

Investigation of Cost Escalation and Rate Analysis in Construction

Noorul Hasan

Department of Civil Engineering

Cihan University – Duhok, Kuridsitan Region Iraq

Abstract: Cost heightening of development activities can be characterized as the flight of definite venture costs (after development) from the underlying spending gauges. Medium to extensive development ventures assume control over a year for finishing and the cost of materials and work frequently increment, which prompts real issues in organization of the agreement. This can be brought about by various elements going from configuration changes to high cost of materials, postponements, hardware and work (i.e. More than at first expected). Cost heightening are a piece of the development ventures. Be that as it may, thinks about demonstrate that infrequently tasks are finished inside stipulated spending plan. Along these lines it is basic to think about and break down reasons for cost acceleration.

1. INTRODUCTION

By and large, development tasks are more often than not of very long going from a while to quite a while. All undertakings are to be performed by a pre-affirmed contract sum and contract assent on a fundamental level. Along these lines, there is a solid likelihood that the cost of work and material will rise or fall intermittently, to a more noteworthy or lesser degree amid the life of venture. Subsequently there is a probability for the greater part of temporary worker is that they need to shoulder harm at that specific period because of sudden change ascent of worldwide crude materials or trade rates under singular amount or settled value contract. In this manner, the arrangements in regards to contract value acceleration ought to be revamped efficiently to adapt to the sudden value changes.

2. SCOPE & OBJECTIVES OF THE STUDY

2.1 Scope of the Study

The extent of the present review is restricted to development extends in India. Notwithstanding, the idea and procedure are non specific in nature and can be stretched out for different parts. The expression "Cost acceleration" utilized as a part of the setting of this review, is the expansion in the cost of any development components of the first contract or base cost of the venture because of section of time.

2.2 Objectives of the Study

The target of the proposed work is to look at the cost of development, for example, building materials, works and types of gear for recent years from the year 2012 to 2016.

To discover different parameters that impacts increment in the cost of development.

To estimate the rate increment in cost of development for the following year 2017.

3. METHODOLOGY

3.1 Methods of Forecasting Factor

Development cost files have been utilized to quantify the cost inclines in the development business. Assessing the expansion in cost over the long haul is practically outlandish as a result of the numerous vulnerabilities outside the ability to control of all gatherings. The same is valid for long haul development ventures with multiyear timetables and begin dates later on. Regardless of this trouble, the proprietors of expansive long haul ventures need to think of the assessed cost of these tasks. The more reasonable approach to approach these issues is to ascertain a scope of conceivable expenses as opposed to a solitary figure.

Quantitative techniques can be partitioned into two noteworthy classifications: factual and causal strategies.

Factual techniques use time-arrangement investigation and bend fitting strategies to gauge the variable later on.

Causal strategies are produced accepting that the variable to be anticipated presents a logical or causal association with at least one autonomous factors.

3.2 Simple Average and Exponential Smoothing

Cases of factual techniques comprise of basic normal and exponential smoothing. The strategy for straightforward normal is fundamentally to take normal of every single watched dat as the figure. The straightforward normal is reasonable for information that vacillate around a steady or have a gradually changing level and don't have a pattern or occasional impacts. The major standard of the exponential smoothing is that the estimations of the variable in the most recent time frames have more effect on the conjecture and thusly ought to be given more weight. This technique infers that as verifiable information get more established, their weight will diminish exponentially. Typically, it is a poor model for medium or, then again long haul gauge. Figures can be tossed into extraordinary mistake on account of extensive irregular change in late periods.

3.3 Box-Jenkins Approach

Other more muddled measurable anticipating techniques are some of the time utilized additionally, yet once in a while in development. For instance, strategies in light of auto backward incorporated moving normal ARIMA models are accessible; however their utilization has been constrained. The time arrangement examination, guaging, and control with the ARIMA display have come to be known as Box-Jenkins philosophy. In spite of Box-Jenkins promising outcomes and power, forecasters and chiefs from time to time utilize this technique since it is confused. It is most appropriate to here and now figure, for example, every day, week after week, or month to month and it require a lot of information.

3.4 Regression

Relapse strategies are any demonstrating of a gauge variable Y as a component of an arrangement of illustrative factors X_1-X_k . The relapse technique's exactness relies on a predictable association with the free factors. In relapse techniques, a precise gauge of the autonomous factors is essential. Numerous relapse strategies all the time require a lot of information.

