

Analysis of Price Adjustment Payments for RCC T-Beam and Pre-stressed Bridges Construction Contracts

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ABSTRACT

Purpose: *Let's compare and analyze the price adjustment payments for RCC T-beam and Pre-stressed bridges construction contracts for evaluation of the cost effectiveness of price adjustment payment.*

Design/Methodology/Approach: *Based on Questionnaire survey and Official documents, comparison and analysis were done for RCC T-beam and Pre-stressed bridges construction contracts of price adjustment payment.*

Findings/Result: *The weightage of price adjustment payment is 9% of total payment. This assessment was done to show the importance of price adjustment and its study in bridge construction contracts. As per GCC & SCC clause 53.7 of Standard Bidding Document, price adjustment is limited to 25%. Comparison of payments for price adjustments was done for different T-girder and pre-stressed bridges. Price adjustment payments for the computed price adjustment coefficients were calculated and compared with that of the actual payment made.*

Originality/Value: *This research was mainly dedicated to deriving logical price adjustment coefficient ranges in making the price adjustment process for RCC T-girder and prestressed construction contracts economical.*

Paper Type: *Research paper*

Keywords: weightage of price adjustment, Standard Bidding Document, Comparison of payments, RCC T-beam and Pre-stressed

1. INTRODUCTION :

The budget gap management is always a big challenge for developing country like Nepal [1, 2]. About 10-15% of Gross Domestic Product is contributed by the construction sector in Nepal. About 35% of Nepal's budget is used by the Nepalese Construction sector. It has been creating employment opportunities to a large number of people. It is generating employment next to agricultural sector in the country. Similarly, about 60% of Nepal's development budget is spent through the use of contractors [3]. From this, it is clear seen that construction is major sector and any productivity enhancement activity will have positive impact in the overall improvement of the national economy (Baral, 2009) [4].

Construction sector has been contributing towards economic growth of the country by providing social requirement like infrastructure, building, etc. In recent years, the construction industry has been facing the major problems of risk management, lack of structure, communication, unrealistic forecasting, Bad expectations, delay in flow of cash & skills (Qadeer, Menon, Leghari, & Menon, 2019) [5]. Cost is one of the main factors associated with the project. Because of the provision of price adjustment, most of the cost is incurred in a price adjustment. This study is a continuity of making the price adjustment process more uniform and makes the contract process more economical.

2. STATEMENT OF THE PROBLEMS :

Because of uniformity in price adjustment coefficient, contractor and client issues gets addressed. Price adjustment provision becomes predictable and it assists in taking significant decision [6 &7].

Use of appropriate cost elements in price adjustment can be beneficial to both project owners and bidders. If price adjustment provision is provided, bidders don't add inflation risk premium and can increase their competitiveness while the owner can expect more realistic bid prices and benefit from price drops during construction. The research to provide uniform price adjustment coefficient ranges comparison for RCC T-beam and Prestressed bridges construction contracts is most to make the price adjustment process more uniform and make the contract process more economical.

3. OBJECTIVES :

To compare and analyze the price adjustment payments for RCC T-beam and Pre-stressed bridges construction contracts.

4. METHODOLOGY :

4.1 Research Design:

The following picture depicts the different stages in designing a research methodology by using the research onion framework [8 & 9].

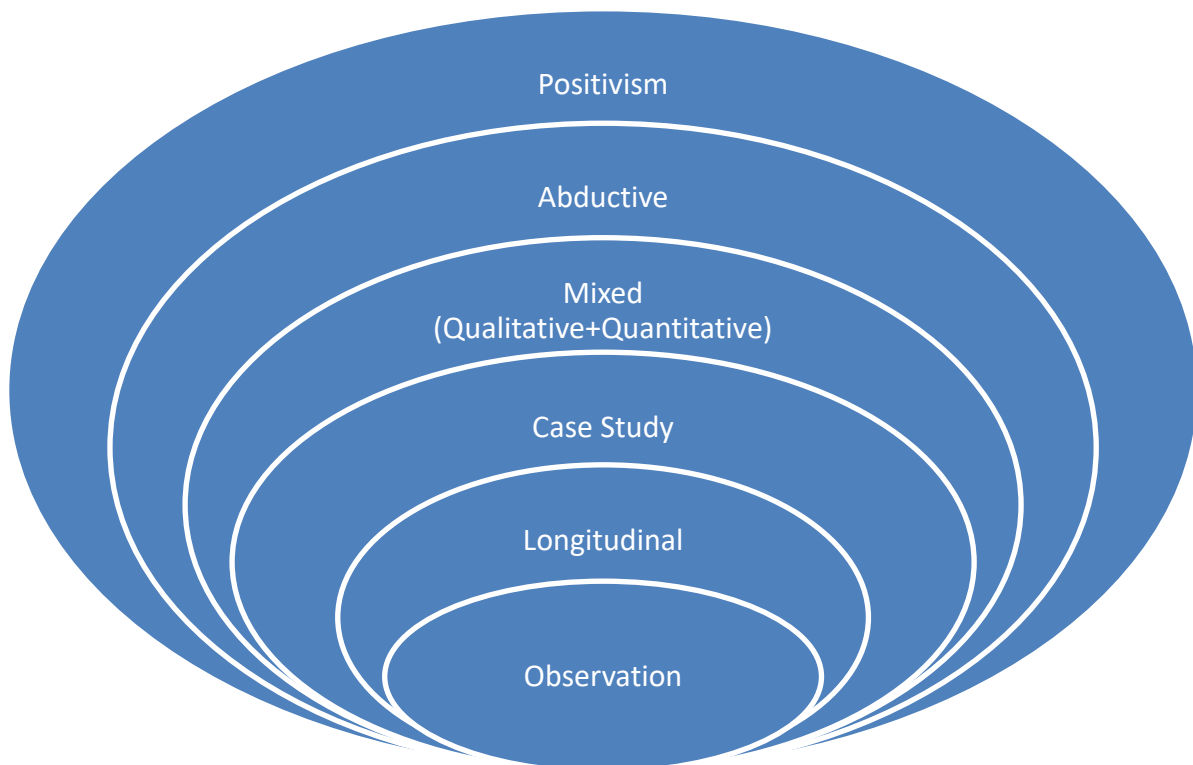


Fig 1: Research Onion [8-9]

The single reality was taken from ontology part and measurable were taken from the epistemology part. The overall research philosophy was Positivism in which only "factual" data acquired from perception (the faculties), including estimation, was dependable. The specialist's capability in these positivist examinations was bound to information on social affairs and objective understanding. The review results in such examinations were oftentimes clear and quantitative. The sober minded way of thinking in view of activity research was embraced. Activity research was characterized as a reasonable way to deal with a particular examination issue inside a local area of training. It included analyzing practice to lay out how it related to the best methodology. It will in general include intelligent practice, which was a methodical cycle by which the expert practice and experience of the professionals can be surveyed. The logical examination approach was gotten. The insightful methodology fostered the speculation or

speculations upon a prior hypothesis and afterward planned the exploration way to deal with testing it [10]. This approach was the most appropriate to settings where the examination project was worried about looking at whether the noticed peculiarities fit with assumption in view of past exploration (Wiles et al., 2011) [8], [11]. Research systems that were taken on: activity research, interview, reviews and contextual investigation research. The mixed method of research was used after assessing the practice and evaluating the coefficient. The auxiliary information was gathered through the Interim payment endorsements and agreement records of the chosen bridge agreements of Department of Local Infrastructure (DoLI). We likewise gathered the information from Cost file distributed by NRB. Auxiliary information was acquired from different sources, for example, Cost change Rules of ADB, 2018[12, 13 & 14], passed Proposition on the connected subjects, important course readings with respect to cost change. FIDIC and PPMO reports, Diaries Information from recently referenced workplaces. Secondary data was collected from the respective project implementing office i.e., Department of Local Infrastructure (DOLI) [15,16,17 & 18].

4.2 Data Analysis:

Data analysis **summarizes collected data**. It involves the interpretation of data gathered through the use of analytical and logical reasoning to determine patterns, relationships or trends.

Analysis of primary data:

Data collected from the questionnaire was used to know the view of the Client and Contractor regarding price adjustment.

Comparison of price adjustment payments:

Calculation of payments from the contractor's quoted coefficients and from the so calculated coefficients were done separately and a comparison was made.

The formula used for calculation of price adjustment payment was:(ADB, 2018) [12].

$$P_n = A + b \frac{L_n}{L_o} + c \frac{M_n}{M_o} + d \frac{E_n}{E_o}$$

Where,

pn = price adjustment factor

A = Coefficient. This is also fix coefficient. Generally, its value is 0.15.

b = Labor coefficient or proposed weightage of labor in escalation. Shall be submitted by contractor while bidding.

c = Construction material coefficient. Shall be submitted by contracted while bidding.

d = Equipment coefficient. Shall be submitted while bidding.

