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EFFECT OF PRICE ESCALATION CLAUSE IN HIGHWAY CONSTRUCTION PROJECT

Mr. Lakhi M. Chavan[1], Asst. Prof. Apeksha Choudhary[2]

[1] Student, M-Tech Transportation Engineering, G H Raisoni University Amarvati. Maharashtra.

[2]Asst. Professor, Dept. of civil Engineering Dept. of G H Raisoni University Amarvati, Maharashtra.

Abstract: In highway Construction industry to save contractors form price fluctuations of material, Fuel, Labour etc. the price escalation clause is added but in different type project and Different type of Government entities are using differential formulae. Contractor/Concessionaire at the time of biding the project and at the time of the project execution i.e from appointed dated its takes about 3-4 years; the project duration above 1 year is taken in to account of price escalation. The price escalation cost will calculate differently with different formulae due to same there is variation of amount. In this paper we will identify the differential cost of price escalation by using one project with different government formulae and we will conclude which type of formulae is adequate. Also, this paper gives us how these prices are calculated, for same which data is to be required. Using different entity price escalation clause, the most efficient and accurate method of price escalation will conclude in this dissertation.

Index Terms - **Price Escalation, Price Index, Clause, WPI, CPI, Preceding Quarter, CPWD, HAM, etc.**

I. INTRODUCTION

1.1 Aim

In the construction industry, the contractor Highway works in surroundings of chance and uncertainty resulting from the financial elements including fluctuations inside the expenses of materials, labour and equipment. Contractors and providers operating in nowadays volatile materials market discover that estimating, bidding and financing the development tasks are demanding situations. Many faces tremendous losses or erosion of expected earnings due to the fact lots of them are locked into fixed price creation contracts wherein contractors undergo the risk of material rate and provider value will increase. without the price escalation clause that permits for an adjustment to the agreement rate, if there may be a surprising rise inside the marketplace costs of key production substances, a contractor will have no respite from such will increase. it's miles vital to have an escalation clause within the contract to shield towards an unexpected spurt in the value of materials. To reduce this degree of hazard, it's miles vital for the contractor to consist of huge contingencies in preliminary estimates of the agreement while he tenders the settlement. If the contingencies are puffed up, the probability of the agreement being provided to any other contractor is accelerated.

1.2 History

In India, Central Public Works department (CPWD) deals with public works of important authorities works. CPWD is above a hundred and fifty years old and contract sorts of the CPWD form the basis of many other agreement paperwork accompanied by other Central and state authorities Departments. For the primary time in Mar-1963, a sub-clause 10C becomes added in CPWD agreement paperwork (Gupta, 1992). inside the modern CPWD contract settlement, the ones summarized below.

Year/ Index	2013	2014	2015	2016	2017	2018	2019	2020	2021
All Commodities	111.1	114.8	110.3	110.3	114.1	118.9	121.2	121.8	135
Cement	103.9	108.7	108.6	107.5	109.9	111.8	118.9	120.2	123.8
Steel	98.8	101.7	90.2	84.2	91.3	109	106.5	107.2	131.9

Table- Historical Index Data

1.3 Price Escalation

Escalation is the change in value or rate of specific items, products, materials & services in a given economy over duration or a period. Inflationary developments in economic system get contemplated through escalation in costs of units. It is the increase in price of any construction factors of the original contract or base price of a project because of passage of time.

Escalation impacts the finances and causes intense monetary overrun by the contractor. It also adds to contingency within the contractor's bid and is the major contributor to the overall cost uncertainty of escalation inside the smooth charges from the company. Creation work is accomplished in keeping with the pre showed agreement settlement. to manage up with the unexpected rate escalation, regulated provision is essential in construction contract document.

An escalation clause is a clause in a contract that ensures a exchange within the contract price as soon as a specific aspect past the manipulate of both party outcomes in an growth or lower within the Contractor's expenses. it is also called "rise and Fall" which suggests that if the rate of positive prices falls then the agreement price could be adjusted within the customers prefer. What is going up may also cross down in any case. pretty often escalation clauses are little understood by using customers unexpected with the specifics of the dredging enterprise. regularly the question arises, "Why do tenderer qualify their gives particularly with admire to fuel escalation?", that is a main element of unit price – typically 20 to 30%. anticipating Contractors to absorb the escalation threat of this of their fees is not exactly the ideal begin for a professional contractual courting among customer and Contractor. furthermore, it is able to properly backfire for the customer with all Tenderers having no other alternative than to place a hefty threat premium into their costs to cowl for sharp increases of factor expenses. based on studies and experience, the advice is made that any dredging agreement of length of greater than 3 to 6 months ought to have an escalation clause covered. on this manner, speculation is eliminated from the obligations of the Contractor and those outcomes in a higher attention on the projected works themselves.

