

CONSTRUCTION COST INDICES

By

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CPWD





150 years of fine traditions

Vice Regal Lodge,
Shimla-1884-88



Hall of Nations, ITPO
New Delhi 1972



ROLE OF CPWD



- **CONCEIVE**
- **PLAN**
- **CONSTRUCT**
- **MAINTAIN**

CPWD

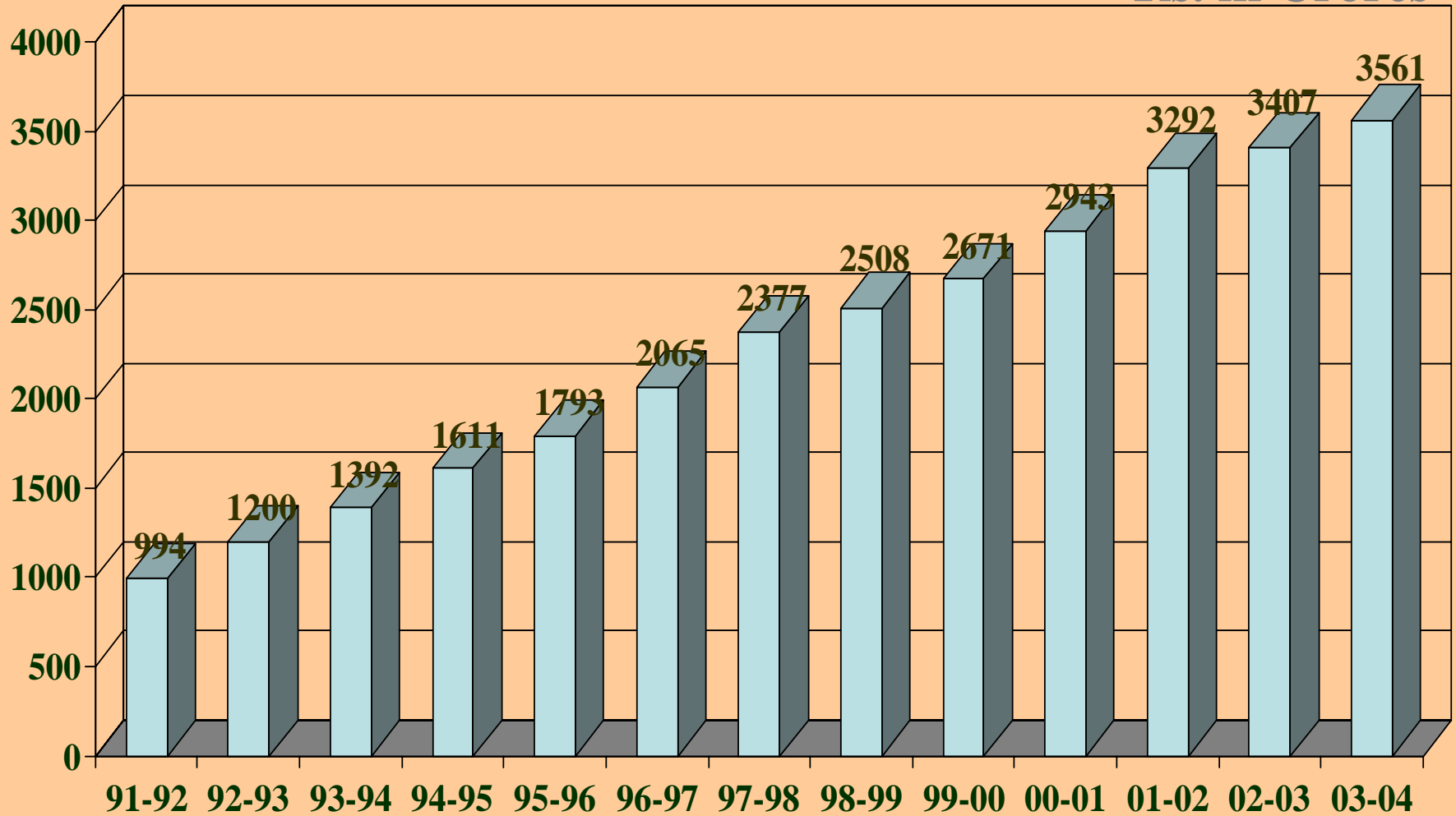
- CPWD has on its role nearly 8500 trained engineers, architects, horticulturists and other technical staff
- It has an annual turnover of about Rs. 34 billion
- It has an annual growth rate of about 4-5 percent
- Is considered to be one of the most respected public construction organisation