Ln = Current Labor index value

Mn = Current Construction Material index value

En = Current Equipment index value

Lo = Base period Labor Index Value

Mn = Base period Construction Material index value

En = Base period Equipment index value

Here the ANOVA test was also done to find whether there was the significant difference or not in the coefficients between different types of T-girder and pre-stressed bridges and also between price adjustment coefficients [8, 9, 10 & 11].

5. RESULTS AND ANALYSIS :

Assessment and Comparison of Price Adjustment Payments for different T-girder and Pre-stressed Bridges were done one by one as follows:

5.1. Assessment of price adjustment payments for Seti (Jhanana) River Bridge:

Name of work: Construction of Seti (Jhanana) River Bridge [19]

Name of contractor: M/S Sharma BKOI JV

Original contract Amount: Nrs. 9,55,26,877.2

Contract No: 12/LRBP/NCB/Seti (Jhanana)/072/073

Date of Agreement: (4/14/2016) 1/02/2073

Initial completion period: 30 months after the date of the agreement

Revised completion period: 2077/02/22

Advanced payment: Nrs. 1,65,60,000.00
 PS Amount: Nrs. 15,35,306.31 (for Insurance)

Table 1: Bidding Details of Seti (Jhanana) River Bridge

	Material	Labour	Equipment
Proposed Weighing	0.5	0.2	0.15
Base Index value (Base Year 1999/00)	298.9	355.2	201.90
Base Index value (Base Year 2017/18)	90.9	355.2	81.40
January, 2016 30 days prior to the bid opening date			
Indices are according to National Wholesale Price Index of Nepal Rastra Bank			

Table 2: Price Adjustment Payments for Seti (Jhanana) River Bridge

S.N	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/ PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/L)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment provided
1	13th June, 2017	10689265.17	1259954.99	9,429,310.18	296.7	408.60	230.20	1.04741	9876378.92	447068.74
2	15th July, 2018	2851844.89	0.00	2,851,844.89	341.2	443.00	240.60	1.14895	3276622.18	424777.29
3	5th July, 2019	5822696.66	0.00	5,822,696.66	108.5	476.60	104.50	1.20773	7032263.51	1209566.85
4	29th April, 2020	8605471.08	2000000.00	6,605,471.08	103.14	500.84	107.68	1.19776	7911760.82	1306289.74

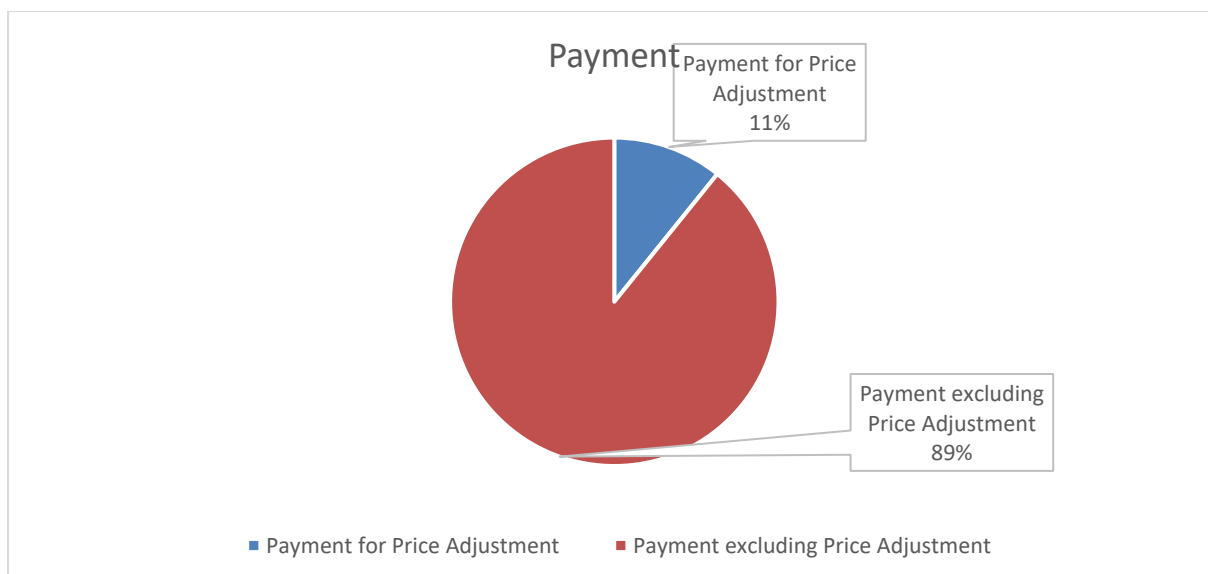


Fig. 2: Price Adjustment Payments for Seti (Jhanana) River Bridge

In actual, total price adjustment payment of Nrs. 33,87,702.63 had been provided in this bridge by client (i.e. Department of Local Infrastructure, DoLI).

5.2 Assessment of price adjustment payments for Marsyangdi River Bridge:

Name of work: Construction of Marsyangdi River Bridge along Abukhareni- Deurali- Palumtar Road [19].

Name of contractor: M/S Swachhanda-Rubina-Mana JV

Original contract Amount: Nrs. 11,36,61,022.06 (with VAT)

Contract Amount with VO: Nrs. 12,07,95,690.64 (with VAT)

Contract No: 10/LRBP/NCB/Marsyangdi/071/072
 Date of Agreement: (7/02/2015) 3/17/2072
 Initial completion period: 3 years after the date of agreement
 Revised completion period: 2077/06/30

Table 3: Bidding Details for Marsyangdi River Bridge

	Material	Labour	Equipment
Proposed Weighing	0.5	0.15	0.20
Base Index value (Base Year 1999/00)	290.40	327.00	190.10
Base Index value (Base Year 2017/18)	89.60	327.00	79.44
March, 2015 30 days prior to the bid opening date			
Indices are according to National Wholesale Price Index of Nepal Rastra Bank			

Table 4: Price Adjustment Payments for Marsyangdi River Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/ PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (equipment)	Price Adjustment Factor $(Pc = A + b*(Ln/Lo) + c*(Mn/Mo) + d*(En/Eo))$	Total Price after Adjustment	Adjustments to be given
1	2nd July, 2016	5,546,407.83	1,402,793.30	4,143,614.53	288.2	365.40	212.20	1.03714	4,297,494.08	153,879.55
2	28th Feb, 2017	4,984,350.35	0.0	4,984,350.35	295.9	404.80	229.70	1.08830	5,424,471.01	440,120.66
3	3rd April, 2018	5,521,686.60	0.0	5,521,686.60	334.6	437.40	242.30	1.18481	6,542,170.00	1,020,483.40
4	24th April, 2019	10,794,574.20	0.0	10,794,574.20	107.2	474.70	104.40	1.23568	13,338,645.78	2,544,071.58
5	5th Feb, 2020	53,237,481.50	16,359,306.00	36,878,175.50	102.33	500.84	107.39	1.23014	45,365,237.13	8,487,061.63
6	5th Apr, 2020	9,851,292.00	3,750,000.00	6,101,292.00	102.94	500.84	107.68	1.23409	7,529,539.70	1,428,247.70
7	16th Oct, 2020	16,809,926.70	95,744.00	16,714,182.70	107.2	474.7	104.4	1.23568	20,653,391.08	3,939,208.38

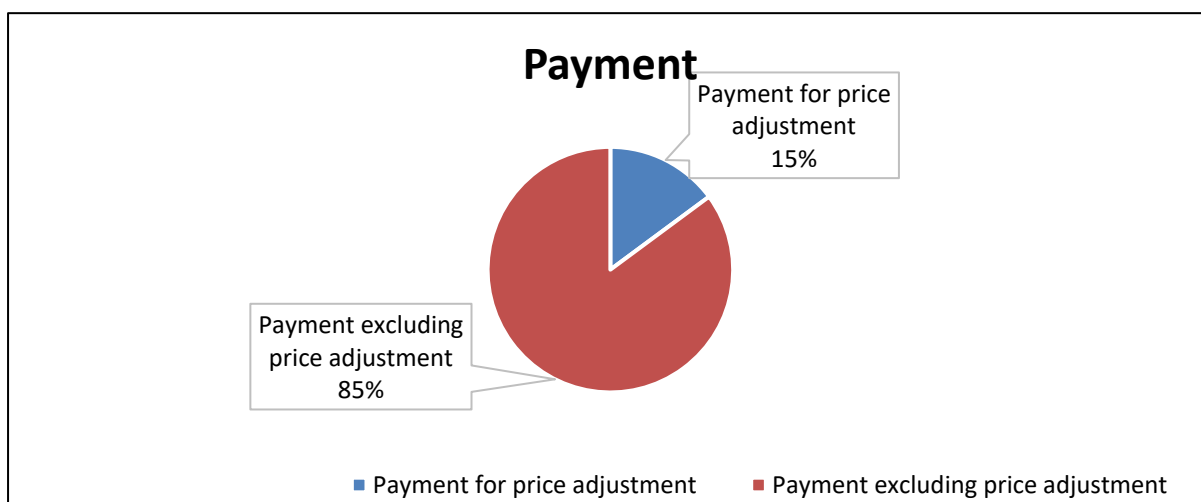


Fig. 3: Price Adjustment Payments for Marsyangdi River Bridge

5.3 Assessment of price adjustment payments for LuhamKhola Bridge:

Name of work: Construction of LuhamKhola Bridge, Salyan
 Name of contractor: M/S Elite Construction Company Pvt. Ltd., Kapan-01, Kathmandu
 Original contract Amount: Nrs. 8,27,67,636.04 (with VAT)
 Contract No: 02/LRBP/NCB/LUHAM/2074/075