1.4 Objective of Project Dissertation

- **1.4.1** To study about price escalation & Collect data for same.
- **1.4.2** To examine the escalation clauses currently used in construction contracts followed through diverse Government Authorities / departments/ organizations in India
- **1.4.3** The adequacy of reimbursement paid to the contractor primarily based on presently used escalation clauses in government Authority containing various contracts.
- **1.4.4** A Case Study of NHAI HAM Project to find out; cost escalation impact on the outcome of construction projects to conclude the efficient way of calculation and Economical Price escalation Formulae.

II. RESEARCH METHODOLOGY

2.1 Collect data for Price Escalation Index and Clause.

Inflation is the expected economic result from the inflation rate calculated from WPI data. Progress refers to the change in price or value of a product or commodity in a particular market over a period of time. Inflationary growth in an economic system is provided by an increase in house prices. John Hollmann and others argue that this is much more than just an increase in the value of the original contract or the initial cost of building the project due to the passage of time. and others defines the increase as the change in the interest rate caused by the main financing. Renovation costs can be prohibitive and cause financial overload for contractors. It also provides an account of the situation in contractor competition, and "inflation" in price competition is important for price uncertainty. The construction process is based on a pre-approved contract. Regulatory clauses should be included in contracts or tenders to avoid exorbitant prices.

2.2 Construction contract and claims against price escalation clause.

Contracts and conditions play an important role in carrying out the work correctly and on time, preventing and resolving conflicts that arise. The Terms of Reference of the Contract define the rights, responsibilities, obligations and procedures that the interested parties must comply with. Setting up a construction bid is nothing more than sharing the risks involved with the various parties in the contract. Despite all the provisions in the tender contract, a bid was submitted at the construction site. Claims are usually made when one of the parties to a settlement is harmed and that party wants to get the money back from the other party.

It can be defined as a valid additional payment request due to performance change. The possibility that the cost will increase during the completion of the project may result in additional funds being requested over the initial cost. Claims lead to conflict even if they are not resolved well.

2.3 Calculation of WPI (Wholesale price Index)

Each index has its own method of calculating and interpreting the content and is expressed as the change of the main value. The shopping cart is the subject of WPI as it is said to represent the entire market. After the cart is placed, changes to the items in the cart in a financial system are tracked and recorded. The offer for th e same product comes from many sellers. Generally based on this information, further calculations are made as follows.