SECTORS OF OPERATION OF CPWD

- HOUSING
- EDUCATION
- HEALTH
- AGRICULTURE
- TOURISM
- SCIENCE & TECHNOLOGY
- CAMPUS DEVELOPMENT
- INFRASTRUCTURE
- SPORTS & CULTURE
- NATIONAL SECURITY
- INDUSTRY
- ENVIRONMENT
- AVIATION

WORK LOAD

Rs. in Crores



India fact file

- Area: 32,87, 590 Sq. Kms.
- Population: More than 1000 million
- Climate: Tropical in South to temperate in North
- Languages: 14 major languages & more than 100 minor languages & dialects
- More than half million villages, 4000 cities and towns – 300 having a population of more than 100,000

Importance of construction in India

- Second largest employment generator
- Contributes about 6-7 percent in GDP of the country
- More than 100,000 small and large enterprises involved in this field
- Considered as vehicle of growth in country
- Demand for infrastructure spurring growth in this sector

Project costs

The capital cost for a construction project includes the expenses related to the initial establishment of the facility:

- Land acquisition, including assembly, holding and improvement
- Planning and feasibility studies
- Architectural and engineering design
- Construction, including materials, equipment and labor

Project costs contd...

- Field supervision of construction
- Construction financing
- Insurance and taxes during construction
- Owner's general office overhead
- Equipment and furnishings not included in construction
- Inspection and testing

Operational & Maintenance costs

- It is equally important to estimate the corresponding operation and maintenance cost of each alternative for a proposed facility in order to analyze the life cycle costs
- The large expenditures needed for facility maintenance are required to be assessed to consider fully the implications of operation and maintenance cost in the design stage itself

Operational & Maintenance costs

The operation and maintenance cost in subsequent years over the project life cycle includes the following expenses:

- Land rent, if applicable
- Operating staff
- Labor and material for maintenance and repairs
- Periodic renovations
- Insurance and taxes
- Financing costs
- Utilities
- Owner's other expenses

Cost Estimation

- According to the American Association of Cost Engineers, cost engineering is defined as that area of engineering practice where engineering judgment and experience are utilized in the application of scientific principles and techniques to the problem of cost estimation, cost control and profitability.
- Cost estimating is one of the most important steps in project management.

Cost Estimation

- A cost estimate establishes the base line of the project cost at different stages of development of the project.
- A cost estimate at a given stage of project development represents a prediction provided by the cost engineer or estimator on the basis of available data.

Construction Cost Estimates

- Construction cost constitutes a substantial fraction of the total project cost
- The required levels of accuracy of construction cost estimates vary at different stages of project development, ranging from rough cost figures in the early stage to fairly reliable figures for budget control prior to construction

Construction Cost Estimates

- Since design decisions made at the beginning stage of a project life cycle are more tentative than those made at a later stage, the cost estimates made at the earlier stage are expected to be less accurate.
- Generally, the accuracy of a cost estimate will reflect the information available at the time of estimation.

Types of Construction Cost Estimates

- Construction cost estimates may be viewed from different perspectives because of different institutional requirements
- In spite of the many types of cost estimates used at different stages of a project, cost estimates can best be classified into three major categories according to their functions

Types of Construction Cost Estimates

- A construction cost estimate serves one of the three basic functions:
 - design
 - bid
 - Control

- Virtually all cost estimation is performed according to one or some combination of the following basic approaches:
 - Production function
 - Empirical cost inference
 - Unit costs for bill of quantities
 - Allocation of joint costs

Unit Cost Method of Estimation

- If the design technology for a facility has been specified, the project can be decomposed into elements at various levels of detail for the purpose of cost estimation
- The unit cost for each element in the bill of quantities must be assessed in order to compute the total construction cost.
- This concept is applicable to both design estimates and bid estimates, although different elements may be selected in the decomposition.

