Similarly, client's cash flow problems, variation orders and slow decision making were found critical delay factors of client related (Muhwezi, Acai, & Otim, 2014). Similarly, inadequate supply of materials by contractor, lack of high technology mechanical equipment, frequent changes of sub-contractor, poor qualifications of contractor technical staff, improper project planning by contractor were found

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major causes of contractor related delay factors (Aziz, 2013). The above mentioned causes of different related groups are common and still exist for general cases but past researches were not found fully sufficient that reflects delay causes for high mountainous and remote areas like Malkot as it is situated at a minimum level of 728 to maximum 4790 meters height from sea level having unique geology, elevations, slope characteristics (stability) and no transportation facility at all (kalikot, 2008). For instance, it took 40 months to complete residential house of Ganesh Budha (a local resident of Malkot village) instead of original 10 months representing a total delay period of 30 months. This research have identified some missing external factors and other related categories factors which are very important, not found in previous researches and needs proper and successful management. This research have identified that external factors (RII= 0.909 – 0.855) are major causes of delay in comparison of factors related to client, contractor and designer for location of Malkot. Huge gap is found between design and construction process in this research. The aim of this research is to identify and analyze major potential key delay factors with their impact value related to all categories (client, contractor, designer and external). Relative importance index (RII) has been used to find impact value for each responses. Identification of high impact delay factors and their management leads project towards success in terms of time, budget and stakeholder's satisfaction.

## 2. Materials and Methods

### 2.1. Study Area

The research was conducted in Malkot village of Kalikot district. Four private residential RCC buildings were selected for the research. Availability of on-going building construction projects, easy accessibility of client and contractors especially in village, unique geology of location, differing site conditions, slope characteristics of site, soil instability, transportation adversity were the main reasons to choice the area to know various perception and impacts regarding all delay factors.

### 2.2. Methodology

Research methodology is the path through which researchers need to conduct their research. It shows the path through which these researchers formulate their problem and objective and present their result from the data obtained during the study period (Suresh Kumar Chaudhary, 2022). The systematic method used to address the research question or problem is research methodology. Methodology was designed to extract primary relevant information from clients, contractors and designers. A study of this nature requires the use of the appropriate tools for data collection, which in most cases is the likert type questionnaire. Primary sources of data were collected using structured questionnaires on a 5- point

likert scale. The questionnaires were directly distributed to respondents. Respondents were requested to indicate which factors they considered to have significant effects on delay of projects based on their experience and other factors. The questionnaire adopted a 5-point likert scale ranging from 5 (strongly agree) to 1 (strongly disagree), the higher the number, the greater the influence on schedule delays. The population size of the study is 8 residential RCC buildings which are currently under construction. In the selected sample of 4 residential RCC building construction sites, there were 16 contractors, 8 designers and 4 clients at the time of recent survey 2022. The primary data were more reliable and have more confidence level of decision-making with the trusted analysis having direct intact with occurrence of the events (Suresh Kumar Chaudhary, 2022). The questionnaire is composed for each categories separately and distributed to relevant respondents. 13 questions were distributed to client, contractor and designer to know their perception about external factors which causes delay in construction process. 8 questions were distributed to clients and contractors to know the perception of them about designer related delay causes. Similarly, 18 questions were distributed to clients and designer to know the perception of them about contractor related delay causes. Finally, 8 questions were distributed to designer and contractor to know the perception of them about clients related delay causes. 12 number of contractors were sample size for 16 numbers of Population size of contractors. 3 numbers of client were sample size for 4 numbers of population size of client. Similarly, 7 numbers of designer were sample size for 8 numbers of population size of designer. The sample selection is based on purposive sampling method. Slovin's formulae is used to find sample size from population size.

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

Where, n = sample size, N = population size and e = margin of error (taken as 10%)

**Table 1.** Population size and Sample size

S.N	Description	Population Size (Nos)	Sample Size (Nos)	Sampling Method
1	Designer (Civil Engineers, Draftsman)	8	7	Purposive Sampling
2	Client	4	3	Purposive Sampling
3	Contractor	16	12	Purposive Sampling

**Table 2.** Respondent's Table

S.N	Respondents	Number
1	Designer(Civil Engineers, Draftsman)	7
2	Client	3
3	Contractor	12

### 2.3. Data Analysis

Relative Importance Index (RII) was used to evaluate attitude by using the eq<sup>n</sup> (2) and the results of analysis were presented.

$$RII = \frac{\sum w}{A*N} (0 \leq index \leq 1) \quad (2)$$

Here,

W= weighting of each factor by respondents from 1 to 5, where “1” is for “strongly disagree” and “5” for “strongly agree”, A= highest weight (5), N= total number of respondents.

