Escalation In Civil Engineering Works

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In a civil engineering works contract, escalation means an increase in the price of an item of work, over and above the rate stipulated in the tender, during the period of the contract. At a time of tender, contractor quotes his rates on the basis of market rates prevailing at that time. But thereafter, during contract period, prices of materials as well as labor increase as the rising trend of market prices had been in past. Therefore, if the contractor were not paid adequately for this increase, it would be inequitable situation.

Before 1960, there was a fixed value concept in contracts. It was modified with a price variation clause provided in the form of reimbursement of the part of excess expenditure incurred due to an effect of statutory rules or order. This clause did not take into account the market fluctuations and hence found insufficient, although various government agencies like CPWD has been amending its clause of escalation time to time.

There has been an inflationary market trend since independence in India and the price increase in construction industry has been non-uniform throughout the spread of years. Fig I, II, III show curves between WPI (Whole Sale Price index of India) & BCI (Building cost index is formulated by CPWD, on the basis of plinth area rates) for the 3 different time span i.e. since 1955 to 2018, as below:

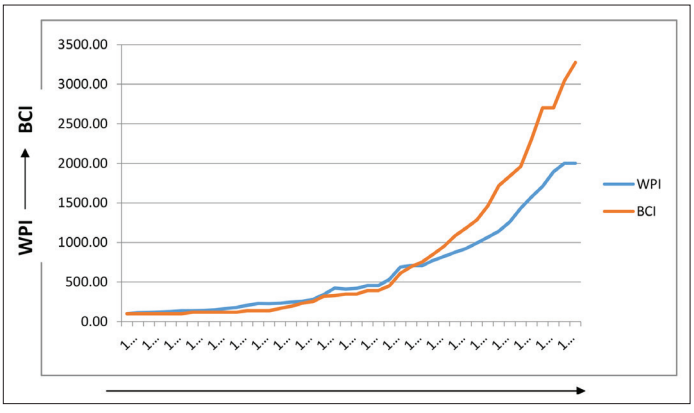

Fig.1: Year 1955 – 1995

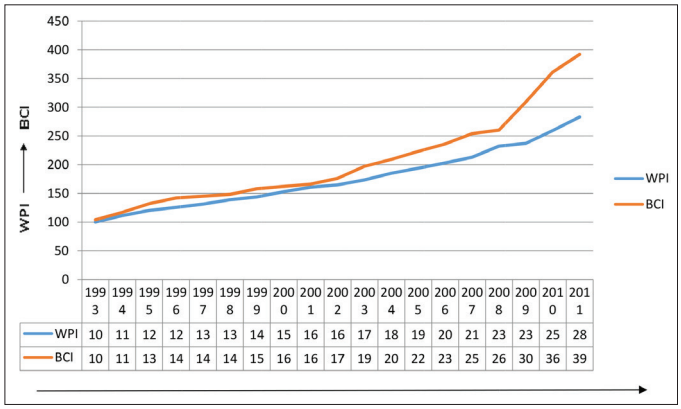

Fig. 2: Year 1993 – 2011

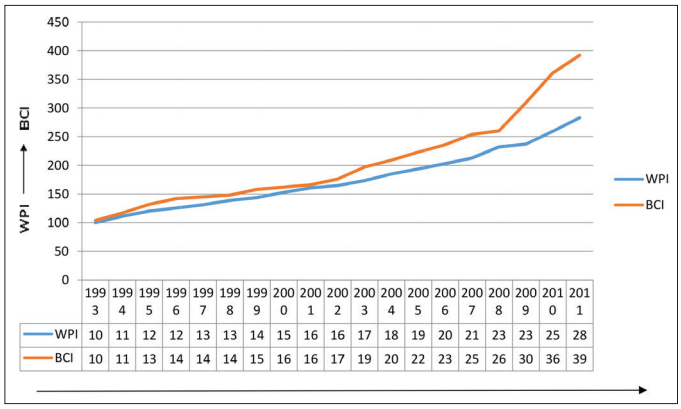

Fig. 3: Year 2011 – 2018

The above data of WPI and BCI (which may be deemed true representative of price increase in civil engineering works) are taken from the website of the office of the Economic Advisor, Ministry of Industry, Govt. of India and CPWD plinth area rates & cost index circulars along with land rates in Delhi 2020 by V.K. Puri (A. Puri publication), respectively.

