

Cost & Constructional Comparison Between Rcc & Prestressed Beams Spanning 16m.

Ankit Sahu, Prof. Anubhav Rai, Prof. Y. K. Bajpai

Abstract- In this Paper I am going to design and estimate of R.C.C. Beam and post-tensioned Beam of span 16 m and then comparing the results. The idea is to reach a definite conclusion regarding the superiority of the two techniques over one another.

Index Terms- Abstract, Introduction, Scope, Methodology, Observation Table, Graph, Results & Discussion, References.

1 INTRODUCTION

In India RCC Structures are commonly used for Residential as well as commercial Buildings. Post-tensioned Pre-stressed beams are rarely used for the same Buildings, or we can say for short Span Buildings. Two Decade ago there was a big problem of Skilled Workers for Pre-Stressing work. But now there are so many agencies for execution of the same work. In RCC Beams, depth of beam increases with increase in Span, because of deflection limitation. Depth of beam can be reduced in Pre-stressed section, for longer span pre-stressed beams are cheaper. This work is proceeding because I want to know the percentage cost difference between both techniques with respect to span.

2 SCOPE

This work includes the design and estimate of beam for Span 16 m by R.C.C. and pre-stressed concrete techniques. And calculation of percentage cost comparison between RCC & Post-tensioned pre-stressed concrete beam.

3 METHODOLOGY

To begin with, a R.C.C. beam manually designed by using the limit state method based on IS: 456-2000. Based on the steps & formulas involved, a design program is prepared in MS EXCEL. The result of the program is checked by first designing the manually designed beam by using the

program & comparing the results. Since in field, a mix richer than M: 30 used for RCC, the grade of concrete is maintained at M: 30 for R.C.C. An identical procedure is followed for Pre-stressed concrete beams. The manual design is based on the limit state method suggested according to British code provisions. The program for designing the same is developed by using MS EXCEL & its result is checked by first solving the manual problem & comparing the results. For Pre-stressing, the beam is designed for M-35 grade concrete. Design is carried out for parabolic cable profile only, which is the most popular one. Programs is also prepare for estimating & costing. Rates will be taken from Amended PWD SOR-2009 of Madhya Pradesh. In case of pre-stressed concrete, some of the rates will be obtained from a well-known private Infrastructure company.

4 OBSERVATION TABLE

Design Results for same span and same loading condition are shown in Estimate Data.

Estimate for 16 m Long RCC Beam

Support	0.5	m		
Span	16	m		
Width	0.4	m		
Depth	0.9	m		
Main Reinforcement				
Top	20	mm	2	Nos.
Main Reinforcement				
Bottom	32	mm	7	Nos.

- Ankit Sahu is currently pursuing masters degree program in Structural engineering in RGPV University Bhopal, India, M-+91-8889317511. E-mail: ankit_2409@rediffmail.com.
- Prof. Anubhav Rai, Asst.Prof. Civil Engineering Dept. GGITS Jabalpur (M.P.) India, M-+918516078002. E-mail: anubhavrai.str4@gmail.com.
- Prof. Y.K. Bajpai, HOD Civil Engineering Dept. GGITS Jabalpur(M.P.) India, M- +919584827555.

Stirrups 10 mm 0.407 m c/c

Estimate for 16 m Long PT Beam

Support 0.5 m
Span 16 m
 18750
Sectional area 0 mm²
 0.187
 5 m²

Main Reinforcement
Bottom 16 mm 16 Nos.
Stirrups 10 mm 0.26 m c/c
End Anchorage
Reinforcement 12 mm 20 Nos.

TABLE-1

ESTIMATE FOR 16 M LONG RCC BEAM

SOR No.	Description Of Item	Nos.	Length	Width	Height	wt./m	Qty.	Unit	Rate as per MP PWD Amended SOR-2009	Amount
5.27+5.28, 2	Beam (M-30)	1	16	0.4	0.9		5.76	Cum	5603	32273.28
5.16.1	Reinforcement Top	2	18.62			2.46	91.79	Kg	48	4406.05
5.16.1	Reinforcement Bottom	7	18.62			6.31	822.46	Kg	48	39478.28
5.16.1	Stirrups	40.3	2.55			0.61	63.34	Kg	48	3040.57
5.16.1	Skin Bars	4	16			0.88	56.79	Kg	48	2725.98
5.9.3	Shuttering Bottom	1	16	0.4			6.4	Sqm	229	1465.6
5.9.3	Shuttering sides	2	16		0.9		28.8	Sqm	229	6595.2
							Total Amount		=	89985