### 3. Results

**Table 3.** Overall delay causes with relative importance index and ranking in descending order

No	Description of causes	Category	RII	Ranking
1	Sloppy characteristics, unique geology, elevations, geographical remoteness	External Factor	0.909	1
2	No Road, lack of Transportation facility	External Factor	0.909	2
3	Delay in making progress payment by client	Client	0.905	3
4	High cost of materials when it reached to working site	External Factor	0.891	4
5	Natural disaster like earthquake, flood, landslide	External Factor	0.873	5
6	Unavailability of utilities (water, electricity, telephone) in site	External Factor	0.873	6
7	Unreliable suppliers	External Factor	0.873	7
8	Lack of suspension bridge and other types of bridges	External Factor	0.873	8
9	Lack of contractor financing in project	Contractor	0.860	9
10	Differing site (ground) conditions	External Factor	0.855	10
11	Design changes during construction by client	Client	0.853	11
12	Late delivery, supply of materials	Contractor	0.840	12
13	Insufficient survey, feasibility study and planning of site before design by designer	Designer	0.827	13
14	Changes made in material and specifications during construction by client	Client	0.821	14
15	Poor communication and coordination between designer and Client	Designer	0.813	15
16	Not providing design on fixed time	Designer	0.800	16
17	Slow mobilization of material and labors	Contractor	0.800	17
18	Harsh climatic conditions	External Factor	0.782	18
19	Escalation of material prices	Contractor	0.780	19
20	Low productivity and efficiency of equipment	Contractor	0.780	20
21	Inadequate experience of designer(practioner)	Designer	0.773	21
22	Re-work due to design error	Designer	0.773	22
23	Slow permit by local authorities in starting phase of construction	External Factor	0.764	23
24	Shortage of adequate material, equipment and labor	Contractor	0.760	24
25	Frequent changes of subcontractor	Contractor	0.760	25
26	Conflicts between main contractor and Subcontractor	Contractor	0.740	26
27	Site accidents due to lack of safety measures	Contractor	0.740	27
28	Design error made by designer	Designer	0.720	28
29	Improper project planning by contractor	Contractor	0.720	29
30	Slow decision made by client	Client	0.716	30
31	Improper construction method implemented by contractor	Contractor	0.700	31
32	Poor site supervision by main contractor	Contractor	0.700	32
33	Incomplete and unclear Drawing provided by designer	Designer	0.693	33
34	Re-work due to error during construction	Contractor	0.680	34
35	Unrealistic time schedule imposed in contract	Client	0.674	35
36	Delay in site delivery	Client	0.663	36
37	Poor qualification of contractors technical staff and labors	Contractor	0.660	37
38	Conflict between joint ownership project	Client	0.653	38
39	Conflicts in subcontractor schedule	Contractor	0.640	39

No	Description of causes	Category	RII	Ranking
40	Poor communication between client and contractor	Contractor	0.640	40
41	Absenteeism of labors and technical staff	Contractor	0.640	41
42	Poor quality of materials	Contractor	0.620	42
43	Delay in performing final inspection and certification by local authorities	External Factor	0.618	43
44	Delay in approving design documents	Client	0.611	44
45	Changes in government rules and regulations	External Factor	0.600	45
46	Conflict with neighbors	External Factor	0.600	46
47	Mis-understanding of Client's requirement	Designer	0.547	47

**Table 4.** External Factors

No	Description of causes	RII	Ranking
1	Sloppy characteristics, unique geology, elevations, geographical remoteness	0.909	1
2	No Road, lack of Transportation facility	0.909	2
3	High cost of materials when it reached to working site	0.891	3
4	Natural disaster like earthquake, flood, landslide	0.873	4
5	Unavailability of utilities (water, electricity, telephone)in site	0.873	5
6	Unreliable suppliers	0.873	6
7	Lack of suspension bridge and other types of bridges	0.873	7
8	Differing site (ground) conditions	0.855	8
9	Harsh climatic conditions	0.782	9
10	Slow permit by local authorities in starting phase of construction	0.764	10
11	Delay in performing final inspection and certification by local authorities	0.618	11
12	Changes in government rules and regulations	0.600	12
13	Conflict with neighbors	0.600	13