It appears from the above curves, that between 1955-1981 i.e. for 26 years after establishment of WPI & BCI data, the escalation payments have been almost correct (because the difference between WPI & BCI values are almost negligible), whereas between 1982-1992, 1993-2010 & 2011-2018 i.e. for 36 years the escalation payments done were much less than the actual.

Need Of Hour

The need of hour is to study the various constituents of Escalation Clause, as Ruling Base Date, Frequency of Payment, Fixed Component, Component of Work, Net Value of Work Done,

Indices of Material and Labour, Frequency of Compilation of Indices and Project Completion Period Liable for Paying Escalation and then evolve Realistic Constituents for making an Equitable Clause of Escalation, so that it could take into account for such price variations to a fair and reasonable accuracy and implementation of such price variation clause both in spirit and letter without any fear or favour could be possible.

This paper contains following methodology for the purpose -

1. Study of different kinds of escalation clauses given by various government agencies in India and abroad
2. A case study in Delhi (Delhi Development Authority)
3. Identify the alternatives for indices for comparison
4. Try to evolve more rational constituents from the study, for an equitable clause of escalation

Study Of Different Kinds Of Escalation Clauses Used By Various Government Agencies In India And Abroad

Various clauses of escalations have been studied besides CPWD clause. These are written below -

1. Escalation Clause in UK (United Kingdom of Britain)
2. FIDIC clause of Escalation (International Federation Of Consulting Engineers)

> "There has been an inflationary market trend since independence in India and the price increase in construction industry has been non-uniform throughout the spread of years."

3. Escalation Formula in Brazil
4. Escalation Formula in Malaysia
5. Escalation Formula in Railways
6. Indian Bank's Escalation Formula
7. CPWD clause of Escalation i.e. 10C, 10CA & 10CC of General Conditions of Contract
8. Escalation Formula adopted in Sardar Sarovar Project executed by the government of Gujarat through an autonomous corporation named Sardar Sarovar Narmada Nigam Limited (SSNNL).

A brief look of components of various escalation clauses with formulae have been given in tabular form below, so that the concept of clause could be known, with a brief comparison among the different clauses also.

Comparison Table Of Different Escalation Clauses

Description	CPWD	UK	FIDIC
Ruling Base Date	Last date of submission of tender	42 days before tender due date	28 days before tender due date
Scope	Labour and Material	Labor, Plant and Material	Material and Labor
Formulae	$VM = W\frac{X}{100} * \frac{MI-MI_0}{MI_0}$ $VL = W\frac{Y}{100} * \frac{LI-LI_0}{LI_0}$ $P = VM + VL$	$PFF = \frac{A(LA-LA_0)}{LA_0} + \frac{B(PL-PL_0)....}{PL_0} + \frac{C(AG-AG_0)....}{AG_0}$ P = PFF * EFF Value (A,B,C are coefficients of items proportions)	1. Basic prices of labor and specified materials & current prices or 2. Application of indices if available
Fixed Component	15%	10% set by government	Overhead and profits are excluded
Effective Value of W.D	W=0.85 M-material supplied by client-service rendered at fixed charges.	0.90 w- material supplied by client-service rendered at fixed charges+/- ad vances.	w= cost of work due to contractor - work by nom inated subcontr.mat/plant - works current prices.
Indices	MAT: WPI For All Commodities, (except the materials considered under clause 10CA.), LAB: min. daily wages /CPI	Construction indices for labor [LA & L] PLANTS[PL]FUEL[FG] MAT-[AG, BR, CL CR TS, RS, CBD,SS]	Depends, as per actual market rates/ available WPI
Frequency of Compilation of Indices	Monthly	Monthly	Not Applicable
Minimum project completion period for escalation purpose	1 Year	When price increases/decreases > 10 %	1 Year