3.5 Steps Involved in Methodology

The above said procedure is to examine, break down and think about the rate of development materials cost, work cost, hardware fetched for recent years. The definite system can be clarified as takes after:

- 1) Study of writing is accessible as books, diaries to get legitimate comprehension of the issue.
- 2) Collection of bill of amount and approval
- 3) Rate investigation is finished.
- 4) Preparation of bill of amount with rates acquired.
- 5) Comparison of bill of amount for recent years from 2012 to 2016.
- 6) Forecasting is accomplished for one year from now 2017 by utilizing relapse technique.
- 7) Results, exchange and conclusion.

4. FACTORS AFFECTING COST ESCALATION

The different critical elements which impacts increment in the cost of

Development materials are

Increment in cost of Bulk Construction Materials.

Increment in cost of Composite Materials.

Increment in cost of Construction Equipment Hire.

Increment in cost of Construction Labor.

Increment in cost of Fuel.

Increment in cost of Electricity.

4.1 Bulk Construction Materials

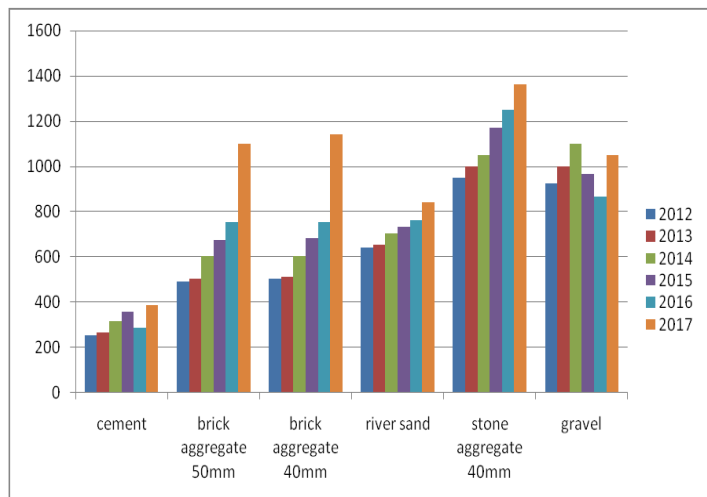
These are essential sources of info and incorporate basic materials, for example, bond, sand, and support steel and in addition fabricated items, for example, concrete, terminated mud items and plywood. This classification may likewise incorporate composite items, for example, window units containing outlines, coating and fittings, for example, pivots and bolts and items like these incorporate essential material contributions as well as other made items and the work required in gathering them.

A specific issue zone in universal correlations is materials, items and congregations for mechanical including, lifts and warming, ventilating and aerating and cooling establishments and electrical and other power and utility establishments. In created nations, mechanical and electrical establishments can speak to at least 33% of the aggregate cost of development, especially constructing, extends so they can't be overlooked. The Bar graph and

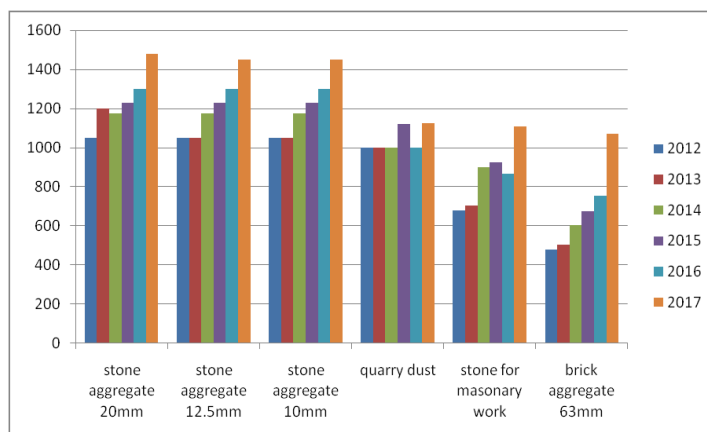
unthinkable section of correlation of mass development
materials and examination of composite development
materials is spoken to.