2.3.1 Allocation of weights

2.3.2 Calculation of price relative

2.3.3 Calculation of Index

2.3.4 Materials in commodity basket

2.3.5 Variation in WPI for major construction materials

2.3.6 Case study NHAI NH-6 Hybrid Annuity Project of 641.6 Cr. Project cost.

Price Escalation in Different Type of Project and Departments					
Item Compensated	Central Public Works Departments	Military Engineer Services	Public Works department Maharashtra	NHAI HAM Project	NHAI EPC Projects
Cement	$V_E = W * (X_t/100) * \{(Cl-CL_0)/CL_0\}$	$V_{Mc}=\{(K_c * V_E)/100\}+V_c$ $E_{Mc}=\{(V_{Mc2}-V_{Mc1})) * ((C_2-C_0)/C_0\}$	$V_C=\{C_0\{(C_{L1}-C_{L0})*T\}/C_{L0}$	Price Index Multiple= {(70%*WPI)+(30%CPI)}/{(70%WPI$_0$)+(30%CPI$_0$)} Project Cost (with Escalation)=Project Cost (Including GST)*Price Index Multiple	VRW= 0.85 RW x [PL x (LI – LO)/LO + PA x (AI – AO)/AO + PF x (FI –FO)/FO + PB x (BI – BO)/BO + PM x (MI – MO)/MO + PC x (CI – CO)/CO+ PS x (SI – SO)/SO] & VBR = 0.85 BR x [PL x (LI – LO)/LO + PA x (AI – AO)/AO + PF x (FI –FO)/FO + PM x (MI – MO)/MO+ PC x (CI – CO)/CO + PS x (SI – SO)/SO]
Steel	$V_E = W * (X_t/100) * \{(SI-SL_0)/SL_0\}$	$V_{Ms}=\{(K_s * V_E)/100\}+V_s$ $E_{Ms}=\{(V_{Ms2}-V_{Ms1})\} * \{(S_2-S_0)/S_0\}$	$V_S=\{S_0\{(S_{L1}-S_{L0})*T\}/S_{L0}$		
Materials ,Plant and Machinery	$V_M=W * (Xm/100) * \{(MI-ML_0)/ML_0\}$ $V=P*Q* \{(CI-CL_0)/CL_0\}$	$V_M=\{(K_m * V_E)/100\}+(V_{cM}-V_0)$ $E_M=\{(V_{M2}-V_{M1})\} * \{(W_2-W_0)/W_0\}$	$V_m=0.85*P_M/100*R*\{(M_1-M_0)/M_0\}$		
POL	$V_E=W*\{(Z/100)*\{(FI-F_0)/F_0\}$	Nill	$V_F=0.85*P/100*R*\{(F_1-F_0)/F_0\}$		
Labour	$V_L=W*\{Y/100)*\{(LI-L_0)/L_0\}$	$E_L=\{(K_l/100)*V_E\}*\{(L_2-L_0)/L_0\}$	$V_L=0.85*P_L/100*R*\{(L_1-L_0)/L_0\}$		
Bitumen	Nill	Nill	$V_B=\{B_{C1}-B_{C0}\}*T$		

Table- Escalation Formulae used in Construction Contracts; various tender types adopted by different govt. Entities/ department/ agencies in India

Description	Central Public Works Department			Military Engineer Services	Tamil Nadu Public Works Department	Airports Authority of India	Bharat Sanchar Nigam Limited
Compensation shall be payable for works whose stipulated period of completion is	6 months or less	0 to 18 months	> 18 months	> 6 months	> 12 months	> 6 months	> 12 months
Clause in the general conditions of contract	10C	10CA	10CC	Special conditions	Special conditions	10CC	10C
Components involved for escalation	Material and Labour	Material	Cement Steel Materials POL Labour	Material POL Labour	Cement, Steel, Material, POL Labour, Bitumen, Plant and Machinery Spares	Material POL Labour	Cement Steel Material POL Labour
Index used for materials	--	WPI	WPI	WPI	WPI	WPI	WPI
Index used for Labour	--	CPI	CPI	CPI	CPI	CPI	CPI

Table - Escalation Clause using Conditions and Criteria using period.

2.3.1 Allocation of weights-

The release price refers to the transaction price obtained in the domestic market when the sales volume begins. Products are weighted according to their percentage of total production in the industry. The weight and impact of individual items. The history of WPI in India is representative of this phenomenon, and the series often goes through seven revisions to include good business practices. The meeting is to revise the series every ten years. The revisions of the Indian WPI series to date are summarized in Table 1 below. Expressed as a percentage of the total price, their total reaches 100. These weights are used to calculate the index for all products. For new products, the weight of the existing product will be changed. Adjust the weight of the item to remove it from different groups.

Sr. No.	Base year	Year of Introduction	No. of Commodities	Groups of Commodities	No of Quotations
1	August, 1939	Jan, 1942	23	4	23
2	End of August, 1939	1947	78	4	215
3	1948-49	1952	112	5	555
4	1961-62 July	July,1969	139	7	774
5	1970-71 Jan	Jan, 1977	360	3	1295
6	1981-82 July	July, 1989	447	3	2371
7	1993-94 April	April, 2000	435	3	1918
8	2004-05 Sept	Sept, 2010	676	3	5482
9	2011-12	May, 2017	697	3	8331
			1. PRIMARY ARTICLES- 2.FUEL & POWER- 13.15 3.MANUFACTURED PRODUCTS 64.23 ALL COMMODITIES= 100		

Table - Revisions in WPI series in India

2.3.1.1. Primary Articles-

More details in the main article, including new vegetables and radishes, carrots, cucumbers, pickles, Mozambique, pomegranate, jackfruit, pear, and more. Materials such as copper concentrate, lead concentrate and garnet were added to the rock organization and copper ore, gypsum, kaolin, dolomite and magnesite were removed. Natural gas was announced as the new product of the main product.