**Table 5.** Client Related Category

No	Description of causes	RII	Ranking
1	Delay in making progress payment by client	0.905	1
2	Design changes during construction by client	0.853	2
3	Changes made in material and specifications during construction by client	0.821	3
4	Slow decision made by client	0.716	4
5	Unrealistic time schedule imposed in contract	0.674	5
6	Delay in site delivery	0.663	6
7	Conflict between joint ownership project	0.653	7
8	Delay in approving design documents	0.611	8

**Table 6.** Contractor Related Category

No	Description of causes	RII	Ranking
1	Lack of contractor financing in project	0.860	1
2	Late delivery, supply of materials	0.840	2
3	Slow mobilization of material and labors	0.800	3
4	Escalation of material prices	0.780	4
5	Low productivity and efficiency of equipment	0.780	5
6	Shortage of adequate material, equipment and labor	0.760	6
7	Frequent changes of subcontractor	0.760	7
8	Conflicts between main contractor and Subcontractor	0.740	8
9	Site accidents due to lack of safety measures	0.740	9
10	Improper project planning by contractor	0.720	10
11	Improper construction method implemented by contractor	0.700	11

No	Description of causes	RII	Ranking
12	Poor site supervision by main contractor	0.700	12
13	Re-work due to error during construction	0.680	13
14	Poor qualification of contractors technical staff and labors	0.660	14
15	Conflicts in subcontractor schedule	0.640	15
16	Poor communication between client and contractor	0.640	16
17	Absenteeism of labors and technical staff	0.640	17
18	Poor quality of materials	0.620	18

**Table 7.** Designer (Engineer, Draftsman) Related Category

No	Description of causes	RII	Ranking
1	Insufficient survey, feasibility study and planning of site before design by designer	0.827	1
2	Poor communication and coordination between designer and Client	0.813	2
3	Not providing design on fixed time	0.800	3
4	Inadequate experience of designer(practioner)	0.773	4
5	Re-work due to design error	0.773	5
6	Design error made by designer	0.720	6
7	Incomplete and unclear Drawing provided by designer	0.693	7
8	Mis-understanding of Client's requirement	0.547	8

## 4. Discussion

A construction project is commonly acknowledged as successful where it is completed on time, within budget in accordance with specification and to stakeholder's satisfaction (Aziz, 2013). The delay in construction projects has a significant impact and consequences on the organizations in terms of profitability and competitiveness in the market (Alali, Suliman, & Al-Shafie, 2022). It is nature of construction projects to be limited by time and cost. Construction projects has always been plagued by delay. Clients, contractors, designers are the main stakeholders and they were found responsible for delay causes in many ways.

### 4.1. External Factors Related Delay Causes

The research undertaken established that external factors related delay causes had highest impact in running building construction projects in Malkot with relative importance index (RII=0.909). The research revealed that sloppy characteristics, unique geology, elevations, geographical remoteness (RII=0.909), lack of transportation facility (RII=0.909), high cost of material when it reaches to construction site (RII=0.891), natural disaster like landslide, flood, earthquake, soil erosion (RII=0.873), unavailability of utilities (water, electricity, telephone) in site (RII= 0.873), unreliable suppliers (RII=0.873), lack of suspension and other types of bridge (0.873), harsh climatic conditions (RII=0.782) and differing site (ground) conditions (RII=0.855) are very critical external factors causing delays in construction works in Malkot. Consequently, the research revealed that slow permit by local authorities (RII=0.764), delay in performing final inspection and certification by local authorities (RII=0.618), changes in government rules