Table 4.1 comparison tabular column bulk construction materials

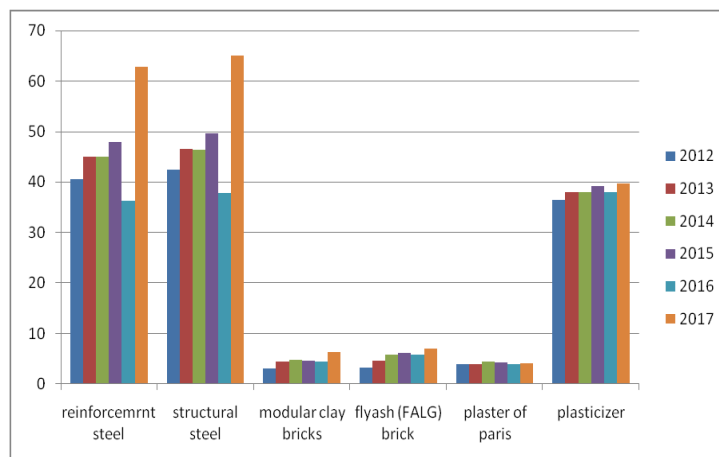
COMPARISON OF CONSTRUCTION MATERIALS								
Item no	Item description	Unit	Basic rate					
			2012	2013	2014	2015	2016	2017
1	Cement	Bag	250.00	262.00	315.00	356.00	285.00	386.00
2	Reinforcement steel	Kg	40.50	45.00	45.00	48.00	36.25	62.75
3	Structural steel	Kg	42.50	46.50	46.36	49.64	37.75	65.00
4	River sand	Cum	640.00	650.00	700.00	730.00	760.00	840.00
5	Stone aggregate 40mm	Cum	950.00	1000.00	1050.00	1170.00	1250.00	1360.00
6	Stone aggregate 20mm	Cum	1050.00	1200.00	1175.00	1230.00	1300.00	1480.00
7	Stone aggregate 12.5mm	Cum	1050.00	1050.00	1175.00	1230.00	1300.00	1450.00
8	Stone aggregate 10mm	Cum	1050.00	1050.00	1175.00	1230.00	1300.00	1450.00
9	Quarry dust	Cum	1000.00	1000.00	1000.00	1120.00	1000.00	1125.00
10	Modular clay bricks	Nos	3.15	4.50	4.85	4.63	4.50	6.40
11	Flyash (FALG) brick 9''x4''x3''	Nos	3.30	4.70	5.80	6.20	5.80	7.10
12	Stone for masonry work	Cum	675.00	700.00	900.00	925.00	865.00	1108.00
13	Brick aggregate 63mm	Cum	475.00	500.00	600.00	673.00	750.00	1068.20
14	Brick aggregate 50mm	Cum	490.00	500.00	600.00	673.00	750.00	1099.40
15	Brick aggregate 40mm	Cum	500.00	510.00	600.00	681.00	750.00	1139.40
16	Gravel	Cum	925.00	1000.00	1100.00	963.00	865.00	1049.00
17	Plaster of paris	Kg	4.00	4.00	4.50	4.32	4.00	4.10
18	plasticizer	Kg	36.50	38.00	38.00	39.20	38.00	39.75



Graph 4.1 hike in construction material cost



Graph 4.2 hike in construction material cost



Graph 4.3 hike in construction material cost

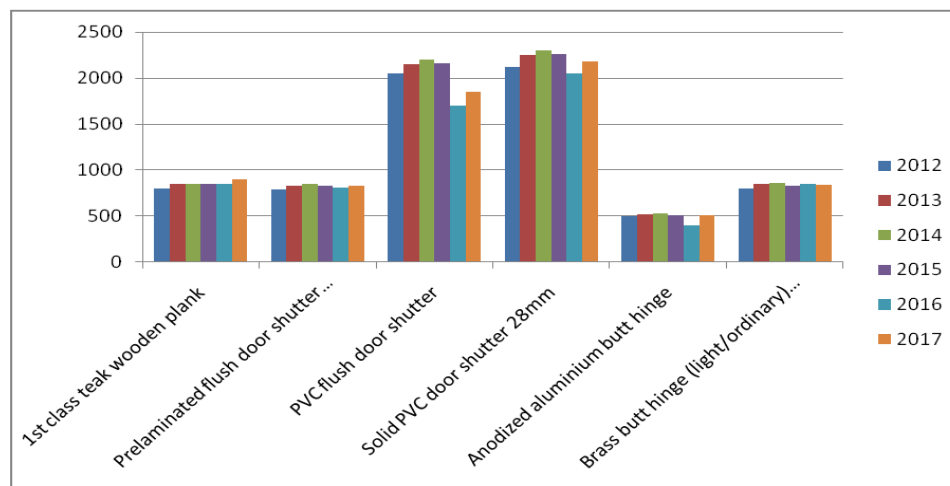
The increase in bulk construction material cost has escalated by 50% during the period 2012-2017 is represented in graph 4.1 to 4.3