2.3.1.2. Fuel and Power-

In the gas and power industry, non-coking coal can also be classified according to the total cost of electricity (GCV) to meet the needs of many households. The Energy Index in the new series will be measured as a separate product suitable for agriculture, industry, home, business and rail use, recorded in 2004-05. In the new series, the monthly average electricity sales of 49 power plants covering water and electricity are used to record electricity meters. While Light Diesel was removed due to its decreasing importance in the Mineral Oils subgroup, Petrol Koku was introduced to the market as a new product due to its significant growth. There are some adjustments to the weight of the fossil fuel tank. The number of offers has increased significantly to provide a wide range of services.

2.3.1.3. Manufactured Products

Numerous products containing synthetic material have been produced. As a result, the double-digit number of industries in the new series increased from 12 to 22 according to the 2008 National Industry Classification (NIC). Around 173 new products were launched, such as conveyor belts, rubber belts, metal cables, tissue paper, wood plywood, composites, while Khandsari, Papad, video CD player, etc. 135 products were removed from the market.

2.3.2 Calculation of price relative-

The relative price is charged for the items in the WPI basket selected by the source identified for data collection. A proposal of at least five possible projects is required, although a smaller number is also recommended due to unavoidable circumstances. Relative price is the ratio of the daily price of the stock to the index price. A relative value is calculated for each calculation. The product offer allows the calculation of the relative price calculated by the formula below.

Price relative = (Current price/ Base price) *100

2.3.3 Calculation of Index

Average of price relatives for all quotations for a given commodity offers the WPI for that specific item. Technique of compilation of index follows Lasperyre's formula primarily based on weighted mathematics imply that is as follows:

$I = (\Sigma(IiXWi)) / (\Sigma Wi)$

Where,

I = Index number of wholesale prices of a subgroup/group/major group/ all commodities

Ii = Index for ith commodity in the subgroup/group/major group

Wi = Weight assigned to the item/subgroup/group/major group within the subgroup/group/major group/basket.

2.3.4 Materials in commodity basket

Include all products considered for use in the WPI calculation. It is essentially a product designed to demonstrate the effectiveness of a generic business. The items in the shopping cart are often updated over time to accommodate changes in customer behavior or behavior. While there were 676 items in total in 2004-05, there were 435 items in 1993-94. 259 items in the collection are not uncommon. The 435 items in the 1993-94 collection, 176 were removed and a total of 417 new items from the 2004-05 collection were added to the basket. In the 2004-05 series the work is 3 main body ie. Primary products, POL and electrical, manufacturing products. Main substances are divided into three groups as food, non-food and food, and finished goods are divided into 12 groups as food, beverages, tobacco products, textiles, wood and wood products, paper and paper, leather and leather products, leather and leather products, rubber products and pharmaceutical products, nonmetal products and metal products, metal products and metal products.

2.3.5 Variation in WPI for major construction materials

Changes in wholesale prices during the year are the result of the economy. Changes in the market are affected by changes in wholesale prices. The construction industry has grown over the past few years. This is also reflected in the increase/change in wholesale prices of basic necessities. The table below shows the change in the Retail Price Index over the last eight fiscal years. Table 6 Monthly Changes in Market Value of Gray Cement and Rebar Products Between January-December 2021

Commodity	WPI of commodities for Month of January									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
OPC cement	100	103.9	108.7	108.6	107.5	109.9	111.8	118.9	120.2	123.8
White cement	100	110.1	115.3	117.1	118.8	119.1	123.6	126.4	122	123.3
Bricks	100	106	100.6	96.4	98	94.7	94	94.5	91.6	91.8
Stone	100	107.4	112.8	116.2	116.7	113.7	112.3	113.4	111.1	113.5
Steel	100	98.8	101.7	90.2	84.2	91.3	109	106.5	107.2	131.9
Bitumen	100	109.3	112.4	84.4	64.7	70.4	85	82.5	73.4	106.2

Table - Yearly variation in WPI for major construction materials

2.3.6 Case study NHAI NH-6 Project.

The Case Study NHAI Project is Hybrid Annuity Mode of **641.6 Cr**. Bid Project cost **536.87 Cr** Estimated cost. In simplification of Price Escalation Calculation, we will consider Estimated project cost i.e., **₹ 5,36,87,28,668** Project in Brief as follows in Image.