and regulations (RII=0.600) and conflict with neighbours (RII=0.600) have less effect on causing delays in building construction projects. From the summary of results in Table 3, it can be observed that external factors related delay causes are the major primary and vital causes of delays in comparison to client, contractor and designer related delay causes for construction works in Malkot village. As mentioned above, Malkot village lies in high mountainous physiographic region and this region consists of sloping and south east faced mountains covered with forest. Steeper slope with rocky exposures are usually covered with thin layer of colluvial soil and they are found susceptible to soil creeping, sheet, rill and gully erosion which causes delays in construction works in this area. Lack of transportation facility is one of the most critical factor causing delays for this region. Malkot village is nearly 8 Km from Khulalu Bazar (Karnali Highway) (Fig 1). There is no any road track to reach Malkot from Karnali Highway (Fig 2). There is no any suspension bridge and other types of bridges across the river which really creates big problem to pass the rivers in rainy seasons. The main means of transportation in the area is animal back and porters are also employed for transportation of construction materials which is very risky and very costly (Fig 3). Suppliers can't distribute and deliver material on time which causes delay in construction work in this area. Similarly, heavy rainfall from July to October is also main cause of delay in this area. There is no electricity facility in Malkot village which also causes delay in construction works. The responses obtained from the respondents related to external factor delay causes are very relevant. The stakeholders have no control over some external factors, although ample strategies must be put in place to address the challenges in the event of occurrence.

#### 4.2. Client Related Delay Causes

The research undertaken established that Clients related delay causes had also high impact in running building construction projects in Malkot after external factors impact with relative importance index (RII=0.905). The research revealed that delay in making progress payment by client (RII=0.905), design changes during construction by client (RII=0.853) and Changes made in material and specifications during construction by client (RII=0.821) are very critical client related delay causes in construction works in Malkot. Consequently, the research revealed that Slow decision made by client (RII=0.716), Unrealistic time schedule imposed in contract (RII=0.674), Delay in site delivery (RII=0.663), Conflict between joint ownership project (0.653) and Delay in approving design documents (RII=0.611) have less effect on causing delays in building construction projects. Contractors cannot run building construction projects smoothly when progress payment is delayed by client as contractors have to manage everything like materials, labors and sub-contractors too. Therefore, timely progress payment is very important to run the construction process and works smoothly. Generally, it is not allowed to change designs and specifications during construction stage as this step changes construction schedules and total project costs which causes delays. Therefore, timely progress payment and working smoothly according to specified design drawings is very essential to complete construction works on time.

#### 4.3. Contractor Related Delay Causes

From the summary of results in Table 6, it can be observed that lack of contractor financing (RII=0.860), late delivery, supply of materials (RII=0.840), slow mobilization of materials and labours (RII=0.800), Escalation of material prices (RII=0.780), low productivity and efficiency of equipment (RII=0.780), shortage of adequate material, equipment and labor (RII=0.760) and frequent changes of subcontractor (RII=0.760) are critical causes of delay in construction works in Malkot village which is related to contractor. The research however revealed that conflicts between main and sub-contractors (RII=0.740), site accidents due to lack of safety measures (RII=0.740), improper project planning by contractor (RII=0.720), improper construction method implemented by contractor (RII=0.700), poor site supervision by contractor (RII=0.700), re-work due to error during construction (RII=0.680), poor qualification of contractors related technical staff and labours (RII=0.660), conflicts in sub-contractor schedule (RII=0.640), poor communication between client and contractor (RII=0.640), absenteeism of labors and technical staff (RII=0.640) and poor quality of materials (RII=0.620) are also causes of delay but these have less significance. There are total 15,000 construction firms registered as class A,B,C and D in Nepal according to Federation of Contractors' Association of Nepal (FCAN) (Nepal, 2020). Contractors finance is very important to run the construction

works smoothly. Lack of financing effects in procurement of materials, managing smooth mobilization of labor and sub-contractors, hence causing delays in construction works. Improper construction methods implemented contractor creates an environment of re-work which causes increase in cost and delays in work too. Contractor must have knowledge of project plan, resource plan, financial plan, quality plan, risk plan and also procurement plan so that they can manage everything in time and run construction works smoothly and can complete the construction works in time without any delay.