4.2 Composite Materials

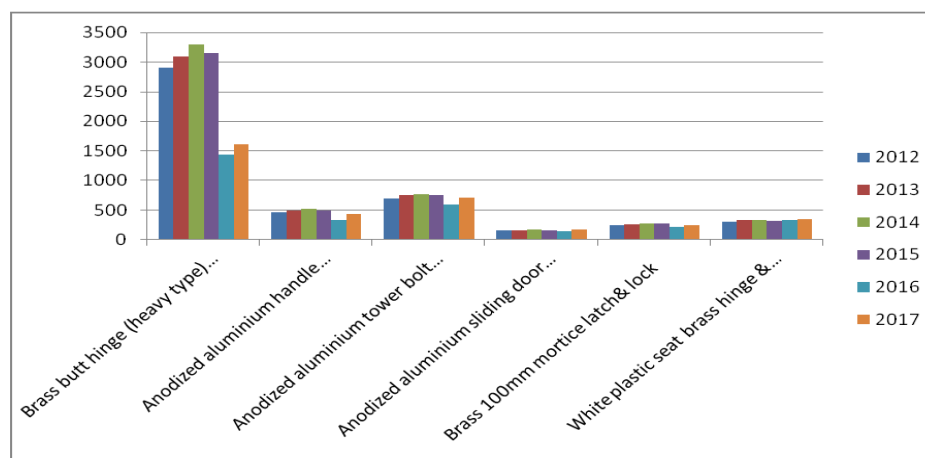
Table 4.2 comparison tabular column for composite materials

COMPARISON OF JOINERY WORKS								
Item no	Item description	Unit	Basic rate					
			2012	2013	2014	2015	2016	2017
1	1 st class teak wooden plank	10 cudm	800.00	850.00	850.00	850.00	850.00	900.00
2	Prelaminated flush door shutter 25mm	sqm	790.00	830.00	850.00	830.00	808.00	834.00
3	PVC flush door shutter	sqm	2050.00	2150.00	2200.00	2160.00	1700.00	1845.00
4	Solid PVC door shutter 28mm	sqm	2120.00	2250.00	2300.00	2260.00	2050.00	2180.00
5	Anodized aluminium butt hinge 100x75x4mm	10 nos	500.00	520.00	530.00	515.00	400.00	510.00
6	Brass butt hinge (light/ordinary) 125x70x4mm	10 nos	800.00	850.00	860.00	830.00	850.00	840.00
7	Brass butt hinge (heavy type) 125x85x5.5mm	10 nos	2900.00	3100.00	3300.00	3150.00	3042.00	3260.00
8	Brass handle 125mm with plate 175x32mm	1 no	140.00	140.00	150.00	155.00	140.00	150.00
9	Brass 150mm floor door stopper	1 no	160.00	170.00	170.00	170.00	170.00	180.00
10	Oxidized mild steel tower (barrel type) 250x10mm	1 no	40.00	45.00	48.00	49.00	45.00	47.00