Project in Brief	
Project Name	Balance work for 4 laning of Amravati-Chikhli section of NH-6 (Package-IV) from Km 315.000 (Near Nandura) to Km 360.000 (Near Chikhli) in the State of Maharashtra to be executed on Hybrid Annuity mode under Bharatmala Pariyojana.
Client	National Highway Authority of India, RO Nagpur under PIU Amravati. Maharashtra
Independent Engineer	M/s. L.N. Malvivya Infra Projects Pvt. Ltd.
Concessionaire	M/s. Nandura Chikhli Highways Private Ltd. (SPV Kalayn Toll Infrastructure Ltd.)
EPC Contractor	Kalayn Toll Infrastructure Ltd.
NH No.(New /Old)	NH-53/ NH6
Scheme/ Phase	NHDP-IV
Mode of the Execution (BOT Toll/ BOT Annuity/ EPC/ HAM/ Item Rate /Others	Hybrid Annuity (HAM)
No. of Lanes / Configuration	Four Lanning
Length of Project(in Km)	45 km (Km 315+000 to Km 360+000)
Project Cost (in Cr)	Bid Project Cost :INR 641.60 Cr & Estimated Project Cost - 536.87 Cr.
No. of Bypasses (Name of Town, Length)	1 No Nandura Bypass –6 Km
No. of Toll plazas (Number and Location)	1No 356.542 (Near Chikhli).
Agreement Date	16.07.2020
Appointed Date	19.05.2021
Construction Period	730 days
Operation Period	15 yrs (from COD)

Table- Project of Brief

Scope of Work			
Sr. No.	Description	Unit	Scope
1	Total Project Length	Km	45
2	Bypass Length	Km	6.7
3	Service Road/ Slip Road	Km	23.06
4	Toll Plaza	Nos.	1
5	Truck Lay bays	Nos.	1
6	Bus Bays/Passenger shelter	Nos.	20
7	Rail Over Bridge	Nos.	1
8	Vehicular Underpass	Nos.	3
9	Cattle/Pedestrian Underpass	Nos.	4
10	Major Bridge	Nos.	4
11	Minor Bridge	Nos.	18
12	Pipe Culvert	Nos.	25
13	Slab and Box Culvert	Nos.	10
14	RE Wall	Sq.M	56000
15	RCC Drain	Km	8.99
16	Boundary Wall	Km	60

Table- Scope of Project

Sr. No.	Item in Brief.	Estimated Qty		Consumption Rate		Consumption		Item Qty	Remark
		Unit	QTY.	Unit	Consumption Rate	Unit	Item wise Consumption		
1	M-15	CuM	5098	Kg/Cum	308	MT	**1570**		
2	M-20	CuM	12374	Kg/Cum	341	MT	**4220**		
3	M-20	CuM	7132	Kg/Cum	377	MT	**2689**		0.07Cum/M
4	M-25	CuM	0	Kg/Cum	380	MT	**0**		
5	M-30	CuM	6046	Kg/Cum	393	MT	**2376**		
6	M-35	CuM	19557	Kg/Cum	402	MT	**7862**		
7	M-40	CuM	19304	Kg/Cum	418	MT	**8069**		
8	M-45	CuM	3043	Kg/Cum	449	MT	**1366**		
9	DLC	CuM	2446	Kg/Cum	165	MT	**404**		
10	PQQ	CuM	4168	Kg/Cum	450	MT	**1876**		
11	CTSB	CuM	211279	Kg/Cum	51	MT	**10835**		
12	CTB	CuM	75058	Kg/Cum	103	MT	**7698**	**48964**	**Cement**
13	Tack Coat	SqM	1017804	Kg/SqM	0	MT	**305**		VG-30
14	BC VG-30	CuM	5227	Kg/Cum	129	MT	**676**	**1362**	**Bitumen**
15	BC VG-40	CuM	34436	Kg/Cum	129	CuM	**4451**		VG-40
16	DBM VG-30	CuM	3603	Kg/Cum	106	CuM	**381**	**11166**	**Bitumen**
17	DBM VG-40	CuM	63504	Kg/Cum	106	CuM	**6716**		
18	Steel	MT	4298	MT	1	MT	**4298**	**4298**	**Steel**
19	Structural Steel	MT	950	MT	1	MT	**950**	**950**	**Stru.Steel**