#### 4.4. Designer (Engineer, Draftsman) Related Delay Causes

The research undertaken established that Designer related delay causes had least impact in running building construction projects in Malkot than others factors with relative importance index (RII=0.827). The research revealed that insufficient survey, feasibility study and planning of site before design by designer (RII=0.827), poor communication and coordination between designer and client (RII=0.813) and not providing design in fixed time (RII=0.800) are the major causes of delay related to designer. The research however revealed that design inadequate experience of designer (RII=0.773), re-work due to design error (RII=0.773), design error made by designer (RII=0.720), incomplete and unclear drawing provided by designer (0.693) and mis-understanding of client's requirement have less impact in comparison of other factors. Complete feasibility study, complete perfect survey and proper planning before design process is very essential for designer as it helps designer to design perfect drawings and accurate cost estimates if necessary. Insufficient survey, poor feasibility study and improper site planning leads towards design error which causes delay in construction process.

### 5. Conclusions

An engineering project is combination of design and construction phase. Delays in construction projects are a widely researched area for which more researchers are constantly being carried out. Various researches were carried out previously by researchers of Nepal regarding delay factors in construction works but scenarios are completely different for construction works of remote areas like Malkot than city area of Nepal. Due to wide coverage of construction projects in terms of size, type, geography, there is still need to investigate and analyze the causes and assess the effect of delays on various construction projects at various levels. For this reason, this research is carried out to address inefficiencies in the construction works in remote area with high geographical disturbances and different restrictions. The effect of construction delays carries a rippling effect on the contracting parties. Delays can be avoided or minimized when their causes are effectively identified and analyzed. In this research, external factors were found major reasons for

construction delay than other factors. unavailability of basic utilities like water, electricity, lack of transportation route, sloppy characteristics of land, instability of soil, low bearing capacity of soil, natural disaster like landslide, soil erosion, high material and labor cost because of adversity of transportation, unreliable suppliers are found major factors for construction delay. Similarly, delay in progress payment by client, poor project financing by contractor and insufficient survey and feasibility study of working site by designer are found other major reasons for construction works. Since, no one have control over nature but risks can be minimized by applying different procedures. Based on the identified impacts, their nature extent and magnitude, the mitigation and monitoring prescription is found necessary which helps to avoid delays in construction works. Alternative modes of transportation is found very essential, especially for these types of area and locations. It can be referred to as the other modes of transportation network to be built which includes trails, ropeways and other modes of transportation. These alternative modes of transportation save considerable travel time and helps to avoid delay. This research strongly suggests to schedule construction period from December to June which is the most suitable choice of the construction of various projects because July to October is heavy rainy season for this area. Clients have choice to select experience designers so that design error can be avoided and hence delay can be avoided to some extent. This research concludes that project financing problems occurs by contractor because contractors are very poor in management plan of time, risk, cost, issue, quality and procurement. Therefore, all these critical causes of delay must be analyzed minutely and must implement practical approach relevant to location to complete the construction works on time within specified budget.

## 6. Recommendations

According to the above mentioned findings, following

points can be recommended in order to minimize and control delays in construction projects:

1. Local authorities and Central government must pay attention towards alternative modes of transportation like trails and ropeways.
2. Local authorities and Central government must pay attention towards management of basic utilities like water, electricity and telephone services.
3. Construction schedule period must be selected from December to June.
4. Designer must give consideration to the potential effect of seismic shaking, soil instability, landslide effect, soil erosion effects when designing structures.
5. Any design error made by designer must be immediately rectified to avoid delays in the progress of work.
6. Designers (Engineers) must carry out sufficient survey, feasibility study before design process.
7. Contractors should ensure that they have enough cash flow to execute the construction works.
8. Contractors should pay more attention to prepare effective planning and scheduling.
9. Main contractor should avoid higher degree of sub-contracting as it may lead to high risk of delays.
10. Contractors should pay more attention to deliver the construction equipment and materials on site on time.
11. Contractors should focus on all risk management process rather than only risk assessment process.
12. Client must pay progress payments on time.
13. Proper and regular communication is must between designer, client and contractor.
14. All the stakeholders should work together and ensure that all disputes are mitigated during the construction period.

Finally, the findings of this research can be used in various types of construction projects, especially of remote areas in developing countries like Nepal.

## Appendix A

### SET A: Questionnaire for Contractor, Client and Designer (22 respondents)

Total 13 questions were asked to 12 number of contractors, 3 number of client and 7 number of designer (22 respondents) to know the status of External factors related delay causes. Questions along with their response in number (Frequency) were presented in table.