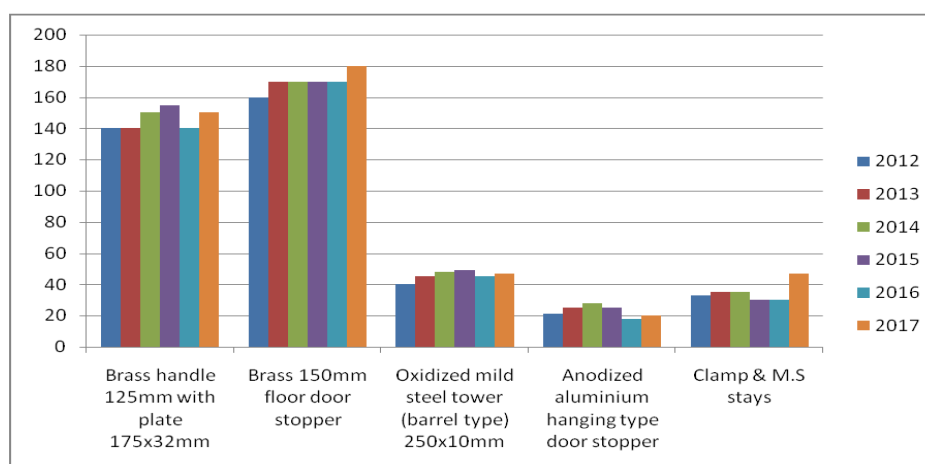
11	Anodized aluminium handle 125mm with plate 175x32mm	10 nos	470.00	500.00	520.00	490.00	330.00	440.00
12	Anodized aluminium tower bolt (barrel type) 300x10mm	10 nos	700.00	750.00	775.00	760.00	590.00	710.00
13	Anodized aluminium sliding door bolt 300x16mm	1 no	155.00	160.00	170.00	160.00	150.00	175.00
14	Anodized aluminium hanging type door stopper	1 no	21.00	25.00	28.00	25.00	18.00	20.00
15	Brass 100mm mortice latch& lock with 6 levers	1 no	250.00	260.00	280.00	270.00	220.00	250.00
16	White plastic seat brass hinge & rubber buffer	1 no	310.00	330.00	330.00	320.00	330.00	345.00
17	Chromium plated brass screw 40mm	100 nos	190.00	200.00	220.00	230.00	310.00	290.00
18	Clamp & M.S stays including each bolt & nuts for 100mm pipe	1 no	33.00	35.00	35.00	30.00	30.00	46.75
19	P.V.C automatic flushing cistern 5 litres capacity	1 no	490.00	490.00	490.00	500.00	490.00	490.00
20	P.V.C automatic flushing cistern 10 litres capacity	1 no	530.00	530.00	530.00	530.00	530.00	530.00



Graph 4.4 hike in composite materials cost



Graph 4.5 hike in composite materials cost



Graph 4.6 hike in composite materials cost

The increase in composite material cost has escalated by 5% during the period 2012-2017 is represented in graph 4.4 to 4.6

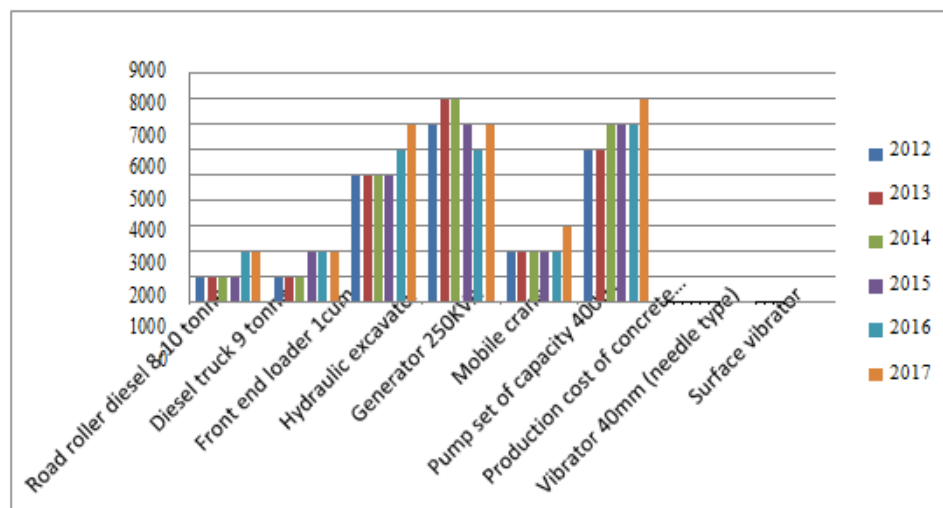
4.3 Construction Equipment Hire

Development hardware incorporates a scope of things from tower cranes and bulldozers to littler hand worked things.

Hardware can be claimed by the fundamental contractual worker, procured as required or incorporated into sub temporary worker costs. On the off chance that it is claimed by the principle temporary worker then the expenses of utilization are for the most part figured as an intermittent rate, for example, every day, week after week and so on in light of the buy cost, possession expenses and running expenses over the life of the thing.