Table-Consumption Summary

As above details will be used for calculation of price escalation Cost. The Project Taken for case study is executing under HAM (Hybrid Annuity Mode) to calculate effect of price escalation clause in highway Construction industry we have to calculate price escalation cost of above project in using all types of departments adopted to calculate the price escalation to achieve conclusion. Also, this calculation also gives information about-

1. Index Adaptation to calculate price escalation.
2. Website on which index available.
3. For Calculation which quantity are to be taken.
4. Where, which and when index is to be calculated.
5. Constants and Star rate calculation using all types of Price escalation in different type departments.

III RESULT AND ANALYSIS

3.1 Price Escalation Cost using Central Public works (CPWD)Formulae.

As per central public works department Memorandum No.DGW/CON/237/ A Dated 31.12.2018 Amendment of Clause 10C, 10CA and 10CC of General Conditions of Contracts 2008 the formulae as follows.

3.1.1 Cement /Steel/Structural Steel Cost.

According to GCC 2008 Clause in CPWD 10 CA - Payment of changes in price of documents as Bids Received should extend the contract (equal) if, after submitting Bids, the price of documents listed in Schedule I/Chart B/Chart F is increased/decreased by more than the price in effect at the last hour of the contract date. 2. However, performance within the extended reasonable period specified above will be limited to the current rate at the date of completion or the current rate for the anticipated period, whichever is shorter. The increase/decrease in the cost of cement, reinforcement and steel structure will be evaluated according to the price index announced by the CPWD Director (Works). For other items listed in Schedule "F",

This should be determined from the All-India Market Prices for Materials published by the Economic Advisor, Government of India, Ministry of Trade and Industry and Base Prices for Cement, Rebar and Structural Steel published by the Director General of CPWD (Works) for Delhi (including Noida, Director of Commerce) under the authority of the Director General of CPWD (Works). CPWD and other local rates for other documents issued by the Regional Marketing Officer specified in the Schedule 'F/G/B', including the extension in the evaluation period (if any), are valid on the date of receipt of the specified trailing offer. If the price index of a product has not been published by the Ministry of Trade and Industry, the closest product price index in the "F" Chart is taken as basis.

Therefore, the contract/tender price for all these materials will be different and calculated according to the following formula for the main materials used in construction: -

Cement Price Variation Calculated such as,

Vc/Vs/Vsc= P*Q * {((CI/SI/SCI)-(CIo/SIo/SCIo)/(CIo/SIo/SCIo)}

Where-

Vc/Vs/Vsc =Variation in material cost i.e. Increase or decrease in the amount in rupees to be paid or recovered. P=Base Price of material For documents issued by the Company, CPWD or the Regional Affairs Manager, as shown in the "G/B/F" Schedule, at the starting price valid at the date of the last receipt of the bids, including any extensions,

Star Rates as per SSR 2019-20 i.e Last Receipt of Tender. i.e 13 Jan 2020.

Sr. No.	Material	Basic rate for 2019-20(Excluding GST)
a)	Cement /PPC	Rs. 4,700/- Per M. T.
b)	PSC	Rs. 4,840/- Per M. T.
c)	GGBS (IS-16714)	Rs. 3990/- Per M. T.
d)	TMT-FE-500 reinforcement	Rs. 41,200/- Per M. T.
e)	HCRM/ CRS reinforcement	Rs. 44,000/- Per M. T.
f)	Structural Steel	Rs. 44,100/- Per M. T.
g)	Bitumen VG-30 (Packed)	Rs. 32,500/- Per M. T.Ex. Refinery Mumbai
h)	Bitumen VG-10 (Packed)	Rs. 31,700/- Per M. T. Ex. Refinery Mumbai
i)	Bitumen VG-40 (Bulk)	Rs. 30,180/- Per M. T. Ex. Refinery Mumbai
j)	Bitumen VG-30 (Bulk)	Rs. 29,200/- Per M. T. Ex. Refinery Mumbai
k)	Bitumen VG-10 (Bulk)	Rs. 28,400/- Per M. T. Ex. Refinery Mumbai
l)	Bitumen VG-40 (Packed)	Rs. 33,580/- Per M. T. Ex. Refinery Mumbai
m)	Bitumen Emulsion	Rs. 23,490/- Per M. T. Ex. Refinery Mumbai
n)	CRMB - 55	Rs. 30,555/- Per M. T.
p)	CRMB - 60	Rs. 30,735/- Per M. T.