Brazil	Malaysia	Indian Banks	Railways
30 days before tender due date	30 days before tender due date	Last date of submission of tender	Last date of submission of tender
Material, Plant, Fuel, Labor and Labor Taxes	Labor, Material and Fuel	Labor and Materials	Labor, Material and P.O.L.
Minimum project completion period for escalation purpose $P = P_0 + \left[\frac{0.70(1+E)}{(1+E_0)} \left\{ \frac{0.30\ S}{S_0} + .70 \right\} (1+D) + .15 \frac{I}{I_0} + .10 \frac{M}{M_0} + 0.05 \frac{C}{C_0} \right]$ D = % salary variation P0 = base price in tender P = updated price E/E0 = social taxes on labour sash S/S0 = decreed minimum wages of labour I/I0 = plant & equipment index M/M0 = material index C/C0 = fuel index (0.70, 0.15, 0.10 & 0.05 are the coefficients representing proportions of the items labour, plant, material & fuel respectively.), labour intensive weighing.	1 Year $K = a_0 + b_0 (E/E_0) + c0 (L/L_0) + d_0 (S/S_0) + f_0(D/D_0) + g_0(A/A_0) + h_0(F/F_0)$ $P = P_0 K$ E/E0 = salary of engineer L/L0 = salary of labour S/S0 = prices of steel D/D0 = prices of diesel C/C0 = prices of cement A/A0 = prices of asphalt F/F0 = prices of fuel oil a0= fixed factor for overheads, contractor profit etc., for which no price variation is considered. B0, C0, D0, F0, G0, H0 = coefficients indicate the % increase of the different respective indices. (the sum of the fixed factors is unity)	When price increases/decreases >10% $VL = (0.87\ P\ K1\ /100 - S) * (CI-C_0)/C_0$ $VM = (0.87\ P\ K2/100 + A - C - R - S) * (I-I_0)/I_0$ K1 & K2 are percentage of labour component and material component P=cost of work done S = cost of services at fixed price A= full value of materials for which secured advance have been paid C = prices of material like cement, steel etc. I & I0 are WPI of all commodities during period of under consideration and on ruling date CO&CI are WPI same as above.	1 Year $M = R*(W-W_0) / W_0 * Q/100$ $L = R * (I-I_0) / I_0 * P/100$ R = gross value of work done W/W0 = index no of wholesale prices for groups and subgroups on period under consideration and base index. Q = % of material component I & i0 are consumer price index P = percentage of labour component
None	30-50% Set By Engineer	13%	15%
W-MAT. SUPP. by client	W-MAT. SUPP. by client	as above in formula	as per usual provisions
National indices for civil construction and pub. Works for hydroelectric works, railways buildings road and associated works, ports	Published for public works indices are categorized into salaries[E,L] steel[S] cement[C]diesel[D] [F] and[A]	LAB: consumer price index MAT: all India W.P.I. for all commodities	LAB: C.P.I FOR Indian workers MAT-W.P.I for all commodities
Monthly	Monthly	Monthly	Monthly
When price increases/decreases = 5% [minimum] >= 5%	-	>6 Months	1 year

Case Study

To be conversant with the escalation formula, one should know the method of reimbursement of escalation to the contractor. For this, a case study has been taken from DDA (Delhi Development Authority).The work has been completed in 1995. The contractor was paid escalation by formula and conditions given in CPWD contract conditions clause 10CC. The details procedure current indices, payment mode i.e. quarterly, base index and client supplied materials (cement and steel) have been given with calculation along with. After analyzing different alternatives (as purposed in last chapter) with the help of case study the best suitable alternative and different constituents of a escalation clause may be recommended.

Name of Work: Construction of 141 MIG houses at Basant Kunj

Cost: ₹2,66,77,417.00

Start Date: 17.05.93

Date of Completion: 16.12.94

Extended Date of Completion: 14.08.95

Base Index - M10 = 231.40 (for material)

December 1992 LI0 - 38.80 (for labor) (MWA)

In case study the total cost of representative materials = ₹17833900 (92% of cost of total material cost of work & 67% of total cost of work)

Total cost of material = ₹1,94,30,966 (74% of total cost of work)

Hence, labor component = 26%

For the purpose of study the labor component has been taken as 25%, as taken in case study i.e. amount for labor escalation is fixed, only the material escalation is being analyze in different alternatives.