Date of Agreement: 2075/03/25
 Initial completion period: 2.5 years after the date of agreement
 Advanced payment: Nrs. 1,43,00,000.00
 PS Amount: Nrs. 17,36,482.09 (for Insurance & Environmental Protection)
 Bidder's proposed price adjustment coefficient:
 b= 0.2
 c=0.4
 d=0.25
 Indices are according to National Wholesale Price Index of Nepal Rastra Bank
 Base Index value Labour (L₀) = 437.90
 Base Index value Materials (M₀) = 102.90
 Base Index value Equipment (E₀) = 100.60

Table 5: Price Adjustment Payments for LuhamKhola Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/ PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor (Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo)	Total Price after Adjustment	Adjustment to be given
1	4/12/2075	16,813,311.33	0.0	16,813,311.33	107.9	464.9	104.10	1.04047	17,493,674.44	680,363.11
2	3/30/2076	21,831,852.66	7200000.0	14,631,852.66	107.9	464.9	101.10	1.03301	15,114,857.04	483,004.38
3	2/9/2077	11,716,174.99	4000000.0	7,716,174.99	103.14	500.84	107.68	1.04727	8,080,946.88	364,771.89
4	3/28/2077	17,613,023.20	3100000.0	14,513,023.20	103.14	500.84	107.68	1.04727	15,199,107.03	686,083.83
5	5/24/2077	11,742,465.46	1,239,159.00	10,503,306.46	102.5	495.97	107.74	1.04271	10,951,909.70	448,603.24
6	9/27/2077	2,181,670.29	0.0	2,181,670.29	104.55	498.81	112.75	1.06443	2,322,228.69	140,558.40

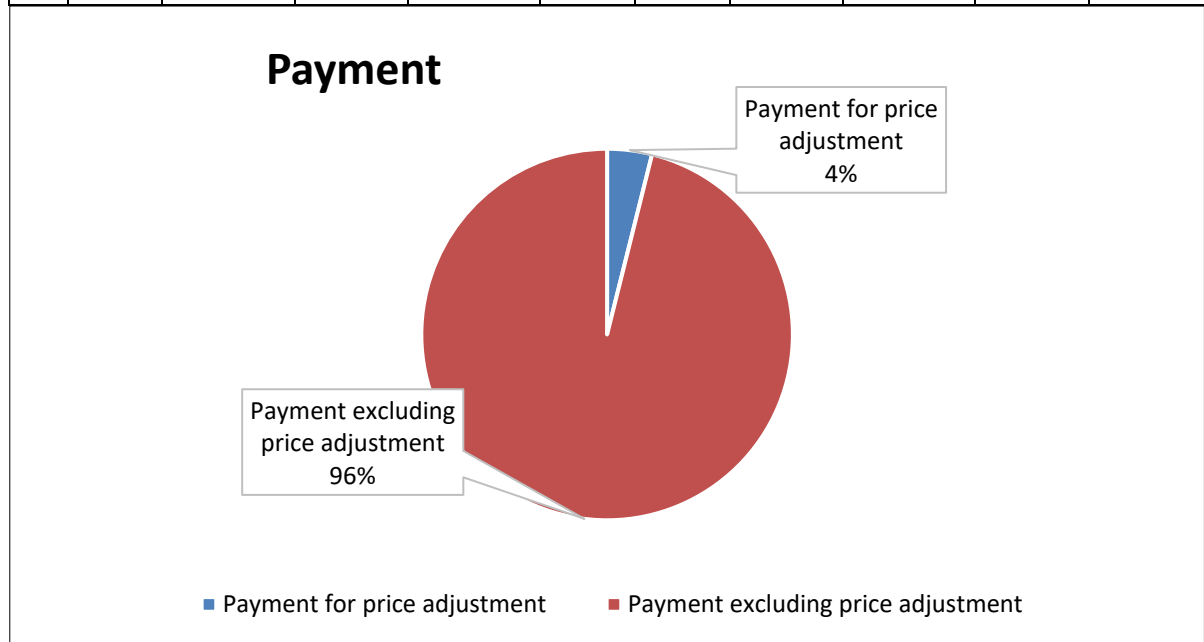


Fig 4: Price Adjustment Payments for Luham Khola Bridge

5.4 Assessment of price adjustment payments for Kamala Nadi Bridge:

Name of work: Construction of Kamala Nadi Bridge along Belsot-Bhiman Road
 Name of contractor: M/S Amar/ Surya JV
 Original contract Amount: Nrs. 12,57,35,056.50
 Revised Contract Amount: Nrs. 14,19,44,133.55
 Contract No: 11/LRBP/NCB/Kamala/071/072
 Date of Agreement: 3/24/2072
 Initial completion period: 3 years after the date of agreement
 Revised Intended completion time: 3/22/2077
 Advanced payment: Nrs. 1,08,00,000.00
 PS Amount: Nrs. 20,24,541.53 (for Insurance)

Table 6: Bidding Details of Kamala Nadi Bridge

	Material	Labour	Equipment
Proposed Weighing	0.45	0.20	0.20
Base Index value (Base Year 1999/00)	290.40	325.00	190.10
Base Index value (Base Year 2017/18)	89.60	325.00	79.44
March, 2015 30 days prior to the bid opening date			
Indices are according to National Wholesale Price Index of Nepal Rastra Bank			

Table 7: Price Adjustment Payment for Kamala Nadi Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilizati on/ PS Deduction	Amount for calculation of PA	Current Index (Material s)	Current Index (Labour)	Current Index (Equipme nt)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	6/21/2017	10,561,380.00	0.0	10,561,380.00	296.7	411.7	230.20	1.10530	11,673,541.52	1,112,161.52
2	1/24/2018	2,538,150.00	2000000.0	538,150.00	330.5	417.2	241.70	1.17316	631,338.27	93,188.27
3	5/3/2018	2,081,557.00	0.0	2,081,557.00	340	437.9	249.20	1.20851	2,515,591.25	434,034.25
4	6/19/2018	1,113,400.00	0.0	1,113,400.00	340.9	443	240.60	1.20400	1,340,532.99	227,132.99
5	12/25/2018	395,485.00	0.0	395,485.00	107.9	464.9	104.10	1.24009	490,435.17	94,950.17
6	6/2/2019	4,623,615.00	1,000,000.00	3,623,615.00	108.4	476.3	104.50	1.25062	4,531,761.68	908,146.68
7	7/4/2019	12,560,544.00	0.0	12,560,544.00	108.5	476.6	104.50	1.25131	15,717,081.86	3,156,537.86
8	1/15/2020	13,137,741.00	0.0	13,137,741.00	102.33	500.84	107.39	1.24251	16,323,787.12	3,186,046.12
9	5/5/2020	15,880,484.00	0.0	15,880,484.00	103.14	500.84	107.68	1.24731	19,807,872.95	3,927,388.95

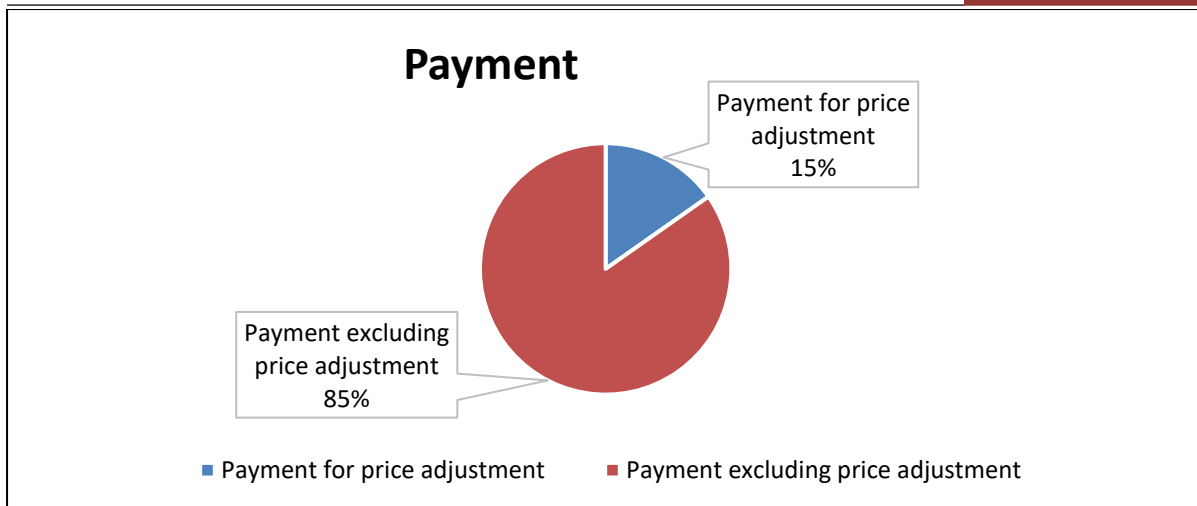


Fig 5: Price Adjustment Payment for Kamala Nadi Bridge

Table 8: Summary of Price Adjustment Payment made by client (i.e., DoLI)