Table-PWD SSR 2019-20 Star Rates

Q =Quantity of material buy at site for confide use in the works since previous bill.

CIo/SIo/SCIo = The price index is given by the Indian Ministry of Industry and Commerce, which is the Economic Advisor of the Government of India, such as Cement, Rebar and Structural Steel, valid on the last day of receiving bids for other items listed in the "G/B/F" Schedule with and with extensions if any.

CI/SI/SCI=Price index for Cement, Rebar and Structural Steel Price Indices published by the Economic Advisor to the Government of India Ministry of Industry and Trade as All India Commercial Price Indices for payment or payment period information

3.2 Price Escalation Cost using HAM Project Formulae-

The price of the bid will be adjusted from time to time in accordance with these provisions to reflect changes in the price evaluated after the date the evaluation was used prior to the bid date., the change in the value of the data showing the date before the tender date is adjusted according to the bid price and the date when the value is used before the specified date is accepted as the bid value at the start of the construction. The Company will calculate the change in the Price Index between the Previous Date Report and the Day Before Closing Date for each month after the specified date and will be expressed as a multiple of the Closing Date ("Price Index Multiplier"). All invoices sent by the Concessionaire to the Company for the construction period must be the product of the relevant portion of the tender price and the valid price on the invoice date.

In HAM Project the Price escalation is to be calculated on Milestone basis the milestone is 10%, 30%, 50%, 75%, and 90%. At each milestone the price escalation which is Positive or Negative side is decided on milestone payment and at the time of annuity this amount is revert back to Contractor by government on half annuity basis. To do simplicity of calculation the price escalation calculated for 90% i.e., after project completion is considered.

The increase in the form of is calculated as follows.

Price Index Multiple= {(70%*WPI)+(30%CPI)}/{(70%WPIo)+ (30%CPIo)}

Project Cost (with Escalation) =Project Cost (Including GST) *Price Index Multiple.

3.3 Price Escalation Cost using PWD Maharashtra Formulae-

Government of Maharashtra Govt. Circular No. Sankirn-2017/C.R.121/Part II/Bldg.2 Dated 23-10-2017 Price Variation is to be calculated as.

It is obligatory to include this price correction clause for projects with a construction period of more than 1 year. According to MoRTH guidelines, there is no interest increase if the term is up to 1 year (12 months). For this reason, price adjustment provisions should be included in projects with a construction period of more than 1 year (12 months). It should also be clarified that works such as pit filling or 1-10km rehabilitation cannot continue beyond the completion of the year without the written approval of the relevant Project Manager. Price adjustment provisions included in the tender are also specified in Annex "A".

3.3.1 Price Adjustment

The contract price should be adjusted to increase or decrease the labor, material, oil and diesel (excluding asphalt, cement and steel) costs according to the following standards and the procedures and standards included in the contract. The amended provisions contained herein shall be as follows:

(a) The revised rate applies to work completed from the start date specified in the Contract Documents to the end of the initial completion period, or extended work as agreed by the Contractor, and failure of the work to be completed beyond the specified time due to the contractor.

(b) The price adjustment shall be determined during each month from the formula given in the contract data.

(c) Following expressions and meanings are assigned to the work done during each month:

R = Total cost of work per month. If any, the Guaranteed Advance amount given in that month will be deducted from the Guaranteed Advance amount returned within the month, if any. The cost of the work done as a variation will not be included, and the cost will be adjusted separately according to the offer. To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs.

The formula for adjustment of prices are: R = Value of work done

3.3.2 Adjustment for labour component

(i) Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the following formula:

VL= 0.85 x P1/100 x R x (LI- Lo)/Lo

(ii) VL= increase or decrease in the labour Cost of work during the month under consideration due to changes in rates for local labour.

(iii) Lo= the consumer price index for industrial workers for the State on 28 days preceding the date of opening of Bids as published by Labour Bureau, Ministry of Labour, Government of India.

(iv) LI= The consumer price index for industrial workers for the State for the under consideration as published by Labour Bureau, Ministry of Labour, Government of India.