1st Quarter: i.e. from June to Aug. 93 since contractor did not do work hence escalation has not been paid.

2nd Quarter: i.e. from Sept 93 to Nov. 93

	M1 (Current indices)	CPI
Sept. 93	250.90	43.05
Nov. 93	252.20	43.05
Nov. 93	251.60	43.05
Average	251.57	43.05

Gross value of work done Upto 2nd R/A bill ₹2558934.0

Recovery of stipulated material - ₹14, 53, 430.00 (cement and steel)

Secured Advance - full value of S/A incorporated to work

= ₹1558500 - ₹392261.00

= ₹1166239.00

Work done net (effective) W = 2558934.00 X .85

= 2175093.90 + 11, 66239.00 - 14, 53430.00 = ₹1887903.00

$$\text{Hence, VM} = 1887903.00 \times \frac{75}{100} \frac{(251.57 - 231.40)}{231.40}$$

= ₹123419.42 = ₹123419.00

$$\text{VL} = 1887903.00 \times \frac{43.05 - 38.80}{38.80} \times \frac{25}{100}$$

= ₹51698.37 = ₹51698.00

Total compensation paid in second quarter

= VM + VL = ₹175117.00

The escalation for successive quarters have been calculated and summarized as below:

3rd - Quarter : VM = 136292.00, VL= 53138.00, total ₹189430.00

4th - Quarter : VM = 146582.00, VL=137688.00, total ₹284270.00

5th - Quarter : VM = 331765.00, VL =242026.00, total ₹573791.00

6th- Quarter : VM = 131401.00, VL =95318.00, total ₹226769.00

7th – Quarter: VM = 3979691.00, VL =244001.00, total ₹641970.00

8th- Quarter : VM = 569028.00, VL =378420.00, total ₹947448.00

TOTAL VM = ₹1836456.00 & VL = ₹1202289.00

GRAND TOTAL = ₹3038745.00

Alternatives For Indices Through Case Study

Three alternatives have been proposed to evolve appropriate indices described as below -

1a - Constructing Separate construction Indices for the work.

1b - As above but freezing cement and steel reinforcement as supplied from client.

1c - Format as in (a) but rates taken from NCT of Delhi instead of taking increase in materials prices from WPI general list.

2 - CPWD construction cost Index format, prices from NCT Delhi.

3 - Cost Breakdown Method (FIDIC)

Alternative No.1a - Construction Of Separate Construction Indices For The Work In Case Study

In the alternative 1 it has been tried to construct separate construction indices of representative/cost contained items (materials), by taking price increase from whole sale price index bulletin for base date as well as current quarters considered for escalation. (As is done in Britain, Malaysia) The idea is to take maximum cost contained (representative) materials for work and price increased from WPI general list to construct indices for materials.

The methodology as given here under consists of breaking down of item of work to representative materials in the case-study. According to the quantum and amount of each material in the work, the weightage have been assigned to each material. The indices as on base date i.e. Dec. 92 have been taken as base indices; the total weightage of items on this date is as 100.

The indices for all representative materials for base date and current date (time of consideration for escalation) have been taken from the whole sale price index bulletin of India for all commodities.

The increase in current indices from base date has been calculated for each current month i.e. from Sep 93 to May 95, for each material and monthly indices have been calculated by taking weighted average of indices of all materials in concerning month.

Having monthly indices calculated, the average quarterly indices have been calculated and quarterly escalation has been calculated by taking difference of average quarterly indices and base indices, as in general practice.

The work done quarterly has been taken from case study, along with all the deductions.

For the purpose of study the labor component has been taken as 25%, as taken in case study i.e. amount for labor escalation is fixed, only the material escalation is being analyze in different alternatives.

The other alternatives of 1b and 1c and along with alternative 2 and 3 i.e. CPWD plinth area (B.C.I.) format and FIDIC method of escalation, the escalation amount have been calculated according to each method above. The table below shows escalation amounts for different 5 alternatives along with case study in column-2.