S. N.	Name of T-girder bridge	Price Adjustment made	Remarks
1.	Seti (Jhanana) Bridge	33,87,702.63	using b=0.20, c=0.50, d=0.15
2.	Marsyangdi Bridge	1,80,13,072.90	using b=0.15, c=0.50, d=0.20
3.	Luham River Bridge	28,03,384.85	using b=0.20, c=0.40, d=0.25
4.	Kamala River Bridge	1,31,39,586.81	using b=0.20, c=0.45, d=0.20

5.5 Assessment of price adjustment payments for Sabha Khola Bridge:

Name of work: Construction of Sabha Khola Bridge along Khadbari- Bardeni- Chainpur Road

Name of contractor: M/S Nilgiri/ Rubina/ Mana JV

Original contract Amount: Nrs. 3,18,83,192.72

Contract No: 03/LRBP/NCB/Sabha/070/071

Date of Agreement: Jun 19, 2014

Initial completion period: 2 years after the date of the agreement

Revised Intended completion time: 3/31/2075

Advanced payment: Nrs. 54,57,000.00

PS Amount= Nrs. 507366.80

Table 9: Price Adjustment Payments for Sabha Khola Bridge

S. N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	28th April, 2016	9,051,318.80	747,366.80	8,303,952.00	105.9	462.9	102.10	1.02681	8,526,560.81	222,608.81
2	5th June, 2016	2,763,670.00	1,000,000.00	1,763,670.00	105.9	462.9	99.10	1.01935	1,797,801.08	34,131.08
3	30th Dec, 2016	1,981,765.00	700,000.00	1,281,765.00	101.14	498.84	105.68	1.03362	1,324,852.17	43,087.17
4	1st March, 2017	3,134,485.00	1,000,000.00	2,134,485.00	101.14	498.84	105.68	1.03362	2,206,236.78	71,751.78
5	2nd May, 2017	3,234,420.00	1,000,000.00	2,234,420.00	100.5	493.97	105.74	1.02905	2,299,335.49	64,915.49
6	9th Feb, 2018	3,171,090.00	1,517,000.00	1,654,090.00	102.55	496.81	110.75	1.05077	1,738,066.16	83,976.16

7	8th July, 2018	6,343,773.00	300,000.00	6,043,773.00	104.2	497.5	112.2	1.06110	6,413,055.47	369,282.47
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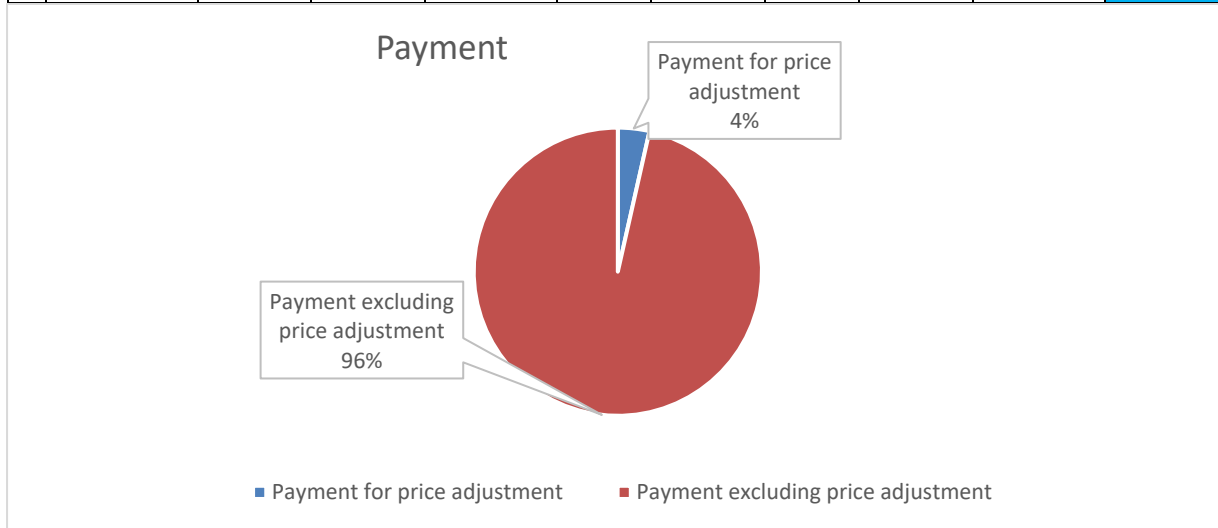


Fig 6: Price Adjustment Payments for SabhaKhola Bridge

5.6 Assessment of price adjustment payments for Kaligandaki Bridge:

Name of work: Construction of Kaligandaki Bridge along Kagbeni- Jhaite Road at Chaile in Mustang District
 Name of contractor: M/S Lumbini/ Rafina J.V., Baneshwar, Kathmandu
 Original contract Amount: Nrs. 4,73,88,068.40
 Contract No: 07/LRBP/NCB/Kaligandaki/070/071
 Date of Agreement: Jun 25, 2014
 Initial completion period: 2 years after the date of agreement
 Revised Intended completion time: Jun 25, 2017
 Advanced payment: Nrs. 81,85,000.00
 PS Amount= Nrs. 7,66,977.72 (for Insurance)

Table 10: Price Adjustment Payments for Kaligandaki Bridge

S. N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/EO))$	Total Price after Adjustment	Adjustment to be given
1	Dec. 15, 2015	2,955,389.40	383,488.86	2,571,900.54	286.2	363.40	210.20	1.03089	2,651,350.83	79,450.29
2	22-Mar-16	11,611,641.38	850000.0	10,761,641.38	293.9	402.80	227.70	1.08206	11,644,694.56	883,053.18
3	8-Jul-16	1,065,847.00	400000.0	665,847.00	332.6	435.40	240.30	1.17857	784,746.52	118,899.52
4	Jul 4, 2018	2,254,640.00	500000.0	1,754,640.00	105.2	472.70	102.40	1.21952	2,139,818.92	885,178.92
5	14-Aug-18	1,327,640.00	-	1,327,640.00	100.33	498.84	105.39	1.21398	1,611,724.95	284,084.95
6	16-Dec-18	4,604,308.00	1,435,000.00	3,169,308.00	100.94	498.84	105.68	1.21793	3,859,992.11	690,684.11
7	30-May-19	11,694,039.00	4,000,000.00	7,694,039.00	105.2	472.7	102.4	1.21952	9,383,035.95	1,688,996.95
8	7-Jul-19	8,742,289.33	1,000,000.00	7,742,289.33	106.5	470.4	100.5	1.22178	9,459,376.73	1,717,087.40