Table 4.3 comparison tabular column for hiring equipments

COMPARISON OF EQUIPMENT RENTS								
Item no	Item description	Unit	Basic rate					
			2012	2013	2014	2015	2016	2017
1	Road roller diesel 8-10 tonne	day	1500.00	1500.00	1500.00	1700.00	2200.00	2450.00
2	Production cost of concrete by batch mix plant	Cum	350.00	350.00	350.00	400.00	400.00	425.00
3	Diesel truck 9 tonne	day	1600.00	1700.00	1700.00	1800.00	2000.00	2275.00
4	Pump set of capacity 4000 litres/hour (dewatering pump)	day	500.00	550.00	600.00	600.00	650.00	750.00
5	Vibrator 40mm (needle type)	day	300.00	325.00	350.00	360.00	350.00	410.00
6	Front end loader 1cum	day	5000.00	5000.00	5000.00	5500.00	6000.00	7100.00
7	Surface vibrator	day	400.00	400.00	400.00	370.00	250.00	340.00
8	Hydraulic excavator	day	7500.00	8000.00	8000.00	7300.00	6500.00	7630.00
9	Generator 250KVA	day	2200.00	2200.00	2300.00	2300.00	2500.00	2760.00
10	Mobile crane	day	6500.00	6500.00	7000.00	7200.00	7500.00	8120.00



Graph 4.7 hike in construction equipment rent

The increase in hiring cost of construction equipment charges has escalated by 24% during period 2012-2017 is represented in graph 4.7

4.4 Construction Labour

This incorporates different sorts and classes of work and how work is portrayed may fluctuate from area to area and even from venture to extend. It incorporates coordinate works who are utilized specifically by the principle temporary worker, and such work may incorporate gifted

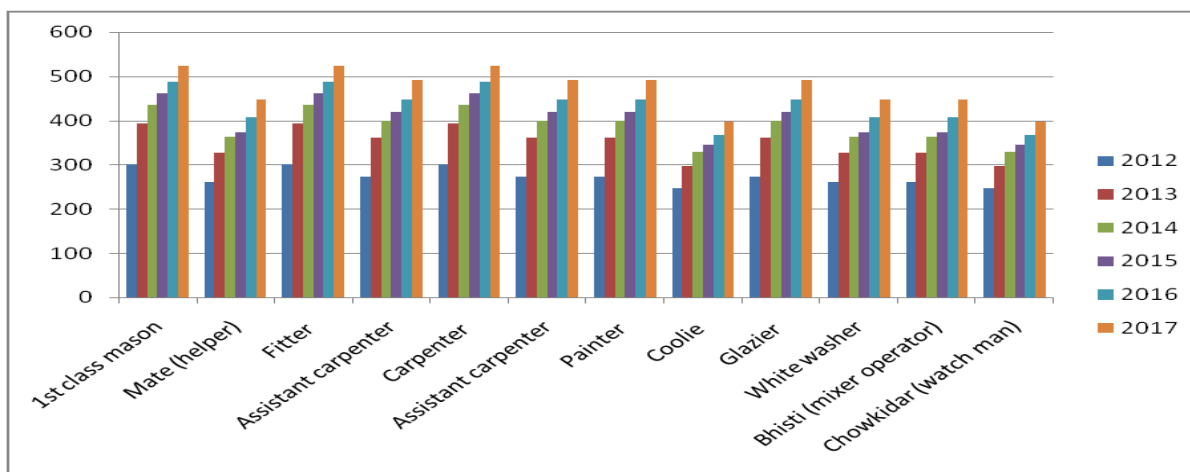
exchange individuals and general semi talented or incompetent individuals.

It additionally incorporates supervisory staffs who are for the most part utilized by the fundamental contractual worker.

Costs related with supervisory staff, for example, site foremen and site chiefs might be unmistakably particular while more ranking staff expenses might be installed in organization overheads so some care is required in measuring the expenses of supervision in general development costs.