Escalation Calculated By Different Alternatives						
Quarters	**General indices WPI (India) (case study at Delhi)**	**Material indices to work taken from WPI Alternative-1a**	**Format as in 1-a, Cement & Steel are Frozen Alternative-1b**	**Format as in (1)A but prices from NCT of Delhi, Alternative-1c**	**CPWD Format of BCI, prices NCT Delhi Alternative-2**	**(as per FIDIC) i.e. cost break down, Alternative -3**
Sept. 93 to Nov. 93	VM = 123419 VL = 51698 Total = 175117	VM = 77168 VL = 51698 Total = 128866	VM = 101380 VL = 51698 Total = 153078	VM = 25911 VL = 51698 Total = 77609	VM = 30300 VL = 51698 Total = 81998	
Dec. 93 to Feb. 94	VM = 136292 VL = 53138 Total = 189429	VM = 110171 VL = 53138 Total = 163309	VM = 137386 VL = 53138 Total = 190524	VM = 41186 VL = 53138 Total = 94324	VM = 34055 VL = 51698 Total = 87193	
Mar. 94 to May 94	VM = 146582 VL = 137688 Total = 284270	VM = 115495 VL = 137688 Total = 253283	VM = 122631 VL = 137688 Total = 260319	VM = 85439 VL = 137688 Total = 223127	VM = 69691 VL = 137688 Total = 207379	
June 94 to Aug.94	VM = 331765 VL = 242026 Total = 573831	VM = 254069 VL = 242026 Total = 496095	VM = 235220 VL = 242026 Total = 477246	VM = 177102 VL = 242026 Total = 419128	VM = 149614 VL = 242026 Total = 391640	
Sept. 94 to Nov. 94	VM = 131401 VL = 95318 Total = 226769	VM = 105403 VL = 95318 Total = 200721	VM = 101260 VL = 95318 Total = 196578	VM = 74635 VL = 95318 Total = 169683	VM = 61865 VL = 95318 Total = 157683	₹2873919.00 (5.42% less)
Sep. 94 to Feb. 95	VM = 3979691 VL = 244001 Total = 641970	VM = 513380 VL = 244001 Total = 757381	VM = 522931 VL = 244001 Total = 766932	VM = 388616 VL = 244001 Total = 632617	VM = 316086 VL = 312105 Total = 560087	
Mar. 95 to May 95	VM = 569028 VL = 378420 Total = 947448	VM = 581104 VL = 378420 Total = 959524	VM = 587307 VL = 378420 Total = 965727	VM = 389601 VL = 378420 Total = 768021	VM = 312105 VL = 378420 Total = 690525	
Total:	VM = 1836456 VL = 1202289 Total = 3038745	VM = 1756890 VL = 1202289 Total = 2959179 (2.62% Less than Col.2)	VM = 1808115 VL = 1202289 Total = 3010404 (0.93% Less than Col.2)	VM = 1182220 VL = 1202289 Total = 2384509 (21.52% Less than Col.2)	VM = 973716 VL = 1202289 Total = 2176505 (28.37% Less than Col.2)	

The escalation thus calculated and tabulated above shows that the results came in alternative 1a and 1b (column 3 and 4), based on the separate indices of representative materials from WPI list of commodities) are quite nearer to escalation calculated in case study (column 2), because they are based on general Whole Sale Price (WPI) index of India. Alternatives No. 1c and 2, (column 5 and 6), which are calculated on local rates i.e. rates of 'National Capital Territory of India' (which should be the actual value of escalation) are much less than that of in column 2 (case study), which is calculated on general WPI basis. For instance as in case study taken in Delhi, has an escalation value calculated by alternatives 1c and 2, comes 21.52% and 28.37% (when local rates of NCT Delhi have been applied on format for separate work of case study and BCI format of CPWD respectively) less than former i.e. in the case study.