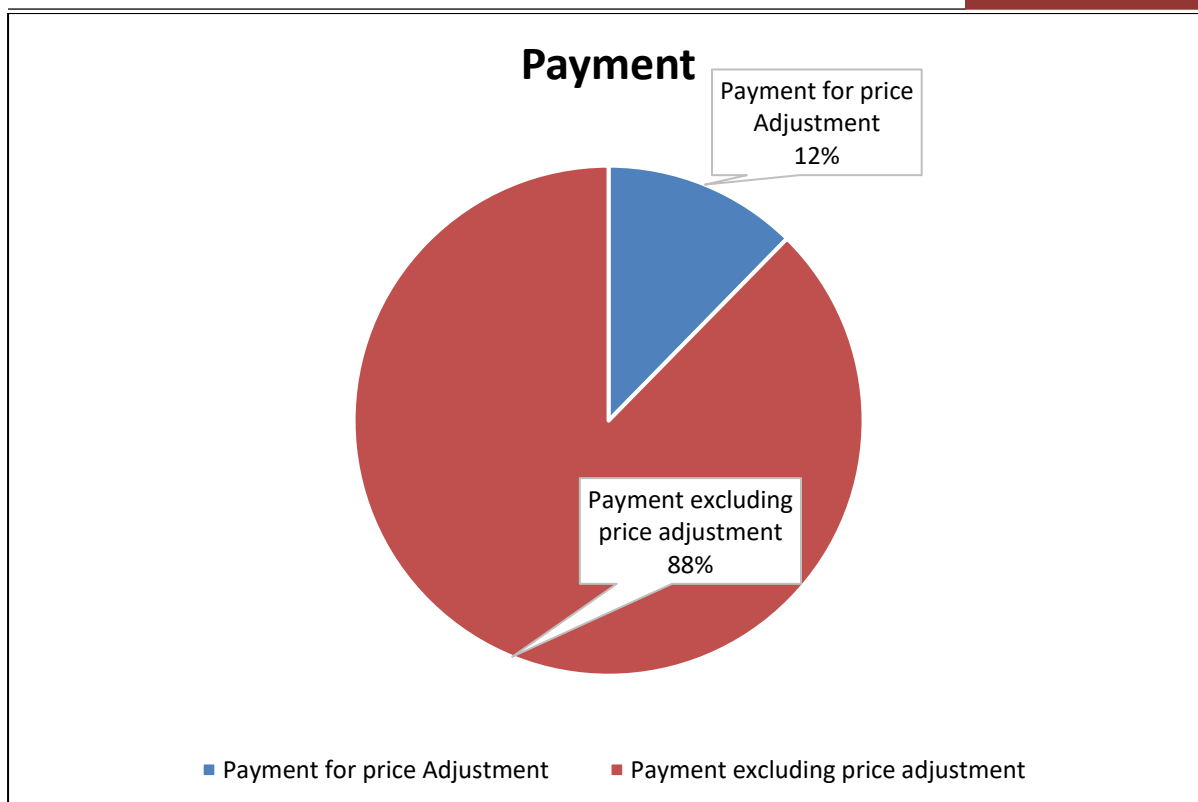


Fig 7: Price Adjustment Payments for Kaligandaki Bridge

5.7 Assessment of price adjustment payments for Sardukhola Bridge:

Name of work: Construction of Sardukhola Bridge, Sunsari

Name of contractor: M/S KarkiBanduNirmanSewa Pvt. Ltd.

Original contract Amount: Nrs. 8,40,32,436.08

Contract No: 01/LRBP/NCB/Sardu/074/075

Date of Agreement: Jul 08, 2018

Initial completion period: 2 years after the date of agreement

Advanced payment: Nrs. 1,44,82,000.00

PS Amount= Nrs. 11,53,520.60 (for Insurance)

Table 11: Price Adjustment Payments for Sardukhola Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	22nd Jan, 2019	11,643,821.81	3,453,520.60	8,190,301.21	107.9	464.90	104.10	1.04185	8,533,030.12	342,728.91
2	25th Feb, 2019	7,590,173.79	0.0	7,590,173.79	107.9	464.90	101.10	1.03737	7,873,837.88	283,664.09
3	7th April, 2019	10,432,418.75	1025000.0	9,407,418.75	107.9	464.90	101.10	1.03737	9,758,997.90	351,579.15
4	8th July, 2019	8,500,296.75	3400000.0	5,100,296.75	108.5	476.60	104.50	1.05070	5,358,888.23	258,591.48
5	19th Nov, 2019	13,743,175.00	4,000,000.00	9,743,175.00	105.8	495.30	107.10	1.05000	10,230,326.26	487,151.26
6	26th April, 2010	12,526,953.50	3,757,000.00	8,769,953.50	103.1	500.80	107.70	1.04029	9,123,262.64	353,309.14

7	10th May, 2010	5,683,161.51	-	5,683,161.51	103.1	500.8	107.7	1.04029	5,912,115.16	228,953.65
8	2nd July, 2020	8,844,531.16	-	8,844,531.16	103.1	500.8	107.7	1.04029	9,200,844.76	356,313.60

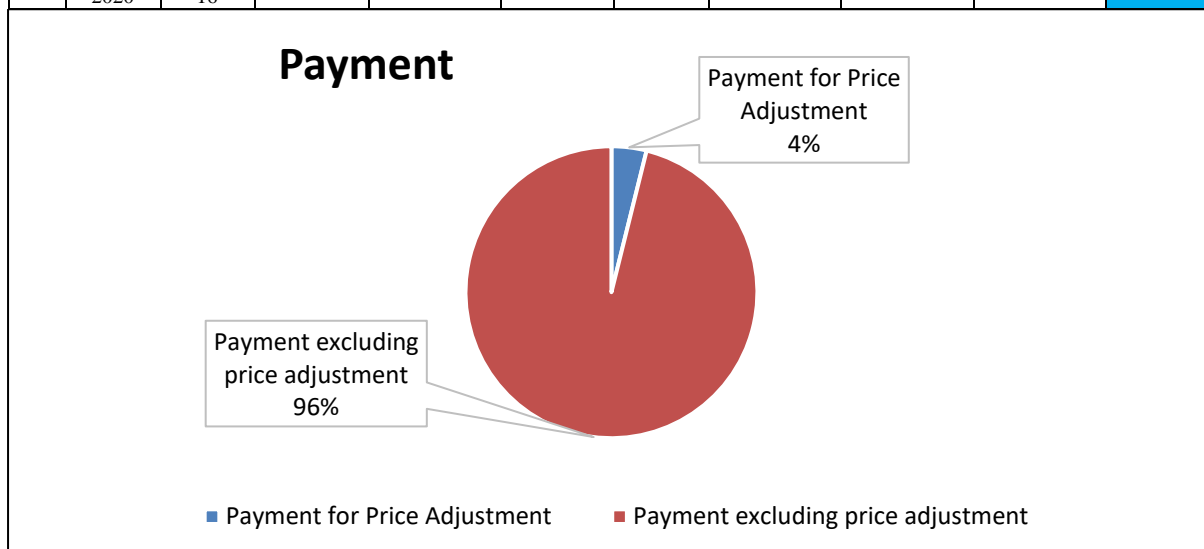


Fig 8: Price Adjustment Payments for SarduKhola Bridge

5.8 Assessment of price adjustment payments for SabhaKhola Bridge:

Name of work: Construction of SabhaKhola Bridge along Khadbari- Bardeni- Chainpur Road
 Name of contractor: M/S Nilgiri/ Rubina/ Mana JV
 Original contract Amount: Nrs. 3,04,78,281.80
 Contract No: 05/LRBP/NCB/Sabha/070/071
 Date of Agreement: Jun 19, 2014
 Initial completion period: 2 years after the date of agreement
 Revised Intended completion time: 3/31/2075
 Advanced payment: Nrs. 52,20,000.00
 PS Amount= Nrs. 4,75,373.80

Table 12: Price Adjustment Payments for SabhaKhola Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(P_c = A_c + b * (L_n / L_o) + c * (M_n / M_o) + d * (E_n / E_o))$	Total Price after Adjustment	Adjustment to be given
1	14th March, 2017	6,625,647.80	475373.8	6,150,274.00	105.9	462.9	102.10	1.02681	6,315,147.92	164,873.92
2	5th June, 2017	2,302,708.00	0.0	2,302,708.00	105.9	462.9	99.10	1.01935	2,347,270.71	44,562.71
3	28th Feb, 2018	5,117,914.00	1220000.0	3,897,914.00	101.14	498.84	105.68	1.03362	4,028,944.33	131,030.33
4	23rd April, 2018	6,437,357.00	1800000.0	4,637,357.00	101.14	498.84	105.68	1.03362	4,793,244.07	155,887.07
5	8th July, 2018	8,103,139.00	2,500,000.00	5,603,139.00	100.5	493.97	105.74	1.02905	5,765,924.20	162,785.20

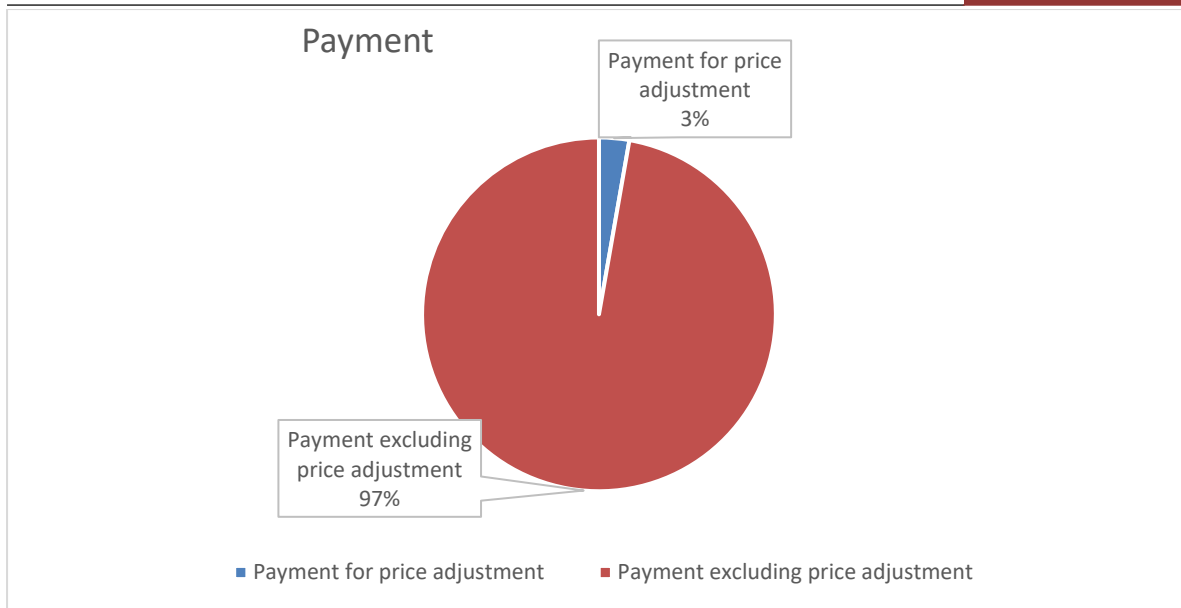


Fig 9: Price Adjustment Payments for SabhaKhola Bridge

Table 13: Summary of Price Adjustment Payment made by client(i.e. DoLI)