Table 4.4 Comparison tabular column for construction labour

COMPARISON OF CONSTRUCTION LABOURS RATE								
Item no	Item description	Unit	Basic rate					
			2012	2013	2014	2015	2016	2017
1	1 st class mason	day	301.00	393.00	435.00	461.00	487.00	523.00
2	Mate (helper)	day	260.00	328.00	363.00	374.00	407.00	448.00
3	Fitter	day	301.00	393.00	435.00	461.00	487.00	523.00
4	Assistant fitter	day	273.00	361.00	399.00	420.00	448.00	492.00
5	Carpenter	day	301.00	393.00	435.00	461.00	487.00	523.00
6	Assistant carpenter	day	273.00	361.00	399.00	420.00	448.00	492.00
7	Painter	day	273.00	361.00	399.00	420.00	448.00	492.00
8	Coolie	day	247.00	297.00	329.00	346.00	368.00	398.00
9	Glazier	day	273.00	361.00	399.00	420.00	448.00	492.00
10	White washer	day	260.00	328.00	363.00	374.00	407.00	448.00
11	Bhisti (mixer operator)	day	260.00	328.00	363.00	374.00	407.00	448.00
12	Chowkidar (watch man)	day	247.00	297.00	329.00	346.00	368.00	398.00



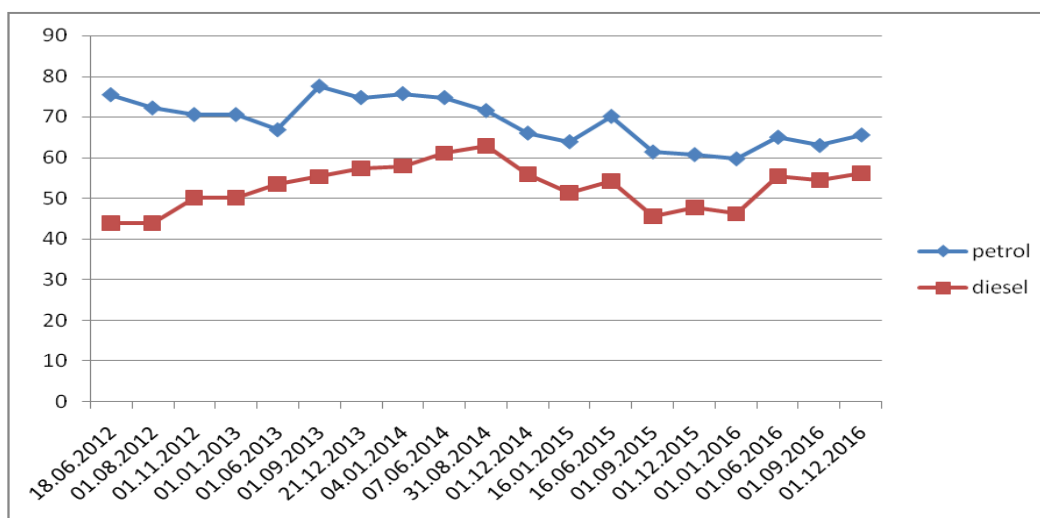
Graph 4.8 hike in construction labour rate

The increase in construction labour charges has escalated by 74% during the period 2012 to 2017 is represented in graph 4.8

4.5 Increase in cost of Fuel

Table 4.5 Comparison tabular column for cost of fuel

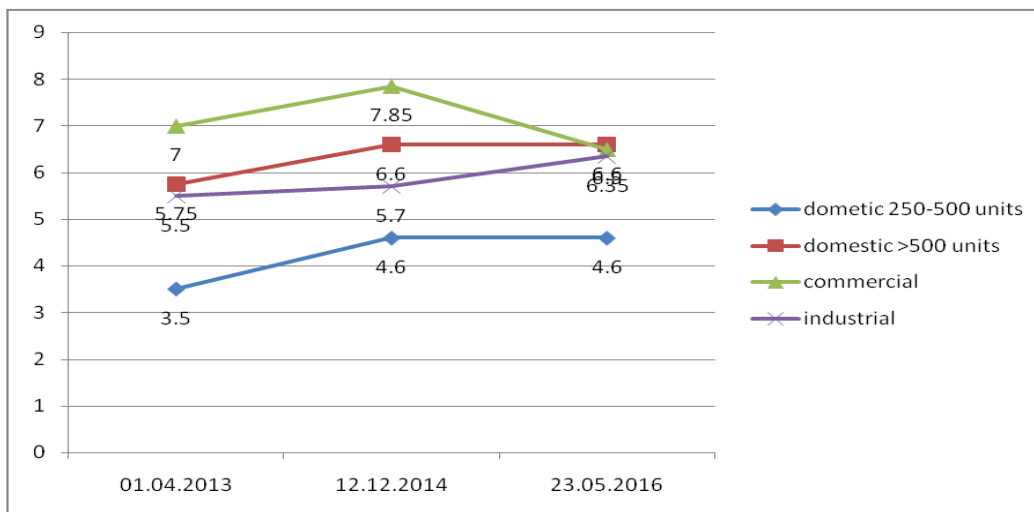
COMPARISON OF PETROL & DIESEL PRICES				
Year	Month	Date	Petrol	Diesel
2012	June	18	75.40	43.95
	August	01	72.19	43.91
	November	16	70.57	50.16
2013	January	01	70.58	50.13
	June	01	66.85	53.53
	September	01	77.48	55.37
	December	21	74.71	57.32
2014	January	04	75.68	57.93
	June	07	74.71	61.12
	August	31	71.55	62.92
	December	01	66.05	55.93
2015	January	16	63.94	51.34
	June	16	70.12	54.29
	September	01	61.46	45.56
	December	01	60.80	47.77
2016	January	01	59.77	46.25
	June	01	65.04	55.44
	September	01	63.02	54.43
	December	01	65.58	56.10