(v) PI= Percentage of labour component mentioned in tender document.

3.3.3 Adjustment of POL (fuel and lubricant) component

Price adjustment for increase or decrease in cost of POL (fuel and lubricant) shall be paid in accordance with the following formula:

Vf = 0.85 x Pf/100 x R x (Fl - Fo)/Fo

Vf = Increase or decrease in the Fuel influence of work during the month under consideration due to changes in rates for fuel and lubricants.

Fo = The official retail price of High-Speed Diesel (HSD) at the existing consumer pumps of lac at nearest center on the day 28 days prior to the date of opening of Bids.

Fl = The official retail price of HSD at the existing consumer pumps of IOC at nearest center for the 15th day of month of the under consideration.

Pf = Percentage of fuel and lubricants component of the work.

Note: For the application of this clause, the price of High-Speed Diesel oil has been chosen to represent fuel and lubricants group.

3.3.4 Adjustment of Other materials Component (Excluding bitumen, steel and cement)

Price adjustment for increase or decrease in cost of local materials other than cement, steel, bitumen and POL procured by the contractor shall be paid in accordance with the following formula:

Vm = 0.85 x Pm /100 x R x (MI - M0)/M0

Vm= Increase or decrease in the Material cost during the month under consideration due to changes in rates for local materials other than cement, steel, bitumen and POL.

M= The all-India wholesale price index (all commodities) on 28 days preceding the date of opening of Bids, as published by the Ministry of Industrial Development, Government of India, New Delhi.

MI= The all-India wholesale price index (all commodities) for the month under consideration as published by Ministry of Industrial Development, Government of India, New Delhi.

Pm= Percentage of local material component (other than cement, steel, bitumen and POL of the work.

3.3.5 Adjustment of bitumen, steel and cement-

Cement Cost - VC=[C0{CL1-CL0)*T]/CL0

Steel Cost-VS=[S0{SL1-SL0)*T]/SL0

Structural Steel Cost-VS=[S0{SL1-SL0)*T]/SL0

Bitumen Cost-VB={BC1-BC0)*T

So, General Price Escalation using Constant P as Follows

Pl -25% (Labour)

Pm- 65%(Material)

Pf -15% (POL)

In view of above all the price escalation from different type of Govt. firms & Projects is summarized below,

Price Escalation Cost in Different Type of Project and Departments			
Sr.No.	Central Public Works Departments	NHAI HAM Project	Public Works department Maharashtra
1	1,19,19,56,886	1,07,37,45,734	1,17,92,73,888

Table -Price Escalation Cost Summary.

IV. CONCLUSION

The Paper gives detail study about Price Escalation. It offers us records about the escalation clauses presently used in construction contracts followed through numerous government departments/ agencies in India. The Dissertation gives the calculation of price escalation and collection of data and implementation of the data in formulae to calculate exact price variation cost. The Case Study which is included detail price and quantity calculation which all type formulae are to be used. After all this with reference to Table.11 Price Escalation Cost Summary different government entity calculate different cost due this it's impose financial loss to government firms and contractor also. As per Table.11 HAM project price escalation cost is economical with respect to other firms for Government sector but this impact on contractors and concessionaire. Also, this method is much simpler that other PWD and CPWD formulae. The CPWD Cost is much higher and its loss making for government.

The PWD Maharashtra formulae are more suitable and detail calculation consisting in it. Also, the cost calculated in this type it is less that CPWD and Higher than HAM. HAM is Lum sum type of tender in which quantities are not to be considered but at the time of confirming schedule G the quantities have to be calculated. So, by using this paper it will suggest that the HAM project is also will be calculated by using PWD Maharashtra formulae. This dissertation gives the effect of price escalation clause in highway construction industry in which this helps contractors to save from price fluctuation also this increase financial burden on government entities. To do the same there will be uniform and only one formulae and calculation will be used to calculate adequate, efficient, accurate, uniform price escalation cost. After all, above the PWD Maharashtra Formulae is fulfil all the requirements.

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[1] Mr. Lakhi M. Chavan,
BE Civil, ME Construction management and Pursuing M-Tech Transportation with 11+ years of Execution, Planning and Billing Experience in Highway Construction Industry such as NH4, NH166, NH66, NH6 and Interlinked Road project works.