Government of Nepal

Ministry of Physical Infrastructure and Transport

Department of Roads

Guidelines for Estimation of Construction Time for Road and Bridge Works

Kathmandu

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Message from the Director General

Cost, Quality and Time are the key factors to judge the success of any project. Determination of construction contract duration is an integral part of project management. The issue of time period in construction projects is vital for both the owner and the contractor. Despite its importance no adequate priority is given to the time factor in construction project. The prevailing practice of fixation of contract period seems not scientific.

A realistic and logic based methodology is felt necessary for estimating contract duration for the construction projects. Department of Roads has initiated effort to prepare a guideline for this purpose. I believe that this guide line will be very much helpful to estimate contract duration in various projects under the DoR. As this is a new initiation in Nepal, suggestions and comments in this document from the concerned authorities are welcomed for improvement of the guideline in future.

I am thankful to all the members of the committee who worked hard to bring this document in this shape. I also would like to thank DoR colleagues for their valuable feedback and suggestions.

Thank you

Madhab Kumar Karki
Director General,
Department of Roads

Preface

Like other countries, construction projects in Nepal are also facing delay in completion. Many infrastructure projects are not being completed within the stipulated time originally provided in the contract. The ultimate effects of project delay also results in cost overrun.

Public tendering on construction is governed by "Public Procurement Act 2007 (PPA) and Public Procurement Regulation 2007" (PPR) in Nepal. There is provision of "duration to be mentioned while preparing the cost estimate" in rule 9 of the Regulation but this provision does not state the methods of determining the construction contract duration (CCD).

Department of Roads (DoR) is a one of the major Departments under the government of Nepal for infrastructure development. DoR has been managing comparatively large road and bridge construction projects through several local as well as international contracts each year. Only few projects have successfully completed within intended schedule while many projects are facing significant time over run.

The duration of a construction project depends primarily on the quantity or magnitude of the construction work and the productivity of the construction crew. In addition, many other factors may also affect the construction duration, such as the type of construction, location and any special features of the project.It is true that there is no scientific method and scheduling technique being applied in determining the real contract period necessary for the completion of the projects in various geographical locations and working conditions.

The method being applied till date to determine contract duration for construction projects in Nepal is mostly ad-hoc irrespective of geographic complexity, nature of work and the workable day considerations. Similarly the contract duration is inconsistent in different projects. A departmental guideline seems necessary for determination of appropriate and consistent contract period with logical basis.

In this light, DoR had decided to form a committee in November 24, 2014 to prepare a guideline for the basis of determining contract duration in road and bridge contracts under the DoR. The committee comprises of DDG Mr. Keshab kumar Sharma, as Coordinator; and RD Mr. Mukti Gautam, SDE Mr. Rajendra Raj Sharma, SDE Mr. Gambhir Shrestha, SDE Mr. Prabhat Kumar Jha and Consultant Mr. Vishnu Prasad Shrestha as members.

The committee has prepared this document after wide consultation with the concerned persons and study of the best practices currently adopted in various countries. This guideline will be helpful in determining construction contract duration for the road and bridge projects in DoR.

Abbreviations

CCD-Construction Contract Duration

D&B- Design and Build

DDG- Deputy Director General

DOR-Department of Roads

IEE- Initial Environment Examination

PPA- Public procurement Act

PPR- Public Procurement Regulation

RD- Regional Director

SDE- Senior Divisional Engineer

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Introduction

Until recent times there is no technically justifiable and objective method of Construction time estimation in the DOR. Each project is assigned a certain time for completion based on the experience of the estimator. So there is a large discrepancy on the time period allocated for even similar sized contracts within the DOR. It was felt necessary to work out some technically justifiable method.

Construction time estimation is an integral part of preparation of an engineer's estimate. Estimation of construction time is important from various aspects e.g. for project planning and scheduling, project cash flow forecasting and for efficient contract administration. In construction contracts provision of bonuses for contractors who finish works earlier or imposing penalty for those delaying the works could be provisioned if an objective method of calculation of project time is available. This document is the outcome of the examination of various factors that affect the duration of a construction contract.

Construction Time for Road and Bridge Works

For determination of time to be allocated for any road/bridge construction project in Nepal following facts are considered:

- Contract duration shall be calculated in number of *working days* and *not calendar days*. This means the contract duration is exclusive of holidays and days with adverse climate (*non working days*).
- Actual calendar days are later calculated from the net working days by adding these non working days.
- In a year consisting of 365 calendar days following days are considered non working days:
    - half of the total number of Saturdays -**26** days
    - public holidays- **29** days
    - rainy and inclement weather days- **75** days (out of 92 days from June 15 to September 15)
    - In areas of heavy snowfall additional snowfall days shall be considered

- For weather sensitive works eg surface dressing works number of days with unfavorable weather shall also be considered

- Construction duration is calculated as number of working days for simple works located in areas of very good access e.g. Kathmandu or Terai. This period is called **Basic Construction Time** and denoted by $\mathbf{T_0}$.
- Following assumptions are made for **Basic Construction Time T0** depending on the project cost only
  - For works of value less than NRs **30** Millions- <**240** working days
  - For works more than NRs **30** millions and less than NRs **1000** millions - as per following formula

    $$T_0 = 500 \log C - 3500$$

    Where, **T0**- **Basic Construction Time** in working days

    C-Project cost in NRs

- For other works the basic period is multiplied by some coefficients depending on the following factors:
  - Terrain or Geography of the project area,**k1**
  - Project extent(or length),**k2**
  - Type of the construction work,**k3**
- Project duration is found as follows:

  $$T = T0 * k1 * k2 * k3$$

- The coefficients are as given on following tables:

Table 1: Terrain and Geography Coefficient, K1

Terrain or Geography*	Coefficient
Plain	1.00
Hill	1.05
Mountain	1.15

*-**Plain** area means project area with elevation below **300m** above mean sea level, **Hill** area means project area with elevation above **300m** and below below **3000m** above mean sea level, Mountain area means project area with elevation above **3000m** above mean sea level

Table 2:Work Extension Coefficient, K2

Work Extent	Coefficient
<1km or other concentrated works like bridges	1.00
1-25km	1.05
26-50km	1.10
> 50 km	1.15

Table 3:Work complexity Coefficient, K3

Work Complexity	Coefficient
Easy work (involving only up to 3 types of major construction materials* for production)	1.0
Complex work (involving more than 3 types of major construction materials* for production using simple equipments**)	1.05
Very complex (special equipments*** and involving special construction methods)	1.1

- *Major construction materials include Bitumen, Cement, GI wire, Subbase and Base
- **Simple equipments mean excavator, grader, roller, bulldozer ,loader and pile boring machines upto 750mm dia)
- ***Pile boring equipments (>750mm dia),Truss erection derricks, arch formworks, pile hammers, special erection cranes(>30 T), bridge lifting jacks(>30T)

- **Basic Construction Time** for various projects as calculated with the above formula is given following table and figure:

Table4: Cost vs Time

Cost, Rs	Time, Working Days	Calendar Months
30,000,000	240	12
50,000,000	360	18
90,000,000	480	24
150,000,000	600	30
270,000,000	720	36
470,000,000	840	42
830,000,000	960	48
1,000,000,000	1000	50

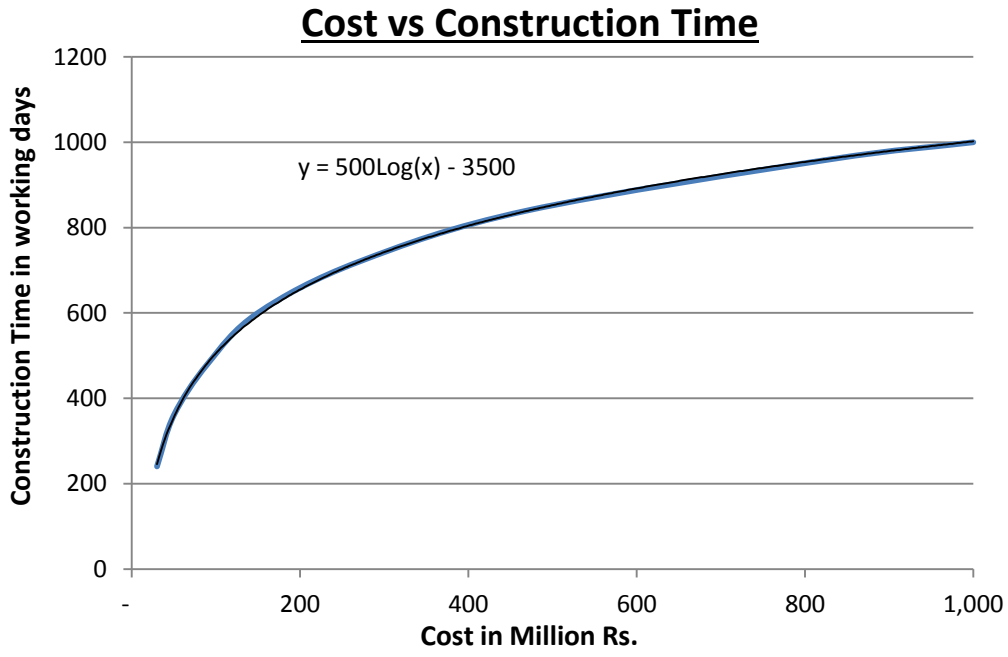

Figure1: Cost vs Time

- For works with value more than **NRs 1000** millions - the duration is specially worked out.

Recommendations

- The method of contract time estimation given here is applicable only for the construction projects.
- These guidelines are for guidance purpose only and should not be taken as cookbook recipe for time calculation.
- For management of any project detailed planning and scheduling techniques should be adhered to.
- This guideline is applicable for projects having cost estimates of NRs. 30 million to NRs. 1 billion.
- Projects with cost estimate less than Rs. 30 million are to be provided contract duration of less than one year whereas the projects with cost estimate more than Rs. 1 billion are to be assessed differently.
- For the crash projects and emergency relief projects, this guideline is not applicable, the public entity is recommended to seek permission from the department chief for applying alternative method.
- Budget availability is supposed as not a constraint for the application of this guideline.
- For Design and Build (D&B) projects, additional period for design and IEE shall be provided on top of the period calculated from this guideline.

Examples:

Example 1: Find the duration of a pre-stressed concrete bridge Construction with estimated cost of NRs 80,00,00,000 located at Bardiya district of Nepal.

Solution:

Basic duration T0=500*log(800000000)-3500=951 working days

Geographical coefficient=1

Work intensity coefficient=1

Work complexity coefficient=1.1

So actual duration T=951*1*1*1.1=1046.1 days

So contract duration in calendar days=1046.1/240=4.359 years i.e**. 4 years 4 months**

Example 2: Find the duration of 12 km long road Construction with estimated cost of NRs 15,00,00,000 located at Solukhumbu district of Nepal.

Solution:

Basic duration T0=500*log(150000000)-3500=588 working days

Geographical coefficient =1.15

Extension coefficient=1.05

Work complexity coefficient=1.05

So actual duration T=588*1.15*1.05*1.05=746 days

So contract duration in calendar days=746/240=3.106 years i.e**. 3 years 1 months**