S. N.	Name of Pre-stressed bridges	Price Adjustment payment made	Remarks
1.	SabhaKhola Bridge	8,89,752.96	
2.	Kaligandaki Bridge	58,47,435.32	
3.	SarduKhola Bridge	26,62,291.28	
4.	SabhaKhola Bridge	6,59,139.23	

5.9 Comparison of price adjustment payments for Seti (Jhanana) River Bridge:

Name of work: Construction of Seti (Jhanana) River Bridge
 Name of contractor: M/S Sharma BKOI JV
 Original contract Amount: Nrs. 9,55,26,877.2
 Contract No: 12/LRBP/NCB/Seti(Jhanana)/072/073
 Date of Agreement: (4/14/2016) 1/02/2073
 Initial completion period: 30 months after the date of agreement
 Revised completion period: 2077/02/22
 Advanced payment: Nrs. 1,65,60,000.00

Table 14: Comparison of price adjustment payments for Seti (Jhanana) River Bridge

	Material	Labour	Equipment
Calculated Weighing	0.60	0.15	0.10
Base Index value (Base Year 1999/00)	298.9	355.2	201.90
Base Index value (Base Year 2017/18)	90.9	355.2	81.40
January, 2016 30 days prior to the bid opening date			
Indices are according to National Wholesale Price Index of Nepal Rastra Bank			

Table 15 (I): Comparison of Price Adjustment Payments for Seti(Jhanana) Bridge

S.N	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/$	Total Price after Adjustment	Adjustment to be given

								$(Lo)+c*(Mn/Mo)+d*(En/Eo)$		
1	13th June, 2017	10689265.17	1259954.99	9,429,310.18	296.7	408.60	230.20	1.03215	9732474.98	303164.80
2	15th July, 2018	2851844.89	0.00	2,851,844.89	341.2	443.00	240.60	1.14116	3254402.61	402557.72
3	5th July, 2019	5822696.66	0.00	5,822,696.66	108.5	476.60	104.50	1.19582	6962879.00	1140182.34
4	29th April, 2020	8605471.08	2000000.00	6,605,471.08	103.14	500.84	107.68	1.17458	7758657.32	1153186.24

Table 15 (II): Comparison of Price Adjustment Payments for Seti(Jhanana) Bridge

S.N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients (b=0.20, c=0.50, d=0.15)	33,87,702.63	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 12.95%.
2.	Payment for price adjustment using computed price adjustment coefficients (b=0.15, c=0.60, d=0.10)	29,99,091.10	

If the contractor had bid the price adjustment coefficients in between the range so computed, client would not had to pay Nrs. 3,88,611.53 more for price adjustment. So, it had been seen necessary to provide price adjustment coefficient range that can guide contractor in bidding price adjustment coefficients. So, this study is mainly concentrated in formulating price adjustment coefficient ranges to make the price adjustment payment more economical.

5.10 Comparison of price adjustment payments for Marsyangdi River Bridge:

Name of work: Construction of Marsyangdi River Bridge along Abukhareni- Deurali- Palumtar Road

Name of contractor: M/S Swachhanda-Rubina-Mana JV

Original contract Amount: Nrs. 11,36,61,022.06 (with VAT)

Contract Amount with VO: Nrs. 12,07,95,690.64 (with VAT)

Contract No: 10/LRBP/NCB/Marsyangdi/071/072

Date of Agreement: (7/02/2015) 3/17/2072

Initial completion period: 3 years after the date of the agreement

Revised completion period: 2077/06/30

Advanced payment: Nrs. 1,97,50,000.00

PS Amount: Nrs. 16,07,361.77 (for Insurance)

Table: 15 (III): Comparison of price adjustment payments for Marsyangdi River Bridge

	Material	Labour	Equipment
Calculated Weighing	0.60	0.15	0.10
Base Index value (Base Year 1999/00)	290.40	327.00	190.10
Base Index value (Base Year 2017/18)	89.60	327.00	79.44
March, 2015 30 days prior to the bid opening date			
Indices are according to National Wholesale Price Index of Nepal Rastra Bank			

Table 16 (I): Comparison of Price Adjustment Payments for Marsyangdi Bridge

S. N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	2nd July, 2016	5,546,407.83	1,402,793.30	4,143,614.53	288.2	365.40	212.20	1.02469	4,245,939.78	102,325.25
2	28th Feb, 2017	4,984,350.35	0.0	4,984,350.35	295.9	404.80	229.70	1.06788	5,322,702.26	338,351.91
3	3rd April, 2018	5,521,686.60	0.0	5,521,686.60	334.6	437.40	242.30	1.16942	6,457,191.44	935,504.84
4	24th April, 2019	10,794,574.20	0.0	10,794,574.20	107.2	474.70	104.40	1.21703	13,137,313.90	2,342,739.70
5	5th Feb, 2020	53,237,481.50	16,359,306.00	36,878,175.50	102.33	500.84	107.39	1.20017	44,260,169.93	7,381,994.43
6	5th Apr, 2020	9,851,292.00	3,750,000.00	6,101,292.00	102.94	500.84	107.68	1.20462	7,349,752.51	1,248,460.51
7	16th Oct, 2020	16,809,926.70	95,744.00	16,714,182.70	107.2	474.7	104.4	1.21703	20,341,651.34	3,627,468.64

Table 16 (II): Comparison of Price Adjustment Payments for Marsyangdi Bridge

S. N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients (b=0.15, c=0.50, d=0.20)	18,013,072.90	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 12.74%.
2.	Payment for price adjustment using computed price adjustment coefficients (b=0.15, c=0.60, d=0.10)	15,976,845.29	

If the contractor had bid the price adjustment coefficients in between the range so computed, client would not had to pay Nrs. 20,36,227.61 more for price adjustment. Because of this, client feels that extra payment is being paid to the contractor.

5.11 Comparison of price adjustment payments for Luham River Bridge:

Name of work: Construction of LuhamKhola Bridge, Salyan

Name of contractor: M/S Elite Construction Company Pvt. Ltd., Kapan-01, Kathmandu

Original contract Amount: Nrs. 8,27,67,636.04 (with VAT)

Contract No: 02/LRBP/NCB/LUHAM/2074/075

Date of Agreement: 2075/03/25

Initial completion period: 2.5 years after the date of agreement

Advanced payment: Nrs. 1,43,00,000.00

PS Amount: Nrs. 17,36,482.09 (for Insurance & Environmental Protection)

Computed price adjustment coefficient:

b= 0.15

c=0.60

d=0.10

Indices are according to National Wholesale Price Index of Nepal Rastra Bank

Base Index value Labour (L_0) = 437.90

Base Index value Materials (M_0) = 102.90

Base Index value Equipment (E_0) = 100.60

Table 17 (I): Comparison of Price Adjustment Payments for Luham Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	4/12/2075	16,813,311.33	0.0	16,813,311.33	107.9	464.9	104.10	1.04188	17,517,492.00	704,180.67

2	3/30/2076	21,831,852.66	7200000.0	14,631,852.66	107.9	464.9	101.10	1.03890	15,201,035.00	569,182.34
3	2/9/2077	11,716,174.99	4000000.0	7,716,174.99	103.14	500.84	107.68	1.03000	7,947,636.37	231,461.38
4	3/28/2077	17,613,023.20	3100000.0	14,513,023.20	103.14	500.84	107.68	1.03000	14,948,369.01	435,345.81
5	5/24/2077	11,742,465.46	1,239,159.0	10,503,306.46	102.5	495.97	107.74	1.02466	10,762,282.09	258,975.63
6	9/27/2077	2,181,670.29	0.0	2,181,670.29	104.55	498.81	112.75	1.04256	2,274,528.46	92,858.17

Table 17 (II): Comparison of Price Adjustment Payments for Luham Bridge

S.N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients (b=0.20, c=0.40, d=0.25)	28,03,384.85	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 22.31%.
2.	Payment for price adjustment using computed price adjustment coefficients (b=0.15, c=0.60, d=0.10)	22,92,004.01	