Graph 4.9 hike in cost of fuels

The diesel price has escalated by 28% and petrol price decreased by 13% during the period 2012 to 2017 is represented in graph 4.9

4.6 Increase in cost of Electricity



Graph 4.10 hike in cost of electricity

The increase in electricity charges has escalated by 31%, 4.3%, -7%, 15.4% during the period 2012-2017 is represented in graph 4.10

5. RESULTS & DISCUSSIONS

The detailed bill of quantities for the year 2016 is done and the percentage increase in cost of construction for the year 2017 is tabulated.

Year	Total Cost of Project	Increase In %
2016	1,26,52,169.00	-----
2017	1,42,96,950.00	12.9%

6. CONCLUSIONS

1. The real parameters that impact the cost acceleration in development are steel, bond, total, blocks, composite materials, types of gear and work expenses are found.
2. From this review, it is discovered that the cost of development materials, composite materials, types of gear contract charges, diesel and development work cost were raised by half, 5%, 24%, 28%, 74%
3. Work cost assumes a noteworthy part in cost heightening which has been raised by 74%
4. Anticipating has been accomplished for the following year 2017 by utilizing relapse strategy.

5. Through anticipating strategy, it is discovered that cost heightening for 2017 would be increment by 12.9%

6. Work cost assumes a noteworthy part in cost acceleration which has been raised by 74%, though gear cost has heightened by 24% So the utilization of supplies in development industry can be augmented to lessen increment in development cost.

7. RECOMMENDATION

Work cost assumes a noteworthy part in cost heightening which has been raised by 74%, while gear cost has raised by 24% So the utilization of types of gear in development industry can be amplified to decrease increment in development cost and abstain from deferring of ventures because of lack of works.

REFERENCES

- [1] Abhishek Bhargava; Panagiotis Ch. Anastasopoulos. Journal of Construction Engineering and Management, Vol. 136, No. II. (Nov 2010), ' Three-stage Least Squares Analysis of Time and Cost Overruns in Construction Contracts', Pg no.20-25.
- [2] Adnan Amin Alvanchi; SangHyun Lee, A.M.ASCE Vol. 138. No.1. (2012), 'Dynamics of working hours in construction'

- [3] Bee Hua Goh, Volume 40, (2005), Issue 2. 'The dynamic effects of the Asian financial crisis on construction demand and tender price levels in Singapore' Pg no. 23-26.
- [4] Brad W.Wambeke, 'Causes of Variation in Construction project task starting times and Duration' ASCE Vol 1(Sep 2011).
- [5] Byung Cheol Kim, A.M. Combination of Project cost Forecasts in Earned Value Management' , ASCE Vol.2, (Nov 2011) and No.2.
- [6] ChangTaek Hyun, TaeHoon Hong, SoungMin, JunHyeok Yu, and SooBae, 'The Development of Probabilistic Time and Cost Data
- [7] Khaled Nassar¹ and Ossama Hosny. 'A Model for Assessing Maximum Overtime Rate in Labor Subcontracting Practices', Vol.2, (Jun 2012) No.2.
- [8] Mohammad A. Ammar 'Optimization of Project Time- Cost Trade off Problem with Discounted Cash Flows', journal of Construction Engineering & management, Vol 137,(Jan 2011), No.1.