Therefore, these two alternatives give escalation value closer to the actual value, as the rates are local i.e. from Delhi, and case study is also from Delhi, (though the difference of amount in them is because of the difference of commodities in formats and their weightage in the respective formats). Hence it is clear that the calculated value of actual escalation is much less than the value of escalation calculated/paid by DDA in case study through WPI, for the country, for considered duration, i.e. Dec 92 to May 95. It is obvious during this period somewhere in the country; the price increase of materials might have been higher contrary to Delhi, than the average increase in WPI for general Commodities. So, the escalation paid in Delhi during the period is much more than the actual, whereas in second condition above vice versa, the escalation paid will be less than the actual, where increase in prices were more than the general WPI.

Therefore, it is recommended to construct separate construction indices for work and price increase should be taken from the local published rates as done in alternatives No.1c, for the purpose of escalation calculation for the civil engineering works.

Study Of BCI, Formulated By CPWD For Uttarakhand State

CPWD has constructed BCI on base year 2012 as 100 for the year 2013 and onwards up to 2019. There is a place named Gunji in district Pithoragarh. The BCI for Gunji is kept 442 for the year 2017 as on 1.4.2017 with base year 2012. The BCI on same date and on same base year, at Delhi is 115, but WPI is happened to be the same i.e. 114.10 for the 2 places even throughout the country.

Therefore, if the escalation is paid at Delhi with base date as on 2012, it will be paid 14.10% above than that of base price, as 100 on 2012 according to WPI, which is just equal to BCI, i.e.15% above at Delhi. But at Gunji, it will also be paid 14.10% above, though the actual rate increase is 342% above than that of Delhi (almost 3.42 times) as per BCI (BCI is deemed to be the true representative of engineering works), which is not only inadequate but inhuman also.

CPWD has constructed base prices of cement and steel items for Uttarakhand also, but they do not represent Gunji. Therefore, the problem may be solved only by making base prices and price increase/decrease monthly in Gunji through BCI and other interior places in India.

Deduction

(Inferences of comparative study of different clauses and case study's alternatives for evolution of 'constituents' of a new clause of escalation): Having completed the study of various clauses of escalation and case study along with its alternatives derived for material indices, the constituents of an escalation clause can be evolved as below.

All the recommended constituents have been tabulated below to see at a glance:

Description	Proposed constituents
Ruling Base Date	30 days before last date of submission of tender
Scope	Labor and material
Formulae	VM = W*XM/100 * (MI-MI_0)/MI_0 VL = W * Y/100 * (LI-LI_0)/LI_0 FF VM = Escalation Amount for Material VL = Escalation Amount for Labour W,XM,Y, MI,MI_0, LI,LI_0 are the usual clause notations mentioned in CPWD clause 10cc for specific work and locally developed indices as per given below
Fixed Component	10%
Effective Value Of W.D.	**For Material** W = 0.90 effective value of work done (Gross value of work excluding cost of extra items/deviated quantities of items based on prevailing market rates, services rendered at fixed charges to be recovered in contractors bill, material cost of store supplied items by department at fixed rates and advances recovered to work, but including advances paid to contractor). **For Labor Part** W = 0.90 gross value of work done (But excluding cost of extra items/deviated quantities of items based on prevailing market rates, services rendered at fixed charges to be recovered in contractors bill, and advances recovered to work, but including advances paid to contractor and material cost of store supplied items by department).
Indices	Labor Indices - Monthly CPI or wage of an unskilled adult male labors under MWA (minimum, wage act) whichever is greater. Material Indices- Separate price indices for the list of commodities given in contract documents for specific work through: 1: Locally available rates like NCT Delhi or, 2: Locally developed CPWD BCI {for base price and price increase/decrease values} or, 3: Price Quotations for commodities considered for making WPI of India for the region concerned.
Frequency of Compilation of Indices	Monthly
Minimum Project Completion Period for Escalation Purpose	Project duration more than one year as in Indian Railways to see the rising trend of price increase in India, or increase/decrease becomes > 10%, whichever is earlier, as in UK, but the increase/decrease shall be > 10% in the former case.

Conclusion

Therefore, local prices/local BCI of CPWD/local quotations for corresponding commodities in WPI of India for base price and price increase/decrease as well, should be made and separate construction indices for specific work are to be constructed so that the arbitration and court disputes can be avoided in days to come. The above tabulated eight constituents should be incorporated in a clause of escalation. ■