5.12 Comparison of price adjustment payments for Kamala River Bridge:

Name of work: Construction of Kamala Nadi Bridge along Belsot-Bhiman Road
 Name of contractor: M/S Amar/ Surya JV
 Original contract Amount: Nrs. 12,57,35,056.50
 Revised Contract Amount: Nrs. 14,19,44,133.55
 Contract No: 11/LRBP/NCB/Kamala/071/072
 Date of Agreement: 3/24/2072
 Initial completion period: 3 years after the date of agreement
 Revised Intended completion time: 3/22/2077
 Advanced payment: Nrs. 1,08,00,000.00
 PS Amount: Nrs. 20,24,541.53 (for Insurance)

Table 18: Comparison of price adjustment payments for Kamala River Bridge

	Material	Labour	Equipment
Proposed Weighing	0.60	0.15	0.10
Base Index value (Base Year 1999/00)	290.40	325.00	190.10
Base Index value (Base Year 2017/18)	89.60	325.00	79.44
March, 2015 30 days prior to the bid opening date			
Indices are according to National Wholesale Price Index of Nepal Rastra Bank			

Table 19 (I): Comparison of Price Adjustment Payments for Kamala Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/ PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	6/21/2017	10,561,380.00	0.0	10,561,380.00	296.7	411.7	230.20	1.07413	11,344,253.64	782,873.64
2	1/24/2018	2,538,150.00	2000000.0	538,150.00	330.5	417.2	241.70	1.15255	620,244.08	82,094.08
3	5/3/2018	2,081,557.00	0.0	2,081,557.00	340	437.9	249.20	1.18568	2,468,052.04	386,495.04
4	6/19/2018	1,113,400.00	0.0	1,113,400.00	340.9	443	240.60	1.18537	1,319,785.78	206,385.78
5	12/25/2018	395,485.00	0.0	395,485.00	107.9	464.9	104.10	1.21816	481,762.49	86,277.49

6	6/2/2019	14,623,615.00	11,000,000.00	3,623,615.00	108.4	476.3	104.50	1.22727	4,447,151.98	823,536.98
7	7/4/2019	12,560,544.00	0.0	12,560,544.00	108.5	476.6	104.50	1.22808	15,425,322.12	2,864,778.12
8	1/15/2020	13,137,741.00	0.0	13,137,741.00	102.33	500.84	107.39	1.20159	15,786,128.88	2,648,387.88
9	5/5/2020	15,880,484.00	0.0	15,880,484.00	103.14	500.84	107.68	1.20738	19,173,705.85	3,293,221.85

Table 19 (II): Comparison of Price Adjustment Payments for Kamala Bridge

S. N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients (b=0.20, c=0.45, d=0.20)	1,31,39,586.81	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 17.59%.
2.	Payment for price adjustment using computed price adjustment coefficients (b=0.15, c=0.60, d=0.10)	1,11,74,050.85	

5.13 Comparison of price adjustment payments for SabhaKhola Bridge:

Name of work: Construction of SabhaKhola Bridge along Khadbari- Bardeni- Chainpur Road

Name of contractor: M/S Nilgiri/ Rubina/ Mana JV

Original contract Amount: Nrs. 3,18,83,192.72

Contract No: 03/LRBP/NCB/Sabha/070/071

Date of Agreement: Jun 19, 2014

Initial completion period: 2 years after the date of agreement

Revised Intended completion time: 3/31/2075

Advanced payment: Nrs. 54,57,000.00

PS Amount= Nrs. 507366.80

Table 20 (I): Comparison of Price Adjustment Payments for Sabha Bridge

S. N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization/PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustments to be given
1	28th April, 2016	9,051,318.80	747,366.80	8,303,952.00	105.9	462.9	102.10	1.02755	8,532,703.99	228,751.99
2	5th June, 2016	2,763,670.00	1,000,000.00	1,763,670.00	105.9	462.9	99.10	1.02457	1,806,995.01	43,325.01
3	30th Dec, 2016	1,981,765.00	700,000.00	1,281,765.00	101.14	498.84	105.68	1.01566	1,301,839.93	20,074.93
4	1st March, 2017	3,134,485.00	1,000,000.00	2,134,485.00	101.14	498.84	105.68	1.01566	2,167,915.18	33,430.18
5	2nd May, 2017	3,234,420.00	1,000,000.00	2,234,420.00	100.5	493.97	105.74	1.01032	2,257,482.82	23,062.82
6	9th Feb, 2018	3,171,090.00	1,517,000.00	1,654,090.00	102.55	496.81	110.75	1.02823	1,700,781.51	46,691.51
7	8th July, 2018	6,343,773.00	300,000.00	6,043,773.00	104.2	497.5	112.2	1.03953	6,282,662.86	238,889.86

Table 20 (II): Comparison of Price Adjustment Payments for Sabha Bridge

S. N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients	8,89,752.96	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 40.29%
2.	Payment for price adjustment using computed price adjustment coefficients	6,34,226.30	

5.14. Comparison of price adjustment payments for Kaligandaki Bridge:

Name of work: Construction of Kaligandaki Bridge along Kagbeni- Jhaite Road at Chaile in Mustang District

Name of contractor: M/S Lumbini/ Rafina J.V., Baneshwar, Kathmandu

Original contract Amount: Nrs. 4,73,88,068.40

Contract No: 07/LRBP/NCB/Kaligandaki/070/071

Date of Agreement: Jun 25, 2014

Initial completion period: 2 years after the date of agreement

Revised Intended completion time: Jun 25, 2017

Table 21 (I): Comparison of Price Adjustment Payments for Kaligandaki Bridge

S.N.	IPC Invoice Date	Bill Amount (Nrs.)	Mobilization/ PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustments to be given
1	Dec. 15, 2015	2,955,389.40	383,488.86	2,571,900.54	286.2	363.40	210.20	1.01859	2,619,719.74	47,819.20
2	22-Mar-16	11,611,641.38	850000.0	10,761,641.38	293.9	402.80	227.70	1.06178	11,426,507.54	664,866.16
3	8-Jul-16	1,065,847.00	400000.0	665,847.00	332.6	435.40	240.30	1.16332	774,594.47	108,747.47
4	Jul 4, 2018	2,254,640.00	500000.0	1,754,640.00	105.2	472.70	102.40	1.20020	2,105,921.50	351,281.50
5	14-Aug-18	1,327,640.00	-	1,327,640.00	100.33	498.84	105.39	1.18334	1,571,055.53	243,415.53
6	16-Dec-18	4,604,308.00	1,435,000.00	3,169,308.00	100.94	498.84	105.68	1.18779	3,764,486.32	595,178.32
7	30-May-19	11,694,039.00	4,000,000.00	7,694,039.00	105.2	472.7	102.4	1.20020	9,234,396.87	1,540,357.87
8	7-Jul-19	8,742,289.33	1,000,000.00	7,742,289.33	106.5	470.4	100.5	1.20546	9,333,020.35	1,590,731.02

Table 21 (II): Comparison of Price Adjustment Payments for Kaligandaki Bridge

S. N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients	58,47,435.32	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 30.58%.
2.	Payment for price adjustment using computed price adjustment coefficients (b=0.15, c=0.60, d=0.10)	44,78,195.78	

5.15 Comparison of price adjustment payments for Sardu Khola Bridge:

Name of work: Construction of Sardu Khola Bridge, Sunsari

Name of contractor: M/S Karki Bandu Nirman Sewa Pvt. Ltd.

Original contract Amount: Nrs. 8,40,32,436.08

Contract No: 01/LRBP/NCB/Sardu/074/075

Table 22 (I): Comparison of Price Adjustment Payments for Sardu Khola Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	22nd Jan, 2019	11,643,821.81	3,453,520.60	8,190,301.21	107.9	464.90	104.10	1.04188	8,533,330.12	343,028.91
2	25th Feb, 2019	7,590,173.79	0.0	7,590,173.79	107.9	464.90	101.10	1.03890	7,885,433.25	295,259.46
3	7th April, 2019	10,432,418.75	1025000.0	9,407,418.75	107.9	464.90	101.10	1.03890	9,773,369.44	365,950.69
4	8th July, 2019	8,500,296.75	3400000.0	5,100,296.75	108.5	476.60	104.50	1.04979	5,354,221.41	253,924.66
5	19th Nov, 2019	13,743,175.00	4,000,000.00	9,743,175.00	105.8	495.30	107.10	1.04303	10,162,451.85	419,276.85
6	26th April, 2010	12,526,953.50	3,757,000.00	8,769,953.50	103.1	500.80	107.70	1.02977	9,031,033.70	261,080.20
7	10th May, 2010	5,683,161.51	-	5,683,161.51	103.1	500.8	107.7	1.02977	5,852,348.38	169,186.87
8	2nd July, 2020	8,844,531.16	-	8,844,531.16	103.1	500.8	107.7	1.02977	9,107,831.53	263,300.37

Table 22 (II): Comparison of Price Adjustment Payments for SarduKhola Bridge

S. N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients	26,62,291.28	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 12.28%.
2.	Payment for price adjustment using computed price adjustment coefficients	23,71,008.01	