Unit Cost Method of Estimation

- For design estimates, the unit cost method is commonly used when the project is decomposed into elements at various levels of a hierarchy as follows:
 - **Preliminary Estimates**
 - **Detailed Estimates**
 - **Engineer's Estimates**

Estimates

- **Preliminary Estimates.** The project is decomposed into major structural systems or production equipment items, e.g. the entire floor of a building or a cooling system for a processing plant.
- **Detailed Estimates.** The project is decomposed into components of various major systems, i.e., a single floor panel for a building or a heat exchanger for a cooling system.
- **Engineer's Estimates.** The project is decomposed into detailed items of various components as warranted by the available cost data. Examples of detailed items are slabs and beams in a floor panel, or the piping and connections for a heat exchanger.

Cost Index

- A ratio between composite costs at one period of time compared to the same composite cost at the base year.
- The index number thus indicates the change in cost between the base year and the later date.
- The base year is the base reference point

Building Cost index in CPWD

- CPWD brings out construction cost indices for various locations in India at regular intervals
- These are used for estimation purposes only
- Calculation is based on 12 important inputs each being given a defined weightage

Inputs for building cost index

Sl. No.	Item description		Unit	Weightage
1	Bricks		1000 (in numbers)	10.50
2	Cement (OPC)		Quintal	14.50
3	Steel 50% small dia.(8mm -10 mm) 50% higher dia.(12mm-16mm)		Quintal	19.50
4	Aggregate (20mm size)		Cubic metre	7.00

Sl. No.	Item description		Unit	Weightage
5	Sand		Cubic metre	3.00
6	Paints			3.00
	(a) Synthetic enamel	50%	Litre	
	(b) Dry distemper	50%	Kg	
7	Ply and commercial wood		Sqm	5.00
	(i) 12 mm particle board	25%		
	(ii) 12 mm medium density fiber board	25%		
	(iii) Steel windows	50%		

Sl. No.	Item description		Unit	Weightage
8	Pipes (i) 15mm GI pipes (ii) 100mm HCl pipes (iii) 20mm black conduits	33.33% 33.33% 33.33%	Metre	2.50
9	Lamps & ceiling fans (i) Ceiling fans 48" (ii) 1200mm Fl. Fitting with single tube	50% 50%	Each	3.50