TABLE-2

ESTIMATE FOR 16 M LONG POST-TENSIONED PRE-STRESSED BEAM

Sor. No.	Description Of Item	Nos.	Length	Width	Height	wt./m	Qty.	Unit	Rate as per MP PWD Ammended SOR-2009	Amount
5.27+5.28.3	Beam (M-35)	1	16		0.1875		3.09	Cum	5658	17504.43
5.16.1	Reinforcement Bottom	16	17			1.57	429.09	Kg	48	20596.31
5.16.1	Stirrups	62.53	3.35			0.616	129.10	Kg	48	6196.87
5.16.1	End Anchorage Reinforcement	10	0.85			0.88	7.54	Kg	48	362.044
5.16.1		10	0.35			0.887	3.10	Kg	48	149.07
	Anchor Plate	2	0.15	0.15	0.008	7850	2.82	Kg	52	146.95
5.9.3	Shuttering Of Bottom	1	16	0.55			8.8	Sqm	229	2015.2
5.9.3	Shuttering Of sides	2	16		0.85		27.2	Sqm	229	6228.8
NSOR	Tendons with Anchors	2	16			4.7	159.8	Kg	152.55	24377.49
							Total Amount		=	77577

Rates as per Approved Agency for PT work in India

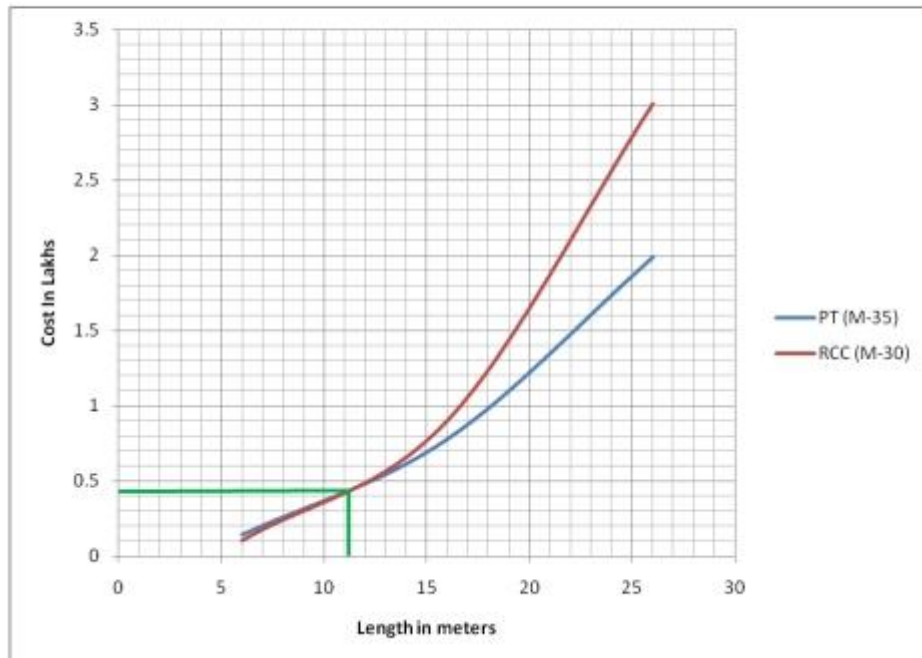
TABLE 3

ECONOMIC COMPARISON BETWEEN R.C.C. BEAMS & POST-TENSIONED PRE-STRESSED CONCRETE BEAMS

Sr. No.	LENGTH OF BEAM IN METERS	ESTIMATED COST OF RCC WITH M-30 GRADE CONCRETE MIX IN RUPEES (`)	ESTIMATED COST OF POST-TENSIONED WITH M-35 GRADE CONCRETE MIX IN RUPEES (`)	PERCENTAGE RATE DIFFERENCE	POST-TENSIONED BEAM IS
1	16	89985	77577	14 %	CHEAP

GRAPH

VARIATION OF COST WITH SPAN OF BEAMS



6 RESULTS & DISCUSSION

Result shows that, for span 16m Post-Tensioned Pre-stressed concrete beam is 14% cheaper than RCC beam.

When we Design for various spans ranging from 6m to 26m & above than, Result shows that for 11.25 meter length cost of RCC Beam & PT Beam are same. RCC Beams are cheaper for spans up to 11.25 meter. And Post-Tensioned pre-stressed beams are cheaper for spans larger than 11.25 meter.

7 REFERENCES

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