5.16 Comparison of price adjustment payments for SabhaKhola Bridge:

Name of work: Construction of SabhaKhola Bridge along Khadbari- Bardeni- Chainpur Road

Name of contractor: M/S Nilgiri/ Rubina/ Mana JV

Original contract Amount: Nrs. 3,04,78,281.80

Contract No: 05/LRBP/NCB/Sabha/070/071

Date of Agreement: Jun 19, 2014

Initial completion period: 2 years after the date of agreement

Revised Intended completion time: 3/31/2075

Advanced payment: Nrs. 52,20,000.00

PS Amount= Nrs. 4,75,373.80

Table 23 (I): Comparison of Price Adjustment Payments for SabhaKhola Bridge

S.N.	IPC Invoice Date	Bill Amount (NRs.)	Mobilization / PS Deduction	Amount for calculation of PA	Current Index (Materials)	Current Index (Labour)	Current Index (Equipment)	Price Adjustment Factor $(Pc=Ac+b*(Ln/Lo)+c*(Mn/Mo)+d*(En/Eo))$	Total Price after Adjustment	Adjustment to be given
1	14th March, 2017	6,625,647.80	475373.8	6,150,274.00	105.9	462.9	102.10	1.02755	6,319,697.84	169,423.84
2	5th June, 2017	2,302,708.00	0.0	2,302,708.00	105.9	462.9	99.10	1.02457	2,359,274.61	56,566.61
3	28th Feb, 2018	5,117,914.00	1220000.0	3,897,914.00	101.14	498.84	105.68	1.01566	3,958,962.90	61,048.90
4	23rd April, 2018	6,437,357.00	1800000.0	4,637,357.00	101.14	498.84	105.68	1.01566	4,709,987.01	72,630.01
5	8th July, 2018	8,103,139.00	2,500,000.00	5,603,139.00	100.5	493.97	105.74	1.01032	5,660,972.44	57,833.44

Table 23 (II): Comparison of Price Adjustment Payments for SabhaKhola Bridge

S. N.	Title	Payment (Nrs.)	Remarks
1.	Payment for price adjustment using proposed price adjustment coefficients	6,59,139.23	Here, the price adjustment payment paid using proposed price adjustment coefficients is more than that obtained from using computed price adjustment coefficients by 57.87%.
2.	Payment for price adjustment using computed price adjustment coefficients	4,17,502.80	

6. DISCUSSION :

Assessment of price adjustment payments were done for T-girder and pre-stressed bridges and comparison of payments were done. Price adjustment payments were calculated for T-girder and pre-stressed bridges. Price adjustment payments and non-price adjustment payments were shown in pie-chart diagrammatically to show the weightage of price adjustment payments in total payment for bridge construction contracts. In an average, weightage of price adjustment payment is 9% of total payment. This assessment was done to show the importance of price adjustment and its study in bridge construction contracts. As per GCC & SCC clause 53.7 of Standard Bidding Document, price adjustment is limited to 25%. Comparison of payments for price adjustments were done for different T-girder and pre-stressed bridges. Price adjustment payments for the computed price adjustment coefficients were calculated and compared with that of actual payment made. Comparison of payment is done to find out whether price adjustment payment had made any economic burden or not. It was found that actual payment made to the contractor was more than payment calculated from computed coefficients by an average 25.82%.

It had been tried to put some straight forward simple questions regarding the existing price adjustment provisions, practice of price adjustment in bridge construction projects, use of price adjustment formulas, relationship of price adjustment with time and cost overrun. The research questions were designed for study through primary level of analysis. The composite views received there on from respondents on the following concerned questions had been presented. Based on the responses from stakeholders, it was concluded that there had been common level of understanding on price adjustment matters.

The construction industry is facing problem of price fluctuation in all of its inputs. This major problem is spread all over the country and Nepalese contractors are critically affected. The construction industry is suffered from various problems, which make hindering the growth of the construction industry. The primary problems of the construction sector can be classified into two main categories. The deficiencies and market price fluctuation of construction elements are also greatly hindering the growth of the construction industry. Sharp price increases in construction elements may lead to the failure of construction project [7, 13, 14 & 20].

Inflation has become a serious problem whose effects the entire construction industry. Contractors have been facing with uncertainties in bidding and financing work on construction projects. Clients are paying for the increased costs of facilities and capital and also for premiums on construction prices because of the uncertainties of inflation and its side effects. Productivity of construction project is affected because of incapability of contractors to properly forecast long-term returns on their investments and is diverting necessary capital to meet resource costs [7, 13, 14 & 20].

For sustainable construction, Price adjustment could be significant for cost controlling as well as avoiding disputes through effecting bidding taking it as constraint for assuring timely and within budget completion of the projects. All the parties involved in bridge construction contract, should get fair compensation which will keep motivating them, at the same time no one should get undue favor. Different types of price adjustment clauses are being used to deal with the issue of price fluctuation [21, 22, 23, 24, 25, & 26].

Progress of most of the bridge projects in their annual report shows that most of the time, projects are not completed within planned time, budget and also sometimes within specified quality. Price escalation is also considered as a big problem, which hinders project progress, since it decreases the contractor's profit leading to huge losses leaving project in a big trouble. This problem is a result of weak economy,

lack of management skills, bad planning, increase in price of materials and others. Project cost overrun is also one of the most chronic problems in Bridge construction sector.

This research was more oriented on narrowing down the range of price adjustment coefficients for RCC T-girder and prestressed concrete bridges. In this research, first of all, ranges for labour coefficient, (b) material coefficient, (c) and equipment usage coefficient, (d) for T-girder and pre-stressed bridges were calculated. With the help of these computed coefficients, price adjustment payments were calculated and these payments were compared with the actual payments made for the economic analysis of the payment.

From the results, it was found that the contractor who had bid material coefficient to high, more price adjustment payment had been paid. If price adjustment coefficient ranges are not provided in bidding document, it was seen that contractor tried to manipulate price adjustment provision to his/her benefit. So, it has been necessary to provide a guideline to contractor in bidding price adjustment coefficients. 8 nos of bridges (4 nos of RCC T-girder and 4 nos of pre-stressed bridges) were taken as a sample and comparison, of price adjustment payments were done. Upon comparison, it was found that more payments had been done for price adjustment which makes the price adjustment process uneconomical. This research aimed at making the RCC T-girder and prestressed bridges construction contracts' price adjustment payment economical.

In order to make the contract process more economical, price adjustment provisions in contract play important role. The provision of Price Adjustment in the Contract is provided with the intention to take care of fluctuations of prices of materials, equipment and labor in the market. The bid price of any Contract depends on how the adjustment provisions are applied in it. If the adjustment price applies from the day the Contract is signed, the bid price is expected to be reasonably low and more economical to carry out the works. If the adjustment is provisioned to apply after a certain period, the Bidder is expected to consider future escalations and to bid accordingly, thus resulting in an inflated bid price. It is generally recommended to apply adjustment provisions the day after the Contract is signed in order to get economical bid [23, 24 & 25].

7. CONCLUSION :

In an average, the weightage of price adjustment payment is 9% of total payment. This assessment was done to show the importance of price adjustment and its study in bridge construction contracts. As per GCC & SCC clause 53.7 of Standard Bidding Document, price adjustment is limited to 25%. Comparison of payments for price adjustments was done for different T-girder and pre-stressed bridges. Price adjustment payments for the computed price adjustment coefficients were calculated and compared with that of actual payment made. Comparison of payments is done to find out whether price adjustment payment had made any economic burden or not. It was found that actual payment made to the contractor was more than payment calculated from computed coefficients by an average 25.82%. Clause 53.1 of Standard Bidding Document for Works should be revised as there is the provision of adjusting price before deducting advance payment. There should be the provision of price adjustment after deduction of advance payment. If the delay in the construction contract is attributed due to the reason of the Client, then the Employer has to pay Price Adjustment using current indices.

8. RECOMMENDATIONS :

Recommendations for Contractor:

- (1) During bidding, a careful consideration should be done in bidding price adjustment coefficients for bridge projects.
- (2) Price adjustment coefficient ranges so calculated in this study can be taken as reference in bidding price adjustment coefficient.
- (3) Contractor should attempt to tie up Price Adjustment payment with the Work Plan.
- (4) If the delay in construction contract is attributed due to the reason of the Contractor, then the Employer has the option to pay Price Adjustment using indices or prices that exist at the time of prescribed completion date or use current indices or prices whichever is less after calculation. So, contractor should complete the project on time.

Recommendations for Client:

- (1) Price adjustment must be provided in such a way that neither of the party(client or contractor) suffers. Nor the client has to suffer from the economic loss and neither the contractor gets demotivated from performing the job.
- (2) Price adjustment provision is to be made more simple and systematic in bridge construction projects.
- (3) In T-girder and pre-stressed bridges construction contracts, price adjustment coefficient ranges so calculated should be provided so that it guides contractor in bidding price adjustment coefficients.
- (4) During preparation of Standard Bidding Document for bridges contract, special attention should be paid in allocating time on fact basis.

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