S.N	Questions	Number of Respondents				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Sloppy characteristics, unique geology elevations, geographical remoteness	20	0	0	0	0
2	No Road, lack of Transportation facility	20	0	0	0	0
3	Natural disaster like earthquake, flood, landslide	11	8	3	0	0
4	Unavailability of utilities (water, electricity, telephone) in site	11	8	3	0	0
5	Differing site (ground) conditions	10	8	4	0	0
6	Unreliable suppliers	10	10	2	0	0

7	Lack of suspension bridge and other types of bridges	10	10	2	0	0
8	Slow permit by local authorities in starting phase of construction	6	8	6	2	0
9	Harsh climatic conditions	7	7	7	1	0
10	Changes in government rules and regulations	4	4	6	4	4
11	Conflict with neighbors	4	4	6	4	4
12	Delay in performing final inspection and certification by local authorities	4	4	6	6	2
13	High cost of materials when it reached to working site	12	8	2	0	0

## Appendix B

### SET B: Questionnaire for Contractor and Designer (19 respondents)

Total 8 questions were asked to 12 number of contractors and 7 number of Designer (19 respondents) to know the status of client related delay factors. Questions along with their response in number (Frequency) were presented in table.

S.N	Questions	Number of Respondents				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Delay in site delivery	2	6	7	4	0
2	Delay in making progress payment by client	12	5	2	0	0
3	Design changes during construction by client	11	4	2	2	0
4	Changes made in material and specifications during construction by client	10	3	4	2	0
5	Slow decision made by client	3	8	5	3	0
6	Unrealistic time schedule imposed in contract	2	7	6	4	0
7	Conflict between joint ownership project	2	6	7	3	1
8	Delay in approving design documents	2	6	5	3	3

## Appendix C

### SET C: Questionnaire for Client and Designer (10 respondents)

Total 18 questions were asked to 3 number of Client and 7 number of Designer (10 respondents) to know the status of Contractor related delay factors. Questions along with their response in number (Frequency) were presented in table.

S.N	Questions	Number of Respondents				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Lack of contractor financing in project	5	4	0	1	0
2	Shortage of adequate material, equipment and labor	3	3	3	1	0
3	Conflicts between main contractor and Subcontractor	3	4	0	3	0
4	Re-work due to error during construction	2	4	1	2	1
5	Improper construction method implemented by contractor	2	5	0	2	1
6	Frequent changes of subcontractor	3	3	3	1	0
7	Conflicts in subcontractor schedule	1	4	2	2	1
8	Site accidents due to lack of safety measures	0	7	3	0	0
9	Escalation of material prices	3	3	4	0	0
10	Low productivity and efficiency of equipment	3	4	2	1	0
11	Poor qualification of contractors technical staff and labors	1	4	2	3	0
12	Poor communication between client and contractor	1	3	3	3	0



13	Improper project planning by contractor	0	7	2	1	0
14	Slow mobilization of material and labors	3	4	3	0	0
15	Late delivery, supply of materials	4	4	2	0	0
16	Poor quality of materials	1	3	3	2	1
17	Poor site supervision by main contractor	2	4	2	1	1
18	Absenteeism of labors and technical staff	0	4	4	2	0

## Appendix D

### SET D: Questionnaire for Contractor and client (15 respondents)

Total 8 questions were asked to 12 number of contractors and 3 number of client (15 respondents) to know the status of designer related delay factors. Questions along with their response in number (Frequency) were presented in table.

S.N	Questions	Number of Respondents				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Insufficient survey, feasibility study and planning of site before design by designer	5	8	1	1	0
2	Design error made by designer	3	6	3	3	0
3	Incomplete and unclear Drawing provided by designer	2	6	4	3	0
4	Inadequate experience of designer(practioner)	4	7	2	2	0
5	Not providing design on fixed time	5	7	1	2	0
6	Re-work due to design error	4	7	2	2	0
7	Poor communication and coordination between designer and Client	5	7	2	1	0
8	Mis-understanding of Client's requirement	2	2	1	10	0

## Appendix E

### Photographs of project area



**Figure 1.** Starting point Khulalu road near Rahagadh khola, Khulalu



**Figure 2.** Hard rock cutting in most of the portion to reach Malkot from Khulalu



**Figure 3.** Animals are the means of Transportation in project Area at present

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