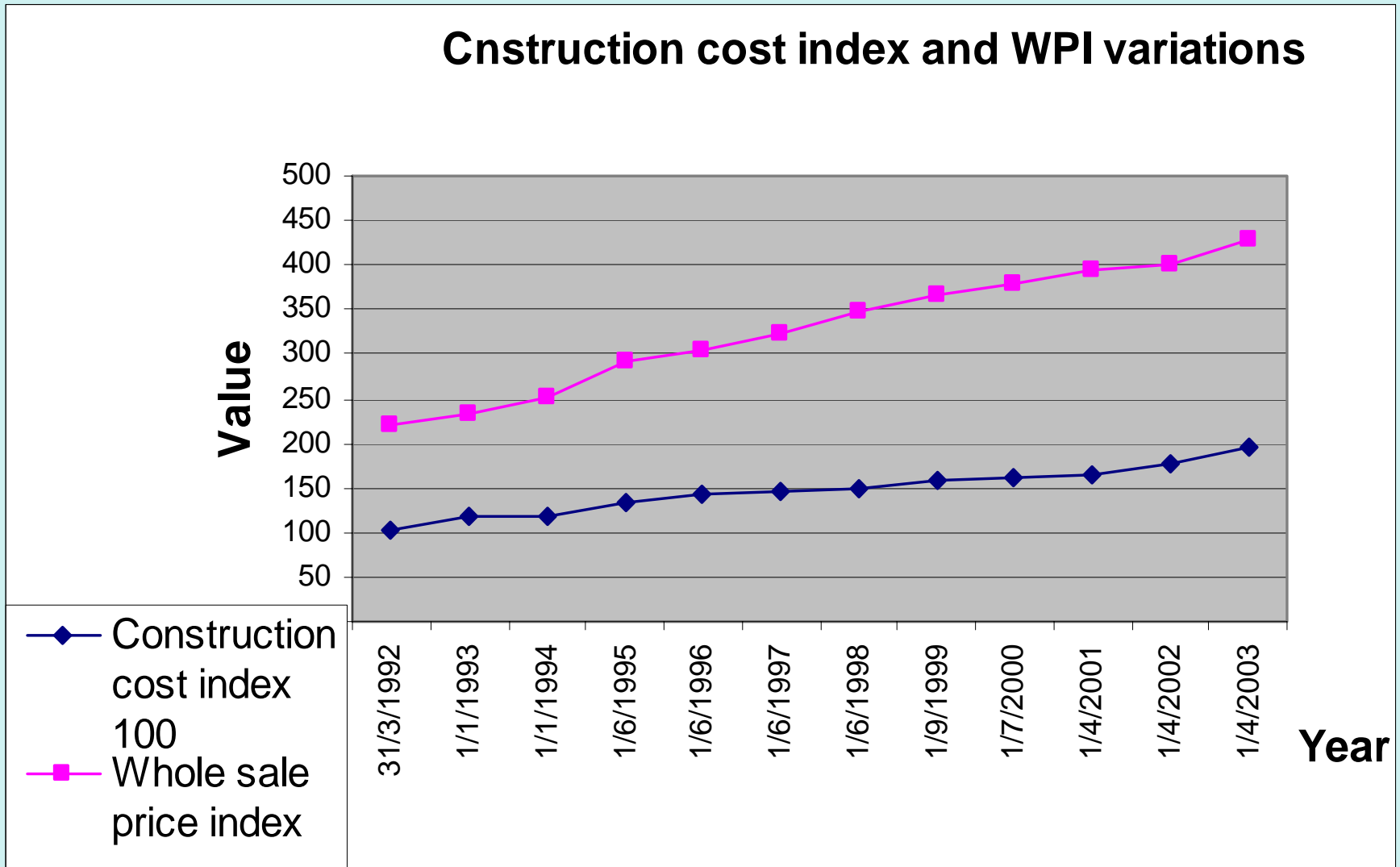
Sl. No.	Item description		Unit	Weightage
10	Electric machinery 7.5HP motors (1500rpm)		Each	2.50
11	Wires & cables (i) Wires (70% of 1.5sq.mm & 30% of 4.0sq.mm) (ii) Cables (300 sq.mm)		100 metre	4.00
12	Labour: (i) Unskilled (ii) Skilled	50% 50%	Each	25.00
	Total			100.00

Reasons for assigning weightages

The weightages adopted in the calculation of cost index have been defined on historical data for the type of construction being carried out and the technology being used

Proof of accuracy of building cost index

Cnstruction cost index and WPI variations



Application of building cost index

- It is used for preparation of preliminary estimates
- The cost of a project is estimated using a “Plinth area rate”-which is the unit cost of construction. This unit cost is then enhanced by the building cost index issued by the department to assess the current cost of production of a building

Other cost indices being used

- Maintenance cost index
- Construction cost index for payment of escalation

Cost index for maintenance estimates

- Maintenance cost index
 - Used for assessing the cost of maintaining a utility
 - This is based on a composition of 7 items consisting of labour 31.5% and materials required for maintenance such as lime/paint/cement etc.

Cost index for payment of escalation

- Payment of escalation for the following items is made by CPWD for works contracts
 - Labour
 - Steel
 - Cement
 - Other materials
 - POL

Cost index for payment of escalation

- Payment of escalation is made on basis of following formula:
- $$\text{Variation in component} = \text{Value of work done} \times (\text{value of component}/100) \times \{(\text{value of current index}-\text{base index})/\text{base index}\}$$
- Base Index is for date of receipt of bid and current index is for period for which escalation is to be paid

Shortcoming in cost index being used by CPWD

- The index is general in nature and is designed on basis of historical data for given type of buildings being built with specifications given in “CPWD plinth area rates”
- When applied to works having different specifications it does not yield accurate results
- Issue is being examined to bring out different indices for different types of buildings and types of methodology used for construction

THANK YOU